RADIO'S FOREMOST PUBLICATION

RADIO NEWS AND SHORT WAVE RADIO

FEBRUARY
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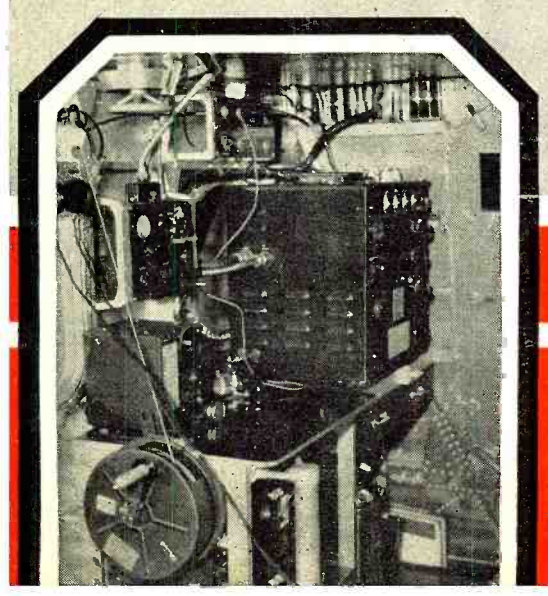
U. S. AND CANADA

How RADIO makes FLYING SAFE



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Service Work	Amateur Activity	Short Waves
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DX Reception	Electronics	Applications
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IS POSITIVELY BETTER WITH

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Every owner of an all-wave receiver wants his set to perform at maximum efficiency. He wants uniformly good reception — a minimum of noise. All this depends to a large degree on the type of antenna system used.

The new G-E V-Doublet All-wave Antenna System approaches the ideal more closely than any heretofore available.

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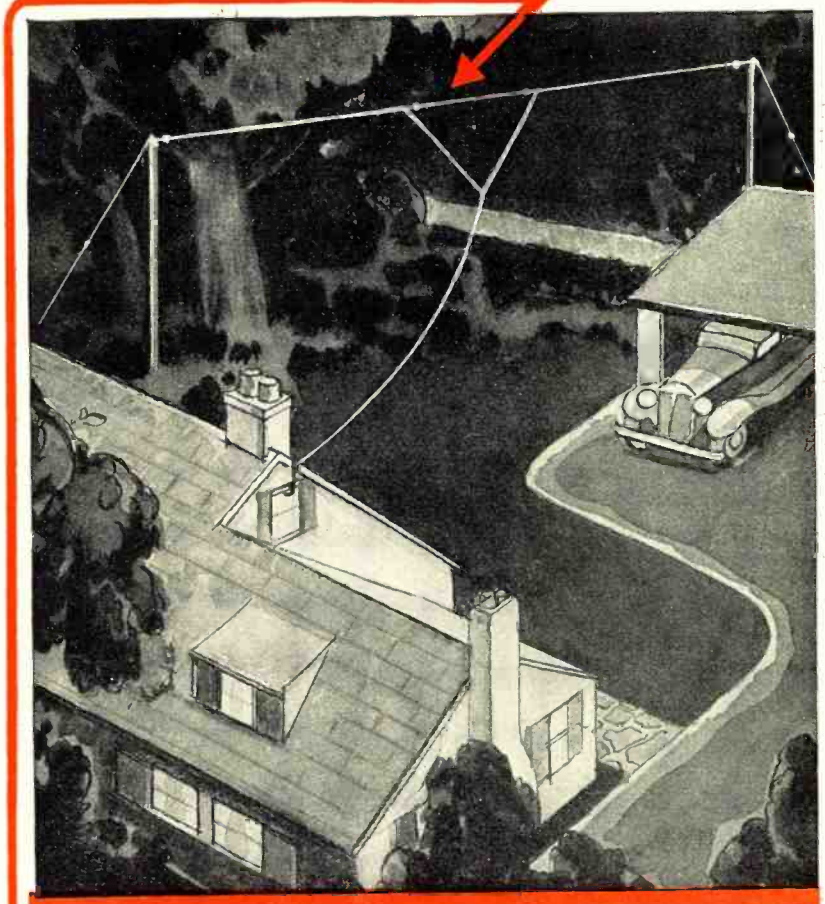
Price of antenna kit $5.95.



General Electric Company,
Merchandise Department,
Bridgeport, Conn. Attention: Sales Promotion Section

I am interested in the New G-E All-wave Antenna System. Without obligation on my part, I would like to have you send me details regarding it.

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J. E. SMITH, President, National Radio Institute, Washington, D. C.—the man who has directed the training of more men for the Radio industry than any other man in America.

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Many Radio Experts make $30, $50, $75 a week. Get ready Now for Jobs like these

Broadcasting stations employ engineers, operators, managers, and men for other jobs that pay up to $5,000 a year. Radio factories employ testers, inspectors, foremen, engineers, servicemen, salesmen, buyers, and pay up to $6,000 a year. Radio dealers and jobbers employ servicemen, salesmen, buyers, managers, and pay up to $75 a week. There are many opportunities to have a spare time or full time Radio service business of your own. Radio is picking up. It's a big business—big enough to absorb many more well trained men—and it's growing bigger all the time. Get ready for Radio. Be a Radio Expert. I'll train you at home in spare time.

Many make $5, $10, $15 a week Extra in Spare Time almost at once

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Short Wave, Loud Speaker Systems Television, Auto Radio, etc., included

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RADIO NEWS

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Vol. XVII February, 1936 No. 8

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Coming—

The New York and Westchester Listening Posts (both of which are licensed amateur stations) are now making a study of available ultra-high-frequency receivers operating in the range of 2½-10 meters. The receivers are being tested thoroughly and those passing the tests will be described, together with photographs and circuit diagrams, in the March issue. These ultra-high-frequency bands provide a great deal of interest for the short-wave listener, as well as the "ham," and this symposium should therefore be of value to readers.

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"The world shrinks again, as your engineering skill . . . has virtually doubled the range of reception heretofore available".—Robert Rossi, Philadelphia, Pa.

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"The 'crowded 49 meter band' is another story with the MASTERPIECE IV and its superlative bandspread arrangement. In one evening tuned in following stations (lists 27 stations on 49 meter band from approximately 5700 kc to 6600 kc) . . . almost all came in clearly without interference . . . that's selectivity!"—C. A. Pickett, St. Louis, Mo.

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"Simply amazed and delighted with the clarity and tonal range. Tuned in VK3ME—Melbourne . . . the volume was excellent with little static and no fading".—I. O. Thorley, Detroit, Michigan.

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We announce the following new features of the new MASTERPIECE IV for 1936:

Octal Sockets—All MASTERPIECE IVs are now equipped with the new eight-pin sockets which take either the new Octal-based glass tubes or (still inferior) metal tubes. This change does not mean, in any sense, that we recommend or accept present metal tubes. What it does mean is that if metal tubes later prove successful, your MASTERPIECE IV is ready for immediate change, simply by replacing tubes. Either way, you are assured that the MASTERPIECE IV which you buy now offers you the best in radio . . . today . . . tomorrow . . . next year.

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+Metal tube merit on short wave is indicated by a measurement made at 10 megacycles, or 30 meters.

Three MASTERPIECE IV tuned circuits alone showed an excellence of 220. Glass tubes connected to them dropped merit to 215—2.3% less. A large number of brand-new and good metal tubes connected across the circuits cut Q or merit to 185—a net loss of 16%! Time, with dirt and moisture would give an even greater loss for metal, but not for glass. 16% loss seems a lot to pay only for metal envelopes on vacuum tubes on short waves!

NEW EASY TERMS!

MASTERPIECE IV may now be purchased on liberal terms and paid for out of monthly income. Or, you may buy one of these superb receivers for cash at

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SILVER MASTERPIECE IV

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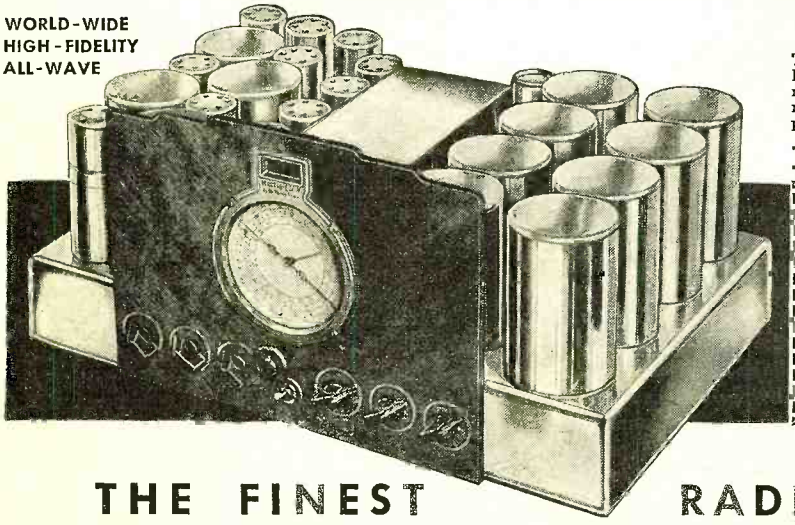

TRY IT FOR 30 DAYS

Try the new MASTERPIECE IV for 30 days in your own home or laboratory, under your own reception conditions. If it fails to meet your every expectation, return it undamaged and your money will be promptly and cheerfully refunded, less only transportation charges.

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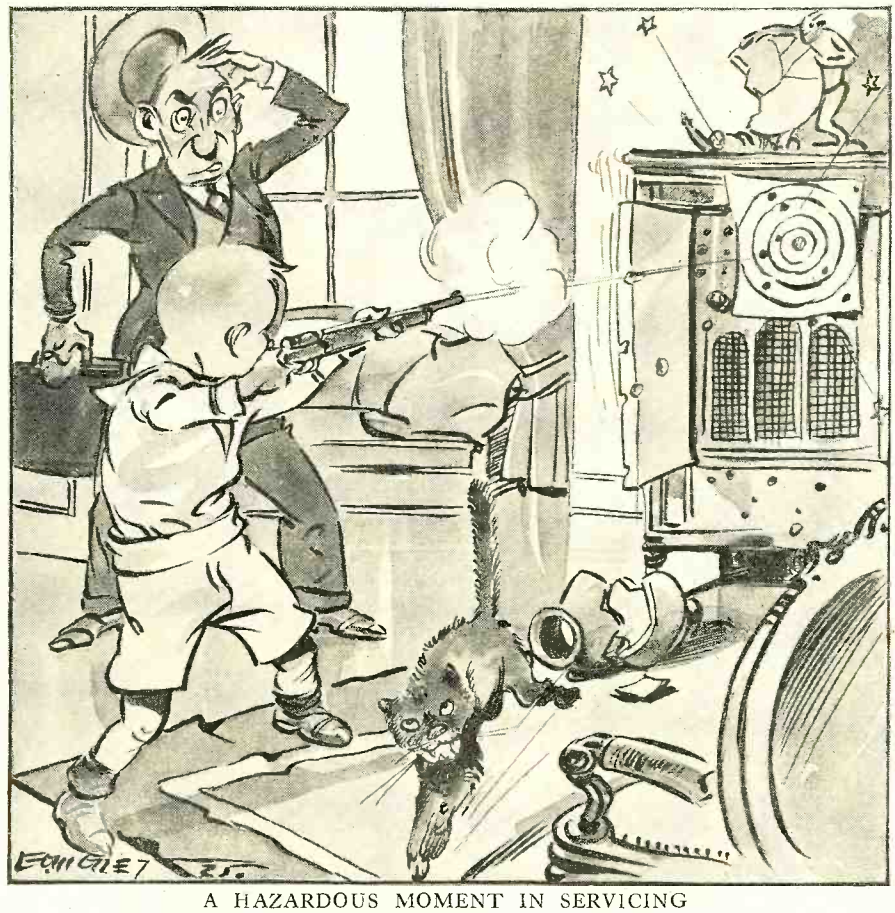
Pages From A Serviceman's DIARY



A HAZARDOUS MOMENT IN SERVICING

Our autobiographer relates an "incident" that called for all of his diplomacy and the utmost in speedy action for self preservation.

MONDAY—Off for a busy morning. Scooted around a traffic light (fast) and was stopped short by a sharp police whistle. Pulled over to the curb, all set for an argument. Up stepped a cop from nowhere. "Say, buddie, you fix radios, don't you? Would you mind dropping over to my house and looking over the set when you have time? Think it needs tubes. The old lady will pay you." What a relief! On my way again.

Number One. Swell apartment house. Maid ushered me into library. Skidded over scatter rugs, on waxed floors, to a Radiola 86. Examined front of cabinet, which was peppered with small indentations, apparently from buck-shot! Grille cloth damaged, likewise speaker cone. Tall, handsome lady entered. "Can you make my radio bullet-proof?" Suggested a new set, pointing out the superlative advantages of metal tubes in withstanding external as well as internal bombardments and the new acoustical labyrinth of Stromberg-Carlson, guaranteed to baffle even dum-dum bullets. "My son," she said, "has an air rifle and likes to pin his targets on the radio. If I forbid him to use the gun, he gets very angry. If I take his targets away, he may practice on the dog, the other tenants, or even the radioman!" Removed the chassis and power unit in a hurry, meanwhile suggesting that they might paint a target on a frying-pan, which would give a distinctive ring when hit. Arranged for a demonstration of new sets—at the store—found out *at what hours the young marksman was certain not to be home.* Stopped off at the building superintendent's office and inquired regarding the customer's financial and mental responsibility. A1—but great kidders!

Number Two. Large house on hill. Drove around to the rear and entered through the kitchen. Cook told me there were six radios in the house. Mrs. X led me upstairs, down the hall to a bedroom, where a Gloritone midget stood on the small table between the twin beds. Started to examine it, but she went on to an adjoining bathroom, beckoning me to follow, which I did with some hesitation. Found another Gloritone on the casement window-sill. Told me her husband was in the advertising business and had to listen to one program which always came on the air while he was shaving. Therefore the peculiar location of the set. Found the voltage divider open. Brought to shop for repair.

Anent Best Customers

After lunch, dropped into a little tumble-down shack near the store, climbed up a creaky stairway and down the hall to a bedroom where a Stromberg-Carlson 12 stood. Found dial drive sticking, removed chassis and drive assembly, greased with vaseline and replaced. Made arrangements with customer for good trade-in allowance on a new high-fidelity Stromberg. One of the best sales in months, which only adds to the proof that the best customers are seldom wealthy.

Stopped over at the cop's house. Majestic 70. Microphonic howl and speaker rattle. Replaced detector tube and cemented seam in speaker cone. Collected for tube but charged the service to goodwill.

Next—A short run over to the Italian section of the town. They are invariably great music lovers and will spend their last dime on the radio. Entered a small, dark room in a two-story house and found a Sparton 930, with children in front of it, in back of it and at various points of vantage around the room. Asked the mother what trouble she had been having with the set and she smiled and said, "Yes." Half a dozen of the youngsters immediately volunteered as interpreters while I proceeded to test the tubes. Found one 182 burned out and the other weak. Remembered I had no Sparton replacements in the truck, so substituted 71A's, which have nearly the same characteristics, explaining, through my interpreters, what I had to do and that these tubes would cost less. Clouds immediately appeared on the horizon, however. She wanted the identical replacements, regardless of cost, or none at all. Compromised by lending the 71A's until I could obtain the 182's. All serene again. Accepted a drink of Italian wine (which I don't like), as a matter of policy, and left.

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.

Wine and Service Do Not Mix

Off to the next call. Brunswick-Radiola 64 combination. Complaint, doesn't play. Switched on set. Operated, but quality of reproduction poor. Turned set around and found one 81 tube not working. Checked balance of tubes and installation. All OK. Replaced defective 81. Now operating OK. Turned off set and called customer to present bill. Received check and proceeded to demonstrate set performance again. Switched on radio. No reception. Moved set out again. Both 81's inoperative! Rechecked tubes in tube checker (with customer watching suspiciously). My new 81 N.G., customer's tube OK. Put customer's tube back in socket. N.G. again! "Apparently you haven't fixed my radio," she said, a little sarcastically. Returned the check and started to work in earnest. Removed 81 sockets and tightened all contacts. Replaced the same 81's. Same trouble. Finally the truth dawned on me. All three 81's had intermittently open filaments! Put in two more 81's, explained trouble to customer, asking her not to pay for same until we were satisfied that the trouble was permanently corrected (which probably saved her the trouble of telling me the same thing). Departed, resolving never again to taste wine during working hours and dreaming of furnishing cartons of 81's for targets for the youngster with the air rifle. Oh, me!

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SERVICE MEN!

HERE'S THE GREATEST TIME-SAVING, MONEY-MAKING IN-VENTION IN THE HISTORY OF RADIO TUBE TESTING!

The NEW DAYRAD patented INDEX SYSTEM

- IT REVOLUTIONIZES TESTING
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SERIES 20

DAYRAD TUBE TESTER *with patented* INDEX SYSTEM

Complete. Size 12 x 11 x 5½". Weight: 9 pounds. Walnut carrying case. Simple as A-B-C to operate. Speeds up testing operations 75%. Tests metal tubes, all octal base and is flexible enough for all future developments.

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In one stride, DayraD has forged ahead TEN YEARS with its new patented Index System. In one master stroke this new invention SIMPLIFIES TESTING, STIMULATES TUBE SALES, BUILDS CUSTOMER CONFIDENCE.

With the Index System even the customer can test his own tubes—and without the possibility of an error! A turn of the index wheel gives complete settings. No unhandy charts to fuss with, to lose, to get smudged and torn. Set the three control dials as indicated—then make your test!

Meanwhile, you test THREE tubes in the time you would ordinarily spend on ONE! And you discover faults, dozens of them, that less sensitive testers never indicate!

The INDEX SYSTEM is only one of many exclusive DayraD features—features that mean greater flexibility, increased sensitivity, hair-line accuracy, ease of operation on the job. To learn more about the advanced engineering now offered you in ALL DAYRAD PRODUCTS mail this coupon. Mail it today!

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My Jobber's Name.....

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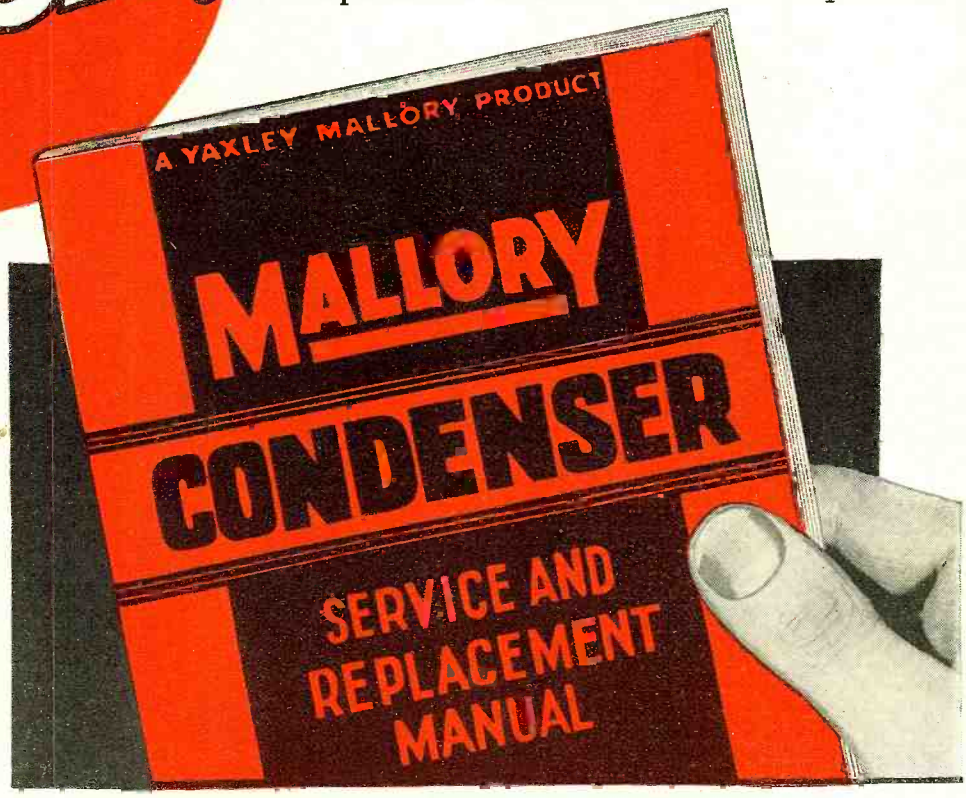
scoops the industry again!

The book you've hoped for is here! Through the co-operation of service men the country over Mallory presents the first thoroughly comprehensive service and replacement condenser manual ever published.



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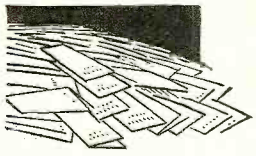

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Two years' careful study of questionnaires in which 29,789 service men presented their condenser problems! Two years of painstaking research, compilation, testing and proving! Two years of hard work to make *your* work easier, more accurate—more profitable. Every page proves this new Mallory Manual as valuable—as indispensable—as the other remarkable handbooks that preceded it.

The Mallory Condenser Service and Replacement Manual lists thousands of sets and shows you how to service them with a mere handful of replacement units. It answers all your questions. It solves all problems. Page by page . . . it will save you hour after hour! You won't want to be without this book a minute longer than it takes us to slip your copy in the mail. And you can't afford to miss the information it contains about the new *universal* Mallory Replacement Condenser Line. Mail the coupon now!

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Please send me a free copy of the Mallory Condenser Service and Replacement Manual.

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Radio News

February, 1936

With RADIO on the STRATO FLIGHT

(Radio, 72,395 Feet Up)

A little over a year ago the author told the story of the flight of the Explorer I, in reaching a height of 60,613 feet and the successful part radio played from start to finish. This year the same author covers the record-breaking flight of the Explorer II made by Captains Stevens and Anderson

By **Samuel Kaufman**

BROADCAST listeners and short-wave enthusiasts had a day of unexpected thrilling radio experiences when the two United States Army fliers, Captains Albert W. Stevens and Orvil A. Anderson broke all altitude records in the stratosphere flight of November 11. From the time the Explorer II left the Strato Bowl near Rapid City, South Dakota, until it safely landed at White Lake, in the same State, listeners on standard broadcast and high-frequency channels were first-hand observers of a true drama of the skies.

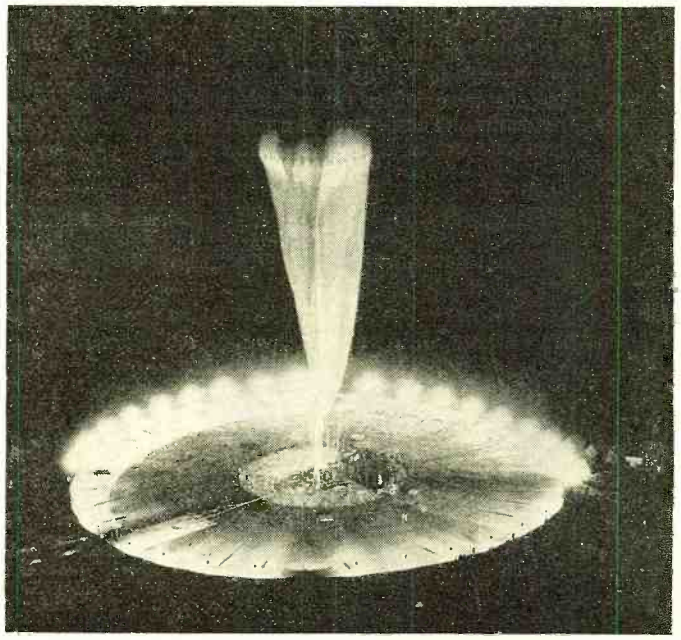
Short-Wave Drama

The short-wave listeners had a bit of an edge on the broadcast-band audience because they were able to hear the entire exchange of conversations between the gondola and land stations, whereas the National Broadcasting Company networks' rebroadcast only used selected portions of the conversation.

Science hailed the flight as a stupendous achievement. In rising to the confirmed height of 72,395 feet, Captains Stevens and Anderson bettered all previous marks, including the Russian record which ended fatally for the fliers. The 1935 stratosphere adventure was jointly sponsored by the U. S. Army Air Corps and the National Geographic Society. This was the same sponsorship as the 1934 stratosphere attempt of the same fliers, which almost ended disastrously when the gasbag disintegrated at a great height and the balloon plunged to earth at terrific speed. The crew, however, parachuted to safe landings and patiently awaited the opportunity of another stratosphere penetration.

JUST BEFORE THE TAKE-OFF FROM THE BOWL

Explorer II, world's largest balloon, being inflated under the glare of floodlights at Rapid City, South Dakota, before the start of the record-breaking ascent.



Thrills Galore

There was another disappointment for the fliers when the contemplated spring, 1935, flight was balked due to difficulties with equipment. So, with a few months to make adjustment, the two intrepid airmen waited the sign of favorable weather for the

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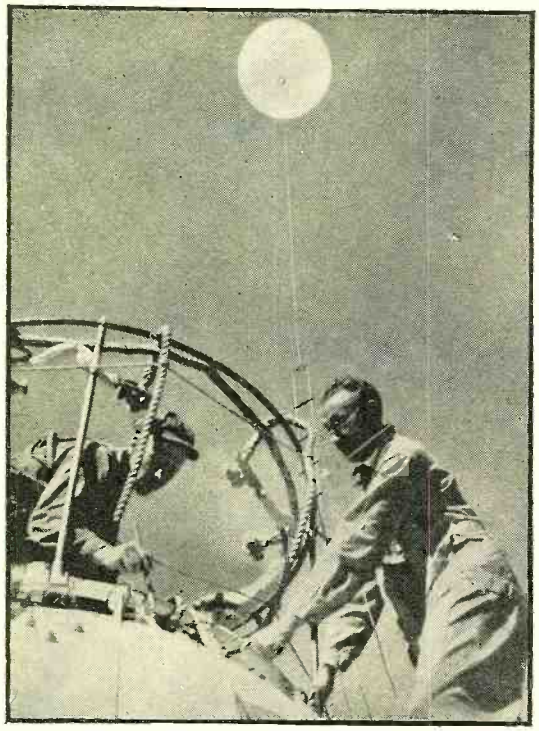
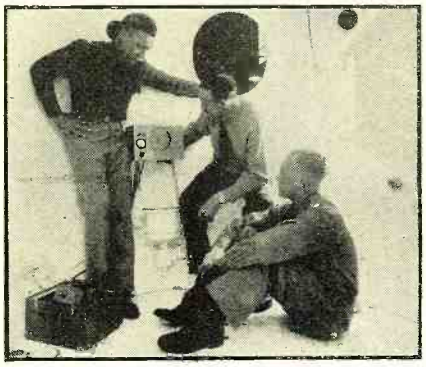


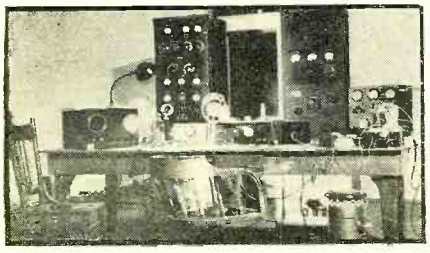
TESTING THE SHORT-WAVE TRANSMITTER

Captain Stevens shown erecting the balloon antenna on the gondola, above. Below: Tuning the transmitter installed inside the gondola



LAST-MINUTE PREPARATIONS

Above: Captain Williams, in charge of ground operations, and the two pilots discussing plans. Below: The set-up of the short-wave ground station



bold and dangerous ascent.

Listeners had many breathless moments, especially at the take-off and landing—disaster threatened. The rocky wall of the strato camp base was cleared by just about fifty feet in the ascent. When word was flashed that the balloon was diving towards earth at a speed of 500 feet a minute, it seemed serious to some listeners, but it settled on the White Lake farm land in as perfect a manner as could be expected, with the fliers and equipment out of danger.

8 Hours in the Air

The balloon cleared the natural bowl at 9 a.m. and landed at 5:13 p.m., Eastern Standard Time. RADIO NEWS Short-Wave Listening Post Observers in all parts of the Continent reported clear reception from the balloon throughout the day. Telegrams from listening posts reporting contact with the balloon were received at the editorial offices of this magazine just a few minutes after the take-off.

One of the most thrilling portions of the stratosphere program occurred when Captains Anderson and Stevens held a conversation, while at a height of more than 35,000 feet, with William Burke "Skeets" Miller, of NBC, who was flying in the Pan-American plane China Clipper off the California coast, and also with a newspaper man in London, England.

The Rebroadcast

The signals from the balloon and the China Clipper were picked up by the two separate receivers at the RCA Communications station at Point Reyes, California. The signals were sent to the NBC control position at San Francisco, where they were balanced. From this West Coast control point the voice of Miller in the China Clipper, and the conversations of the army men in the balloon were fed to the combined NBC networks. Then, from the main NBC control room at Radio City, New York, the conversation was sent by wire to a short-wave station in New Jersey for relaying to London.

When the conversation between the balloon and the China Clipper was completed, the entire network was immediately reversed to New York. At Radio City, the announcement was made that a journalist in London desired to talk to the stratosphere explorers. The newspaperman's voice was flung across the Atlantic to a short-wave station at Netcong, New Jersey, and then routed by phone lines to the Radio City control room for relay, via short-wave stations, to the balloon.

A two-way conversation, lasting approximately five minutes, followed the swift arrangements. In London, the *Morning Telegraph* went to press with a full text of the short-wave conversations immediately after the transmissions.

Due to some fading at the Point Reyes reception point during the China Clipper and Explorer II conversations, the NBC receiving point at Chicago was utilized for the two-way conversation with London.

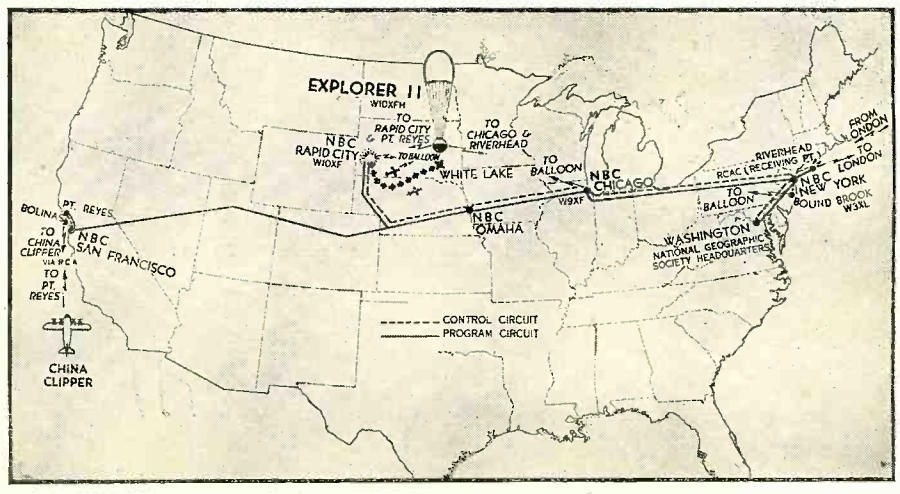
A Radio Achievement

The set-up for the amazing series of stratosphere broadcasts was intricate, indeed. William Lundell, NBC director of special events, spent thirty-eight hours without rest, organizing and directing the stratosphere program. He sat at his special listening post in Radio City, where he could contact all coöperating transmitting and receiving points. Here, he had to quickly decide on which portions of the transmissions should be relayed to the network audience. An engineer, sitting alongside, carried out the technical phases of the swift shift-overs.

RCA-Victor and NBC engineers cooperated in the design and construction of gondola radio equipment for the Explorer II. The (*Turn to page* 500)

DETAILS OF THE FLIGHT

Map showing the special NBC land-wire and radio circuits, used during the flight, to allow the pilots to talk to the listening public on short and long waves and also to hold conversations with the China Clipper, flying off the Coast of California, and with the editor of a London daily newspaper speaking from London, England



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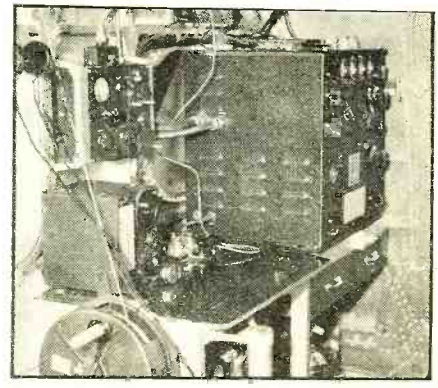
How Radio Makes Flying SAFE

New radio devices that enable aviators to literally "fly the ether waves" from a starting point directly to their destination and that eliminate the hazards of taking-off and landing are the latest contributions of radio to the art of flying—private and commercial

By **Laurence M. Cockaday**

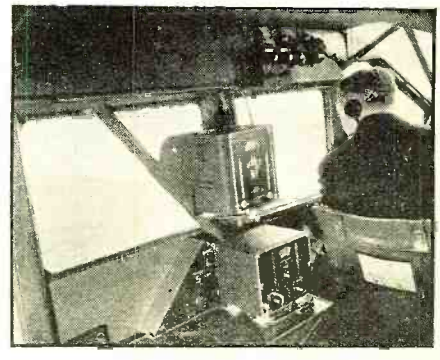
THE "HOMING" COMPASS

Remote-control plane of the Coast Guard Service seen through the loop equipment on a similar plane. Below: Some of the equipment.



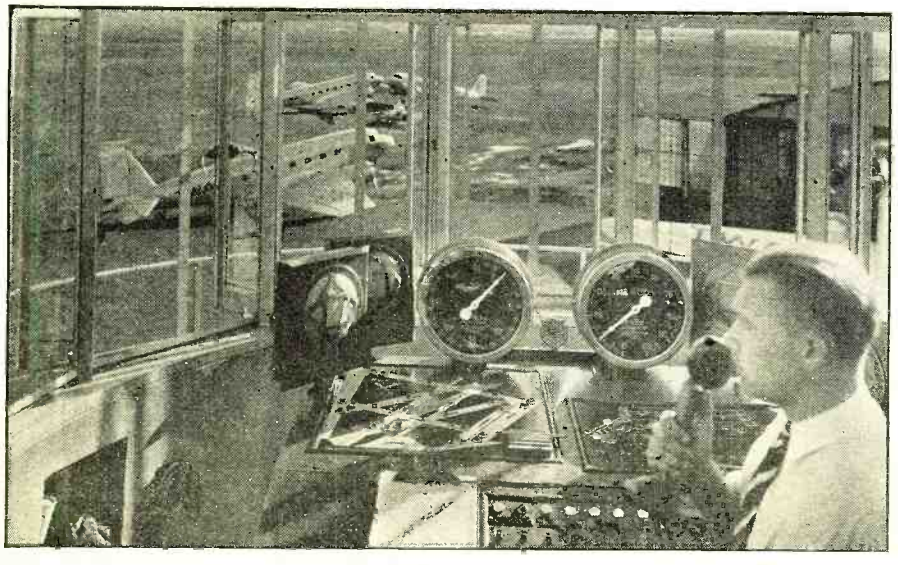
DIRECT CONTACTS WITH GROUND

Above: Pilot receiving orders while approaching an airport. Below: Receiving and transmitting equipment for the private flyer.



NEW radio equipment designed for the Commercial Transport flying services, for the Army-Navy services and for Private Pilots (so called itinerant flyers) is today making flying safe and eliminating the hazards of bad weather conditions, fog and nighttime flying. One of the recent developments, a new "homing" radio compass, enables the pilot to literally fly the ether waves, emanating from a beacon or a fixed broadcast station, all the way from a starting point directly to the transmitting antenna towers. This system employs visual indicators for the receiving apparatus and indicates directly on the plane's instrument panel the proper course to fly to arrive at a chosen destination. New radio transmitters and receivers of featherweight construction are now available for private flyers to enable them to take advantage of Department of Commerce long-wave radio services for the reception of weather information along the route, for the regular aural beacon services and for direct communication to airports throughout the United States. One type of receiver enables the pilot to receive regular broadcast entertainment in the intervals between picking up weather reports or beacon signals, when flying a familiar course.

The latest of these developments, the "homing" compass, types of which have been made available for aviation by the Western Electric Company, the Fairchild Aerial Camera (*Turn to page* 478)



TRAFFIC CONTROL AT AIRPORTS

Looking out of a traffic-control tower at the Newark Airport. W. J. Conrad is directing the take-off and landing of planes by radio. The dials in front of him indicate wind speed and direction, and the loudspeakers bring signals from planes arriving at or leaving the field. He tells them when to start or to land.

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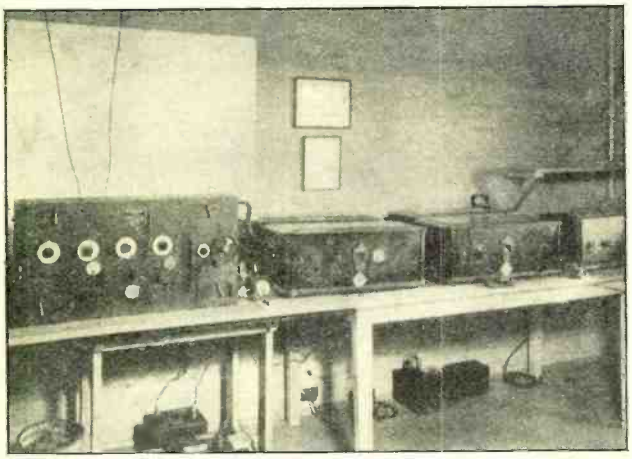
FREQUENCY MODULATION

ARMSTRONG'S
(For the Reduction

The latest attack upon the radio "noise" Major Edwin H. Armstrong, Professor of versity, after a period of research covering fessor Armstrong's solution to this problem been predicted that this invention will be

By Dale



RECEIVING INSTALLATION

A view of part of the set-up for a receiving installation using the new Armstrong system of frequency modulation at the home of George Burghard at Westhampton, Long Island. The remainder of the installation is shown in the photograph below.

SINCE the problems connected with the elimination of electrical disturbances are complex, it might be expected that a successful solution would also be complicated. Such is the case with Armstrong's invention; so many new ideas are included that it may be some time before the principles are widely applied. In these articles, the new system of communication will be described, with an explanation of the means by which disturbances are reduced. The first article will treat the fundamentals of frequency modulation, and will describe the transmitter which has been designed for obtaining frequency modulation, leaving for the second article a description of the receiver and an explanation of the reduction in disturbances which is obtained by the use of the system.

It will be desirable to discuss briefly the kinds of disturbances which cause interference with radio communication. The first of these is atmospheric disturbance, or "static." The effects of static are well known, the amount and type observed being dependent upon geographic location, time, frequency and weather conditions. One important fact should be noted, namely, that, as the frequency is increased, the magnitude of static disturbances is reduced, until, at very high frequencies, the amount of static is small. Advantage is taken of this phenomenon by the Armstrong system, which functions at frequencies above 30 megacycles.

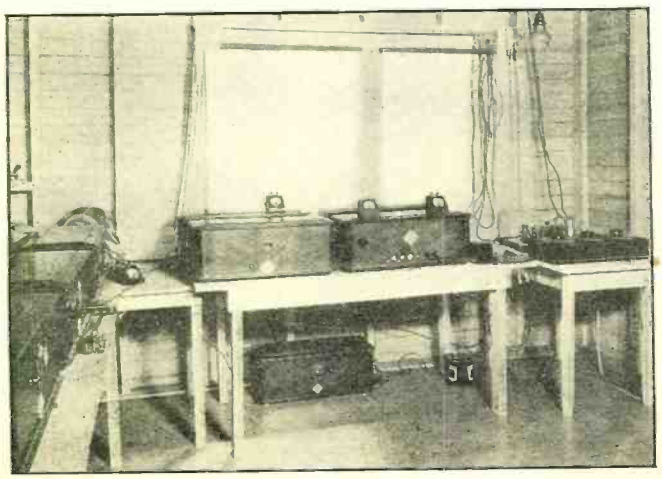
"Man-Made" Radio Noise

There is another type of disturbance, on the other hand, which is of considerable magnitude at very high frequencies. This is man-made noise, and, since it can often be eliminated directly, has received considerable attention during recent years. Automobile ignition noise is especially troublesome at these high frequencies with the ordinary system of communication, but this is bound to become less objectionable *when the use of suppressors on automobiles becomes universal!* Tube noise is also important at high frequencies, and is the factor which limits the distance over which transmission can be accomplished with the usual system at frequencies above 30 megacycles. The intensity of such noise is greatly reduced by the system to be described, as will be explained later in this article.

Station Interference

Interference between stations on the same or on neighboring frequencies is also a common type of disturbance, which is encountered at all frequencies. A different kind of disturbance, which must also be mentioned, is that which results in fading of the signal. Fading effects are now understood more clearly than formerly. Much of the trouble from this source can be eliminated by the use of automatic volume control, and, in commercial circuits, by diversity reception.

The last type of disturbance to which radio communication is subject is known as "selective fading" which results from interference between the ground waves



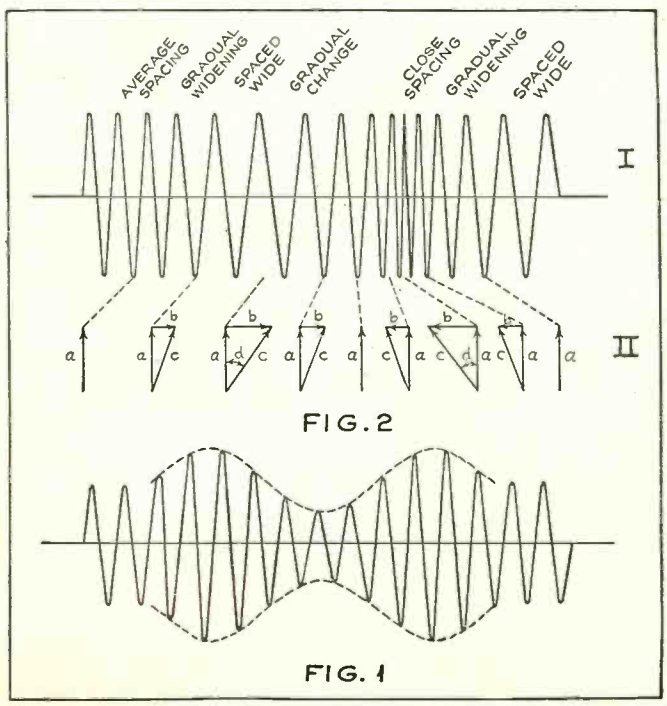


FIG. 2

FIG. 1

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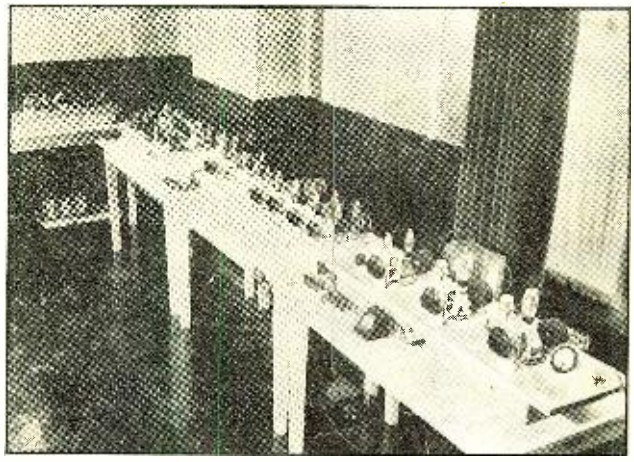
ON ULTRA SHORT WAVES

INVENTION

of Radio Disturbances)

problem has recently been announced by Electrical Engineering at Columbia Uni- many years. From present indications Pro- appears to be a complete one, and it has one of the important steps in the radio art

Pollack



ORIGINAL APPARATUS SET-UP

This view shows a number of the various circuits for the original transmitter that was installed for tests at the Empire State Building in New York City. These circuits employ mostly receiving tubes.

and the sky waves from the same transmitter. A peculiar type of frequency distortion due to this phenomenon can be observed at distances from 50 to 75 miles from a broadcast transmitter.

The Armstrong Method

Many scientists and experimenters have worked on each of these interference problems, with varying degrees of success. In particular, hundreds of "static eliminators" have been invented, as an examination of patent literature will show, but most of these have failed to achieve the desired result, due mainly to a misunderstanding of the nature of the problem. Some effective steps have been taken to minimize certain types of disturbances, however, a notable example being the application of the diversity reception principle.

Professor Armstrong has approached the disturbance problem in a novel manner, returning to the use of frequency modulation, a method of communication which had previously been considered inferior to present means of transmitting signals. The solution which he proposes, in its briefest terms, is to employ a wide-band, frequency-modulated system at very high frequencies. In addition, a new method of transmitting and receiving frequency modulated signals has been invented. Since some of the conceptions involved, in dealing with frequency modulation will be unfamiliar, the fundamental principles will be discussed in some detail.

The Fundamentals

The usual radio transmission is "amplitude" modulated. That is, the *amplitude* of the carrier frequency is made to vary in accordance with the modulation frequency, usually at an audible rate. This is illustrated by the familiar diagram of Figure 1. Up to the point "A" the carrier is unmodulated, beyond this point amplitude modulation is applied. Mathematically. if Figure 1 represents the instantaneous current in the antenna circuit of a transmitter, then the current, at any time (t), is given by the following trigonometric equation—

$$i = I(1 + m \sin 2\pi ft) \sin 2\pi Ft \quad (1)$$

where i = instantaneous current
I = peak amplitude of unmodulated carrier
F = carrier frequency
f = modulation frequency
t = time
m = (percentage modulation) /100

This is equivalent to

$$i = I \sin 2\pi Ft + \frac{m\,I}{2} \sin 2\pi(F-f)t + \frac{mI}{2} \sin 2\pi(F-f)t \quad (2)$$

The last two terms are in the side bands, and have frequencies equal to the sum and difference of the carrier and modulation frequencies.

In "frequency" modulation, on the other hand, the amplitude of the carirer is unchanged, but the *frequency* of the carrier is varied. Figure 2. represents the instantaneous current in a frequency modulated system. "I" is the pictorial representation (*Turn to page* 499)

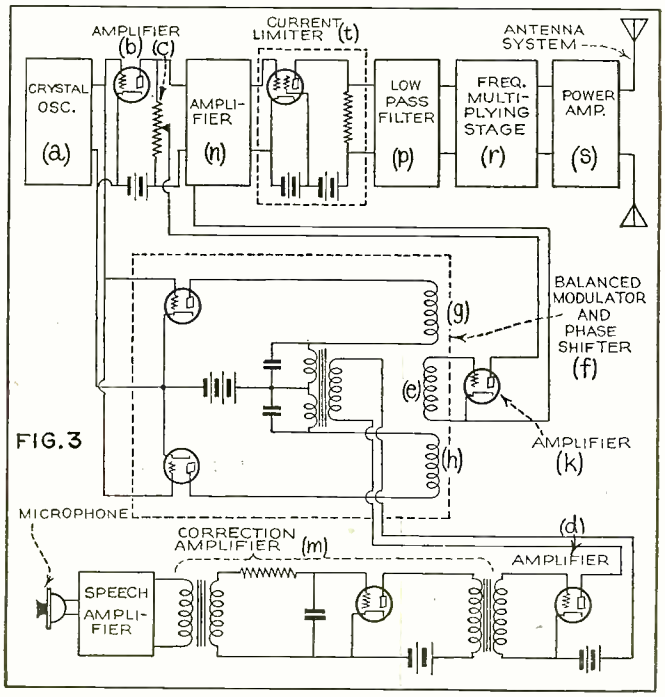


FIG. 3

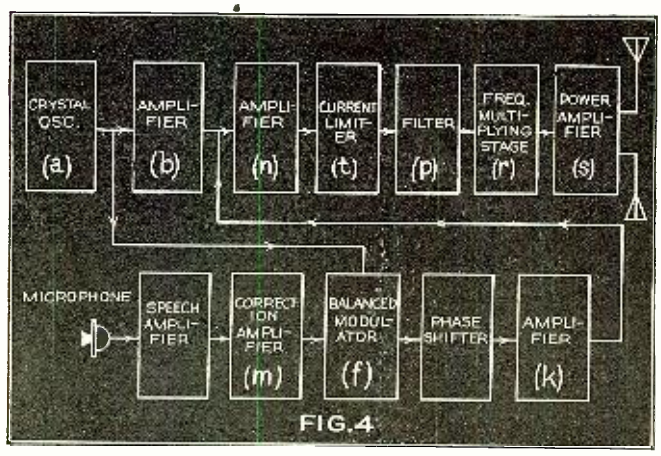


FIG. 4

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FORECASTS

What about all these rumors that television is soon ment of the ultra-high frequencies for television and short waves continue making progress as a medium What about metal tubes? Are they here to stay? proceed in the United States? Will radio broadcast- directly or indirectly? These are some of the questions ing radio authorities. Next month's issue will contain

Television in Six Months

By Philo T. Farnsworth

Television is making an orderly progress toward early commercial use. Within a few months, perhaps six at the most, several television stations will be operating on an experimental schedule with a fairly consistent time schedule of operation, so that it will be possible for amateurs to build their own television receivers, and to receive excellent television pictures. Standardization as to the number of lines, the number of pictures, etc., will probably then be decided upon without much more than a few months delay. Whether it will be practical then to start commercial broadcasting can only be conjectured at present, but in my opinion it is probable that as soon as standards have been accepted by the industry, commercial broadcasting will commence, at least, in a few key cities.

The market for television receivers should be present as soon as commercial broadcasting is started, and it is a certainty that receivers will be available the moment any adequate market develops. The corner which television is supposed to be "just around," therefore, seems to me to have its greatest curvature at the point where commercial broadcasting begins.

Short Waves Making Whole World "Neighbors"

By E. H. Scott

Viewing the shortwave radio field in a reminiscent frame of mind, I am tempted to look back on those pioneer days of 1928 and 1929 when the reception of foreign shortwave stations was an unusual event, rather than the regular daily occurrence that it is today. It is with no small degree of wonderment that I consider what possibilities lie in its future. In my opinion, no other accomplishment of man has done more to bring about a better understanding among the peoples of the earth than shortwave radio. No longer are Englishmen, Americans, Germans, or Italians strangers to each other, but have become familiar neighbors to each other, though thousands of miles of land and water separate them. I believe that shortwave radio is the answer to the accomplishment of a Universal brotherhood of man closely knit together by common understanding.

Vocational Training by Radio

By M. H. Aylesworth

What is the future of radio in education? It would be as easy to guess at the future of civilization, for radio today is one of the most powerful educational forces we know. Through it the American people, adults as well as children are receiving practical aid in such fields as finance, home economics, health, vocational training; they are becoming informed on problems of government and economics and current affairs; they are following history as it is being made. The National Broadcasting Company is doing its part by reaching into every field of listener interest; trying to do the best possible educational job in the home as well as the school. We shall continue those efforts, trying to foresee future needs, and adapting our programs to meet them.

Short-Wave Radio in the Home

By Lloyd Hammarlund

With the increased brilliant musical and topical programs, which have been made available daily from short wave stations throughout the entire world, every one is becoming "Short-Wave Minded," and accordingly, on their toes in their search for perfected short wave radios for receiving international programs. Such precision instruments will further promote listener interest and add impetus to the lively parade of short wave enthusiasts during 1936. Short wave reception will soon be as important a factor in the homes of the world as general broadcast reception is now.

Television as an Educational Medium

By Dr. Alfred N. Goldsmith

For centuries education has depended upon words spoken by teachers or words placed on the printed page for most of its training. People learn mainly through the senses of sight and hearing. Radio offers an excellent opportunity in the future to teach by both these methods. Telephone broadcasting appeals to the ear; facsimile broadcasting will be an adjunct to the present text book; and television can adequately supplement pictorial illustrations by clear depiction of scenes, persons, experiments and other valuable educational material.

Amazing Development of Ultra-High Frequencies

By Arthur H. Lynch

It is very likely that the wave length area below ten meters will be developed in most amazing fashion for all forms of communication during the next five years. Consistent operation of our own high frequency stations, over ranges heretofore considered impossible, form the basis for our optimism. The present work being done on the ultra high frequencies has already shown progress which indicates that the history of most other portions of the ether is likely to be repeated. As the wave lengths for radio stations were lowered, the range was generally very limited until the development of transmitters and receivers came up to the requirements of a new set of conditions.

Mechanical Scanner Best for Television

By Lee De Forest

Realizing the hazards of prophesy, especially considering all the traditional predictions for television, I venture the opinion (based on careful study and observations both here and abroad) that home television by cathode beam will never become commercially satisfactory. Limitations inherent in the cathode tube (fragility, short-life, high-cost, sensitive electrical controls, fundamentally small pictures) will prevent this. But a practical, reliable, noiseless, simply serviced, low-cost mechanical scanner, giving fine picture detail now exists whereby commercial home television will enter a million metropolitan district homes, affording screen pictures four to nine square feet with acceptable brilliance.

M. H. AYLESWORTH

E. F. W. ALEXANDERSON

DAVID SARNOFF

E. H. SCOTT

A. N. GOLDSMITH

J. G. HARBORD

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for the Year 1936

due to "turn that corner"? How far will the develop- other communication advance during this year? Will of communication as well as home entertainment? Into what channels will the radio service business ing advance further as an educational force either considered and answered by some of America's lead- another installment continuing these prognostications

Television and Ultra Short Waves

By E. F. W. Alexanderson

Tests of ultra short waves within recent years in Schenectady have proven the superiority of sound reproduction in that wave range. A third chapter in the use of radio is thus probably near at hand, supplementing for new purposes the present service in long waves and international short waves. This will undoubtedly open up new fields for the use of radio such as television. As a matter of fact, research to such ends is being done in radio laboratories in all parts of the world.

Radio an Educational Force

By Bond Geddes

In addition to music and other entertainment, information and religion, education is an established feature and function of radio. Fortunately this has been recognized by broadcasters from the beginning of radio. A large and proper share of broadcasting facilities and time has been accorded to educational features. The broadcasting interests have learned how to present educational features and make them more interesting and palatable to the public.

Metal Tube Here to Stay

By Powel Crosley, Jr.

The metal tube situation is somewhat similar to that of four wheel brakes when they were first introduced. Metal tubes have proved outstanding in quality and performance. They make possible more efficient design of both tubes and radio sets, greater durability, much greater precision, and perfection in manufacturing. The fact that metal tubes are less than half the size of their glass equivalents gives the engineer more flexibility in design. The metal tube has proved itself. It is here to stay.

Complicated New Circuits Give the Service Engineer Greater Opportunities

By A. D. Davis

The development of complicated radio circuit designs and particularly the advent of the 8-element metal tube, has given radio servicing a true professional dignity. There is rapidly arising a skilled group of servicemen who are engineers in every sense of the word. This new era of radio servicing has enlisted the invaluable aid of such ingenious instruments as the cathode-ray oscillograph, neonized tube testers, etc., which have been specifically developed to cope with the complicated new circuits. Today, the outlook for the progressive radio service engineer is a bright one: he can truly be a specialist because he has available to him modern testing equipment at all price ranges; today also, with the proper will and endeavor, he can make of his profession the profitable and specialized one it was intended to be.

Facsimile Research Aids Television

By James G. Harbord

Seeing a man who is talking to us from a distant city, as if he were speaking face to face, seems a nearer possibility today than sending a telegram across an ocean without wires did on the eve of Marconi's first transatlantic test . . . What we have learned from television research has aided facsimile research and what we have learned about facsimile has taught us many things about television.

5 k.w. Television Transmissions in the Spring

By William Hoyt Peck

A mechanical scanner, capable of producing pictures using from 180 to 1000 lines, and automatically synchronized with any transmission, is perhaps the most revolutionary advance in television which we plan to present in 1936.

One model of the new receiver will utilize a 1/100 h.p. motor and a three-inch reflecting-lens disc, weighing about five ounces and producing a 14 x 16-inch picture, composed of 180 lines. This receiver is expected to retail, complete in a console with an all-wave radio sound receiver, for about $225.00

Our Canadian company is now building a 5 kw. transmitter to be used in broadcasting both motion picture film and direct pick-up, whether studio or outdoor events. It will operate on 6 meters over the Company's station, VE9AK, and modulate a band of 1,000,000 cycles. This transmitter will be in operation early in the spring of 1936.

Short-Waves as a Peace Medium

By McMurdo Silver

To say that short-wave receivers today bring the world to millions of American homes is to state a self-evident fact. The result of such daily world-wide contacts cannot fail to make for a better, more peaceful and more prosperous world. This aspect is evident today, and the avoidance of European war is in large measure the first evidence of the tremendous human effects of world-wide short-wave radio. With the homes, from which fighters must be drawn, daily informed on all sides of every international question, the era of peace on earth and goodwill to men is not inconceivably distant.

We Are Going to Have Television!

Some quoted remarks by David Sarnoff

We are going to have television. The people in this country are demanding it and as you may have noticed whenever the public demands anything in the way of a service it generally gets it. Television will in many respects revolutionize broadcasting . . . actors will really have to act and, as no scripts can be read, they will, of course, have to be letter-perfect in their parts before they go on the air . . . television reception is not, can not be, like sound reception. Today radio is used as a background for other entertainment or by the housewife who turns the button and listens to the music while she goes on with her work. Television can never be like that because not only will it require close attention on the part of the onlooker, but also it will be necessary for the room to be somewhat darkened.

(*Turn to page* 507)

A. D. DAVIS

McMURDO SILVER

B. P. GEDDES

LEE DeFOREST

J. F. RIDER

POWEL CROSLEY, JR.

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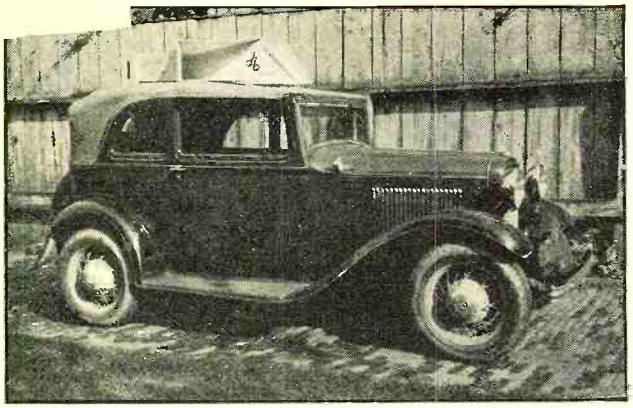


PORTABLE PUBLIC ADDRESS ON A CAR

Figure 3. This sport convertible is equipped with a portable P.A. system. Notice the modernistic streamlined speakers on the top.

The SERVICE

The serviceman today is at last address work is recognized by him sideline. The Service Bench is have been deterred from going into an expensive

Conducted by

REGARDLESS of expense, an intelligently operated P. A. service will soon pay for itself. However, the first cost of an effective system is not necessarily high and any serviceman who has afforded a good analyzer cannot afford to be *without* public-address equipment. The apparatus described below is well within the pocket-book limitations of most servicemen. Additional details regarding an inexpensive initiation into the profitable P. A. field will be found in this month's *Serviceman's Prize Contest.*

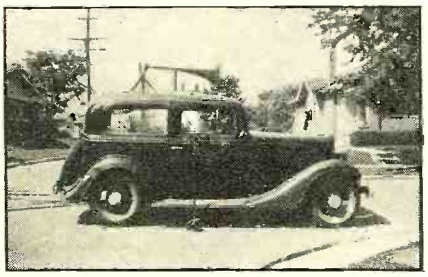
A P.A. System Built With Receiver Parts

DON BLAIR, of Franklin, Pa., sends us the description of a battery-operated, public-address system built entirely of inexpensive auto-radio receiving parts. The wiring diagram, Figure 1, and the plan layout, Figure 2, are practically self-explanatory, and tell most of the story. Essentially, the equipment consists of two separate amplifying and loudspeaking systems, with independent high voltage sources, a common low voltage supply, microphone and crystal pickup which can be input to either or both amplifiers. Mr. Blair describes the high-voltage source as motor-generators, but we are inclined to believe that they are dynamotors, such as the "Genemotor". The designer supplies the following supplementary notes: "The battery supply is rated at 8 volts instead of the usual 6 volts, and a voltmeter and rheostat are so arranged that the voltage supplied to the amplifiers, under load, can be held at 6.3 volts until the batteries are completely exhausted. This system also makes it possible to increase the input power, for short intervals when more sound is required. The safe limit here is 7.5 volts for the type of auto-radio parts used in these amplifiers. The total current drain at 6.3 volts is 10.6 amperes. Switches are provided so that the tubes can be kept heated while the plate supplies are turned "off," thus keeping the battery drain at minimum.

"Two different types of amplifiers have been used. The first is a straight

A $25 HORN? NO—$2.75!

Figure 5. An economical P.A. horn installation atop a motor car that costs less than $3.



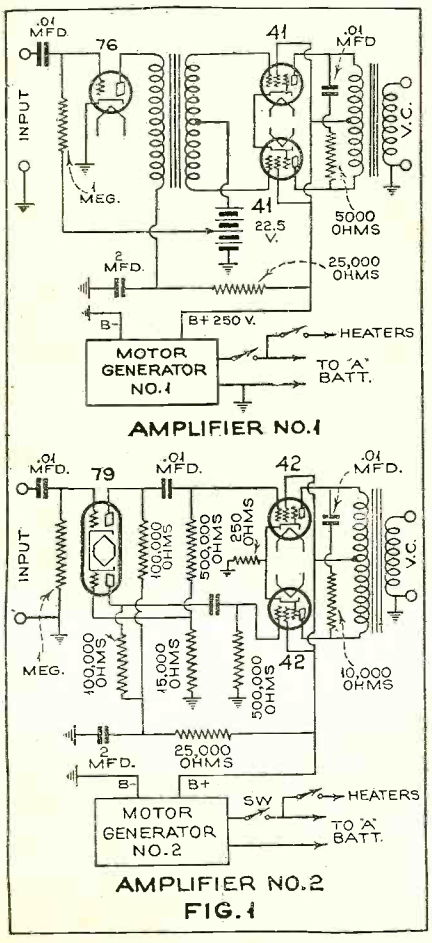


FIG. 1

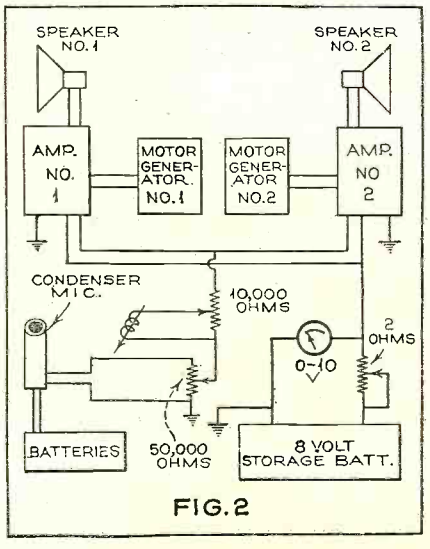
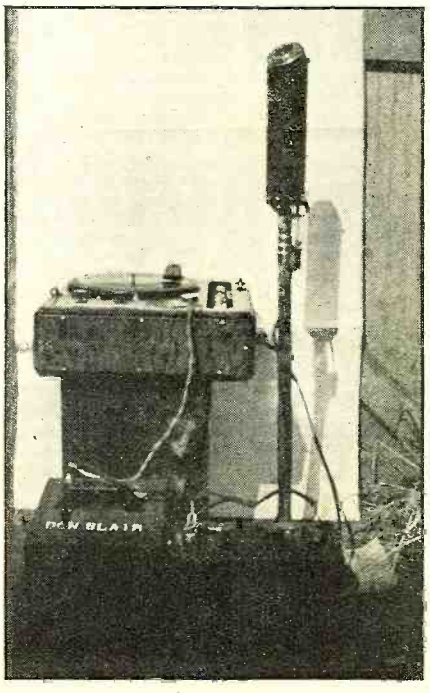


FIG. 2

A PORTABLE OUTFIT COMPLETE

Figure 4. Compactness, light weight, effectiveness and low cost are the features of the P.A. outfit.



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BENCH

thoroughly P.A. conscious. Public- as both a logical and a profitable dedicated to those servicemen who the P.A. field by considerations of first investment

Zeh Bouck

Service Bench Prizes

RADIO NEWS is offering five cash prizes of $10.00, $5.00, $4.00, $3.00 and $2.00 each month for photographs and descriptions of service shops. We and our readers are as much interested in seeing *where* you work as in knowing *how* you work. Elaborateness will *not* be the deciding factor. Ingenuity and neatness will count the highest. Send in your Service Bench photo. Describe your equipment and anything unusual you have done with it in 200 words or less. All material used will be paid for, whether prize-winning or not. Address contributions to, yours for better servicing—

THE SERVICE CONTEST EDITOR.

push-pull unit employing a 76 and two 41s, with a midget 22.5-volt C battery for fixed bias. The second amplifier is a phase inverter unit with a 79 and two 41s. The first amplifier has a higher output, but the second is more compact and the quality is superior at high output levels.

"Ordinary 50-milliampere, 250-volt motor-generators ("Genemotor" makes one, battery drain 4.5 amps at 6 volts, and the price is $10.88 at the mail-order houses. Editor) of the type recommended for auto-radio replacements are used, and after two season's wear and tear are still running as smoothly as ever.

"The 8-inch permanent-magnet speaker units, with light-weight plywood horns, will handle a full 7.5 watts apiece, and seem just as sensitive as units drawing 10-watts field supply. The horns, as will be observed in Figure 3, are made in a modernistic stream-lined design, and provoke considerable curiosity and interest whenever seen (Hardly an exponential horn, but should give excellent sound distribution and adequate loading. Editor). By using two separate amplifiers and power supplies, the chance of a complete failure in the field is greatly lessened. Also, full 15-watts output is obtained with low cost receiver parts."

The complete set-up, with the exception of the speakers, is shown in Figure 4.

An Inexpensive Trumpet Horn

An adequate horn for a P. A. system will often represent a considerable part of the original investment. Merrill Lindley, of Indianapolis, Ind., tackles and solves the problem as follows: "I obtained a wooden horn from an old Victor phonograph for $1.50. These horns can be found in junk shops and phonograph repair places. I had a local mechanic make me up a long-necked funnel at a cost of $.75, and the brass neck connecting the funnel to the unit set me back exactly six bits. Thus the total cost was $2.75, which is a lot better than $25 to $30. The quality, throwing power and amplification are on a par with commercial designs. The photograph of Figure 5 gives a good idea of the horn, and shows a convenient wooden framework which makes it possible to mount the speaker on the top of any sedan."

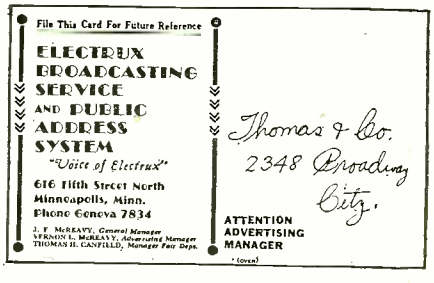
Merchandising the Public-Address System

A public-address system is a white elephant unless you can *sell its service!* We have in the past given considerable attention to the commercial end of sound work, and reiterate that advantage should be taken of every legitimate form of advertising and publicity within reason. The first and second prize winners in this month's service prize contest have some vital things to say in this respect.

The card, in Figure 6, is an excellent example of what can be done in the way of solicitation by mail. The obverse side carries a half-tone reproduction of a large sound-truck which is described as "A Traveling Billboard Day or Night (Electrically Illuminated at Night)." Additional reading matter states—"A $10,000 sound-truck for all occasions day and night, with the most up-to-date sound equipment in the United States. For portable and permanent installations of every description. A real sensational attention compelling advertising medium." The card is attractively printed in red and black, and may be enclosed with a letter or mailed by itself as a postal.

AN EFFECTIVE CARD

Figure 6. Soliciting by mail with a card as shown below will help build up your P.A. business.


File This Card For Future Reference

ELECTRUX BROADCASTING SERVICE AND PUBLIC ADDRESS SYSTEM

"Voice of Electrux"

616 Fifth Street North
Minneapolis, Minn.
Phone Geneva 7834

J. F. McKEAVY, General Manager
VERNON L. McKEAVY, Advertising Manager
THOMAS H. CANFIELD, Manager Fair Days

Thomas & Co.
2348 Broadway
City.

ATTENTION ADVERTISING MANAGER

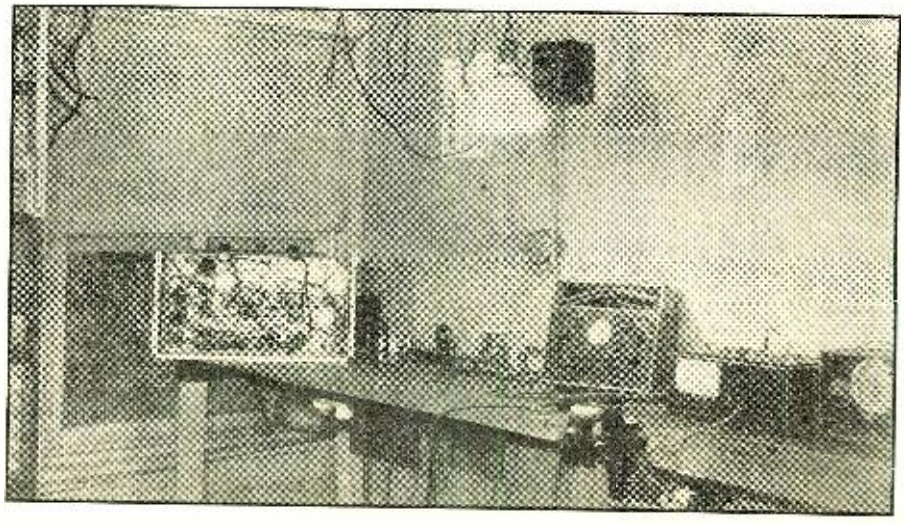
(over)

THIS MONTH'S SERVICE SHOP

Ralph Mellon sends us the photo of his service shop shown in Figure 7. His shop has been selected this month for several reasons—plenty of light, knee and elbow room, and particularly because while Mr. Mellon has been making a living at radio servicing exclusively for the last six years in this shop on the third floor of his home in Pottstown, Pa., he has been able to do so *without elaborate* (*Turn to page* 489)

SIMPLEST SERVICE BENCH

Figure 7. Cost has been minimized in this Bench, which is merely a place to work, by the use of portable equipment that can be stored in cabinets and that also does duty in the field.



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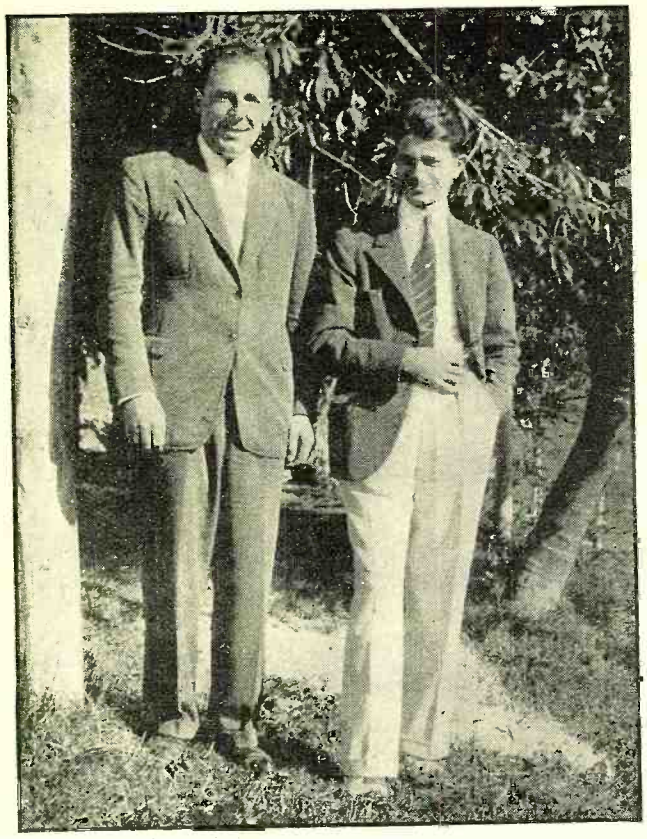
"SELLING

Radio servicemen today are one of the most in this country. Perhaps that is because they the past few years by tube and receiver test instrument manufacturers, all of whom knowledge. Even the lone independent remote rural district has acquired an

By A. A. Ghirardi



STUDIES SERVICE CONDITIONS ABROAD

Alfred Ghirardi, with S. A. J. Deloso in a garden in Milan, Italy, during a trip through Europe for studying service conditions. Mr. Deloso was formerly chief engineer of a well-known radio corporation in America.

IMPORTANT as the technical side of radio is to service work, technical knowledge and the best equipment alone do not assure financial success for the independent serviceman. He can offer the best service in the world, but unless he also learns how to "sell" it to the members of his community—*and sell it at a profit!*—he will never make very much money in his business. The old story about the man who can make a better mouse-trap, having a path beaten to his door may have been true years ago in the mouse-trap business, but any man in the radio service business who waits for customers to wear out his doorstep just because he feels that he is a top-notch serviceman, will very likely have his doorstep carried away by his *creditors* before its paint is even marred.

It is to help the thousands of servicemen who realize this important condition, but who do not know just exactly how to go about "advertising" and "selling" their service profitably to their community, that this article is written.

The first article in the series (which appeared in the December issue of RADIO NEWS), reviewed the various practical selling methods which are open to the radio sales and service shop and considered Counter Selling and Outside Canvassing. We will continue from this point:

The "Approach" in Outside Canvassing

In outside selling you cannot, of course, expect everyone you call on to be a prospect—only a percentage of your calls will turn out to be real prospects. But you must remember that sooner or later almost every one who owns a radio set will need service. The important thing on your first call is to make a contact—to get *in* and get *known*. Whether your first call is profitable or not, it may lead to business in the future, or it may provide you with an opening for the sale of some appliance you carry as a side line.

Pay careful attention to the time of day at which you make your calls. Nine until eleven-thirty, and two until four are good times in many communities. Your experience will soon tell you what your best times will be. But don't call when the housewife is preparing lunch for the kiddies, or is at the height of her housework.

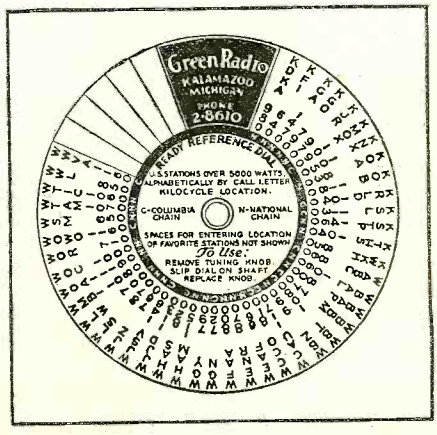
Give some real thought to the "approach" which you use. As you know, housewives are continually besieged by canvassers, so much so that they automatically put themselves in a negative frame of mind when they open the door—just for self-protection. In order to get her interest at all, you must "pack a wallop" in your first few words— or else you'll find yourself facing a closed door again. Avoid generalities and commonplace expressions and don't waste her time. *Get to the point at once!* The best possible kind of approach is to make the prospect some tangible, specific offer or proposition that appears to be a little different from what she usually hears. Here are a few opening phrases and ideas along this line that are used with success by servicemen:

You may open your conversation with, "Good morning. Is this Mrs. Blank (or Mr. Blank)? I am Jones the neighborhood radio man, and am:

(1) *"Making a check-up on radio*

STATION LOGS ARE POPULAR

To the right and left are two types of station logs that can be given away to service prospects and can bear the imprint of the serviceman's organization. These logs are useful and are kept by the set owner in a handy place. If anything goes wrong, the reference comes in handy. The log book on the left is furnished by the Hygrade Sylvania Corporation and the circular log on the right was developed by Mr. A. O. Green.



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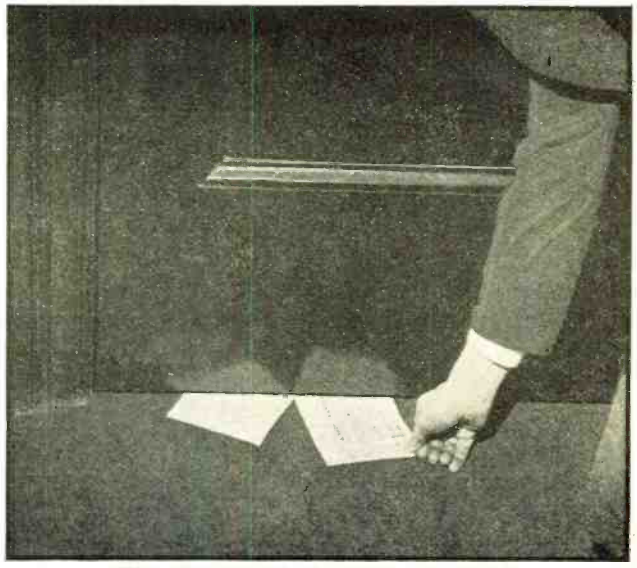
SERVICE"

"education-conscious" groups of technicians have been "hammered" at so much during manufacturers, servicemen's organizations, are anxious to have them increase their radio serviceman operating "on his own" in some amazing thirst for technical radio knowledge

and T. S. Ruggles



THE PROSPECT WASN'T AT HOME

The question posed by this illustration is, "Will this service card left by the serviceman be kept or thrown away?" The text of this article gives good advice regarding cards left at the door.

sets." (You can generally get a lot of useful information on a check-up of this kind. After you get talking a bit with the housewife you will find it easy to swing the conversation into the subject of a tube test, a set check-up, or service).

(2) *"Making a service survey."*

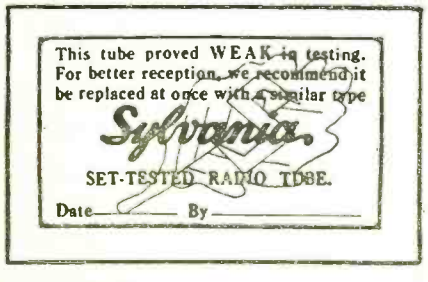
(3) *"Making a noise survey in connection with all-wave sets."* (This often leads to the installation of an all-wave noise-reducing antenna system, line filters, etc.)

(4) *"Making a free inspection."* (If you use this plan, have some impressive-looking forms printed. You can call them "Report of Condition". Fill them out and sign them. Even if you don't get an authorization to proceed with the repairs, your prospect will have this written report to show her husband and to act as a constant reminder if the set needs some repairs or new tubes. It will also be useful to refer to when you make a personal or telephone follow-up. Keep a carbon copy of the Report in your file for future reference).

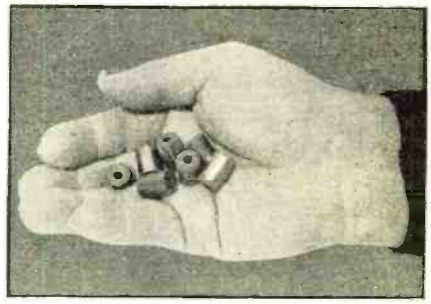
(5) *"Making a courtesy call to all new residents in the neighborhood."* (Offer to help them install their radios and make necessary adjustments at a special price—as a neighborly courtesy. There are few people who will not appreciate an act of genuine helpfulness such as this. You can count on them (*Turn to page* 498)

USING COURTESY STICKERS

Below are shown two courtesy tube stickers obtainable at low cost from the manufacturers. The name, address and phone number can be printed on these. They act as silent "ads" for the service organization.



METAL CORES *for* R. F. COILS



By Frederick Siemens

A NEW metallic core material designed for r.f. and i.f. coils, has just been announced by Henry L. Crowley & Company. It is understood that many outstanding receiver manufacturers will use the Crolite Magicores —as the core units are named—in new models.

The metallic core replaces the usual air coil design. The new alloy cores are said to increase selectivity 2¼ times over corresponding air-core coils, double the gain and cut the power factor in half. Such gains, it is claimed, can be used for better performance with the usual bulk and number of tubes. One prominent advantage is that it facilitates the construction of small receivers.

Another claim is that the metallic cores can show the way to permeability tuning. Also in the radio field's constant climb to higher and higher fidelity, involving higher frequencies than can be handled satisfactorily with the usual laminated-core type of audio transformers, the new metallic cores afford another improvement in general efficiency over resistance-coupled amplification, the manufacturer states.

After considerable research and the subsequent elimination of many methods and materials, the designers chose a magnesium ferrous alloy as the ideal high-frequency core material. To these finely divided alloy particles, a suitable binder and insulator body was applied.

Instead of moulding or pressing, as with resinous binders, the high-frequency core material is forced through a die under tremendous pressure to be formed in any desired lengths. In accordance with ceramic practices the lengths are then cut into small pieces and fired at high temperature. The standard "Magicore" is ½-inch long by ⅜-inch diameter, with a ⅛-inch center hole. Additional dimensions can be met, however.

For standard r.f. or i.f. transformers or coils, two cores are usually required. These are separated by a gap determined by windings and other factors. Coil dimensions, due to greatly augmented gain, may be reduced for a still more compact chassis. This feature also may become useful to the makers of motor car, aviation and portable receivers.

The new cores, while chiefly intended for use in new types of receivers, can be introduced into existing sets and, in addition, offer interesting possibilities with experimental hook-ups.

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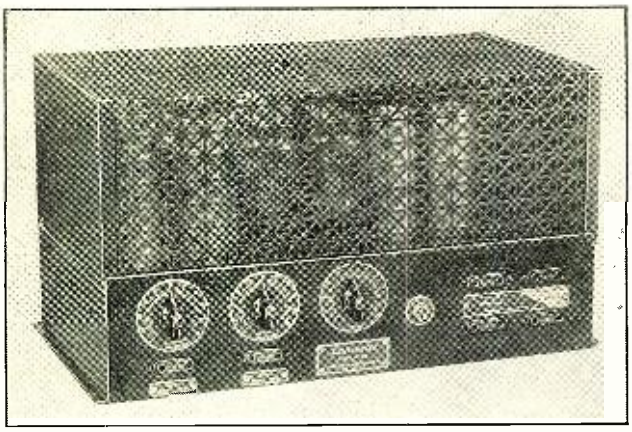


Some New and Efficient

PUBLIC ADDRESS

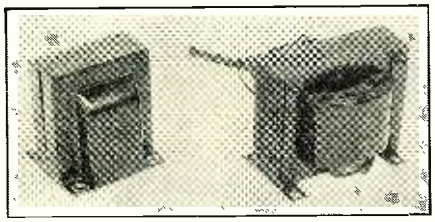
Amplifiers, Microphones,

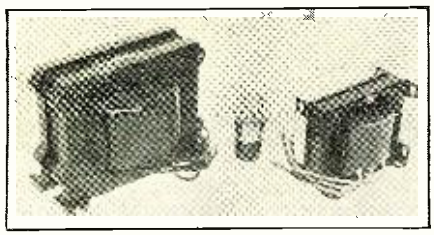
***By* William**

THE most expensive thing in public-address work is an amplifier or other part that breaks down the day the equipment has been rented for a public meeting, dance festival or other occasion which the owner counts on to repay perhaps one-quarter or one-third of the total cost of his apparatus.

The importance of an occurrence of this kind can hardly be exaggerated. The unfortunate owner of such equipment loses much more than his fee for that particular occasion. He inflicts deep disappointment on the sponsors of the affair, who may have put in a great deal of hard work toward making it a success and who will feel little inclined to trust him again when they have another occasion for using public-address equipment. In addition, word of the mishap is likely to spread through the community and other potential customers are likely to feel equally distrustful.

It is the truth that one undersized transformer in a P.A. amplifier can cost its owner enough business to pay for the whole amplifier ten times over. Yet in spite of this fact there is an unfortunate tendency toward building public-address equipment of radio receiver parts designed and intended for use in the home. This is, however, a tendency scrupulously avoided by manufacturers who have a reputation to maintain, and know that a customer who has been successful in the rapidly growing business of renting P.A. equipment will soon have need for a second and third system. The two photos below contrast the large transformers used in this amplifier with typical undersized units.





An example of public-address amplifiers built of special, oversize parts throughout is the Lafayette Model 260-A, recently designed by the writer. Of 25 watts rated output, this amplifier weighs approximately 50 pounds, as compared with numerous present-day amplifiers of equal rating which, built of receiving parts, weigh only about 30 pounds. The difference will be found in the transformer iron, in the cross-section of choke and transformer wire, and in the heavier construction of every minor part, from resistors and sockets to the chassis frame that grounds out hum.

Using Oversize Parts

With oversize parts throughout, it was found possible to include in this amplifier many unusual precautions against hum and noise, as well as against breakdown. The transformers, for example, are specially wound to avoid inductive pickup. They are also carefully positioned with the same object in mind, while the extra-heavy chassis, in addition to stiffening the entire assembly against the normal accidents of rough-and-tumble P.A. work, provides a very low-impedance ground in which eddy-current effects are kept at a minimum.

One exceptional feature of this amplifier is the use of a separate filter system to provide grid-bias for the power output stage. This arrangement utilizes one 8- and one 16-microfarad condenser at either side of the power stage grid supply choke coil, and permits the grids to be driven highly positive without upsetting the stability of operation. In consequence, although the power output of four 2A3's is 25 watts to a 500-ohm line, and 38 watts peak, the maximum harmonic content of the amplifier is only 5%.

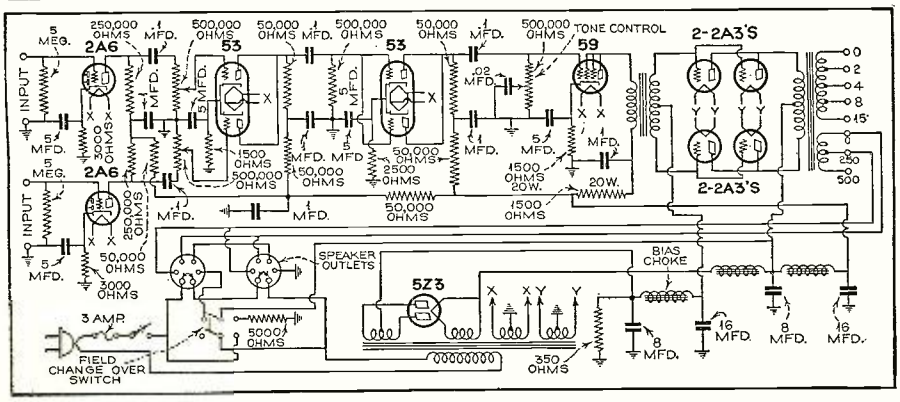
Experience has long since proved to the writer that two requirements are outstanding in connection with present-day public address work: one is sufficiently high gain to permit direct operation with a velocity or sound-cell (crystal) microphone without clumsy and troublesome separate pre-amplifiers; the other is a low-cost mixer built into the amplifier, avoiding the necessity for a separate and inconvenient mixer panel. But mixing at a level 124 db. below the output of the amplifier could not possibly be made noiseless! The solution was ultimately found in the use of two 2A6 tubes, one in each input channel, as built-in pre-amplifiers ahead of the mixer. A 53 tube, its grid separately connected to two 500,000-ohm potentiometers, serves as the electronic mixer and simultaneously adds to the gain of the amplifier.

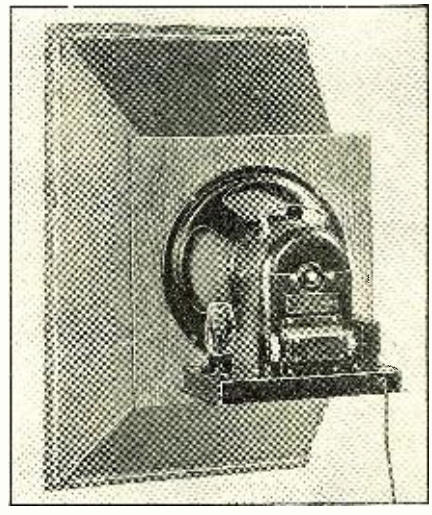
A second 53, triode-connected, is capacitively coupled to the mixer output, and feeds through condenser coupling into a 59 operating as a tetrode driver. The input to the control grid of the 59 includes a 500,000-ohm potentiometer and a .02 microfarad condenser as tone control. The output of the 59 is transformer-coupled, for greater gain and stability, to four 2A3's in push-pull parallel. The power output of the 5Z3 rectifier is sufficient, in addition to the requirements of the amplifier, to supply 25 watts of filtered d.c. for speaker field excitation, which can be switched in or out of use as occasion warrants.

The frequency response obtained is flat within two decibels from 50 to 10,000 cycles.

This amplifier was designed to fill all the requirements of an ultra-modern, medium-power, high-fidelity P.A. amplifier. For use in connection with an orchestra, two

(*Turn to page* 504)





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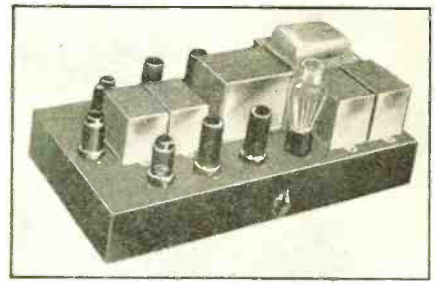
as well as Medium Priced

SYSTEMS

Loudspeakers and Accessories

C. Dorf



Class A 15-Watt Amplifier

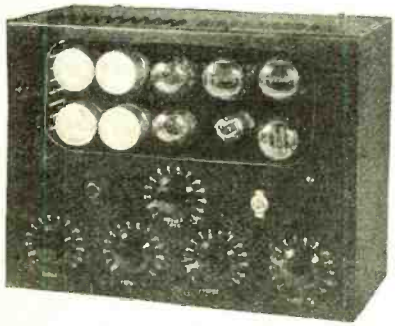
This new high-gain, 15-watt, class A amplifier, with 4-position input mixing arrangement, designed by the Webster Company engineers opens up a new and profitable field for temporary or permanent installations in numerous sound-distributing applications. The complete job is contained in a metal cabinet measuring 13½ by 10½ by 7½ inches and the net weight is 30 pounds. The compact design of the amplifier makes it an ideal semi-portable P.A. system to meet the many occasions calling for a quick and easy sound installation.

Employs High Gain

A gain of 117 db. permits direct operation with low-level high-impedance crystal or velocity-type microphones, without the necessity of a pre-amplifier. The unit is designed to have a particularly flat frequency response. A multiple output-impedance connecting arrangement is provided to meet any combination of speakers.

Four Input Circuits

The amplifier circuit used shows that the input of each microphone is fed directly to the control grid of its respective pre-amplifier tube, a type 6C6. Four 6C6's are



connected as pentodes in this input circuit. The output of these pre-amplifier tubes is fed through individually controllable resistance-coupled networks to two type 6A6 tubes (which are dual triodes in the one envelope). The double-grid construction of a single 6A6 tube allows for the acceptance of signals from two of the pre-amplifier tubes. Therefore, two of these 6A6's will handle the signals from all four input tubes and if the output plates of these dual triode tubes are connected in parallel (as they are in this circuit), complete electronic mixing is accomplished.

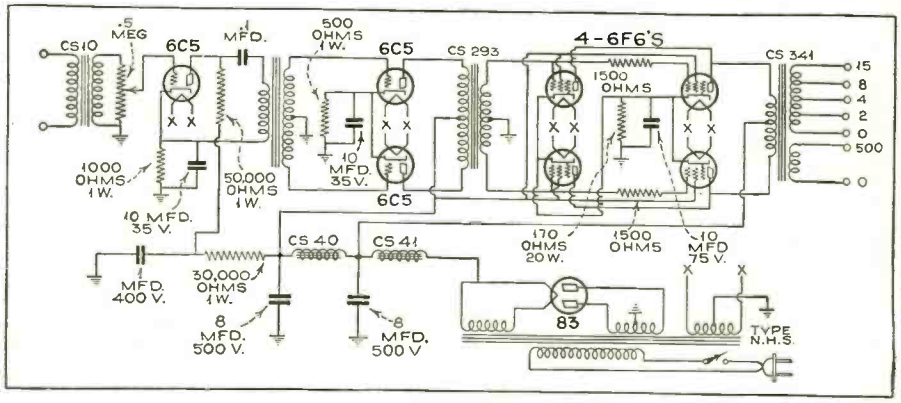
The output of the dual triodes is fed through a main control to a type 76 triode amplifier and its signal is in turn passed on to the push-pull, transformer-coupled power stage using two type 2A3 tubes. The type 5Z3 is employed for rectification.

A Powerful Sound System With Metal Tubes

This high-fidelity, 35-watt, 3-stage, transformer-coupled amplifier is available in kit form from the United Transformer Corporation. It employs 7 metal-type tubes comprising: a type 6C5 in the input stage followed by two 6C5's in a push-pull driver stage, the output of which is transformer-coupled to four 6F6's, pentode connected in a push-pull parallel class AB circuit. The type 83 full-wave glass-type rectifier tube is used in the power supply.

In addition to metal-type tubes the amplifier features, 95 db. gain, sufficient output to handle up to 20 dynamic-type speakers, a flexible input and a special output connection arrangement and rugged mechanical construction. A reference to the circuit diagram will show that the input circuit has facilities to match a high-impedance crystal or ribbon-type microphone or a carbon or dynamic-type mike and, of course, the equivalent impedance of a phonograph pick-up.

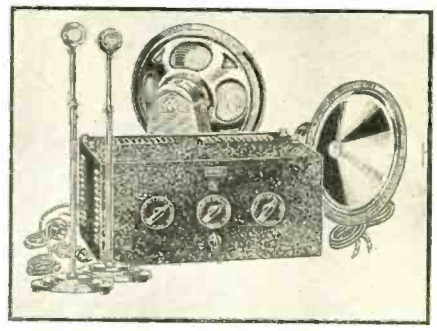
The compact design of the amplifier (made possible by the metal tubes) and the new developments incorporated in the unit should recommend it to the sound engineer, the serviceman and the dealer.



Complete P.A. System With Dual Microphone Input

Outstanding in Allied Radio's new line of 1936 sound equipment is this complete 30-watt, public-address system, shown in the accompanying illustration. The amplifier incorporates 4 high-gain stages developing a gain of 106 db., permitting the direct use of high-impedance crystal and velocity-type microphones. It is designed to have a flat frequency response from 45 to 10,000 cycles and to provide 30 watts power with less than 5 per cent distortion at full output.

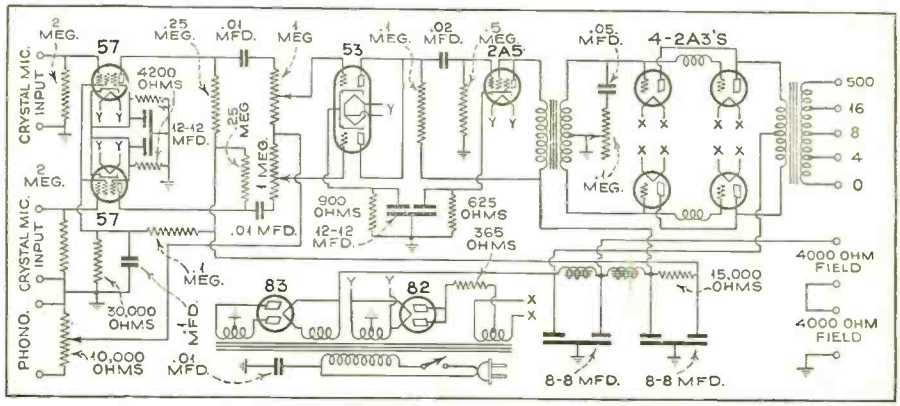
A 3-channel mixer is built into the amplifier to mix the microphone output with phonograph pick-up, as desired. The system includes two crystal microphones, two large auditorium dynamic-type speakers,



microphone floor stands, cables, etc.

The tube equipment comprises: two 57's as pre-amplifier tubes; one 53 as a voltage amplifier and electronic mixer; one 2A5 as

(*Turn to page* 504)



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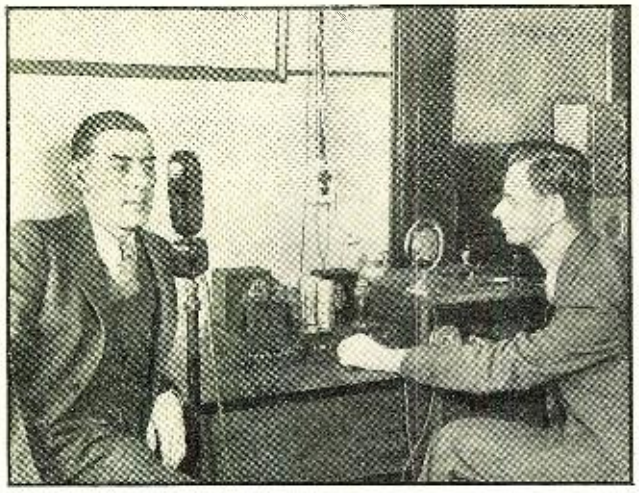

TESTING THE NEW AMPLIFIER

The authors trying out the finished model in the Radio News Lab. The gain is such that good output volume is obtained from even a velocity microphone without resorting to the use of a preamplifier.

Servicemen! HERE'S THE 20 Watt *for* PHONE

An entirely new Class A and direct coupling is rates a new fool-proof and high-fidelity, low-cost phase inversion. A "Ham"

By J. H. Potts

ORIGINALLY intended as an aid to speakers addressing large outdoor gatherings, the use of public address systems has rapidly expanded in recent years into many unforeseen fields. In large organizations, officials may drop in freely on various departments with the assurance that they may be instantly contacted through the public-address system without constantly notifying secretaries as to their whereabouts. Entertainers in night-clubs, roadhouses, and the like, have found the P. A. system a valuable accessory in their work, permitting better delivery with less effort. Their use in airports is of course common, but now that the sound system has itself taken to the air, it is no longer unusual to hear a stentorian voice from the skies above proclaiming the virtues of butchers, bakers and candlestick-makers.

This year, with another Presidential election in the offing, it should be remembered that candidates appreciate the aid of sound systems in garnering votes. The political power of the late Huey Long was maintained and expanded with the help of his three sound trucks. Recently, public address systems have come into use in traffic control, affording the police a convenient and efficient means of directing traffic and admonishing offenders without impeding the smooth flow of vehicles at busy intersections.

In the above applications, the systems serve to amplify and spread sound over a larger area with greater intensity. It is not so generally realized that public address systems are equally valuable in creating a quiet atmosphere. For instance, one exclusive jewelry store locates microphones at a sales counter so salesmen may unobtrusively notify executives regarding important transactions. Proprietors of lunch rooms find their patrons eat more when their ears are not continually assaulted with the bellowing and shrieking of orders to the kitchen. Small sound systems quietly and efficiently convey the order to the chef.

Method of Rating Amplifiers

The problems encountered in the design and construction of amplifiers capable of high quality performance with adequate power output are not simple. Also, the methods of rating amplifier performance often confuse those who are not specialists in the public address field. In this article, and others to follow, it is our aim to supply full constructional data on the design, construction, testing and methods of using a high-quality sound system.

Phase-Inversion Circuit

The amplifier to be described features the superior quality of reproduction obtainable with Class A power amplification and resistance-coupled voltage amplification, both in push-pull. A new non-distorting phase-inverting circuit voids the use of transformers or chokes for this purpose, eliminating one source of induction hum and possible distortion. Resistance-capacity filters of unusual size insure complete absence of "motor-boating" and reduce hum to a negligible quantity. Absolute stability with high gain is attained through careful design and selection of the components used.

SCHEMATIC DIAGRAM OF THE PHASE-INVERTING CIRCUIT

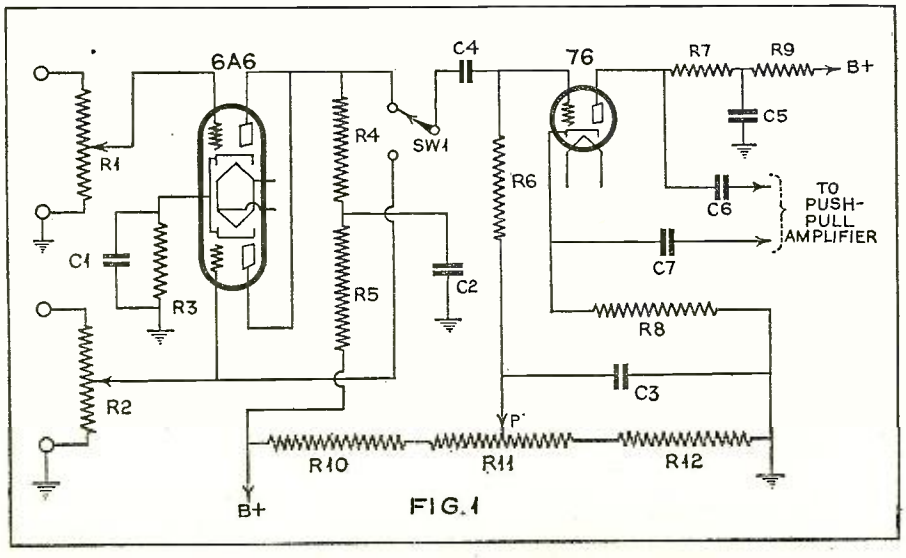

FIG. 1

Dual Input Circuit

The input circuit employs a dual-triode 6A6 as an electronic mixer and amplifier, permitting the use of two microphones simultaneously with independent control of each one by the two volume controls R1 and R2 (Figure 1). A switch, SW1, is provided so phonograph pickup amplification is accomplished without using the additional gain provided by the 6A6, affording a smoother and wider range of control. A tone control is also provided (not shown in the diagram), which may be employed to minimize needle scratch when using records, reduce microphone hiss, etc., when required. In spite of its high-gain and power output of full 20 watts, the amplifier is perfectly stable even when operated at full sensitivity. It may be used without a pre-amplifier,

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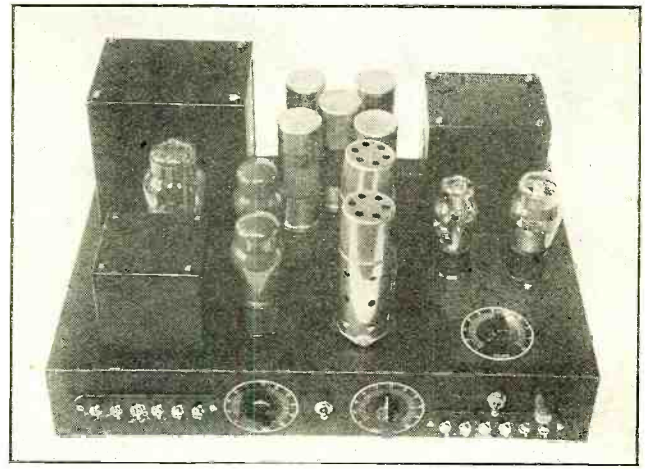
Amateurs! PERFECT Amplifier and P. A. WORK



amplifier which incorpo- distortionless method of combination of resistance employed resulting in a amplifier ideal for P.A. or applications

and **J. M. Borst**

with either carbon or crystal microphones. Velocity mikes may also be used, but while good volume is obtained, the usual pre-amplifier should be used for maximum output.

Drawbacks of Earlier Circuits

The usual phase inverter consists of two triodes and rests on the principle that the signal in the plate circuit is 180 degrees out of phase with the signal in the grid circuit. The phase is then reversed by applying a part of the output of the first tube to the grid of the second tube and taking the signals from the plate circuit of the two tubes. The system is imperfect because due to the capacity coupling the two sides are not exactly in opposite phase, although the difference is small. Furthermore, if one tube changes its characteristics through ageing, the balance is lost and the two sides will have unequal amplitude.

1-Tube Inverter

In this new system only one tube is used and the two sides of the signal are perfectly in phase and of equal amplitude. When a resistor is in the plate circuit, during the positive half cycle of the input signal, the current increases and the voltage across the plate load increases, so the plate voltage drops. If the plate load is put in the cathode side, when the current decreases the cathode voltage goes up. So, if the load is divided equally between the plate and cathode circuit (R7 and R8, Figure 1), the drops across these load resistors will be equal and opposite and the inversion is complete. There are no condensers to shift the phase and variations in the mu of the tube will have no effect.

The big problem, however, is to supply the correct bias to the grid without spoiling the balance. One solution to this was given by Mr. W. Richter in Electronics for September 1935. The grid return is brought to a point on a voltage divider, R10-R11-R12, which is negative with respect to the cathode thereby placing the correct bias on the tube. Under these conditions, the variation in voltage across the cathode resistor, R8, reacts on the grid bias so as to cause degeneration. Consequently there can be no gain in the stage. The output of one side of the push-pull arrangement is about .8 of the input signal voltage. The degeneration does not affect the desired phase inversion in any way, it just does not deliver any large output.

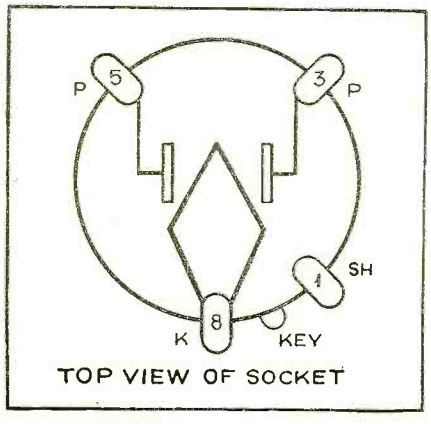
The voltage amplifier is resistance coupled to the push-pull power stage. The plate and grid resistor values have been conservatively chosen, not to provide the utmost in gain but rather to assure reliable operation with tubes of varying gas content.

The power stage consists of two 6B5's, a type of tube which is coming into wide use in sound system amplifiers. Essentially, it consists of two tubes in a single glass envelope with the second section direct-coupled to the first, or input section. Through its use a full 20 watts of undistorted (*Turn to page* 495)

New METAL TUBES

By **Richard Purinton**

A NEW rectifier tube, type OZ4, developed especially for automobile radio supply systems has just been announced by the Raytheon engineers at their Newton laboratory. This new tube has no filament, but operates through the ionization of a gas contained in the glass inner bulb. In basic principles the OZ4 is closely related to the gas rectifier which Raytheon pioneered in 1922 and continued developing to date. Raytheon holds several exclusive patents on this gas type of rectifier. The cathode of the new rectifier operates at an emitting temperature, thus permitting values of rectifier efficiency and voltage drop comparable to those found in a mercury vapor tube, equipped with a filament.



The OZ4 was developed primarily for use in vibrator type B-supply units for automobile receivers. It has the typical characteristics of all gas-filled rectifiers as regards a constant drop and ability to handle peak currents and a tendency to generate r.f. noise. The r.f. noise may be avoided by proper filtering and by connecting the metal shell to the point giving the best shielding. The shielding and filtering commonly used to eliminate vibrator noise is (*Turn to page* 478)

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Theory and Practice for Correct

IMPEDANCE MATCH

By C. A. Johnson

Part Five

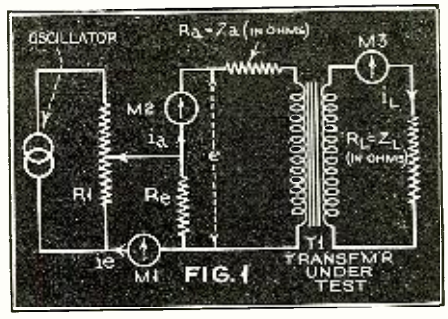

FIG. 1

IN Part IV we discussed the ideal transformer, and showed, in a general way, how it functions as an impedance-matching device. Fundamentally, it provides an optimum ratio between source and load; such that the impedance "looking into" the primary, $Z_{1\text{-}2}$, is given by the formula—

$$Z_{1\text{-}2} = \frac{Z_p}{Z_s} Z_L \qquad (1)$$

(See equation 4, Part IV.)

In practice, therefore, we build transformers to obtain desired ratios. For example, if the impedance looking into a source is Z_a, and the impedance looking into a load is Z_L, the two will be matched by a transformer such that

$$\frac{Z_a}{Z_L} = \frac{Z_p}{Z_s} \qquad (2)$$

Now, will this transformer work for matching a source of impedance $2Z_a$ to $2Z_L$? If so, how about using it to match $10Z_a$ to $10Z_L$? Formula (1) places no restrictions upon such an application. On the other hand, we know that in practice we do not in general use a "50- to 200-ohm" transformer to match a 500-ohm line to a 2000-ohm speaker.

The general answer to this question is found in the fact that the actual transformer has certain inherent losses. The values for Z_p and Z_s cannot of course be infinite, nor are they pure inductances. They are merely designed to be large compared to Z_a and Z_L and to have the optimum amount of d.c. resistance. We can see immediately, then, that if the actual value of Z_a becomes comparable to Z_p, the latter will act as a shunt across Z_a. Thus, a transformer which was designed to have the optimum value of Z_p for coupling a 50-ohm line to a 200-ohm line would probably have too low a value of Z_p for matching 500 ohms to 2000 ohms. This would result, among other things, in a discrimination against the lower frequencies.

Incidentally, this is the main reason why we find it more satisfactory in practice to mismatch from a low impedance secondary into a higher impedance primary (of the next transformer) rather than vice versa. Moreover, it is always the extreme ends of the frequency range that will be affected. If the frequency range to be transmitted is limited to a few octaves, in the center of the audio band (i.e., from 200 to 4000 cycles), it would perhaps be possible to use one Z_p/Z_s ratio for terminal ratios from $\frac{.2Z_a}{.2Z_L}$ to $\frac{5Z_a}{5Z_L}$. Assuming that the transformer was properly designed for $\frac{Z_a}{Z_L}$, it would merely represent a "poor design" for the extreme values. There is no general rule, of course, as to what the result will be, unless we know the exact constants of the transformer in question.

How to Calculate Transformer Efficiency

What the experimenter is really interested in, is how he can determine the behavior of a given transformer for a given task. Then he can decide for himself as to whether or not it meets his requirements. This can be done completely by calculation, provided all the constants of the transformer are known for the frequency range concerned. Since the complete calculations involve complex quantities, they are rather tedious and should perhaps be reserved for the cases where direct measurement is impossible or impracticable. Therefore, we will first describe a method of direct measurement of transformer performance.

Let us assume, therefore, that we have two impedances, Z_a and Z_L, and that we wish to find out (by measurement) how well a given transformer will match them. This measurement will consist of a comparison between the power developed in Z_a and the power developed in Z_L, over the frequency range concerned. Since the phase angle shift produced between the primary and secondary of a good transformer is very small, we can assume that the insertion of a transformer between Z_a and Z_L will not alter their phase relations appreciably. Hence, our measurement will simply tell us as to what extent we have changed reflection losses. Since no measurement of phase effects is involved, Z_a and Z_L can be replaced, in the test circuit, by pure resistances equal to their absolute value. Figure 1 is a general form of such a test circuit.

The following is a summary of how the circuit operates:

1. The oscillator generates a sinusoidal e.m.f. over the frequency range to be tested.

2. The oscillator output is controlled by R_1 or some similar device so that i_e is kept constant for all frequencies.

3. The output of the oscillator is fed through a resistor, R_e. The current, i_e, is monitored by M_1, which must be some type of audio-frequency milliammeter such as a thermal type of meter.

4. The values of R_e and i_e are chosen so that their product will give the desired voltage, e, to be applied to the primary of T, through R_a. This should be of the same order of magnitude as the voltage applied to the transformer when in use. Since the voltage across R_e is kept constant at all times, R_e acts as if it had no impedance, as far as the primary of T_1 is concerned, so its value does not enter into the primary load.

5. The current i_a flowing through R_a is measured by a second thermal milliammeter, M_2, having a very low resistance compared to R_a. The power developed in R_a is then given by

$$P_a = i_a^2 R_a \qquad (3)$$

6. Similarly the current, i_L, flowing in R_L, is measured by M_3; and the power developed in R_L is

$$P_L = i_L^2 R_L \qquad (4)$$

7. The relation between P_A and P_L in decibels is then obtained by the well-known relation—

$$N_{db} = 10 \log \frac{P_L}{P_A} \qquad (5)$$

Since P_L will always be at least slightly less than P_a, the value of N_{db} will have a negative sign. This simply indicates the number of decibels which the transformer is "down" for the various frequencies.

Use a V.T. Meter

If M_2 and M_3 are not available for this test circuit, the values of P_a and P_L may be calculated from a measurement of the voltage drop across R_a and R_L. This measurement must be made with a vacuum tube voltmeter, or some other voltage-measuring device which does not absorb any appreciable power from the circuit. Both voltages may be measured by a single meter with a "throw-over" switch. If voltage measurements are used, the powers are then given by

$$P_a = \frac{E_a^2}{R_a} \qquad (6)$$

and

$$P_L = \frac{E_L^2}{R_L} \qquad (7)$$

Both methods are equally satisfactory and thoroughly accurate, provided that the calibration of the meters is correct.

If the transformer under test is to be associated with a vacuum tube in practice, it should be tested in a vacuum tube circuit. This will involve the use of a second transformer in the test circuit. The characteristics of this second transformer must be known, so that any necessary corrections can be applied to the characteristics of the one under test.

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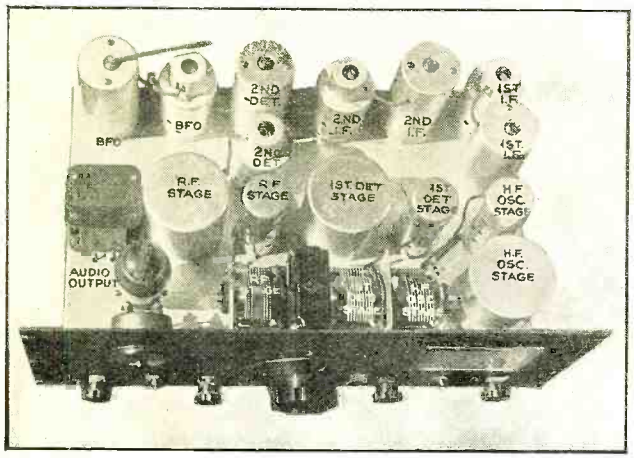
Design and Construction Data on a New Type of High-Frequency Superheterodyne

The BRL-8

For Discriminating Amateurs and Short-Wave Listeners

By C. Watzel and W. Bohlen

Part Two



EFFICIENT AND WORKMANLIKE LAYOUT

This is the top view of the laboratory receiver, showing the placement of the various parts on top of the sub-base and the mounting of the condensers and other controls on the panel. In the final model the audio transformer was changed to a different type.

SEVERAL points should be emphasized before construction of this amateur communications receiver is begun. They are: the necessity of using only those parts specified; keeping the exact layout of parts as shown; and making no changes in either the wiring diagram or the single-ground-point, short-lead wiring system to be described. The success of this receiver is due, not to any unusual or tricky design, but rather to the important factors mentioned above.

AS some of the important parts in this receiver are made by only one or two manufacturers, it will be necessary, in building the set, to stick exactly to the manufacturer specified for each corresponding part. Probably the most important items of construction are the National type PW dial and condenser unit, the Hammarlund coil forms with their associated type APC air-trimmers and Hammarlund i.f. transformers and air-tuned b.f.o. transformer. These three items form the foundation upon which the receiver is designed. The National unit in particular is a real precision job, not a cheap "back-lash type band-spread" contraption.

The Chassis

It will be noticed that standard chassis construction is followed. All partitions and baffles are left out. Individual coil and tube shields, plus the isolated tuning condensers and wiring system used, make their use unnecessary. The chassis used is of well-plated heavy steel, permitting of good, solid grounding of all tube and coil shields and preventing any detuning effects to result from distortion of the chassis. The front panel is of standard (19 by 8¾-inch) relay rack size. The cabinet is of very heavy, accurate steel construction. The large top cover and full-length opening in the bottom of the back plate make for easy connection and tube or coil change.

The first step in the actual construction is to mark out the top and back edge of the chassis. Do *not* mark the front edge of the chassis as yet, as these holes are marked through later from the corresponding panel holes. A square and pencil should be used for marking. These pencil marks can be wiped off later with a clean cloth. The second step is to drill all holes on the top and back edge of the chassis. Use a regular circle cutter (fly cutter) for the socket holes.

Marking the Panel

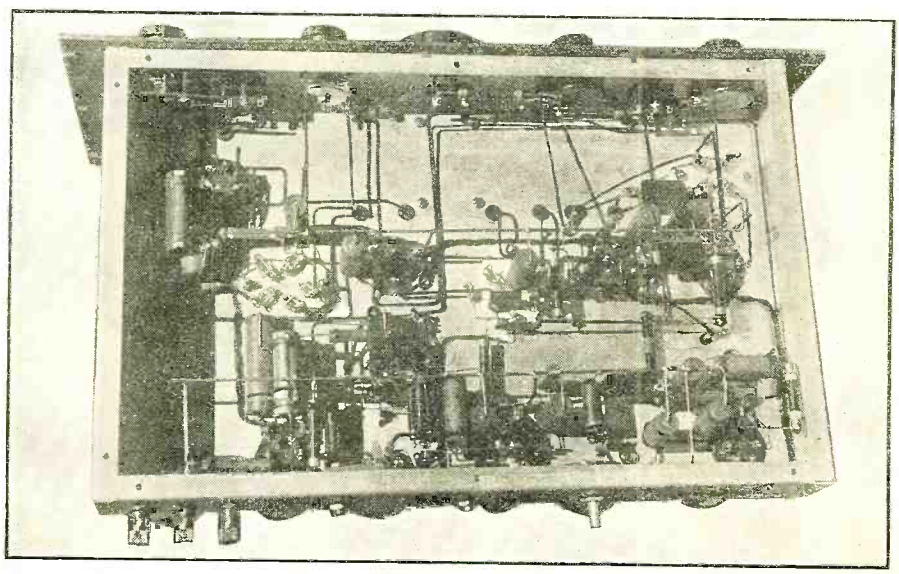
The third step is to mark out and drill the front panel. Do *not* drill the six holes for the controls at the bottom of the panel to full size at this time. Drill only a small hole for them, as they will be used later for marking the front edge of the chassis.

The fourth step is to mount the tuning condenser unit on the chassis. Then place the chassis, with the bottom screwed on, in the cabinet and bolt on the front panel. Now mount the dial on the projecting shaft. This should be done carefully, according to the instructions accompanying the unit. When this unit is satisfactorily lined up, hold the chassis tight up against the front panel with one hand and with the other mark through on the front edge of the chassis the seven holes appearing at the bottom of the panel. Use a pencil for this purpose.

The fifth step is to disassemble the panel, chassis and condenser unit and finish the drilling. The control holes at the bottom of the panel can be drilled for the correct shaft size of each control. The corresponding holes in the front edge of the chassis should all be drilled with the next larger size of drill. This allows a little leeway in lining up. The chassis, panel, cabinet, condenser unit and controls should now be completely assembled and properly lined up. After that the worst of the job is done and the rest of the apparatus can be mounted.

I.F. Coil Adjustment

Before the first i.f. transformer is mounted it should be disassembled and the cathode coil (*Turn to page* 509)



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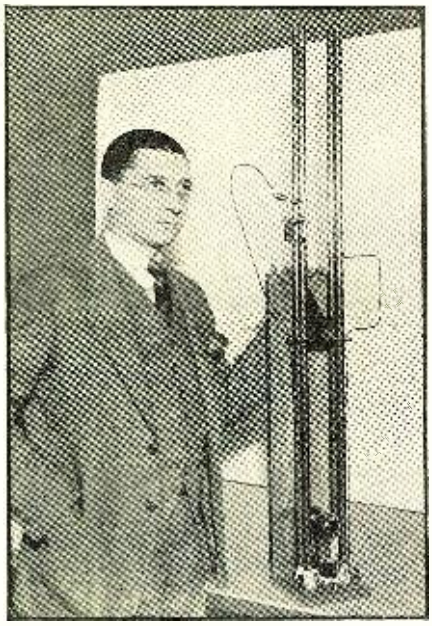


A NEW OSCILLATOR UNIT

At left: Arthur Lynch, well known as a pioneer in ultra short-wave developments and former editor of RADIO NEWS *and "Radio Broadcast," poses with the oscillator he describes in the text below. This is the unit he uses at his own home, as well as at his mobile installation and at W2DKJ—portable at 40 Wall Street.*

5-METER *Oscillator*

A PRACTICAL application of the oscillator, first brought to the attention of ham radio by George Shuart, W2AMN, and which has since gone a long way to cut down interstation interference in the New York area, where more than a thousand 5-meter transmitters are operating.

By Arthur H. Lynch

IN presenting the details of this more convenient form of "Long Lines" oscillator, it is not our purpose to suggest that there is anything revolutionary about it, or even that there is anything new about it. The only reason for discussing it at all is because we have simplified the construction and, since all the material may be had from the "store-around-the-corner," we trust that this type of transmitter will soon replace some of the other forms of modulated oscillators, which cause all kinds of interference in congested areas because of the wide space they occupy on the dial of the present day receiver.

The accompanying drawings of this Long Lines oscillator are so complete, that, coupled with the pictures, there is little that need be said, regarding the construction. However, one or two suggestions may be helpful. By the way, the oscillator described here is a little better, as far as frequency stability is concerned, than the one we use in New York. The reason for that is that the copper pipes are of slightly greater diameter. The "Q", or stiffness of the oscillator circuit of this type is a function of the diameter of the tubes and their distance apart and the material from which they are made. Copper is advisable. Brass is useless, or nearly so. Aluminum is worse. They should be separated by the diameter of the pipes or tubes, as indicated in the drawings. For other size pipes, if this size is not available, the dimensions between them are the only dimensions which must be altered.

In making this particular unit, we wanted to use material (*Turn to page* 508)

The "HAM" Shack

Conducted by

Everett M. Walker

Editor for Amateur Activities

LAST month and this month we are devoting this department to a digest or symposium of the latest types of receiving sets available to the amateur. The purpose of publishing these data was to provide both the station owner and the prospective amateur with a complete digest of the features of these sets so that he may not only choose a receiver to his own fancy if he is contemplating a new one, but to acquaint him with the features of all these sets so that he might know what the receiver on the other end of a QSO is like. Furthermore, it represents a brief résumé of the trend of short-wave receiver development in a tabloid form.

SINCE the material for last month's department was prepared, several new receivers have made an appearance.

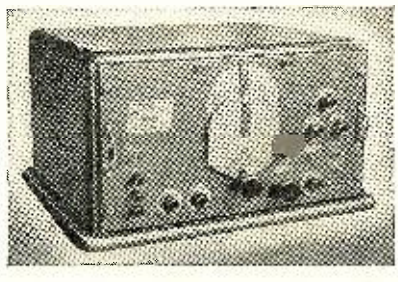
The RCA AR-60

The new AR-60 is manufactured by the RCA Victor Division of the RCA Manufacturing Company, of Camden, N. J. This receiver has been designed with a consideration to all of the problems that might be encountered in both commercial and amateur communication. Special care has been taken in providing the greatest usable sensitivity, selectivity, frequency stability and reliability.

The receiver is an 11-tube super-heterodyne, and employs many new features. It is ruggedly constructed, and weighs more than seventy pounds. One of the most interesting features is the incorporation of a highly-efficient, antenna-coupling system. The purpose of this arrangement, obviously, is to increase the usable sensitivity of the receiver. Tube noises in a super-heterodyne originate usually in the first tubes in the set. Noise developed at this point naturally limits the usable sensitivity. There is no limit to the amount of sensitivity that could be built into a set, except for the fact that the noise ratio would become so intense, beyond a certain optimum value that sensitivity beyond that point is unusable. To go beyond this average, it is necessary to tune the antenna circuit so that it will feed to the grid of the input tube a signal that has a greater voltage than that caused by the electron action of the tube, which is the limiting factor in sensitivity. In the AR-60, a novel antenna-coupling arrangement is provided which affords accurate matching of antenna or line impedances to the input circuit over a range from 50 to 500 ohms.

A tabulation of the AR-60 features follows: Cabinet: Three types are available; one, AR-60-R, which is a rack-mounted type; two, AR-60-T, which is a cabinet type with a standard black wrinkle finish and AR-60-S, which also is a cabinet type with a special two-tone gray finish. Circuit: 11-tube super-heterodyne with intermediate stages tuned to 750 kilocycles. Tubes: Two 6C6s as r.f. amplifiers; one 6C6 as first detector; 6C6 as first oscillator; two 6D6's as i.f. amplifiers; one 6B7 as i.f. amplifier, second detector and automatic volume control; one 6F7 as C.W. beat oscillator and audio amplifier; one 41 as output stage; and one 991 as voltage regulator. Frequency range: 1,500 to 25,000 kilocycles in six bands. The band ranges are: 1, 1,500 to 2,290 kilocycles; 2, 2,290 to 3,630 kilocycles; 3, 3,620 to 5,650 kilocycles; 4, 5,650 to 9,250 kilocycles; 5, 9,250 to 15,200 kilocycles and 6, 15,200 to 25.000 kilocycles. Dial: Twin control—one for general coverage and the other for band spread. The fact that six sets of coils or band ranges are provided gives tremendous band spread. Both dials are mounted in the same relative position with one projecting above the other. Two controls are provided adjacent to the dials. Provision is made for accurate logging. Band changing: A specially-designed switch, controlled from the front panel, is provided. The switch has six rotor arms, and special attention has been given to the contacts providing good connection with a minimum of losses. Power supply: Built-in power supply with the unique feature of provision for for adapting the transformer for either 110 or 220 volt, 40 or 60 cycle supplies by making a simple wire change. Also terminals are provided for external batteries. Speaker: External. Crystal filter: A unique feature of the crystal filter is that a balanced link is used to couple the first detector plate—and first intermediate amplifier grid. It is possible to peak selectivity to 125 cycles. Also a neutralizing control is provided which in addition to the normal crystal control, provides for reflecting heterodynes within one-kilocycle without materially affecting the desired signal. Controls: Main tuning, band spread tuning, band change switch, antenna coupling, antenna trimmer, audio volume control, intermediate amplifier sensitivity control, beat frequency switch, crystal selectivity control, on which is incorporated the "on" "off" switch, automatic volume control switch, beat frequency oscillator switch, audio filter or tone control switch, output jacks (two) for 'phones and power switch. All controls are identified by name plates.

THE RCA AR-60



The Breting Receiver

The Breting amateur receiver is a 12-tube all-wave super-heterodyne that is equipped with many features of unusual interest to the amateur. In addition to a crystal filter, the a.f. amplifier is arranged so that it may be employed as a speech amplifier for driving a modulator stage or public address work. In addition it is equipped with a percentage modulation indicator and a field-strength indicator. Also it is equipped with a high-fidelity audio channel and has wide-range automatic volume control. Other features of the Breting follow: Cabinet: Black crystalline finish. Circuit: 12-tube super-heterodyne. Tubes: One 6B7, which is used as an r.f. amplifier, and the diode portion for volume level indicator; One 6D6, second r.f.; One 6C6 as first detector; One 6D6, as high-frequency oscillator; two 6D6's as i.f. amplifiers; one 6B7 as diode detector, a.v.c. and first audio amplifier; one 42 triode connected as audio driver; two 42's triode connected as push-pull output stage; one 6D6 as beat-frequency oscillator and one 5Z3 as rectifier. Dial: Vernier control that provides adequate band spreading over entire range which includes all amateur bands. Band-changing: By means of switch on front panel. Power supply: Built in as integral part of receiver. Speaker: External. Controls: Main tuning control; band-change switch; Beat-frequency oscillator switch and manual volume control combined; a.v.c. on off switch; Audio volume control; Crystal "on-off" switch; crystal-phasing control; Audibility-meter adjustment; "on-off" switch; Switch for swinging audio amplifier from output of receiver to speech circuit; microphone jack; 'phone jack and sensitivity control.

The "Radio" Silver 5-D

The "Radio" Silver 5-D is a product of the R-S Merchandising Committee of Chicago, and is available in either kit or completely constructed form. It is a 10-tube super-heterodyne and is designed for all-wave coverage with particular attention given to features necessary to the modern amateur receiver. One of the principal features of the set is the use of iron-core i.f. transformers which provide high gain with a greater amount of available selectivity. Among its other features, it has two stages of

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

r.f. pre-amplification, a crystal filter, with both parallel and series control, which makes it useable on telephone signals as well as c.w.—the range is 150 cycles to 10,000 cycles. Among its other features are: Cabinet: Optional. All parts are chromium finished, which gives the receiver a good appearance without cabinet. Circuit: 10-tube super-heterodyne with i.f. tuned to 465 kilocycles. Tubes: Two 6D6's as tuned r.f. amplifiers; one 6D6 as suppressor grid injected first detector; one 76 high-frequency oscillator; one 6D6 intermediate amplifier; 6C6 tetrode second detector; 6B7 as amplified a.v.c.; 76 as beat-frequency oscillator; 42 output pentode and 5Z3 as rectifier. Frequency range: 1,700 to 33,000 kilocycles in four low-C bands. Dial: Calibrated in kilocycles for each band. Main tuning control geared at 23:1 and vernier control geared at 130:1. This latter dial spreads the 160-meter band over 900 degrees; the 80-meter band over 620 degrees, gives 216 degree coverage on 40 meters and 153 degrees on 20-meter band. Band-changing: Front panel switch provides changing of individual coils in all r.f. stages, detector and oscillator circuits. Power supply: built in. Speaker: Eight inch dynamic. Controls: Crystal phasing and on-off switch; sensitivity control; beat-frequency oscillator switch and pitch control; main and vernier tuning control; a.v.c. switch; band changing switch; audio volume control; on and off switch and tone control.

The receiver also is equipped with a visual tuning meter which is calibrated to read in R units.

The Hammarlund Comet Pro

The Comet Pro also is manufactured by the Hammarlund Manufacturing Company. It has been available for more than three years, although numerous improvements have been made on the set each year. It is available either with or without crystal filter, and covers a frequency range from 550 to 37,500 kilocycles by means of changeable coils. Others features of the Comet Pro are: Cabinet: Black crystalline finished metal. Circuit: 8-tube super-heterodyne. Tubes: Four 58s; two, 57s, one 2A5 and one 80. Intermediate Frequency: 465 kilocycles with air-tuned transformers. Dial: Twin controls for the high-frequency oscillator and the first detector which are set for the desired frequency range, and a band-spread control which tunes both circuits simultaneously. This provides continuous electrical band-spread over the entire range of the receiver. Power supply: Built in. Speaker: External. A permanent dynamic-type speaker is available with the set designed to match the output of the 2A5. Controls: Twin tuning controls; band-spread control; sensitivity control; on-off switch; 'phone jack. Models with a crystal filter have an on-off switch for the crystal and phasing control.

The Hammarlund "Super-Pro"

The Hammarlund "Super-Pro" is manufactured by the Hammarlund Manufacturing Company, of New York. It is a superheterodyne designed to meet the most critical needs of commercial communication as well as amateur practice. It is available with or without a crystal-filter circuit and is designed for either rack-and-panel mounting or table use.

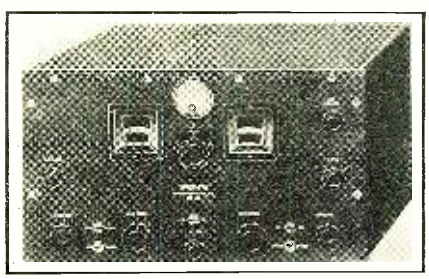
One of the features of the "Super-Pro" is the dial which permits only one of the five band ranges to show at any given time. The dial also is accurately calibrated permitting logging of stations and return to any given frequency with ease. Another interesting feature is the employment of continuous and adequate electrical band-spread throughout the receiver's entire range which is from 540 to 20,000 kilocycles. This includes broadcasting as well as all short-wave channels. On the two low-frequency ranges which together cover from 540 to 2,500 kilocycles, band-spreading is not necessary, and therefore, on these ranges the band spreading condensers are disconnected. Incidently these two ranges are calibrated in kilocycles, whereas the high-frequency ranges, which are 2,500 to 5,000 to 10,000 and 10,000 to 20,000 kilocycles, are calibrated in megacycles on the dial.

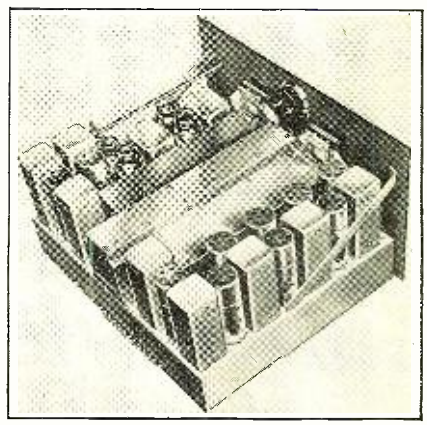
The band-spreading is accomplished by means of condensers connected in parallel with a band-spread control and is similar to the system employed in the Hammarlund Comet Pro. This provides two controls which might be termed "master tuners," and once these are set the band-spread will track over a wide range of frequencies.

Other features of the "Super-Pro" are: Cabinet: Panel 18 by 10½ inches with a shield cover that fits back of the front panel, making the total depth 14¼ inches. Circuit: 16-tube super-heterodyne, with 465 kilocycle intermediate-frequency. Incidentally, the i.f. transformers are provided with variable coupling which is controlled from the front panel, thereby providing almost any degree of selectivity in this circuit that may be desired. Tubes: Two 6D6s as r.f. amplifiers or preselectors; one 6A7 as first detector; one 6C6 as high-frequency oscillator; three 6D6's as i.f. amplifiers; 6B7 as second detector; 6B7 as amplified automatic-volume control; one 6C6 as a beat-frequency oscillator: one 76 as a.f. amplifier; one 42 triode connected as a class A driver; two 42s triode connected amplifiers in class AB, providing fourteen watts output. Band-changing switch: Specially designed switch with silver contacts which is controlled from the front panel. It short-circuits all unused coils and also controls the dials, allowing only the one that is in use to show in the window. Power supply: External, but included with the receiver. It is equipped with a 5Z3 rectifier tube, which provides the necessary current. Speaker: Two speakers are available with the receiver—one designed for use where the receiver is to be used for communication purposes, and the other where high-fidelity is desired. The latter is a 12-inch dynamic. Controls: Fourteen are contained on the front panel: One, band-change switch; two, "on-and-off" switch; three, a.v.c.-Manual switch; four, beat-frequency oscillator switch five speaker 'phone switch; six "send-receive" switch; seven main tuning knob; eight band spread tuning knob; nine, radio-frequency gain control; ten, intermediate frequency gain control; eleven, variable selectivity knob; twelve, B.F.O. peak control; thirteen, tone control; fourteen, a.f. volume control.

HAMMARLUND SUPER PRO

At right: Chassis view of the new communication type Super-Pro. Below: Front view of the set, showing the tuning and band-spread dials and the various other controls employed to get the utmost sensitivity and selectivity.





New 50 WATT *Transmitter*

By John Strong

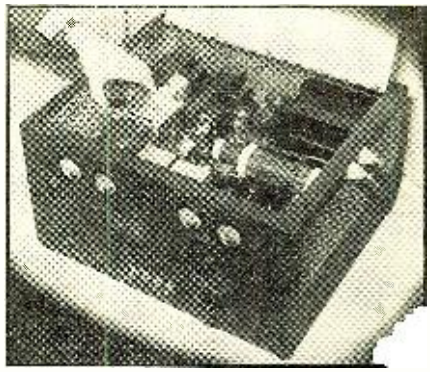
New Amateur All-Band Transmitter

A medium-powered transmitter designed to meet the requirements of modern amateur station operation recently was announced by the Collins Radio Company of Cedar Rapids, Ia. One of the most interesting features of this transmitter is the manner in which any predetermined frequency within the range of 1800 to 30,000 kilocycles may be obtained.

Frequency changing is simplified by providing small aluminum cases containing not only a pre-tuned, oscillator-tank circuit, but also a crystal for each frequency, whereon it is desired to operate. When changing freqency from one band to another it is merely necessary to plug in a different unit and final tank coil and adjust the final amplifier grid and plate controls, which are tuned to a predetermined point on the scale. In order to simplify this operation the oscillator unit has a card attached, indicating the proper setting for the final amplifier controls, and therefore the matter of changing frequency requires less than ten seconds.

The new transmitter, which is designated as the 45A by the Collins company, is designed to provide outputs up to 50 watts on telephone, and as high as 160 watts on c.w. It is completely self-contained and includes all power supplies and speech amplifier and requires only the connection of antenna, microphone or key and insertion of the power plug into a convenient base plug to set it in operation.

Lineup of tubes in this transmitter also is interesting. A C-100 type tube which is designed especially for the transmitter is used as the oscillator. This circuit is keyed, thereby providing break-in operation when c.w. is employed. This is followed by a type 46 tube as a doubler which is used only when it is necessary to double the crystal frequency to operate on the higher frequency bands.



Following the 46 is a RK-23 which serves as a first amplifier and operates as a straight buffer on all frequencies. On the lower frequencies where it is not necessary to more than double the crystal frequency, this tube is used to excite the final amplifier, which is a C-211D, a heavy-duty triode, made especially for the Collins company and having characteristics similar to the standard 211. If further doubling is required beyond the RK-23 in order to operate on the higher frequency bands, a C-830B is connected in the circuit. This tube serves as a power doubler.

Another interesting feature of the transmitter is an adjustable r.f. transformer which is part of the output coil of the transmitter. This arrangement was developed in order that a single antenna might be erected which would be effective over a wide range of frequencies. The secondary of this transformer is adjusted for the proper load on each frequency. These alignments are not disturbed when changing from one band to another.

Modulation is of the control-grid type and the capability of 100 percent modulation is obtained by means of a 3-stage audio channel with a gain of 60 db. and a frequency response from 40 to 10,000 cycles, uniform within plus or minus 1.5 db.

The transmitter is constructed much in the manner of the modern aircraft transmitter. It is contained within a cabinet 21½ inches wide, 18 inches deep and 12 inches high. Four meters are mounted on the panel: one indicating modulation percentage; another indicating grid current to the final amplifier; a plate current meter and an antenna-current meter. Switches are provided for turning on the filaments, plate voltage, stand-by and for changing from 'phone to c.w. or vice versa.

Course for Amateurs

The Federal government is now providing training for prospective amateurs through the Works Progress Administration, at least in the New York Area. According to a communication from J. A. Daniel, courses in both code practice and technical radio subjects are being offered at the Y.M.C.A. branch at 180 West 135th Street, New York City. Mr. Daniel, who is the radio instructor, says the courses for the budding amateur cover electrical and radio fundamentals, short-wave receiver design and theory, c.w. transmitters, power supplies, antennas, frequency meters and advanced as well as beginners' code classes. The courses are free and are

(*Turn to page* 490)

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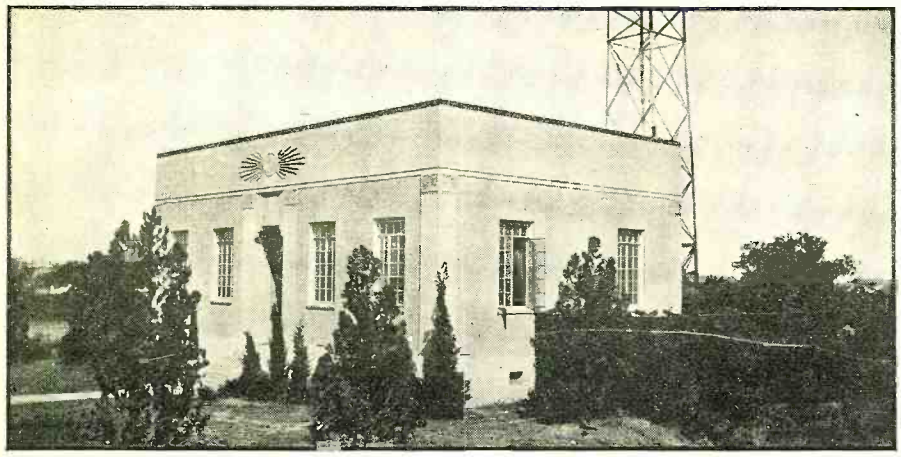

LISTEN ON 1420 KC.

Here is shown the transmitter house of WJBO, Baton Rouge, La. This station will be on the air with 4 Radio News "specials" during January and February (See DX Calendar below)

THE DX CORNER

S. GORDON TAYLOR

(For Broadcast Waves)

L. P. O. Applications

New applications and applications for reappointment are still coming in, and as a result publication of the 1936 list of observers will be delayed until next month, at which time it should be possible to present a complete list of the 1936 appointments to date. Those who have filed applications will be interested in knowing that the new 1936 certificates will be mailed out on or about the first of the year. Those who have not yet filed applications and wish to do so may send them in at any time.

New Tips Broadcasts

Observer Covert is preparing the script for the regular weekly tips broadcasts which are conducted by Andy Potter over KGGC, San Francisco, 1420 kc., 100 watts. These programs are put on each Sunday morning beginning at 12:30 a.m., EST. Tips and other information from RADIO NEWS LPO's will be appreciated and should be sent to Roy Covert, 3940—24th St., San Francisco, California.

Observer Ellis, 1624 South Sycamore, Los Angeles, California, begins a series of weekly DX tips broadcasts over KFAC, 1300 kc. He is assisted in this by Jarry O. Jones. The broadcasts take place each Thursday from 9:15 to 9:30 PST. The cooperation of other LPO's in supplying tips, etc., will be appreciated.

The Editor would like to inform Observers Covert and Ellis—and all other conductors of tips programs—that they are at liberty to quote any items of interest from RADIO NEWS, should they so desire. It would be appreciated if the magazine is given credit for material thus quoted.

Greetings from New Zealand

Observer Watson, in his capacity as Publicity Officer for the New Zealand DX Radio Association, asks us to convey to the DX clubs of the world and to every individual DX'er the best wishes of this club for the new year. It is with the greatest of pleasure that this friendly greeting is passed along and we feel sure that the clubs and individual listeners of the United States join us in reciprocating the sentiment expressed.

Canadian DX Relay

December 14th and 15th marked the third anniversary of the founding of this DX club and this event was celebrated by means of numerous special broadcasts.

The club issues a bulletin to members weekly during the DX season. Recent issues of the bulletin contain six or seven pages, carrying a wealth of interesting information for DX'ers. In addition, arrangements have recently been completed by the club to broadcast its DX tips weekly over stations WCCO, Minneapolis; WSB, Atlanta; KDKA, Pittsburgh; KFI, Los Angeles; WORK, York, Pennsylvania; and WBRC, Birmingham, Alabama. DX contests are conducted annually by the club with several silver cups as the prizes. Last year over 1100 special DX programs were arranged for and dedicated to this club, thereby establishing a new record for programs dedicated to a single club.

Officers of the club are: President, Fred H. Bisset of Goderich, Ontario; Chairman of CPC, Elwin H. Bullard of Drummondville, Quebec; Publicity Manager, B. L. Ahman, Jr., of Baltimore, Maryland; Technical Advisor, C. H. Hesterman of Saskatoon, Saskatchewan; Short Waves Editor, Frank Petch of Gananque, Ontario; and Circle Letters Manager, Leo Shelly of St. Catharines, Ontario.

Anyone desiring further information concerning this organization may address an inquiry to the Editor of the DX Corner who will see that all such inquiries are passed along for the personal attention of the proper CDXR executive.

Asking for Verifications

An interesting communication has been received from R. B. Sutton of the Technical Department of Stations KFPY, Spokane, Washington. While this communication is not an official one, it nevertheless contains a suggestion which DX'ers will do well to bear in mind: "May I say a word regarding fans requesting veri cards—I am qualified to speak since I answer most of them. We receive cards giving a list of numbers heard on a program; these are usually useless to us since a large portion of our program material is received from either the Columbia or the Don Lee Columbia network. Obviously, it is impossible for us to utilize these lists of numbers in most cases. I suggest that when fans write for veri cards that they quote any local advertisement heard or a word for word station call announcement. If we get a report saying that the advertisement of the Jones Drug Company located at Main & Posts streets was heard at a given time, it is an easy method of our checking and issuing a positive verification.

OBSERVER GAISER, BUTLER, N. J.

A Hammarlund Comet "Pro" serves for both broadcast and s.w. reception in his Official Listening Post

Also, most stations have a set manner of giving the station call or a slogan at the time the station call is given. This is an excellent method of enabling us to be sure that the fan did hear us and not another station."

DX CALENDAR

Below are given lists of special and periodic DX broadcasts which are scheduled up to February 15th. 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
			January			
1	2-2:20	1310	**WEBR**	**N. Y.**	.1	**R. NEWS**
	2-9	590	XEPN	Coah.Mex.	50	CDXR & NRC
	3-4	1200	CHAB	Sask.	.1	CDXR
	3-5:10	1400	WIRE	Ind.	.5	CDXR
	5:40-6	**1370**	**KFRO**	**Texas**	.1	**R. NEWS**
2	2:40-3	1420	**WJBO**	**La.**	.1	**R. NEWS Golson**
	4-4:20	**580**	**WDBO**	**Fla.**	1	**R. NEWS**
	4:50-5:10	**1310**	**KVOL**	**La.**	.1	**R. NEWS**
	5:10-5:30	**1370**	**WPAY**	**Ohio**	.1	**R. NEWS**
	5:10-5:30	**1420**	**KCMC**	**Ark.**	.1	**R. NEWS Halsey**
3	2-3	1290	KDYL	Utah	1	CDXR
4	4:20-4:40	1310	**WLNH**	**N. H.**	.1	**R. NEWS Cleaver**
	4:30-5:30	1200	CKNX	Ont.	.05	CDXR & MCDXE
	5-6	1370	WMFO	Ala.	.1	NNRC
	5:40-6	**880**	**WSUI**	**Iowa**	.5	**R. NEWS**
	7-8	1210	WSBC	Ill.	.1	NNRC
5	1-2	1310	CJLS	N. S.	.1	
	1-4	1150	XEWZ	Mex.City	.1	CDXR
	2-3	1270	CMKC	Cuba	.15	NNRC
	2-4	890	WMMN	W. Va.	.5	GCDXC
	3-?	1450	CFCT	B. C.	.075	GCDXC
	4-4:20	**1260**	**KPAC**	**Tex.**	.5	**R. NEWS**
	4-4:30	630	CKOV	B. C.	.1	
	6-7	950	KMBC	Mo.	1	CDXR
6	12-12:30	1140	WAPI	Ala.	5	CDXR
	3-4	1440	XEFI	Chih.Mex.	.25	CDXR
	4:40-5	**1310**	**WRAW**	**Pa.**	.1	**R. NEWS**
7	2-2:20	1210	**WPAX**	**Ga.**	.1	**R. NEWS Wood**
	2:40-3	**1500**	**WOPI**	**Tenn.**	.1	**R. NEWS**
	4-5	1350	WAWZ	N. J.	.5	CDXR
	4:10-4:30	**1310**	**WTJS**	**Tenn.**	.1	**R. NEWS**
	4:50-5:10	**1310**	**WROL**	**Tenn.**	.1	**R. NEWS**
8	12-1	1310	XEFW	Mex.	.5	CDXR
	1-3	601	RABAT	Morocco		IDA
	2-?	1210	KIUL	Kans.	.1	
	2:30-4	**920**	**WPEN**	**Pa.**	.5	**R. NEWS Cleaver**
	6-6:30	1270	WOOD	Mich.	.5	CDXR
9	2-3	830	WRUF	Fla.	5	CDXR & GCDXC
11	5-6	1370	WMFO	Ala.	.1	NRC
	7-8	1210	WSBC	Ill.	.1	NNRC
12	1-4	1150	XEWZ	Mex.City	.1	CDXR
	2-4	**1420**	**WJBO**	**La.**	.1	**R. NEWS Golson**
	2:30-4:30	1320	KID	Idaho	.25	NNRC
	3-3:30	630	CKOV	B. C.	.1	CDXR
	3-4	1370	KFRO	Tex.	.1	NNRC
	3-5	830	WEEU	Pa.	1	ICCP
	3-5	1450	CFCT	B. C.	.075	CDXR
	3-6	780	WTAR	Va.	.5	MCDXE
	4-4:30	630	CKOV	B. C.	.1	
	4-5	1310	WOL	Wash.D.C.	.1	
	4-30-6	620	WHJB	Pa.	.25	CDXR
	4:30-6	1290	WJAS	Pa.	1	CDXR
	4:30-6	1380	KQV	Pa.	.5	CDXR
	5-6	1210	KGY	Wash.	.1	MCDXE
13	1-2	1360	WGES	Ill.	.5	NNRC
	2-5	1320	CMOX	Cuba	.25	
15	2-?	1210	KIUL	Kans.	.1	
	2:30-3	1370	WHBQ	Tenn.	.1	CDXR
	2:30-3	1370	WHBQ	Tenn.	.1	NNRC
	2-4	1200	CHAB	Sask.	.1	MCDXE
17	2-3	1530	W1XBS	Conn.	1	CDXR & NRC
18	1-2	1080	WMBI	Ill.	5	NRC
	4-5	1010	CHML	Ont.	.1	CDXR
	4-5	1330	KMO	Wash.	.25	NNRC
	5-6	1370	WMFO	Ala.	.1	NNRC
	7-8	1210	WSBC	Ill.	.1	NNRC
19	1-4	1150	XEWZ	Mex.City	.1	CDXR

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	2-3	1250	CMKC	Cuba	.15	CDXR
	3-3:30	630	CKOV	B. C.	.1	UDXC
	3-4	780	KFDY	S. D.	1	GCDXC
	3-4	1300	WHAZ	N. Y.	.5	GCDXC
	3:30-4:30	1370	KFRO	Tex.	.1	CDXR
	4-5	630	WGBF	Ind.	.5	CDXR & NRC
	5-7	1310	WTRC	Ind.	.1	NZDXRA
20	3-4	1440	XEFI	Chih.Mex.	.25	CDXR
21	1-4	940	WDAY	N. D.	1	
22	2-?	1210	KIUL	Kans.	.1	
	3-6	1500	WOPI	Tenn.	.1	CDXR
	6-6:30	1270	WOOD	Mich.	.5	CDXR
25	2:30-4	1200	KADA	Okla.	.1	
	5-6	1370	WMFO	Ala.	.1	NNRC
	7-8	1210	WSBC	Ill.	.1	NNRC
	11-12 p m	1500	WTMV	Ill.	.1	MCDXE
26	12-3	1500	WTMV	Ill.	.1	MCDXE
	12:01-3	1420	WPAR	W. Va.	.1	CDXR
	1-4	1150	XEWZ	Mex.City	.1	CDXR
	2-4	1010	CHWC	Sask.	.5	IDA
	3-3:30	630	CKOV	B. C.	.1	CDXR
	3-4	1220	KWSC	Wash.	1	CDXR
	3-?	**1420**	**WJBO**	**La.**	**.1**	**R. NEWS Golson**
	3-5	1450	CFCT	B. C.	.075	CDXR
	3:30-4	710	KMPC	Calif.	.5	NRC
	4-4:30	630	CKOV	B. C.	.1	
29	2-?	1210	KIUL	Kans.	.1	
	2-3	1370	WOC	Iowa	.1	NNRC
	4-4:30	1340	KGMO	Kans.	.25	MCDXE
	4:15-4:45	1010	KGGF	Kans.	1	MCDXE
	5:30-6	1060	KFBI	Kans.	5	MCDXE
30	5:30-6	1310	WRAW	Pa.	.1	CDXR

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	1-2	1310	CJLS	N. S.	.1	
	2-4	1200	CHAB	Sask.	.1	NNRC
	4-4:30	630	CKOV	B. C.	.1	
3	3-4	1440	XEFI	Chih.Mex.	.25	CDXR
5	2-2:30	1310	WEBR	N. Y.	.1	CDXR
	3-5:10	**1400**	**WIRE**	**Ind.**	**.5**	**R. NEWS Kalmbach**
	3:30-3:50	**1370**	**WSVS**	**N. Y.**	**.05**	**R. NEWS Kalmbach**
6	**2:40-3**	**1420**	**WJBO**	**La.**	**.1**	**R. NEWS Golson**
	5:10-5:30	**1420**	**KCMC**	**Ark.**	**.1**	**R. NEWS Halsey**
7	2-3	1290	KDYL	Utah	1	CDXR
8	5-6	1370	WMFO	Ala.	.1	NNRC
	7-8	1210	WSBC	Ill.	.1	NNRC
9	1-2	1250	CMKC	Cuba	.15	UDXC
	2:30-4:30	1320	KID	Idaho	.25	NNRC
	3-3:30	630	CKOV	B. C.	.1	CDXR
	3-4	1370	KFRO	Tex.	.1	NNRC
	3-5	830	WEEU	Pa.	1	ICCP
	3-5	1450	CFCT	B. C.	.075	CDXR
	4-4:30	630	CKOV	B. C.	.1	
	4-6	**1310**	**WTRC**	**Ind.**	**.1**	**R. NEWS Floyd Smith**
12	2-?	1210	KIUL	Kans.	.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	5-6	1370	WMFO	Ala.	.1	NNRC
	7-8	1210	WSBC	Ill.	.1	NNRC

PERIODIC

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

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

Thursdays—
12:15-12:30a.m. 1300 kc., KFAC, Los Angeles, 1 kw.(tips)
12:30-1:15 a.m. 1390 kc., KLRA, Little Rock, Ark., 1 kw. (MCDXE)
8 p.m. 1320 kc., WORK, York, Pa., 1 kw. (NRC) (tips)
11-11:15 p.m. 1010 kc., CKCK, Regina, Sask., .5 kw. (tips)

Fridays—
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)
12:30-1:15 a.m. 1390 kc., KLRA, Little Rock, Ark. 1 kw. (NNRC)
10-10.15 a. m. 830 kc., WEEU, Reading, Pa., 1 kw. (tips)
3 p.m. 1360 kc., WQBC, Vicksburg, Miss., 1 kw. (tips)
8:45-9 p.m. 1420 kc., KCMC, Texarkana, Ark. 1 kw. (Radio News) (tips)

Sundays—
12:30-12:45 am. 1420 kc., KGGC, San Francisco, Calif. .1 kw. (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

Foreign Station Addresses

Following are addresses of some foreign stations submitted by Walter F. Johnson, Official LPO, Minnesota:

XEFI 932 Eighth Ave., San Diego, California.
TIPG "La Voz de la Victor," Apartado 225, San Jose, Costa Rica.
CMCD "La Voz del Aire, S.A.," P.O. Box 2294, 25 y G. Vedado. Havana, Cuba.
XETF "La Voz de Veracruz," Ave. Independencia 28, Veracruz, Mexico.
3YA New Zealand Broadcasting Board, Station 3YA. Christchurch. New Zealand.
XEAF Compania Radiodifusora Sonoreuse, S.A. Nogales, Sonora, Mexico.
XEMO Box 202, San Diego, Calif.
XEW Estacon XEW, Av. 16 de Septiembre 9-A, Mexico, D.F.
CMBX Calle San Miguel 194, Havana, Cuba.
TGX M. A. Mejicano Novales El Liberal Progresista. Guatemala City, Guatemala.
XEBC Hotel Agua Caliente, Baja California, Rep. of Mexico.
KGU Honolulu Advertiser, Honolulu, Hawaii.
1YA New Zealand Broadcasting Board, Auckland, N. Z.
XEAF Gia, Radiodifusora Sonoreuse, S. A., Nogales, Sonora. Mexico.
YV1RC Box 290 Broadcasting Caracas, Caracas, Venezuela.
TGW Radiodifusora Nacional TGW, Rep. de Guatemala, C. A.

ART HARRIS, WINCHESTER, MASS.

An all-wave DX'er who also owns and operates his own "ham" transmitter under the call W1JGX

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 Tyndall, Birch, Roberts, Reichardt, Robbins, Lawton, Grabowski, Williams, Hammond, Beal; Column 2 (New York, New Jersey)—Observers Tomlinson, Lonis, Kentzel, Buitekant, Meehan, Gaiser; Column 3 (Maryland, Pennsylvania, Ohio)—Observers Rank, McVey, Wilson, Parfitt, Routzahn, Marshall, Beitman, Botzum, Schmidt, Kocsan, Gordon; Column 4 (Illinois, Kansas, South Dakota, Minnesota)—Observers Rimer, Mrs. Johnson, Walter F. Johnson, Rebensdorf, Smith, Diedrich; Column 5 (Arkansas, Texas, Louisiana)—Observers Halsey, Kimmons, Deterly; Column 6 (California, Oregon, British Columbia)—Observers Hunter, Sholin, Covert, Ker.

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 the frequency, call, location and hour [your own local time] when best heard.)

L.P.O. JURD, TOWNSVILLE, AUSTRALIA

with his "Amalgamated Wireless" receiver with which he regularly tunes in U. S. stations and other parts of the globe

Kc.	*Call*	*1*	*2*	*3*	*4*	*5*	*6*
565	Athlone	6	–	–	–	–	–
570	2YA	–	*	*	4	–	1
574	Stuttgart	1	–	–	–	–	–
580	3WV	–	–	–	–	–	1
583	Grenoble PTT	2	–	–	–	–	–
590	JOAK-2	–	–	–	–	–	4
592	Vienna	1	–	–	–	–	–
610	11FI	2	–	–	–	–	–
610	2FC	5	–	*	*	–	–
610	JODK-2	–	–	–	–	–	4
625	CE62	–	*	–	–	–	–
630	CKOV	*	–	*	*	3	–
630	LS3	9	–	*	–	–	–
630	3AR	5	–	–	–	–	4
638	Prague	1	–	–	–	–	–
640	5CK	–	*	*	*	–	1
648	Lyon	2	–	–	–	–	–
650	CX6	9	–	–	*	–	–
650	1YA	5	6	*	4	5	1
658	Cologne	2	*	–	–	–	–
660	XGOA	–	–	–	–	4	–
668	North Regional	6	–	–	–	–	–
670	LS4	7	*	*	–	–	–
670	2CO	6	*	*	*	–	3
670	JFAK	–	–	–	–	–	*
677	Sottens	4	–	–	–	–	–
682	HJN	–	*	–	–	–	–
690	CX8	9	8	–	–	–	–
690	6WF	–	–	–	5	–	–
695	Paris PTT	4	–	–	–	–	–
710	LS1	9	–	–	–	–	–
713	11RO	5	–	–	–	–	–
720	3YA	5	*	*	4	5	3
730	5CL	–	*	*	–	–	–
731	EAJ-2	6	–	–	–	–	–
731	EAJ-5	6	–	–	–	–	–
740	Munich	2	–	–	–	–	–
740	2BL	6	*	*	5	–	*
749	Marseille	4	2	–	–	–	–
750	KGU	–	*	*	5	–	–
750	PRA-8	7	–	–	–	–	–
750	7NT	5	*	*	5	–	3
750	JOBK-1	–	–	–	–	–	4
767	South Regional	6	–	–	–	–	–
770	CX12	7	–	*	–	–	–
770	3LO	6	*	–	5	–	1
770	JOHK	–	–	*	5	–	4
776	Toulouse	5	8	–	–	–	–
780	JOPK	–	–	–	–	–	4
785	Leipsig	2	–	–	–	–	–
790	LR10	9	–	–	7	–	–
790	4YA	–	–	*	*	–	–
790	JOGK	–	–	–	–	–	4
795	EAJ-1	5	–	–	–	–	–
800	HIX	8	–	–	–	–	–
800	PRB-7	–	–	*	–	–	–
800	4QG	6	*	*	5	–	1
804	West Regional	5	6	–	–	–	–
810	CX14	9	*	*	–	–	–
810	Jock-1	–	–	*	–	–	4

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L.P.O. TYNDALL, BURLINGTON, VT.

An old timer in the DX game, he has accumulated 1250 broadcast-band verifications in 11 years

Kc.	Call	1	2	3	4	5	6
814	Milan	5	*	2	–	–	–
815	PRF-3	7	–	–	–	–	–
815	PRA-6	6	*	–	–	–	–
830	LR5	8	8	*	8	–	–
830	3GI	6	*	*	5	–	1
830	JOIK	–	*	*	–	–	1
840	CMQ	–	–	–	11	–	*
841	Berlin	2	–	–	–	–	–
850	CX16	9	8	–	–	–	–
850	EAJ-3	5	–	–	–	–	–
850	JOFK	–	–	–	*	–	*
859	Strasbourg	2	*	–	–	–	–
868	Paris AGEN	4	–	–	–	–	–
870	LR6	9	8	*	7	–	–
870	2GB	6	–	–	–	–	–
870	JOAK-1	–	–	*	5	–	4
877	London Regional	6	5	–	–	–	–
880	LV2	–	*	*	–	–	–
898	ZP9	–	8	–	–	–	–
900	JODK-1	–	–	–	–	–	4
904	Hamburg	2	6	–	–	–	–
910	LR2	7	–	*	–	–	–
910	4RK	–	–	–	5	–	1
913	Toulouse	4	6	3	–	–	–
920	HHK	8	–	–	–	–	–
920	2ZR	–	–	–	*	–	–
923	PRF-4	8	8	*	–	–	–
930	CX20	9	–	–	–	–	–
930	JOAG	–	–	–	–	–	1
932	Brussels	2	–	–	–	–	–
950	LR3	10	8	*	7	–	–
950	Breslau	2	–	–	–	–	–
950	2UE	–	–	*	*	–	–
959	Poste Parisien	3	6	2	–	–	–
960	YV1RC	6	6	*	*	–	–
960	PRB-4	–	*	–	–	–	–
986	11GE	2	–	–	–	–	–
990	LR4	9	*	–	*	–	–
990	2GZ	5	–	–	–	–	3
995	PFBI	3	*	–	–	–	–
1005	HJ3ABH	–	9	–	–	–	–
1010	XEU	–	–	–	11	–	–
1010	CX24	9	–	*	–	–	–
1010	3HA	–	–	–	–	–	1
1013	Midland Regional	6	6	–	–	–	–
1017	PRB9	8	6	–	–	–	–
1020	2KY	–	–	*	–	–	1
1022	EAJ-15	5	–	–	–	–	–
1030	CFCN	–	–	*	–	1	–
1030	LR9	9	–	*	–	–	–
1031	Koenigsberg-Heilsberg	2	–	–	–	–	–
1040	CP4	8	–	–	–	–	–
1040	Rennes	3	*	1	–	–	–
1040	5PI	–	–	–	–	–	1
1050	CX26	9	–	–	–	–	–
1059	11BA	5	6	–	–	–	–
1070	LR1	9	–	*	–	–	–
1077	Bordeaux	3	6	1	–	–	–
1080	LT3	9	–	–	–	–	–
1085	JOBK-2	–	–	–	–	–	4
1086	SCC	1	–	–	–	–	–
1086	Zagreb	–	5	–	–	–	–
1090	CX28	9	–	–	–	–	–
1095	EAJ-7	5	6	–	–	–	–
1104	11NA	2	–	–	–	–	–
1104	Madona	1	–	–	–	–	–
1110	LS5	9	–	*	–	–	–
1110	2UW	6	–	–	–	–	–
1113	Radio-Normandie	3	6	2	*	–	–
1120	4BC	6	–	*	*	–	1
1122	HAE	–	5	–	–	–	–
1130	CX30	8	–	–	–	–	–
1132	PRD-8	7	–	–	–	–	–
1140	11TO	5	*	2	–	–	–
1149	North National	5	–	–	–	–	–
1149	West National	5	–	–	–	–	–
1150	LR8	8	8	–	7	–	–
1158	Kosice	1	–	–	–	–	–
1167	Monte Ceneri	5	–	–	–	–	–
1175	JOCK-2	–	–	–	–	–	4
1176	Copenhagen	2	6	–	–	–	–
1185	Nice-Corse	5	–	–	–	–	–
1190	LS2	9	8	*	–	–	–
1190	2CH	6	–	–	–	–	–
1195	Frankfurt	2	6	2	–	–	–
1200	YV3RC	7	–	*	–	–	–
1210	TGW	4	*	*	*	–	–
1210	CX34	–	*	–	–	–	–
1213	Lille	5	6	–	–	–	–
1222	11TR	2	*	*	–	–	–
1230	LS8	8	9	*	7	–	–
1230	2NC	5	–	–	–	–	1
1231	Gleiwitz	1	–	–	–	–	–
1240	WKAQ	7	*	*	*	1	*
1240	3TR	–	–	–	–	–	1
1267	Nurnburg	2	5	–	–	–	–
1270	LS9	9	–	–	–	–	–
1270	2SM	6	*	–	–	–	–
1280	3AW	6	–	–	–	–	–
1282	PRG-3	6	8	–	–	–	–
1285	Dresden	1	–	–	–	–	–
1290	WNEL	*	6	*	*	*	–
1294	Dorbirn	1	–	–	–	–	–
1310	CJLS	–	–	–	*	–	–
1320	KGMB	–	–	*	*	–	–
1321	HAE-2	1	–	–	–	–	–
1330	Bremen	1	–	–	–	–	–
1339	Montpellier	–	5	–	–	–	–
1348	Paris-Ile de France	2	–	–	–	–	–
1348	Konigsberg	1	–	–	–	–	–
1380	4BH	6	–	–	–	–	–
1393	Lyon	4	–	–	–	–	–
1410	2KO	6	–	–	–	–	1
1450	CHGS	–	*	*	–	–	–

F. C. C. Monitor Schedule

The complete schedule of F. C. C. Monitor broadcasts appeared in the November issue. Since that time a few changes have been made as follows:

Add

MONDAY: 3.00 a.m., 1200 kc., WBNY, Buffalo, N. Y.
WEDNESDAY: 4:50 a.m., 1400 kc., WIRE, Indianapolis, Ind.; 5:50 a.m., 1210 kc., KVSO, Ardmore, Okla.
THURSDAY: 2:10 a.m., 1420 kc., KALB, Alexandria, La.; 2:30 a.m., 1310 kc., WTAL, Tallahassee, Fla.
FRIDAY: 5:50 a.m., 1210 kc., WMFG, Hibbing, Minn.

Delete

TUESDAY: 2:10 a.m., 1200 kc., WBHS, Huntsville, Ala.
WEDNESDAY: 4:50 a.m., 1400 kc., WKBF, Indianapolis, Ind.
SATURDAY: 3:50 a.m., 1200 kc., KGEK, Sterling, Colo.

Changes

THURSDAY: 5:00 a.m., 1230 kc., KGBX, Springfield, Mo., frequency changed from 1310 kc.
SUNDAY: 5:00 a.m., 570 kc., KGKO, Wichita Falls, Texas, frequency changed from 1240 kc.

Our Readers Report

Observer Tyndall (Vermont): WSVA, Harrisburg, Va., 550 kc. is on at 6:30 a.m., EST every day.

Observer Birch (Massachusetts): HHK, Haiti, has shifted to 915 kc. for the Friday broadcasts.

Observer Roberts (Massachusetts): "Australian stations have been consistently poor. In fact during the 3-month period ending November 20th the best TP reception occurred during the first week of September. The South Americans are the best I have ever heard them. I find they come through best just after a storm, as the barometer begins to rise."

Observer Reichardt (Massachusetts) reports the European stations heard as late as 4:58 a.m., Fecamp just disappearing at that time. This was especially true on November 9th, 10th and 11th when a flock of Europcans were brought in between 12:05 and 4:58.

Observer Robbins (Massachusetts): WSMK, Dayton, Ohio, is on all night, 1380 kc.; WHN, New York, on most of the night, 1010 kc. XEAW no longer remains on the air all night but comes on again at 5 a.m.

Observer Lawton (Rhode Island): Have just acquired a new 1936 Zenith for my Listening Post. CMBX is received on 1380 although listed in my call book as 1425 (*1380 is correct—Ed.*).

Observer Williams (Maine): Fecamp broadcasts a program in English from 3-4 a.m. EST on 1113 kc.

Observer Beal (Massachusetts) reports the following stations heard each Sunday mornings: CMBX 1-5; WHN 12-4:30; XEAW 1 a.m. on; XEPN 1-3; WSMK 1-6; WJBK 1-6; KNX 1-3; KFI 1-3. All EST.

Observer Tomlinson (New York): Have installed a Scott Imperial 23 tuber this fall. It's excellent on the short-waves and is doing some nice work on split frequencies on the broadcast band.

Observer Kentzel (New York): Am expecting a new 10-tube receiver in a couple of weeks and am looking forward to big DX.

Observer Buitekant (New York) would like to correspond with foreign DX'ers. Those desiring to take advantage of this invitation may write as follows: Murray Buitekant, 2961 Brighton 8th Street, Brooklyn, New York, U. S. A.

Observer Meehan (New Jersey): Doc Brinkley's old station XER, the stormy petrel of past years, is back on the air again this time with the call XERA on 830 kc. This is evidently a sister station of XEAW using the same Mexican and Texas studios. XERA is on the air all night. Cuban CMBY is the station on 640 kc. that interferes with KFI up to midnight.

Observer Gaiser (New Jersey) would like to correspond with short-wave listeners in foreign countries and will be glad to exchange S.W.L. cards. Guarantees to answer all letters and will exchange photos (the address is: Robert F. Gaiser, Box 182, Butler, New Jersey, U. S. A.).

Observer Routzahn (Pennsylvania) has a source of worry which many other DX'ers would be glad to shoulder. His complaint is that he is receiving so many foreign stations that he is having difficulty in identifying them because of their use of foreign languages. His log of broadcast band stations now stands at 888.

Observer Parfitt (Virginia) passes along a whole bag full of tips as follows (EST): KIUN has a special program the 9th of each month from 2 a.m.; WCMI comes on daily at 6:30 a.m.; WJEJ also on at 6:30 a.m.; WSMK now on all night and will verify all reports: WHDL on each Saturday at 6 a.m.; KFBI, KRNT, WJAY, and WMT (with same program as KRNT) are on at 6 a.m.; CKNX on first Saturday of each month 4:30-5:30 with regular DX program.

Observer Wilson (Virginia) is hearing two Spanish speaking stations on 830 and 540 kc. Thinks they're both Cubans but has not been able to definitely identify them. Can anybody help him?

Observer Kocsan (Pennsylvania) writes that he is now all set in DX'ing with a 1933 Crosley, a 1935 Midwest, a R. N. Tenatuner, Doublet and Cage Antennas, a turning meter which he has attached to the Crosley set, a good log book —and RADIO NEWS.

Observer Halsey (Arkansas) has been experimenting with antennas and grounds and will be glad to correspond with anyone interested in the results he has obtained from those experiments. Address: James F. Halsey, 923 East Fifth Street, Texarkana, Arkansas.

A GIANT INSULATOR

Where the radio tower itself serves as the antenna, insulation becomes a real problem. The insulator shown here supports one corner of a 100-ton, 500-foot tower at WCFL. The insulator weighs 1200 pounds and is over 4 feet high

Observer Kimmons (Texas): Today my log stands at 536 heard with 470 verified and 12 reports out. During November conditions were bad. Japs were heard on 560, 590, 610, 750-770, 810, 830, 850, 870, 1085 kc., but were too weak to report. 1YA, 650 kc., Auckland, New Zealand was heard several times but signals not as good as usual.

Observer Smith (Illinois): I live in the country where water pipes are not available for ground. I have tried numerous other types and find an aluminum plate suspended in a well gives a remarkable increase in signal strength and tends to reduce atmospheric noises. WMBI, 1080 kc., Chicago is on every Saturday, 1-2 a.m., EST. KGFW, 1310 kc., Kearney, Nebraska, is on the second and fourth Wednesday every month 6-6:15 a.m.

Observer Rebensdorf (Illinois): Expect to try out some of the swell circuits you have been publishing in RADIO NEWS. 1YA has been very consistent here this fall between 4 and 5 a.m., CST.

Observer Johnson (Minnesota): XEFL,

(*Turn to page* 510)

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BROADCAST STATIONS IN THE U. S.

(Revised by Frequency. Wavelength and Call Letters Included)

Compiled by John M. Borst

550 kc., 545.1 m.
KFUO, KFYR, KOAC, KSD, WDEV, WGR, WKRC, WSVA.

560 kc., 535.4 m.
KFDM, KLZ, KSFO, KWTO, WFIL, WIND, WLIT, *WNOX, WQAM.

570 kc., 526.0 m.
KGKO, KMTR, KVI, WKBN, WMCA, WNAX, WOSU, WSYR, WSYU, WWNC.

580 kc., 516.9 m.
KMJ, KSAC, WCHS, WDBO, WIBW, WTAG.

590 kc., 508.2 m.
KHQ, WEEI, WKZO, WOW.

600 kc., 499.7 m.
KFSD, WCAC, WCAO, WICC, WMT, WREC.

610 kc., 491.5 m.
KFRC, WDAF, WIP, WJAY.

620 kc., 483.6 m.
KGW, KTAR, WFLA, WSUN, WHJB, WLBZ, WTMJ.

630 kc., 475.9 m.
KFRU, KGFX, WGBF, WMAL, WOS, WPRO.

640 kc., 468.5 m.
KFI, WAIU, WOI.

650 kc., 461.3 m.
KIRO, WSM.

660 kc., 454.3 m.
WAAW, WEAF.

670 kc., 447.5 m.
WMAQ.

680 kc., 440.9 m.
KFEQ, KPO, WPTF.

690 kc., 434.5 m.
(Reserved for Canadian Stations)

700 kc., 428.3 m.
WLW.

710 kc., 422.3 m.
*KIRO, KMPC, WOR.

720 kc., 416.4 m.
WGN.

730 kc., 410.7 m.
(Reserved for Canadian Stations)

740 kc., 405.2 m.
KMMJ, KTRB, WHEB, WSB.

750 kc., 399.8 m.
KGU, WJR.

760 kc., 394.5 m.
KXA, *WBAL, WEW, WJZ.

770 kc., 389.4 m.
KFAB, WBBM.

780 kc., 384.4 m.
KEHE, KELW, KFDY, KFQD, *KGHL, WEAN, WMC, WTAR.

790 kc., 379.5 m.
KGO, WGY.

800 kc., 374.8 m.
WBAP, WFAA, WTBO.

810 kc., 370.1 m.
WCCO, WNYC.

820 kc., 365.6 m.
WHAS.

830 kc., 361.2 m.
KOA, WEEU, WIIDH, WRUF.

840 kc., 356.9 m.
(Reserved for Canadian Stations)

850 kc., 352.7 m.
KIEV, KWKH, WWL.

860 kc., 348.6 m.
WABC, WBOQ, WHB.

870 kc., 344.6 m.
WENR, WLS.

880 kc., 340.7 m.
KFKA, KLX, KPOF, WCOC, WGBI, WPHR, WQAN, WSUI.

890 kc., 336.9 m.
KARK, KFNF, KFPY, KSEI, KUSD, WBAA, WGST, WILL, WJAR, WMMN.

900 kc., 333.1 m.
KGBU, KHJ, KSEI, WBEN, WELI, **WFMD, WJAX, WKY, WLBL, WTAD.

910 kc., 329.5 m.
(Reserved for Canadian Stations)

920 kc., 325.9 m.
KFEL, KOMO, KPRC, KVOD, WAAF, WBSO, WPEN, WRAX, WSPA, WWJ.

930 kc., 322.4 m.
KGBZ, KMA, KROW, WBRC, WDBJ.

940 kc., 319.0 m.
KOIN, WAAT, WAVE, WCSH, WDAY, WHA.

950 kc., 315.6 m.
KFWB, KGHL, KMBC, KHSL, WRC.

960 kc., 312.3 m.
(Reserved for Canadian Stations)

970 kc., 309.1 m.
KJR, WCFL, WIBG.

980 kc., 305.9 m.
KDKA.

990 kc., 302.8 m.
WBZ, WBZA.

1000 kc., 299.8 m.
KFVD, WHO.

1010 kc., 296.9 m.
KGGF, KQW, WHN, WIS, WNAD, WNOX.

1020 kc., 293.9 m.
KYW, **WDZ.

1030 kc., 291.1 m.
(Reserved for Canadian Stations)

1040 kc., 288.3 m.
KRLD, KTHS, *KWJJ, WESG, WKAR, *WTIC.

1050 kc., 285.5 m.
KFBI, KNX.

1060 kc., 282.8 m.
KWJJ, WBAL, WJAG, WTIC.

1070 kc., 280.2 m.
KJBS, WCAZ, WDZ, WTAM.

1080 kc., 277.6 m.
WBT, WCBD, WMBI.

1090 kc., 275.1 m.
KMOX.

1100 kc., 272.6 m.
KGDM, WLWL, WPG.

1110 kc., 270.1 m.
KSOO, WRVA.

1120 kc., 267.7 m.
KFIO, KFSG, KRKD, KRSC, WCOP, WDEL, **WGCM, WISN, WTAW.

1130 kc., 265.3 m.
KSL, WJJD, WOV.

1140 kc., 263.0 m.
KVOO, WAPI.

1150 kc., 260.7 m.
WHAM.

1160 kc., 258.5 m.
WOWO, WWVA.

1170 kc., 256.3 m.
WCAU.

1180 kc., 254.1 m.
KEX, KOB, WDGY, WINS, WMAZ.

1190 kc., 252.0 m.
WATR, WOAI, WSAZ.

1200 kc., 249.9 m.
KADA, KBTM, KFJB, KFXD, KFXJ, KGDE, KGEK, KGFJ, KGHI, KMLB, KOOS, KSUN, KVOS, KWG, WABI, WAIM, WBBZ, WBHS, WBNO, WCAT, WCAX, WCLO, WFAM, WHBC, WHBY, WIBX, WIL, WJBC, WJBL, WJBW, WKBO, WKJC, WLVA, WMFR, WMPC, **WNRI, WRBL, WWAE.

1210 kc., 247.8 m.
KASA, KDLR, **KDON, KFJI, KFOR, KFPW, KFVS, KFXM, KGY, KIEM, KIUL, KPPC, KVSO, KWEA, KWTN, WALR, WBAX, WBBL, WBRB, WCOL, WCRW, WEBQ, WEDC, WFAS, WGBB, WGCM, WGNY, WHBF, WHBU, WIBU, WJBY, WJEJ, WJIM, WJW, WKOK, WMBG, WOCL, WOMT, WPAX, WPAY, **WSAY, WSBC, WSIX, WSOC, WTAX.

1220 kc., 245.8 m.
KFKU, KTW, KWSC, WCAD, WCAE, WDAE, WREN.

1230 kc., 243.8 m.
*KGBX, KGGM, KYA, WFBM, WNAC.

1240 kc., 241.8 m.
KGCU, KLPM, KTAT, KTFI, WKAQ, WXYZ.

1250 kc., 239.8 m.
KFOX, WCAL, WDSU, WHBI, WLB, WNEW, WTCN.

1260 kc., 238.0 m.
KGVO, KOIL, KPAC, KRGV, KUOA, KVOA, WHIO, WNBX, WTOC.

1270 kc., 236.1 m.
KGCA, KOL, KVOR, KWLC, WASH, WFBR, WJDX, WOOD.

1280 kc., 234.2 m.
KFBB, WCAM, WCAP, WDOD, WIBA, WORC, WRR, WTNJ.

1290 kc., 232.4 m.
KDYL, KLCN, *KTRH, WEBC, WJAS, WNBZ, WNEL.

1300 kc., 230.6 m.
KALE, KFAC, KFH, KFJR, WBBR, WEVD, WFAB, WFBC, WHAZ, WIOD, WMBF.

1310 kc., 228.9 m.
KCRJ, KFBK, KFPL, KFPM, KFXR, KFYO, KGBX, KGCX, KGEZ, KGFW, KINY, KIT, KIUJ, KMED, KRMD, KROC, KTSM, KVOL, KXRO, WAML, WBEO, WBOW, WBRE, WCLS, WDAH, WEBR, **WEMP, WEXL, WFBG, WFDF, WGH, WHAT, WJAC, WLBC, WLNH, WMBO, WMFF, WNBH, WOL, WRAW, WROL, WSAJ, WSGN, WSJS, WTAL, WTEL, WJTS, WTRC.

1320 kc., 227.1 m.
KGHF, KGMB, KID, KRNT, WADC, WORK, WSMB.

1330 kc., 225.4 m.
KGB, KMO, KSCJ, KTRH, WDRC, WSAI, WTAQ.

1340 kc., 233.7 m.
KGDY, KGNO, KGIR, WCOA, WEAF, WSPD.

1350 kc., 222.1 m.
KIDO, KWK, WAWZ, WBNX.

1360 kc., 220.4 m.
KGER, WCSC, WFBL, WGES, WQBC, WSBT.

1370 kc., 218.8 m.
KAST, KCRC, KELD, KERN, KFGQ, KFJM, KFJZ, KFRO, KGAR, KGFG, KGFL, KGKL, KICA, KIUP, KLUF, KMAC, KONO, KRE, KRKO, KSLM, KUJ, KVI, KWKC, KWYO, WABY, WAGF, **WBNY, WBTM, WCBM, WDAS, WGL, WHBQ, WHDF, WIBM, WJTL, WLLH, WMBR, WMFD, WMFO, WOC, WPFB, WQDM, WRAK, WRDO, WRJN, WSVS.

1380 kc., 217.3 m.
KOH, KQV, WALA, WKBH, WNBC, WSMK.

1390 kc., 215.7 m.
KLRA, KOY, WHK.

1400 kc., 214.2 m.
KLO, KTUL, WARD, WBBC, WIRE, WKBF, WLTH, WVFW.

1410 kc., 212.6 m.
KGNC, WAAB, WBCM, WHBL, WHIS, WRBX, WROK, WSFA.

1420 kc., 211.1 m.
KABC, KABR, KALB, KBPS, KCMC, KFIZ, KGFF, KGGC, KGIW, **KHBC, KIDW, KIUN, **KNET, KORE, KRLC, **KRLH, KUMA, KWBG, KXL, WACO, WAGM, WAZL, WCBS, WEED, WEHC, WEHS, WELL, WGPC, WHDL, WHFC, WILM, WJBO, **WJBR, WJMS, WKBI, WLAP, WLBF, WLEU, WMAS, WMBC, WMBH, WMFJ, WNRA, WPAD, WPAR, **WPRP.

1430 kc., 209.7 m.
KECA, KGNF, KSO, WBNS, WHEC, WHP, WNBR, WOKO.

1440 kc., 208.2 m.
KDFN, KLS, KXYZ, WBIG, WCBA, WMBD, WSAN.

1450 kc., 206.9 m.
KTBS, WGAR, WHOM, WSAR, WTFI.

1460 kc., 205.4 m.
KSTP, WJSV.

1470 kc., 204.0 m.
KGA, WLAC.

1480 kc., 202.6 m.
KOMA, WKBW.

1490 kc., 201.2 m.
**KFBK, WCKY.

1500 kc., 199.9 m.
KDB, KGFI, KGFK, KGKB, KGKY, KNEL, KNOW, KOTN, KPJM, KPLC, KPQ, KREG, **KRNR, KXO, WCNW, WDNC, WGAL, **WHBB, WHEF, WJBK, WKBB, WKBV, WKBZ, WKEU, WMBQ, WMEX, WNBF, WOPI, WRDW, WRGA, WSYB, WTMV, WWRL, WWSW.

* By special authorization.
** Construction permit.

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How Radio Makes Flying SAFE

By L. M. Cockaday

(Continued from page 457)

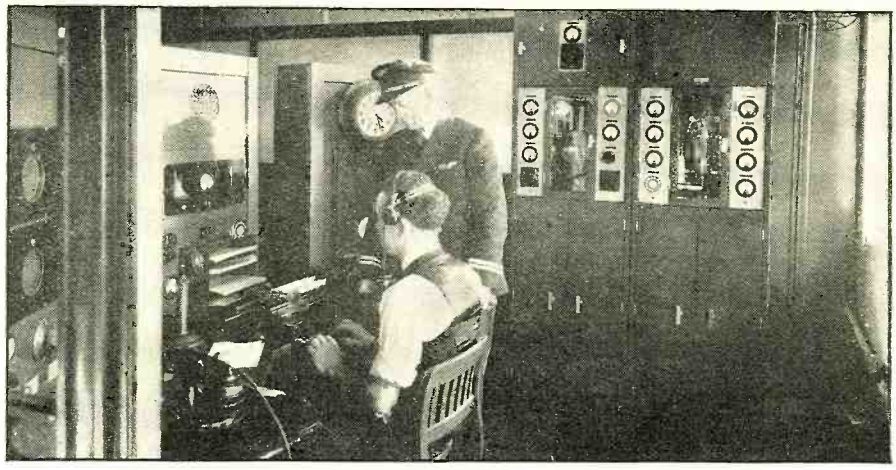
Corporation and the Lear Development Company, contains a special loop antenna located on the fuselage so that its plane is perpendicular to the fore and aft axis. The receiving equipment of the "homing" compass employs a visual indicator which is placed in full view of the pilot. The ship is then piloted directly into the transmitting station's wave-front, simply by keeping the indicator on "dead-center." If the course varies, the indicator moves to left or right and the pilot can bring the ship back on a bee-line by correcting the course of the ship. The compass receiver on the plane is tuned to a beacon or broadcast station whose identity has been predetermined and which lies in the direction the pilot desires to go. An accuracy of 1 to 2 degrees can be obtained with this device at distances up to 300 or 400 miles and it is entirely possible, now, to fly across the United States without an old-fashioned compass and without the complicated calculations needed for regular navigation. Slight corrections are made for "wind drift" and for "night error" (the latter caused by radio-wave distortion) if the flyer wishes to keep an actual straight-line course rather than a slightly zigzag or curved one. Equipment of the type under consideration is illustrated on these pages.

Already existing standard Beacon Stations of the Department of Commerce, of which there are now over 70, as well as the 80 marine Beacon Stations along our coasts operate in the following manner: In Figure 1 is a diagram, at the center point of which is a beacon transmitter with two antennas. One of these transmits a telegraphic dot-dash or the letter "A", the other a dash-dot or the letter "N". These two signals overlap along the paths indicated by the solid lines, the signal on these paths merging into a steady "T".

Assume that the pilot's course is in the direction LD. As long as he remains truely on the course he hears the letter "T". Should he fly too far to the left the letter "N" becomes predominant; two far to the right the letter "A" predominates. These signals, transmitted from the beacon are occasionally interrupted for the beacon's identification signal (see list of U. S. Beacon Stations on page 511.

NEW TYPE STREAM-LINE LOOP

This system, which is also of the double-loop type shown elsewhere in this article, employs a stream-line housing for the antennas that greatly reduces wind pressure. The housing is made in two sections riveted together and is said to increase the speed of the plane five miles per hour, by reducing air impedance.



A COMMERCIAL AIRLINE'S RADIO GROUND STATION

E. L. Saunders, radio operator, typing a message for Fred A. Jones, pilot. Two panels in the background comprise the Western Electric transmitting equipment. To the left is a cabinet containing control equipment and next to this is a speech amplifier, while on the extreme left is the receiver rack containing the National airport receiver

Directly above the transmitting beacon there is a decided dead spot giving an indication to the pilot that he is passing right over its location. After he passes the beacon transmitter the "A" is now on the left and the letter "N" is on his right. The signals, of course, increase in intensity reaching a climax just before the dead spot directly over the beacon so that the pilot can determine, not only his true course, but knows just when he has arrived at the beacon's location on the map. These signals can be received on a standard light-weight receiver now available to all pilots including private flyers.

A receiver of this type designed by the Bell Telephone Laboratories and made available through the Western Electric Company is so compact that it measures only 7¾ inches each way and weighs but 11 pounds, complete with tubes and mounting bracket. It tunes in equally well the Weather Beacon band of 200 to 400 kilocycles and the Broadcast Band of 550 to 1500 kilocycles. The set is a 3-tube superheterodyne, requiring only a short antenna and produces an output of one-half watt, enough energy to supply several pairs of headphones. Its selectivity is such that it will separate a beacon signal from interfering signals on the adjacent bands; interference only 6 kilocycles away from the desired signal is 40 decibels down. The set has three controls, one to switch from the Beacon Band to the Broadcast Band; another control for tuning; and a third for controlling volume.

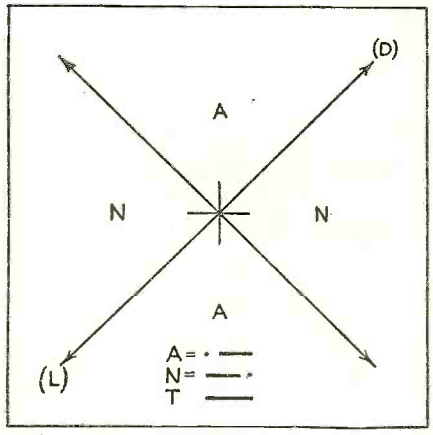


FIGURE 1

A transmitter that adds greatly to the safety of privately-owned aircraft is also available, now, from the same manufacturer. It weighs only 11 pounds and is 8½ by 9½ by 6½ inches in size. It operates over the frequency range between 2 and 7 megacycles and can be used for speech and tone telegraphy with an output of 5 watts, and for cw with an output of 15 watts. Power for the filaments of the transmitting tubes is obtained from a 12-volt storage battery and power for the plate circuits is supplied from a 550-volt dynamotor operated from the same battery. Any two frequencies may be used by inserting the proper crystal unit and adjust the tuning control. A twin-crystal unit is available for use with this transmitter as standard equipment, enabling the pilot to transmit on 3105 or on 3120 kilocycles, the frequencies assigned by the FCC for calling and working with any Department of Commerce station along the commercial airlines routes or with any radio-equipped airport. The pilot merely flips a switch on the transmitter to shift from one frequency to the other.

With this equipment the pilot can request specific weather data that may not be included in the regular broadcasts but that may prove especially important to him. He can also talk directly to airports for information about landing regulations, especially those airports that maintain radio traffic control for taking-off and landing. In this way the private flyer is now protected with all the radio safety measures that are proving so powerful a factor in American air transport services.

The progressive and up-to-date airport is now fully radio-equipped and such landing fields contain a radio tower, one of which is illustrated herewith, with an experienced operator who controls landing and taking-off and thus keeps down the possibility of accident.

The ground stations of the commercial airlines also employ powerful transmitters and sensitive receivers for maintaining contacts, not only with their own planes, but with private flyers. These stations also use teletype transmission on their communication lines, for written traffic orders and reports.

The use of radio, therefore, and especially the newer radio devices outlined above, are making flying safe and eliminating the hazards of unknown weather, lost position and landing and taking-off mishaps. The flyer today is no longer an isolated "dot" far above the earth, hoping that he will arrive somewhere near his destination to make a happy landing; radio has given him magic ears and eyes to conquer fog and darkness, and a pigeon's uncanny "sixth sense" to guide him directly to his goal.

New Metal Tube

(Continued from page 469)

usually sufficient. The tube is filled with a permanent gas rather than a vapor filling. The tube characteristics are independent of the surrounding temperature.

The OZ4 has the same external form and dimensions as other tubes of the metal line. However, in this tube the metal shell serves chiefly as container and electrostatic shield for the glass bulb, which is required to insulate the contained gas from the grounded shell.

Operating Conditions and Characteristics

DC Voltage Output	300 max.	Volts
DC Output Current	30 min.	m.a.
	75 max.	m.a.
Peak Plate Current	200 max.	m.a.
Starting Voltage	300 min.	Volts
Voltage Drop (Dynamic)	24 avg.	Volts

Leading manufacturers of vibrators and automobile receivers are enthusiastic about the performance of the OZ4 in service tests which have been running for several months. It is said that synchronous vibrator rectifier efficiency can be had with the OZ4 and a simple non-synchronous rectifier. It is well-known that the non-synchronous vibrator will operate over long periods without re-adjustment and that adjustment when needed is relatively easy.

The tube is rugged and has no filament to break or burn out. It is expected to simplify the power supply problem for many automobile receiver manufacturers during the coming season. The base of this tube is a standard octal type.

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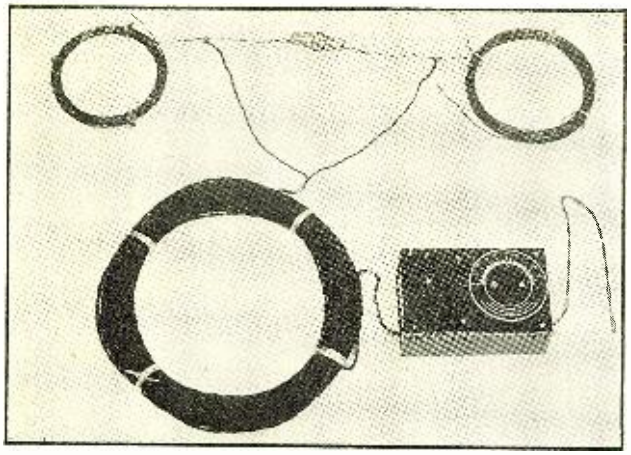


THE NEW TUNED ANTENNA

The doublet, twisted-pair lead-in and tuner box are furnished as shown here, connected up and ready for use.

A "TUNED" Short-Wave ANTENNA

("R9+" S.W. Aerial)

By McMurdo Silver

NOISE-REDUCING antennas have found widespread use in the last several years, and during the past two years an attempt has been made in their design to obtain physical sizes that would approximately resonate to short-wave broadcast bands. In these antennas, approximate tuning has been sought by cutting the antenna flat top to a physical length which causes it to substantially resonate at say, 6,000 kc. or 50 meters. and again at the 2nd harmonic, or 12,000 kc., 25 meters.

Universal in Application

Such efforts are not always dependable, as is proven by Mr. Jones, who puts up the "Blank" antenna and finds it excellent, while Mr. Smith finds it worthless at his home. Each owner erected his antenna just as specified, and one worked well and one worked poorly. The answer is variation in individual local and terrain conditions which in the second case completely upset the resonance characteristics of the antenna.

The writer has given this subject much thought, including the problem of tuning an antenna so it would work efficiently in any location and at any frequency; also, of coupling the tuned antenna to a standard all-wave broadcast receiver in such a manner that it would not upset the receiver, and still be coupled sufficiently close to give real gain. The result of this study is the "R9+" antenna system described here.

Tunable Coupling

As differentiated from other short-wave antennas now available this new antenna employs two modes of operation—natural resonant at the tuning period of the flat top, and tunable resonance at all other wave-lengths within its range. Actually, however, since like all other semi-resonant (cut to resonant physical lengths) antennas, such naturally resonant operation is dependent upon uncontrollable factors of erection and location to a point where this natural condition may frequently be unrealized, no dependence is placed upon the natural resonant period of the flat top. This is a sharp advance from previous practice, no complete tuning having been heretofore provided on short-wave antennas.

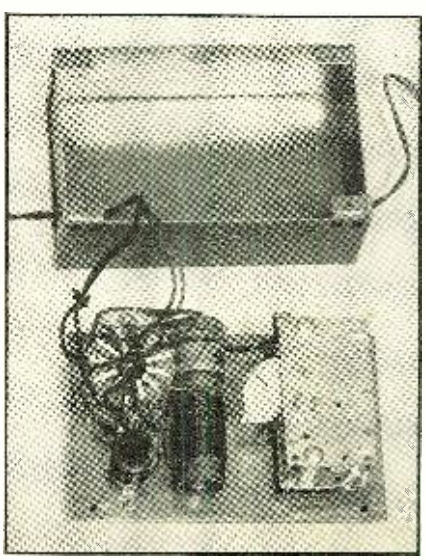
Considering practical operation, the improved performance of the antenna as measured against a popular type of short-wave antenna was found to be as follows:

Kc.	Db. Gain of "R9+" Antenna
1,800	15.6
4,200	4.74
8,200	12.0
7,300	4.5
9,000	10.9
12,000	9.6
14,000	8.6
15,000	10.5
18,000	3.5

The "R9+" antenna consists of a doublet 50 feet long (25 feet per side), three special insulators, 131 feet of weatherproof twisted pair lead-in and the tuner and switch box, as illustrated herewith. It comes with all connections soldered and all insulators in place. To erect it, it is merely necessary to tie a rope to the insulators at the ends of the 50-foot flat top, and hoist the antenna on its supports. The higher up it is and the further away from electrical apparatus, such as motors, and auto roads, the better. The lead-in is carried down to a window near the radio, the tuner box pulled in through the window, its leads fastened to the antenna binding posts of the set, and the job is done. If too much lead-in is left over, it can be coiled and placed out of the way, or exactly 78 feet—no more, no less—can be cut off. If a longer lead-in is needed, as many extra 78-foot lengths of twisted pair as are required may be spliced into the original 131-foot lead-in.

THE TUNER-SWITCH BOX

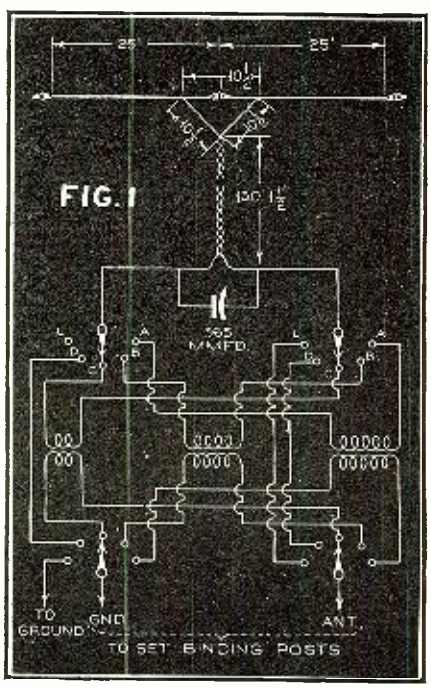
Opened to show the 3 r.f. transformers, the variable condenser and the band-selector switch which permit the antenna to be tuned to any short-wave range between 9 and 200 meters.



The "Tuner Box"

The tuner box contains three balanced, separate coupling transformers, the antenna tuning condenser, and the five-position selector switch. Three positions of the switch select the three balanced coupling transformers for different wavelengths, the fourth feeds the balanced doublet transmission line directly through the tuning condenser to the receiver, and the fifth position gives a standard L antenna for broadcast band reception.

Operation consists only in initially selecting that dial setting which in conjunction with one of the switch positions, gives greatest (*Turn to page* 501)



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The DX for the

Conducted by Laurence

A DX CORNER IN THE "BUCKEYE" STATE

The shipshape Listening Post of Dwight Williamson of Dayton, Ohio. He is an ardent reader of RADIO NEWS *and uses two receivers relying on the one he is pictured tuning, a Hammarlund Comet Pro.*

THE thirty-fifth 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 Wireless 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.

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.

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

Last Call for New Applications or Renewals

The list of Official Observers is being prepared and it is hoped that appointments for 1936 can be made and included in a listing in the March issue. . . . 1935 Observers who desire re-appointment should mail their applications to the Editor of the Department including a brief summary of DX accomplishments to date and a brief description of the equipment employed.

Results of Vote on Listing

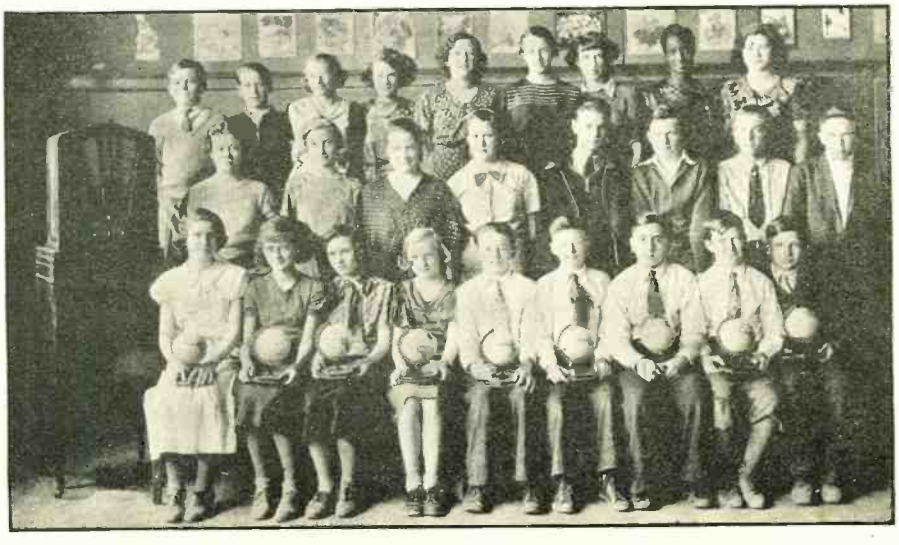
In the December DX Corner we asked our readers to vote on whether we should use the legal speed of 300,000,000 meters-per-second rather than the technically more accurate figure upon which our wavelengths for the stations have been calculated. The vote has been overwhelmingly to *use the legal speed as a basis for the measurements* and therefore in our March issue this will be adopted, making the calculated wavelengths slightly higher than those shown this month. We believe this is a good decision as all international con-

GREETINGS FROM QUEBEC

Official Observer A. Belanger of Hull, Quebec, sends 73's to RADIO NEWS *readers. He uses a Stromberg-Carlson preselector with a standard receiver for short-wave work.*

THE WORLD EXPLORERS' CLUB

A group of students of the Kern Road Junior High School of East Detroit, Michigan, whose one purpose is to enjoy and understand transmissions of the people of foreign lands over short-wave radio. The list of stations they receive regularly is too long to publish.



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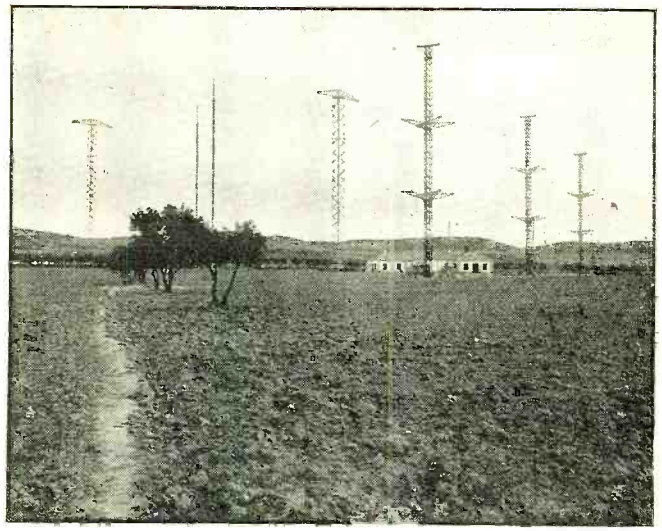
Corner SHORT WAVES

M. Cockaday



FAMOUS OLD "EAQ" TOWERS AT ARANJUEZ

Looking through the ploughed fields surrounding the Madrid Station, EAQ, showing the transmitting house and the antenna array.

ventions have adopted this arrangement and stations are allocated by frequencies and legal wavelengths are calculated on this basis.

Another decision, we would like our readers to make, concerns "time". We, therefore, ask our readers to vote on whether we should continue listing the partial information paragraphs on new stations, in E.S.T., or should we change to Greenwich Mean Time? Simply send in a post card to the Short-Wave DX Editor with these words: "I vote E.S.T." or "I vote G.M.T."

Listening Post Observers and Other Fans Please Notice

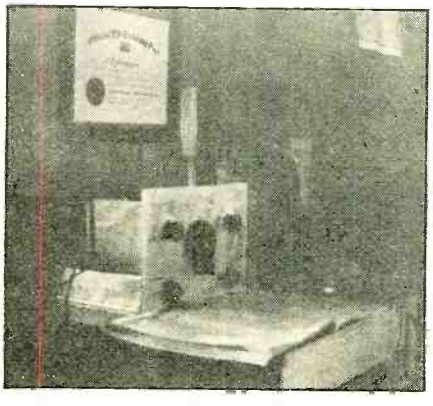
Listed in next column is this month's partial information regarding short-wave stations heard and reported by our World-Wide Listening Posts. Each item in the listing is credited with the Observer's surname. This will allow our readers to note who obtained the information given. If any of our readers 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:

HE'S STARTING IN RIGHT

This is Corwin Denney, young short-wave fan of Washington, Ohio, who took his complete receiver out in the backyard in order to take this photograph for RADIO NEWS.

ANOTHER CERTIFICATE IN EVIDENCE

Observer J. T. Atkins of Minnedosa, Man., Canada, who was only 16½ years old when he first received his RADIO NEWS *appointment. Notice a copy of* RADIO NEWS *opened to the Time-Table, in front of the receiver.*



EUROPE

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

SPW, Warsaw, Poland, 22 meters, 13635 kc., 10 kw. transmitting daily except Sundays, 11:30 a.m. to 1:30 p.m. E.S.T. (Peyer, Vassallo, Sholin, Self, DeLaet, Mallet-Veale, Marshall.) (This new station has been heard well at the Westchester Listening Post announcing in English as well as French, German and Polish.)

IQA, Rome, Italy, 20.51 meters, 14732 kc. heard daily. (Donald Smith, Wilkinson.)

DJJ, Zeesen, Germany, 10042 kc. reported transmitting 2-4 p.m. E.S.T. (Seright, Gavin, Flick, Belt, Munz.)

DJI, Zeesen, Germany, 9675 kc. reported heard 5-7 p.m. E.S.T. (Seright, Flick.)

PCI, Holland, 15220 kc. reported heard 8:45 a.m. E.S.T. (Koehnlein.)

DJM, Zeesen, Germany, 49.4 meters, heard testing at 4 a.m. (N. C. Smith.)

RKI, Moscow, U.S.S.R., 19.9 meters, 15040 kc., is reported heard with very strong signals Sunday mornings and irregularly. (Shea.)

ASIA

XGR, Shanghai, China, 11.5 mc., has been heard playing records around 6:30 a.m. E.S.T. (Adams.)

HANOI, China, 9.4 mc., has been heard playing records 8 a.m. (Adams.)

ZCK, sometimes reported as ZEK, and who broadcasts ZBW on 8750 kc. may soon change frequency to 5400 kc. for the winter. (Golden, Craft, Brewer, Howald, Partner.)

FZR, a station in Indo-China, 16200 kc., reported heard 8-8:30 a.m. and 9:30-10:30 a.m. E.S.T. (Marshall, Baadsgaard.)

HSP, Bangkok, Siam, 16.92 meters, 17750 kc., reported heard 5-6:30 a.m. (Adams, Lower.)

Colombo, Ceylon, 6036 kc., reported heard 8:30-11:30 a.m. E.S.T. (Adams.)

AFK, Kabul, Afghanistan, 30.9 meters, reported heard irregularly at night. (Scala.)

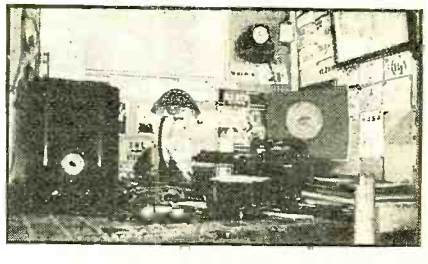
AFH, Herat, Afghanistan, 50.8 meters, reported heard irregularly evenings with 500 watts power. (Scala.)

ZGR, Kedah, British Malaya, 49 meters, heard irregularly. (Westchester.)

(*Turn to page* 484)

GEORGIA HEARD FROM

This is the Listening Post of Reeve Owen of Calhoun, Georgia. He uses a Zenith receiver and his antenna is the RCA World Wide type.



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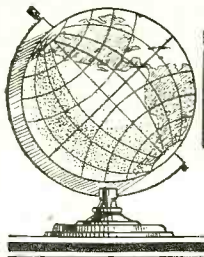
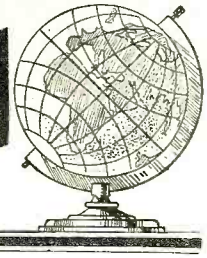


WORLD SHORT WAVE TIME-TABLE



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
13.9+	W8XK	21540	Pittsburgh, Pa.
15.9+	PLE	18830	Bandoeng, Java
16.8+	GSG	17790	Daventry, England
16.8+	W3XAL	17780	Bound Brook, N. J.
16.8+	DJE	17760	Zeesen, Germany
19.5	HAS3	15370	Budapest, Hungary
19.5+	W2XAD	15330	Schenectady, N. Y.
19.6+	DJQ	15280	Zeesen, Germany
19.6+	W2XE	15270	New York, N. Y.
19.6+	GSI	15260	Daventry, England
19.6+	FYA	15245	Pontoise, France
19.7	PCJ	15220	Huizen, Holland
19.7	W8XK	15210	Pittsburgh, Pa.
19.7	DJB	15200	Zeesen, Germany
19.8	GSF	15140	Daventry, England
19.8	HVJ	15121	Vatican City
19.9+	RKI	15040	Moscow, U. S. S. R.
20.5+	JVH	14600	Nazaki, Japan
21.2+	HJ5ABE	14120	Cali, Colombia
21.9+	SPW	13635	Warsaw, Poland
22.7+	ORP	13200	Ruysselede, Belg.
22.9+	VPD	13075	Suva, Fiji Islands
23.3+	CNR	12830	Rabat, Morocco
24.5+	TFJ	12235	Reykjavik, Iceland
24.8+	CT1CT	12082	Lisbon, Portugal
24.9+	RV59(RNE)	12000	Moscow, U. S. S. R.
25.2	CT1GO	11900	Parede, Portugal
25.2+	FYA	11890	Pontoise, France
25.2+	W8XK	11870	Pittsburgh, Pa.
25.2+	GSE	11860	Daventry, England
25.3+	W2XE	11830	New York, N. Y.
25.3+	I2RO	11810	Rome, Italy
25.4+	W1XAL	11790	Boston, Mass.
25.4+	DJD	11770	Zeesen, Germany
25.5+	GSD	11750	Daventry, England
25.5+	PHI	11730	Huizen, Holland
25.5+	CJRX	11720	Winnipeg, Canada
25.5+	FYA	11720	Pontoise, France
25.6+	HJ4ABA	11710	Medellin, Col.
27.2+	PLP	11000	Bandoeng, Java
27.2+	XBJQ	11000	Mexico City, Mex.
27.9+	JVM	10740	Nazaki, Japan
28.1	CEC	10670	Santiago, Chile
28.1+	JVN	10660	Nazaki, Japan
29.0+	ORK	10330	Ruysselede, Belgium
29.2+	PMN	10260	Bandoeng, Java
29.5+	OPM	10135	Leopoldville, Africa
30.4+	EAQ	9860	Madrid, Spain
31.1+	I2RO	9635	Rome, Italy
31.2+	CT1AA	9600	Lisbon, Portugal
31.2+	HBL	9595	Geneva, Switzerland
31.2+	W3XAU	9590	Philadelphia, Pa.
31.2+	VK2ME	9590	Sydney, Australia
31.2+	HP5J	9590	Panama City, Pana.
31.3+	VK3LR	9580	Lyndhurst, Australia
31.3	GSC	9580	Daventry, England
31.3+	W1XK	9570	Millis, Mass.
31.3+	VUY (VUB)	9565	Bombay, India
31.3+	DJA	9560	Zeesen, Germany
31.4+	DJN	9540	Zeesen, Germany
31.4+	LKJI	9530	Jeloy, Norway
31.4+	W2XAF	9530	Schenectady, N. Y.
31.5+	VK3ME	9510	Melbourne, Australia
31.5+	GSB	9510	Daventry, England
31.5+	PRF5	9501	Rio de Janeiro, Braz
31.8	COCH	9428	Havana, Cuba
31.8+	PLV	9415	Bandoeng, Java
32.8+	HAT4	9125	Budapest, Hungary
32.8+	CP6	9120	La Paz, Bolivia
34.2+	ZCK (ZBW)	8750	Hong Kong, China
35.9+	HCJB	8333	Quito, Ecuador
36.4+	ZP10	8220	Asuncion, Paraguay
36.7	CO9JQ	8170	Camaguey, Cuba
37.3+	CNR	8035	Rabat, Morocco
38.1+	HC2JSB	7854	Guayaquil, Ecuador
38.4+	HBP	7797	Geneva, Switzerland
40.4+	HJ3ABD	7406	Bogota, Colombia
40.6+	XECR	7380	Mexico City, Mex.
41.1+	HJ1ABD	7281	Cartagena, Col.
41.7+	CR6AA	7177	Lobito, Angola, Afr.
42.1+	HB9B	7118	Basle, Switzerland
42.3+	PI1J	7082	Dordrecht, Holland
43.4+	H13C	6900	La Romana, D. R.
44.0	HIH	6818	San Pedro, D. R.
44.4+	JVT	6750	Nazaki, Japan
44.6+	TIEP	6710	San Jose, Costa Rica
44.9+	YVQ	6672	Maracay, Ven.
44.9+	HC2RL	6668	Guayaquil, Ecuador
45.3	PRADO	6616	Riobamba, Ecuador
45.3+	RV72	6611	Moscow, U. S. S. R.
45.7+	TIRCC	6550	San Jose, Costa Rica
45.9+	YV6RV	6520	Valencia, Ven.
46.2	HJ5ABD	6490	Cali, Colombia
46.2+	HI4D	6482	San Domingo, D. R.

HOURS OF TRANSMISSION

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WORLD SHORT WAVE TIME-TABLE

(*Continued from the Previous Page*)

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

8	9	10	11	M	1	2	3	4	5	6	7	FILL IN LOCAL 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

Wave-length Meters	Call Letters	Frequency Kc.	City Country	HOURS OF TRANSMISSION
46.4+	YN1GG	6450	Managua, Nicaragua	D D / D D / D D
46.5	HJ1ABB	6447	Barranquilla, Col.	D / D D / S D D D
46.7+	TIPG	6410	San Jose de Costa Rica	/ / / / / / / / / D D D
47.0	YV4RC	6375	Caracas, Venez.	/ / / / / / / / / / D D
47.2+	HRP1	6350	San Pedro Sula, D. R.	/ / / / D D / / / / D D
47.4+	HIZ	6315	San Domingo, D. R.	/ / / / $ $ S / I I I I
47.5+	VUC	6300	Calcutta, India	I I D D Sa Sa / / / / / / /
48.1+	OAX4G	6230	Lima Peru	/ / / / / / / / / / / L
48.1+	HJ1ABH	6225	Cienaga, Colombia	/ / / / / / / / / / / AM
48.4+	HI1A	6188	Santiago de Los Caballeros, D. R.	/ / / / Z Z D D / / / / D
48.5+	HJ3ABF	6180	Bogota, Colombia	/ / / / D / / / / / / XS
48.6+	VPB	6160	Colombo, Ceylon	D D D D D / / / / / / /
48.6+	CJRO	6160	Winnipeg, Manitoba	/ / / / / / / / / / / D
48.7+	HJ2ABA	6150	Tunja, Colombia	/ / / / / D / / / / / D
48.7+	YV3RC	6150	Caracas, Venezuela	/ / / / D D D / / D D D
48.7+	HJ5ABC	6150	Cali, Colombia	/ / / / D $ $ / / / / XA
48.7+	CO9GC	6150	Santiago, Cuba	/ / / / / D / D D D D
48.8+	W8XK	6140	Pittsburgh, Pa.	/ / / / / / / / / / /
48.8+	CR7AA	6135	Lourenzo Marques, Mozambique	/ / / / / AC AC AC / / /
48.9	ZGE	6132	Kuala Lumpur, F. M. S.	AE / / / / / / / / / /
48.9+	COCD	6130	Havana, Cuba	/ / / / / / / / / D D
48.9+	CT1GO	6130	Parede, Portugal	/ / / / S S S / / / / XY
49.0+	W2XE	6120	New York, N. Y.	/ / / / / / / / / / / D
49.0+	HJ1ABE	6115	Cartagena, Col.	/ / / XA XA / / / / / / S XS
49.0+	VE9HX	6110	Halifax, N. S.	/ D XA XA XA XA XA XA D SA D D
49.0+	GSL	6110	Daventry, England	/ / / / D D D D H / / D D
49.1+	W3XAL	6100	Bound Brook, N. J.	/ / / / / / / / AH / / /
49.1+	W9XF	6100	Chicago, Ill.	/ / / / / / / / / / / /
49.1+	HJ4ABB	6100	Manizales, Col.	/ / / / XA / / / / / / /
49.1+	ZTJ (JB)	6098	Johannesburg, Africa	XS XS / / / XS XS D D D D Sa
49.1+	CRCX	6090	Toronto, Can.	/ / / / S S S S D D D D
49.2+	VQ7LO	6083	Nairobi, Kenya, Afr.	E E / D D D XS Sa / / / /
49.3+	CP5	6080	La Paz, Bolivia	/ / / / / / / / I I I
49.3+	W9XAA	6080	Chicago, Ill.	XS XS D D D D D D S S S
49.3+	ZHI	6080	Penang, S. S.	XS / / / / / / / / / / /
49.3+	CON	6073	Macao, Asia	/ / / / K K / / / / / /
49.3+	OER2	6072	Vienna, Austria	I D D D D D D D D Sa / /
49.3+	HH2S	6070	Port au Prince, Haiti	/ / / / / / / / / / / /
49.3+	VE9CS	6070	Vancouver, B. C.	/ / / / / S S S S D D /
49.4+	HJ4ABL	6065	Manizales, Col.	/ / / D / / / / / D D /
49.4+	W8XAL	6060	Cincinnati, Ohio	D D D D D D D D D D D D
49.4+	W3XAU	6060	Philadelphia, Pa.	/ / / / / / / / / / / D
49.4+	OXY	6060	Skamlebaek, Den.	/ / / S S D D D D D D /
49.5+	GSA	6050	Daventry, England	/ / / / / / / / D D D D
49.6	HJ3ABI	6045	Bogota, Colombia	/ / / / / / / / / / / /
49.6+	HJ1ABG	6042	Barranquilla, Col.	/ / / / XS XS S S S S / XS
49.6+	W1XAL	6040	Boston, Mass.	/ / / / / / / / S S S E
49.6+	W4XB	6040	Miami, Fla.	/ / / / D D / / / D D D
49.6+	PRA8	6040	Pernambuco, Brazil	D D D / / D D XS D D D D
49.7+	HP5B	6030	Panama City, Pan.	/ / / / D / / / I / / /
49.7+	VE9CA	6030	Calgary, Alberta, Can.	/ XS XS XS D D D XS / S S D
49.8	DJC	6020	Zeesen, Germany	/ / / / D D D D D D D D
49.8	XEUW	6020	Veracruz, Mexico	/ / / / / / / / / / D D
49.8+	ZHI	6018	Singapore, Malaya	N / / / / / / / / / / /
49.8+	HJ3ABH	6012	Bogota, Col.	/ / / D D D P / D D D D
49.8+	COCO	6010	Havana, Cuba	/ D D D D / / / D D D /
49.9+	HJ1ABJ	6006	Santa Marta, Col.	/ / / / D / / / / / / D
49.9+	VE9DN	6005	Montreal, Canada	/ / / / / / D / / / / /
49.9+	XEBT	6000	Mexico City, Mex.	/ / D D D D D D D D D D
49.9+	RV59	6000	Moscow, U. S. S. R.	/ / / / / I I D D Xth / /
50.1+	HJ2ABC	5985	Cucuta, Col.	/ / / / / / / / / / D D
50.1+	HIX	5980	San Domingo, D. R.	/ / / / D / / / / / / I
50.1+	XECW	5975	Xantocam, Mexico	/ / / / / / / / / / / /
50.2+	HVJ	5969	Vatican City	/ / / / / / D / / / / /
50.4	TG2X	5940	Guatemala City	/ / / / / / / / / / / /
50.5+	HJ4ABE	5936	Medellin, Colombia	/ / / D D D / / / / D D
50.9+	YV8RV	5880	Barquisimeto, Ven.	/ / / / / / / / / / XS XS
51.0+	HRN	5875	Tegucigalpa, Hond's	/ / / / / / / / / / D D
51.2+	YV5RMO	5850	Maracaibo, Ven.	/ / / XS XS S S / / XS XS XS
51.6	YV7RMO	5810	Maracay, Ven.	/ / / D D / / / / D D D
51.6+	YV2RC	5800	Caracas, Ven.	/ / S S D D D S S D D D D
51.8+	OAX4D	5780	Lima, Peru	/ / AN AN AN / / / / / / /
52.4+	YV10RSC	5720	San Cristobal, Ven.	/ / / / / / / / / / / /
70.2	RV15	4273	Khabarovsk, Siberia	D D D I / / / / AD AD / /
79.5+	HB9B	3770	Basle, Switzerland	/ / / / / / / / / / / /

List of Symbols

A—Thursday, Sunday
C—Monday, Wednesday, Friday
D—Daily
E—Tuesday, Thursday
F—Friday
G—Tuesday, Thursday, Saturday
H—Monday, Saturday
I—Irregularly
K—Monday, Friday
L—Wednesday, Saturday
M—Monday
N—Monday, Wednesday, Thursday
O—Monday, Tuesday, Wednesday, Friday
P—Except Tuesday, Wednesday
R—Thursday, Friday, Saturday
S—Sunday
T—Tuesday
U—Wednesday, Thursday, Sunday
Th—Thursday
V—Sunday, Wednesday
W—Wednesday
XTh—Except Thursday
Y—Sunday, Monday
Z—Tuesday, Friday
AB—Tuesday, Wednesday, Friday, Saturday
AC—Monday, Thursday, Saturday
AD—Monday, Thursday, Friday
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
XSa—Except Saturday
XX—Tuesday, Thursday, Friday
XY—Except Tuesday, Sunday

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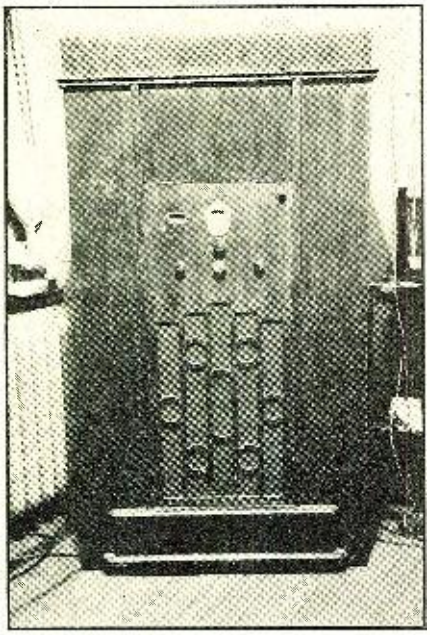
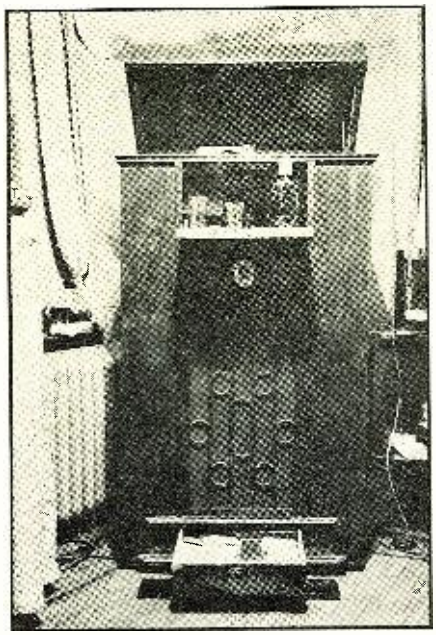


TIPS FOR SHORT-WAVE FANS

The two photographs to right and left show the ingeniously constructed radio cabinet of S. F. Litwin of Milwaukee, Wisconsin. He built it for his short-wave set and his own enjoyment. (If we owned this set we suspect that some of the tipping would not have been on short-waves but rather of the elbow.)



The DX Corner (Short Waves)

(*Continued from page* 481)

AFRICA

ETA, Addis Ababa, Ethiopia, 7620 kc., reported heard transmitting news reports. (O'Mallet-Veal, Hull.)

ETA, Addis Ababa, Ethiopia, 16200 kc., reported heard with news reports early in the morning. (Hull.)

ETB, Addis Ababa, Ethiopia, 11900 kc., reported heard 4:45-5:15 a.m. E.S.T. (Houghton. Marshall.)

ETC, Addis Ababa, Ethiopia, 18270 kc. and 18080 kc., reported heard early mornings. (Hull.)

American War Correspondents with the Italian troops are now heard sending press reports on 27.5 meters. (Houghton.)

IDU, Asmara, Eritrea, 22.40 meters, reported heard. (D. Smith.)

ICK, Tripoli, Libya, heard on 31.7 meters, 29.2 meters and 51.4 meters. (D. Smith.)

IRG, Massaua, Eritrea, 14.74 mc., heard transmitting war news from 6 a.m. to 6:58 a.m. (DeLaet.)

L.P.O. Belanger reports recently receiving his long-awaited veri from SUZ, Cairo, Egypt. (FBOM—Editor.)

VQ4CRL, Nairobi, Kenya, 14020 kc., is reported as an amateur who tests irregularly with phonograph records from 8:30 to 11 a.m. E.S.T. (Jones.)

ZE1JR, Salisbury, Rhodesia, 21.37 meters, 14040 kc., reported heard Sundays 6-7 p.m. and on 7260 kc. from 11 p.m. to midnight.

OPM, Leopoldville, Belgian Congo, 29.59 meters, 10140 kc., heard Saturdays 3-4 p.m. (Hynek.)

NORTH AMERICA

TFJ, Reykjavik, Iceland, 12235 kc., 7½ kw., transmits Sundays 1:40-2 p.m. (Houghton, Mallet-Veale, DeLaet, Shea.)

VE9BK, Vancouver, Canada, 4795 kc. is heard testing. (Pilgrim.)

CDXR, Goderich, Canada, 6000 kc., 15 watts, heard Sundays until 1:30 p.m. E.S.T. with program and DX tips. (Meade.)

W10XFH, the strato flight was reported along with its ground stations by so many L.P.O.'s that we cannot list the separate names.

W3XAL, Bound Brook, N. J., heard on 16 meters Sunday afternoons. (Robinson.)

WJJD, Chicago, and **WJR,** Detroit, are reported as having very strong harmonics on 6770 kc. and 5980 kc. respectively.

W9XBS, Chicago, Illinois, 6425 kc., reported heard 12 noon to 6 p.m. E.S.T. (Horwath, Adams, Graham, Hynek, Jacobs, Vassallo.)

KHABZ, The China Clipper flying boat, 50 watts, has been heard a number of times transmitting on aviation frequencies. (Sholin.)

WYYA, Patterson Air Field, heard on 6350 kc. (Robbins.)

WWKA, Bartlett, New Hampshire Air Field, heard on 6370 kc. (Robbins.)

WWKE, Plymouth, New Hampshire Air Field heard on 6370 kc. (Robbins.)

W1XAL, Boston, Mass., 040 kc. heard Tuesdays and Thursdays, 7-9 p.m. and on 11790 kc., Sundays 4-7 p.m. E.S.T. (Devaraj, Skatzes, Arickx.)

W2XDV, New York (The Columbia Chain) transmits on 8.43 meters, 35600 kc. daily 5-10 p.m. (Cohan.)

XEVI, Mexico City, 5970 kc. (6000 kc. announced) signs off at 10 p.m. (Gallagher, Craft, Skatzes, Butcher.)

XEFT, Vera Cruz, Mex., 6100 kc., also 9600 kc., daily 11 a.m. to 3 p.m. E.S.T.; also Mondays, Thursdays and Fridays 7:30 p.m. to midnight E.S.T.

XEUV, Vera Cruz, Mexico, 6300 kc., heard relaying XEU at 11 p.m. (Marshall.)

XFX, Mexico, 6180 kc., reported heard Saturdays, 8-10 p.m. (Anca.)

XBJQ, 11000 kc., 1 kw., relaying XEW heard 5-10 p.m. E.S.T. (Gavin, Cummins, Jacobs, Belt, Shea, Robbins, Brown, Akins, Kentzel, Moffatt, Jensen, Craft, Kemp, Golden, Coover, Miller, Adams, Hull, Wickham, Hamilton, Bissell, Dodge.)

ZFA, Barbados, reported heard on 59.3 meters, 5025 kc. and closing down at 6:15 a.m. E.S.T. (N. C. Smith.)

COCH, Havana, Cuba, reported heard 7-9:20 p.m. E.S.T. (Harris.)

HRN, Tegucigalpa, Honduras, 51.065 meters, 5875 kc., reported heard daily 6:30-8 p.m., 8:30-10 p.m. E.S.T. on Sundays, heard 9:30-11:30 p.m. E.S.T. (Gavin, Chambers, Brown, Craft, Robbins, Bundlie, T. W. Smith, Bennett, Seright, Vahle, Butcher, Gaiser, Dickes, Wilkinson, Bissell, Skatzes, Twomey, Coover, Jacobs.)

HI1A, Santiago, D. R., 48.5 meters, 6185 kc., reported heard. (Hyde.)

HI5N, Santiago, D. R., 6150 kc., 100 watts, reported heard 6-7 a.m., 12 noon-2 p.m. and 7-9:30 p.m. E.S.T. (Perez.)

TG1X, Guatemala City, Guat., 9450 kc., 200 watts, heard regularly (Sholin.)

TIGX reported heard on 64.1 mc., 12 p.m. (Vahle.)

TIPG, 6410 kc., 1 kw., reported heard until 10 p.m. (Seright, Fletcher, Gavin, Bundlie, Twomey.)

TG2X, Guatemala City, Guat., 5940 kc., 500 watts, 9 p.m.-12:30 a.m. daily and until 1 a.m. Saturday night. Station engineer, Nason, says they are on the air daily afternoons and on Mondays, Thursdays and Saturdays 8-10 p.m. (Seright, Pilgrim, Sholin, Wilkinson, Bundlie, Marshall, Butcher, Meade, Kentzel, Craft, Partner.)

TIGPH, San Jose de Costa Rica, 5820 kc., 8-10 p.m. (Wilkinson, Vassallo, Sholin, Twomey.)

TIPG, San Jose de Costa Rica, 1 kw., 6410 kc., reported heard 6-11 p.m. (Wickham, Seright, Libby, Robbins, Kemp, Anca. Haws, Craft, Brown.)

TI5HH, San Ramon, Costa Rica, 5520 kc., heard testing. (Anca.)

YNVA, Managua, Nicaragua, reported heard on about 8675 kc., 7:30-9:30 p.m. E.S.T. (Seright, Messer.)

HRP1, San Pedro Soula, Honduras, heard on 6350 kc. 6-10 p.m. E.S.T. (Anca. Johnson, Seright.)

HP5B, Panama City, Panama, 47.5 meters, reported heard daily 7-11 p.m. and on Sundays 10 a.m.-1 p.m. E.S.T. (Trzuskowski.)

HP5J, Panama City, Panama, 31.28 meters, reported heard 7-11 p.m. E.S.T. daily and at 10:45 a.m.-11:15 a.m. and 11:45 a.m.-1:15 p.m. (Dodge, Craft, Trzuskowski.)

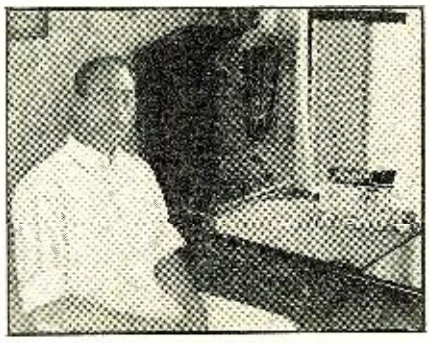
HP5F, Colon, Panama, 49.34 meters, 6080 kc., heard irregularly 11:45 a.m.-1:15 p.m. and 7:45-10 p.m. (Craft, Trzuskowski.)

HP5H, Colon, Panama, reported

(*Turn to page* 496)

MASSACHUSETTS ON THE MAP

Meet short-wave listener Francis L. Guertin of Needham, Mass., who pulls in short-wave stations from all over the world.



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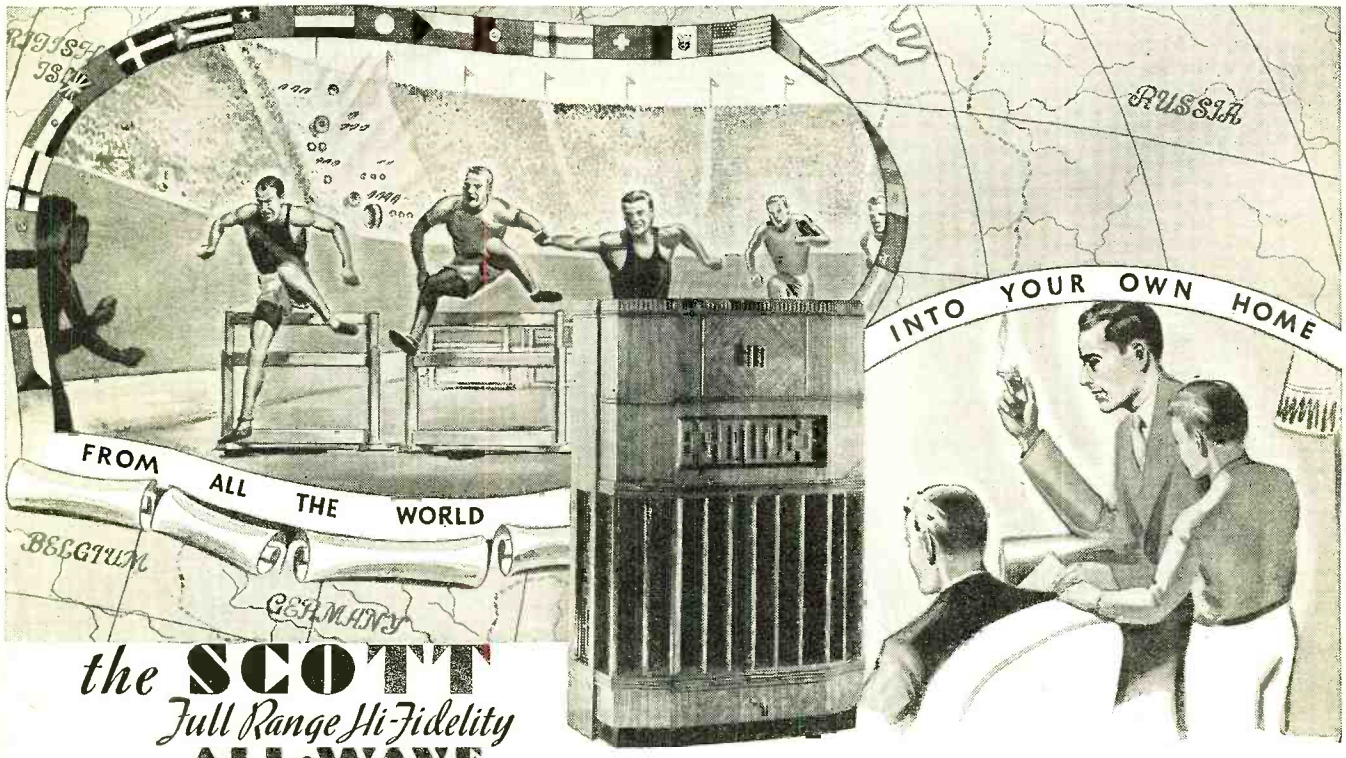

the SCOTT Full Range Hi-Fidelity ALL-WAVE

WILL BRING YOU THE STIRRING OLYMPIC MUSIC AND ACHIEVEMENT—WITH EXCITING REALISM

Olympic Games!—Across half the world will come this historic world event!—from Berlin's Reich Sport Field! Banners in the breeze a hundred nations strong. Blast of trumpets—thunder of drums—strange rhythms that electrify the blood! A sudden silence gripping the throng—pistol report—athletes away! Flying legs—heart-breaking seconds!—Then the roar of a hundred thousand voices acclaiming a new champion—and the glory of his national anthem ringing out to all the world!

Only once in four years can you hear this breathless climax of national music and world achievement! Make sure you hear it at its best—direct from Germany—with the magnificent new 23-tube SCOTT ALLWAVE!

THE MOST STATIONS—TRUEST TONE

The SCOTT with its 35 Watts strictly Class "A" power amplifier will give you that greatest thrill of great music—*the splendor of undistorted "peak" passages.*

Bear down on the Selectivity Control—it's continuously variable—cut away the *powerful adjacent wave length* stations in U. S. A. with the precision of a bullet. Turn up the Sensitivity Control! Listen to programs from England—France—Australia—the Argentine—Brazil and dozens of foreign stations, regularly with a SCOTT—the AllWave receiver that has for years been establishing world's long distance reception records.

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25 to 16,000 cycles. Twice the tonal range of *any* other receiver—bringing you every glorious glowing overtone audible to the human ear—overtones of voice, violin, oboe, clarinet, trombone, saxaphone, etc., *missed by all other high fidelity radios.*

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Put the SCOTT Full Range Hi-Fidelity ALLWAVE in your home on 30-day trial. It is unqualifiedly guaranteed to entertain you night and day *with more foreign and domestic programs, with more magnificently true tone, with more crystal clear freedom from noise, with more exhilarating power than any radio anywhere in the world at any price!* And you can own the SCOTT for no more than you would pay for an ordinary radio. (Budget plan if desired.)

Decide to send TODAY for the fascinating details! Mail the COUPON NOW — for the most thrilling record of globe-encircling performance in radio history!

HIGHEST STRICTLY CLASS "A" POWER — 35 watts. 50 watts Class "AB" for undistorted programs at concert volume. Six times average power.

HIGHEST SIGNAL-TO-NOISE RATIO—clearer foreign reception than any other radio—provable in any comparative test. Less than 1 microvolt sensitivity.

BULLET-DIRECT SELECTIVITY — Continuously variable—for more foreign stations than you have ever heard before. Most revolutionary feature of importance today.

PERFECTED AUTOMATIC VOLUME CONTROL—keeps world programs at practically even volume.

FOREIGN STATION LOCATOR — instantly locates foreign stations.

TONETRUTH SOUND CHAMBER—eliminates all boom.

FULL RANGE HI-FIDELITY—provably twice the tonal range of any other high fidelity receiver. 25 to 16,000 cycles. All overtones of voice, violin, clarinet, oboe, saxaphone, etc.

MORE IMPORTANT FEATURES than any other receiver, including True Bass Control, Precision Dial Calibration, AllWave Reception, Shadow Meter Tuning, 23 Tubes.

SEND THIS COUPON TODAY—DETAILS FREE

E. H. Scott Radio Laboratories, Inc.
4440 Ravenswood, Dept. 5B6, 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*.....

When in New York visit our great permanent Salon at 650 Fifth Avenue, Rockefeller Center

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ELEANOR POWELL

BEN BERNIE

BUDD HULICK

BETTY LOU GERSON

Backstage in Broadcasting

By Samuel Kaufman

ELEANOR POWELL, singing and dancing star of the stage and screen, has been signed to a long-time contract by the sponsors of "The Flying Red Horse Tavern," presented Fridays on CBS. She has been guest star of various programs on NBC and Columbia, but radio fans welcome her heartily to the ranks of regularly scheduled performers. Miss Powell's successes have been numerous but her fine work in "The Broadway Melody of 1936" placed her in a stellar spotlight. A new triumph was her assignment to the Broadway musical hit, "At Home Abroad." Eleanor learned tap dancing from the famous Bill Robinson. And she was clever enough to study singing, knowing that the combination of talents would be lucrative.

BILLIE TRASK, 21-year-old vocalist, is the winner of a series of auditions to select a successor to Harriet Hilliard on the Fleischmann Bakers program of NBC, Sundays. Harriet's leave of absence, due to a talking picture contract, caused Ozzie Nelson, the baton-wielder, and Robert Ripley, the Believe-It-or-Not man, to seek a new songster for their period. Billie, who was christened Florence, thus found herself as featured soloist on a coast-to-coast broadcast just a month after being a despondent job-seeker. She was just about to give up the search for a placement in New York and return to her home in Boston when she heard of the Nelson-Ripley auditions. She sang in several Boston night clubs and later appeared in vaudeville. Her initial radio contact occurred when she won a prize in a local audition held by Paul Whiteman. Her appearance on the Fleischmann Bakers series, however, marks her first professional broadcasting engagement.

BEN BERNIE had been working for his old sponsor so long that it is taking some listeners a bit of time to familiarize themselves with the Old Maestro and All the Lads under their new banner. The succeeding sponsor is the American Can Company. Wisely, the program continues to be broadcast at his old time, but the NBC hook-up is now keyed by WJZ instead of WEAF as in the past. After a long period of hopping around the U. S. A., the start of the American Can series found Bernie and the lads back in New York. Salutes from the Harry Sosnick Orchestra in Dallas, Mary Small in Washington, Tamara in Boston, and George Olsen's Orchestra in Chicago, were highlights of the inaugural program.

BETTY LOU GERSON was recently assigned the starring feminine role of the First Nighter programs presented over NBC Fridays under the sponsorship of the Campana Sales Company. The pretty young Southern brunette plays opposite Don Ameche in the "Little Theatre Off Times Square." Despite the use of the Times Square designation, the series originates in the Chicago NBC studios. Betty Lou is known to air audiences a little over a year. She entered radio drama without any professional stage experience and made good at it. She hails from Chattanooga, Tennessee, but spent most of her life in Birmingham and Miami. She had appeared on the First Nighter series before, but now she is regular co-star.

TO Alois Havrilla, veteran NBC announcer, went the honor of being awarded the 1935 radio diction medal of the American Academy of Arts and Letters. It is an established annual award, but the judges skipped the 1934 presentation. In 1929, the first award of the kind went to the popular Milton J. Cross. Other winners were: 1930, Alwyn Bach; 1931, John Holbrook; 1932, David Ross; 1933, James Wallington. The award is made on the basis of pronunciation, articulation, tone quality, accent and cultural effect. "This award to me," Havrilla commented, "is an illustration of the opportunities America offers." He came to the U. S. A. from Czecho-Slovakia at the age of four and became acquainted with English through the stately cadences of a church where, at the age of seven, he

BILLIE TRASK

ALOIS HAVRILLA AND DR. WM. LYON PHELPS

JIMMY DURANTE

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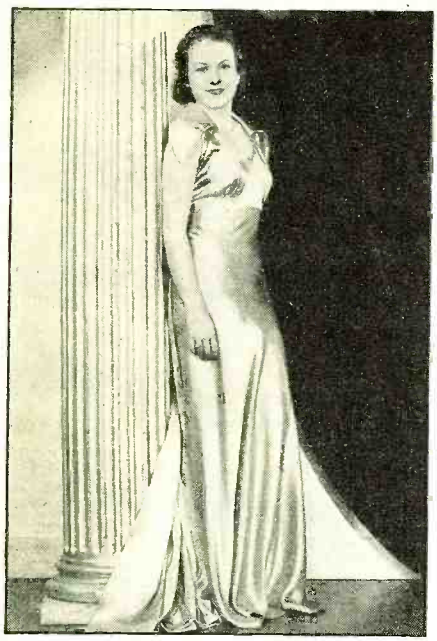


LORETTA LEE

sang in the choir. If you are interested in the career of announcers, we might mention the fact that Ted Husing, CBS sports announcer, is the author of "Ten Years Before the Mike" (Farrar & Rinehart), a story of his varied broadcasting experiences.

AFTER several years as radio headliners, Colonel Lemuel Q. Stoopnagle (F. Chase Taylor) and Budd (Wilbur Budd Hulick) have temporarily severed partnership. But from CBS comes the soothing news that the pair will be back on the air together again early in 1936. Budd remains on the air, but not in the role of a comic. CBS features him Saturdays in the combination assignment of band leader, vocalist and master-of-ceremonies. But Budd without the Colonel is like corned beef without cabbage or pretzels without beer. Regardless of his success in his new assignment, listeners cannot forget the spontaneous comedy antics of the two when teamed together. So, here's hoping they are back together soon!

ONE of the most unusual programs to hit the airwaves is the new Texaco Jumbo-Firechief offering presented over

(*Turn to page* 495)

DONALD NOVIS AND GLORIA GRAFTON

NEW

THE MOST IMPORTANT RESISTOR DEVELOPMENT IN THE HISTORY OF RADIO

IRC

REG. U.S. PAT. OFF.

INSULATED *Metallized* RESISTORS

(Right) IRC RESIST-O-CHEST—handiest container for resistors and other parts. Learn how you can get it free with your order for 56 Insulated Resistors. Ask for catalog S-88.

. . . The FIRST solidly sealed INSULATED Resistors—designed to meet your demands for the best modern radio performance.

. . . No danger of shorts. No metal ends or caps. Complete, high voltage insulation molded around FAMOUS METALLIZED TYPE RESISTANCE ELEMENT also seals it against moisture.

. . . Smaller — Quieter — More accurate.

. . . No "opens". Wire leads permanently contacted to resistance element inside molded insulation.

. . . Rugged — Strong — Vibration-proof—Light in weight.

. . . Both color coded AND imprinted with resistance value for quick, positive identification.

Never before has a resistance development received the widespread approval accorded IRC Type "B" INSULATED METALLIZED Resistors. . . . And never have resistors warranted greater praise. For here are truly modern units—fully sealed and insulated, compact, quiet and more accurate than ever—designed to meet the most exacting demands imposed by the finer, more sensitive radio equipment of today. These unique NEW IRC Resistors incorporate every famous Metallized advantage plus many new ones besides. Far beyond the experimental stage, they have already been used by leading manufacturers for two years. Now sold by leading jobbers. Two sizes, B-½ (½-watt) and B-1 (1-watt) meet every need. Try them and be convinced!

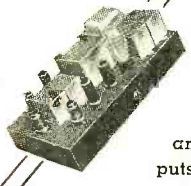
INTERNATIONAL RESISTANCE CO.
2100 Arch St. Philadelphia, Pa.
(*In Canada, 187 Duchess St., Toronto, Ont.*)
Prices slightly higher in Canada

FREE SAMPLE

To bonafide servicemen and amateurs requesting it, we'll gladly send FREE a sample ½ Watt unit (List value 20c). See for yourself how good they are. Write today for catalog S-88 and sample resistor.

A NEW UTC

CK 8 METAL TUBE SUPER POWER AMPLIFIER



Low in Price Mighty in Performance

35 Watts undistorted output—will handle up to 20 dynamic speakers. 8 tubes used: 3—6C5 triodes, 4—6F6's in Pentode A prime connection, 1—83 rectifier. 95 D B gain. Input of amplifier will match crystal or high impedance ribbon mike outputs. Also adapted for carbon or dynamic mikes through external transformer input.

C K 8 transformer kit mounted on chassis with all accessories, except tubes, ready to wire..... List $45.00 Net $27.00

Write for free constructional diagrams on this latest C K 8 kit

UNITED TRANSFORMER CORPORATION
72 Spring St., New York, N. Y. Export Division, 15 Laight St., New York, N. Y.

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NEW and SIMPLIFIED
All-Wave Antenna
RCA RK-40, $5.50

Here's a genuine RCA Antenna that you can install in a few minutes. Just attach the support ropes to the two insulators and it's up. Receiver coupling unit is then attached to the binding posts of the receiver, transmission line is cut to length, and there you are. Your customer is all set to hear stations never heard before. Factory assembled, all joints soldered. Ask to see it at your RCA Parts Distributor's.

RCA Mfg. Co., Inc., Camden, N.J.
A subsidiary of the
RADIO CORPORATION OF AMERICA

RCA WORLD WIDE ANTENNA SYSTEM

GRASP IT—SERVICE DEALERS!

1936 OPPORTUNITY TO OWN FINE SHOP EQUIPMENT FREE OFFERED BY NATIONAL UNION

RESOLVE NOW
To take advantage of National Union free shop equipment offers. Remember, when you handle National Union radio tubes you get the benefit of a superior quality product *plus* premiums of fine modern service instruments.

NATIONAL UNION RADIO CORP. OF NEW YORK
570 LEXINGTON AVENUE, NEW YORK, N. Y.

What is your 1st special equipment opportunity for 1936?

Name.....
Street..... RN-236
City..... State.....

Servicemen's PRIZE CONTEST

Announcement of Awards

Zeh Bouck
Service Editor

FIRST PRIZE
Widening the Scope of P. A. Work

The full possibilities of public-address work are rarely appreciated by the average serviceman who believes he has taken advantage of them when he parades a sound truck through the street, or rents his facilities to a visiting politician. Allan F. Seaver augments work of this type with something more—as enterprising as it is unusual—and advertises his special services on an attractive card. Unfortunately the card is red (with black ink) which makes it impractical to reproduce, so we must content the reader with copying its message:

INTRODUCING
A New Service for SOCIAL and DRAMATIC ORGANIZATIONS
SOUND EQUIPMENT
(with microphone)

For the reproduction of MUSIC and EFFECTS in the small hall and little theater. Eliminates the expense of an orchestra and the handling of cumbersome sound effect machines.

RECORDINGS OF ALL KINDS
Sound effects (from life).
Dance music.
Concert selections.
Humorous sketches and dialogs.
Musical comedy selections.
Vocal, banjo, piano, etc., solos.

SOCIAL CLUBS
Popular music for small dances.
Classical selections for dinner parties.
Music and humorous dialog to fill in between numbers of your entertainment.

DRAMATIC ORGANIZATIONS
The Wind Howls—An Airplane Passes—A Crowd Applauds—A Train Passes—A Lion Roars—Sound effects of all kinds for your back-stage noises. Incidental off-stage music. Dance music after the show. Equipment set up to your individual requirements and personal satisfaction, and efficiently operated to produce realistic effects and music.

Rental charges very reasonable. For information, call ALLAN SEAVER.

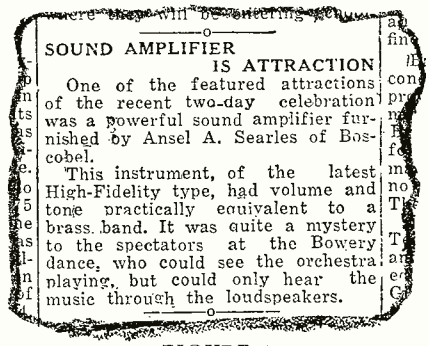
SECOND PRIZE
A P. A. Sales Stunt

Ansel A. Searles, whose letterhead describes him as a radio and sound technician and the owner-operator of W9CLM, went in for P.A. work on a shoestring (just to show that it can be done) without investing a lot of money until business warrants it. "A 2A3 amplifier was built of old ham Thord. transformers, discarded filter chokes from a Federal 201A in-series receiver, 6-inch lightning arrester resistors for voltage dividers, together with a new Philco H. F. input driver and a Thordarson output for four 2A3's in parallel push-pull. This combination was used to drive a 12-inch Utah speaker mounted on a 4-foot homemade horn. I borrowed a pick-up from a funeral director whose amplifier I had in for repair, and used a $1.25 mike for announcing.

"I live about half a mile from town—a burg of 1,700 population—and during the quiet of evening the music could be heard all over the village. Hoping to earn a dime or two, I asked a few merchants how they'd like to have their wares advertised through the outfit some Saturday evening for a consideration of 50 cents each. The response was rather surprising. I got forty-four to chip, ordered some more records, a crystal pick-up and a decent mike. The concert went over quite well (incidentally leading to two fairly good P.A. jobs) and I have been pulling the same stunt in all the towns around here.

"The usual method is to get into a town early in the morning and find a suitable place near the middle of the business section, tear off a couple of peppy marches, then go around and solicit the merchants for half-buck per each. As this is not so much, lots of them dig up just out of curiosity, and usually more than fifty percent of the business men will contribute. This is not big dough, but 5 to 20 clackers for a Saturday is not too bad!"—*Ansel A. Searles, Boscobel, Wis.*

Not bad at all—several Boscobels up, we'd say. Friend Searles also believes in



SOUND AMPLIFIER
IS ATTRACTION

One of the featured attractions of the recent two-day celebration was a powerful sound amplifier furnished by Ansel A. Searles of Boscobel.

This instrument, of the latest High-Fidelity type, had volume and tone practically equivalent to a brass band. It was quite a mystery to the spectators at the Bowery dance, who could see the orchestra playing, but could only hear the music through the loudspeakers.

FIGURE 1

publicity, as the reader will note in Figure 1. Every little bit helps, and the local papers are always glad to give the P.A. man a break.

THIRD PRIZE
A Sales Message with Your Check

Local merchants from whom the serviceman himself buys are, logically enough, his best potential customers. Ralph Mellon appreciates this fact, and when he sends his check in payment for anything from the grocery bill to an auto repair, he encloses it in the folder shown in Figure 2. The obverse side, which is in the form of a flap to hold the check, reads: "The merchandise or service for which this check is payment was satisfactory in every respect. Thank you....."

In addition to this good-will engendering tap-on-the-back, the folder takes advantage of the fact that folks are disposed in a particularly friendly manner to a person who has just sent them a check—unless they have to sue to get it.

www.americanradiohistory.com

THIS MONTH'S WINNERS

FIRST PRIZE—for *Enterprise!* $10.00 to Allan F. Seaver, 195 Cottage Street, New Bedford, Mass., for appreciating that there is a lot more to P. A. work than a set-up at the county fair.

SECOND PRIZE—for *Economy and "Push"!* $5.00 to Ansel A. Searles, Searles Radio Service, Boscobel, Wisconsin, for building up a P. A. outfit mostly from junk parts, and then going out and making money with it.

THIRD PRIZE—for *Cordiality!* $4.00 to Ralph Mellon, 25 King Street, Pottstown, Pa., for combining good-will with a sales message.

FOURTH PRIZE—for *Common Sense!* $3.00 to Murle E. Beauchamp, Muskogee, Oklahoma, for appreciating the fact that a P. A. system can be used to advertise the serviceman as well as customers.

FIFTH PRIZE—for *Novelty!* $2.00 to Eugene J. Borsattino, R. R. 1, Garyton, Gary, Ind., for bringing the mountain to Mohammed.

Congratulations and thanks—from RADIO NEWS *and its servicemen readers!*

FOURTH PRIZE

Keeping Dust Off P. A. Equipment

In the course of these contests, this is the second time that Mr. Beauchamp, of Murl's Radio Service, has been in the money. He writes: "One of the soundest (no pun intended) business-building and name-promotional advertising ideas is that of donating—not renting—public address systems. The natural inclination of owners and operators of P.A. systems is to let the equipment gather shelf-dust if there is no immediate buyer of the service available. A too strict adherence to this policy will result in passing up some very valu-

(*Turn to page* 501)

The Service Bench

(*Continued from page* 463)

equipment! Not that anything from a cathode-ray oscilloscope to a Wheatstone bridge is to be dispensed with lightly, but the finest service laboratory in the game will always find stiff competition from the man with essential equipment—an oscillator and analyzers or their equivalent—and who knows how to use it!

THE DAY'S WORK

It is just about time for trouble to develop in auto radios installed for last summer's driving—so a few notes may be in order. Morris Chermow, of New York City, sends us the following dope on the Delco models 630 and 50: "A common complaint is lack of reception when some distance from the desired station. This is usually due to the weak signal-blocking effect of the noise-suppression circuit. The trouble can be corrected by making a simple wiring change as follows. 1. Remove the wire connecting the ground end of the volume control to the chassis ground. 2. Connect the ground lug of the volume control to the cathode of the 6D6 tube.

"In some instances, it was found that the above change resulted in the appearance of vibrator noise. This can be eliminated by the following additional changes: 1. Connect a 100-ohm resistor in series with the 275-ohm bias resistor common to the 6D6 and 6B7 tubes (cathode side). 2. Disconnect the cathode end of the lead running from the original ground lug on the volume control. (The connection described as num-

(*Turn to page* 501)

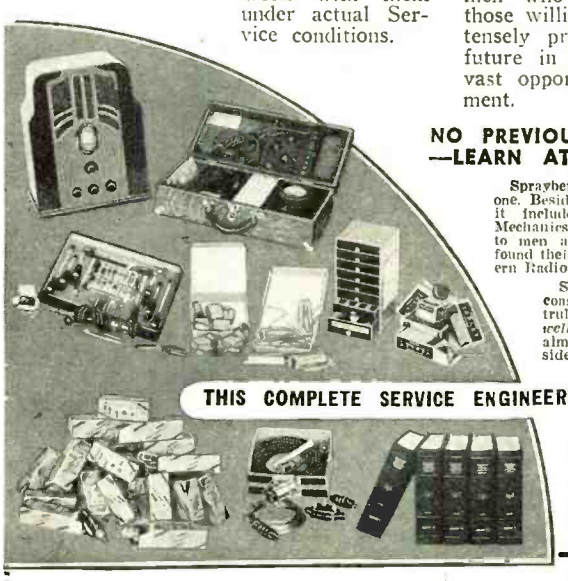
This NEW Type of RADIO TRAINING

ACTUALLY SETS YOU UP IN BUSINESS . . .

. . . . In the Fastest Moving Industry in the World . . . .

Here, at last, is a NEW and DIFFERENT type of Training that not only teaches you all phases of Radio Service Engineering work—*but which equips you for an actual start in business.* No matter what kind of Radio training you may take, you will require such materials before you actually are ready for business. Sprayberry Training gives them to you—teaches you to work with them under actual Service conditions.

Nor is that all. Never forget that there are too many men of only mediocre ability in ALL lines of business. That is why average wages are low—why many men are out of work. Radio is no exception. *But there is always room—there is good pay*—AT THE TOP OF THE LADDER—*and this is where Sprayberry Training is specifically designed to put you.* It is for men who take Radio seriously—for those willing to work along sound, intensely practical lines to win a real future in a fascinating industry with vast opportunities for future development.



NO PREVIOUS EXPERIENCE REQUIRED —LEARN AT HOME IN SPARE TIME

Sprayberry Training is really two courses in one. Besides the necessary fundamental teaching, it includes the famous Sprayberry Practical Mechanics of Radio Service formerly sold ONLY to men already in Radio—many of whom had found their previous training inadequate for modern Radio needs.

Sprayberry Training has been honestly, conscientiously developed to fit you for a truly worthwhile place in Radio—*a place well above the average.* It is different from almost any other course you might consider. It is complete—modern—practical.

THIS COMPLETE SERVICE ENGINEERING EQUIPMENT IS YOURS!

Upon completion, you have both the knowledge and equipment to enter business then and there for full or part time profits—or to start out in any one of Radio's specialized fields such as sound, broadcasting, etc. Certainly you owe it to your future to investigate—TODAY!

SPRAYBERRY ACADEMY OF RADIO

2548 University Pl., N. W., WASHINGTON, D. C.

BEFORE ENROLLING FOR ANY HOME STUDY COURSE, YOU OWE IT TO YOUR FUTURE TO INVESTIGATE THIS ONE.

Without cost or obligation on my part please rush complete details of your new type of training and the booklet, "MY FUTURE IN RADIO."

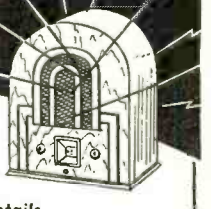
NAME.....

ADDRESS.....

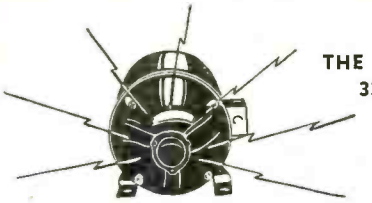
.....

RN 2-36

Stop radio noises at their source



An interference suppressor that really works. Attaches directly to interfering device—not to radio. Simple to install. Sizes for every type of installation.



Write for complete details

THE AUTOMATIC ELECTRICAL DEVICES CO.
335 E. Third St. Cincinnati, Ohio

FILTRAD

www.americanradiohistory.com

HERE IS SOMETHING!

Not only have they the quality which makes them the choice of those who want the best but also the appearance which has enabled these sockets to become a part of one of the new products which has received the first prize in the PRODUCT DESIGN PRIZE CONTEST of "*Electrical Manufacturing*."

These sockets have the clips which should be in every instrument because—

- **Tube prongs enter and are removed easily, yet**
- **Life tests throughout millions of contacts have been unable to develop a contact failure, and**
- **A careful recording of records fail to show a single failure of this "tuning fork" clip over a period of eighteen months.**

NEW OCTAL LOCKING ANALYZER PLUG KIT

Here is a new objective in analyzer plugs and adapters!

- Plug has a special molded type octal base with generous separation and insulation for all cable wires to withstand several thousand volts.
- Adapters have short bodies and no studs for ultra-compactness.
- Plug and adapter height is shorter to duplicate tube height for use in all sets—also provides improved appearance.

Unique quick-fitting 10-prong cable plug supplied attached to 8-wire cable with 10-contact socket to match.

Six new neat, compact adapters supplied for 4, 5, 6, 7 large, 7 small and 8-hole sockets. ● Adapters have special Na-Ald processed silver plated phosphorus bronze clip of same "tuning fork" design as used in tests reaching 1,900,000 perfect contacts without failure.

908CN KIT. Complete as illustrated and described. **List Price, $11.50**

Blocked Octal Sockets

New sets like Atwater-Kent and Zenith have blocked octal sockets in which no holes are punched where tube prongs are omitted.

Hence, to insert an analyzer plug, adapters are necessary.

It has been suggested that these hole positions be drilled out or that these "blocked" sockets be replaced with 8-hole octal types.

It certainly would not take many socket replacement jobs to equal the cost of an adapter at 60 cents net (without stud), 75c net (with).

Why not get the necessary adapters and avoid tearing out riveted sockets from new sets?

Associated Analyzer Plug Adapters for Octal Sockets

Without latch.....List Price $1.00 each
With latch.....List Price $1.25 each

Get your name on our mailing list for the new 1936 catalog.

Na-Ald items are widely stocked—try your regular supplier—if he hasn't them and does not care to get the genuine Na-Ald products order direct from us.

NA-ALD

ALDEN PRODUCTS CO.
Dept. RN-2 715 Centre St.
BROCKTON, MASS.

BIG 1936 WHOLESALE CATALOG

FREE

164 pages—Radio, Electrical and Refrigeration Equipment at lowest net prices. A catalog of great value to every dealer, service man and amateur. Complete sets, parts, amateur and commercial apparatus. Write today.

BURSTEIN-APPLEBEE CO.
1012-14 McGee St., Kansas City, Mo.

Get into RADIO
REAL JOBS REAL PAY

Earn While Learning at Home!

Television, Photo Electric Cells, Public Address

Many R-T-I Trained Men make up to $75 a week and more in full-time radio jobs—$5-$15 in spare time alone. More trained men needed. Learn at home by quick, easy, R-T-I WAY. Endorsed by 50 big concerns. Write for big Opportunity Book FREE.

RADIO AND TELEVISION INSTITUTE, Inc.
2130 Lawrence Ave., Dept. 42, Chicago, Ill.

PHILCO
CROSLEY
ZENITH
GRUNOW
and 46 other mfgrs. endorse R-T-I

RADIO PHYSICS COURSE

ALFRED A. GHIRARDI

Lesson 49. Ohm's Law for A.C.

IN direct-current circuits, the power expended is given by the product of the applied e.m.f. and the current. Thus if an application of 110 volts to a circuit produces a current flow of 5 amperes, the power used is 110 × 5 or 550 watts. In an a.c. circuit containing resistance only, the e.m.f. and current are in phase at every instant and the power in watts is also equal to E × I. When inductance or capacitance are in the circuit, the current lags or leads respectively the applied e.m.f., the current being at times positive when the e.m.f. is negative. Hence under these conditions the actual true power is less than that given by E × I. When the reactance is very great compared to the resistance, the current is 90° out of phase with the e.m.f. and the actual or true power taken from the line is zero. This is called a *wattless current*. In circuits of this kind, the energy is stored in the device (either in the form of a magnetic or an electrostatic field) during one part of the cycle, and is returned back to the line during the next part, so that the net power taken from the line is zero.

The electrical power in a circuit at any instant is equal to the product of the instantaneous current and the instantaneous e.m.f. existing at the time. Thus at (A) of Figure 1, the voltage and current waves for a circuit containing pure resistance are plotted. They are in phase with each other. If we select some instant represented by F on the horizontal or time axis, the power in the circuit at that instant is equal to the height FG of the e.m.f. curve above the axis line at that instant, multiplied by the height FH of the current curve above the axis line at that instant. This power may be represented by point J. If the instantaneous powers at various instants during the cycle are found in this way and plotted we will have the power curve throughout the cycle as shown. The *total* power is represented by the total area of the shaded portions of the curve. Notice that the power curve lies wholly above the axis line, for during the second alternation both the e.m.f. and the current are negative (—). The result of multiplying two negative quantities together gives a positive quantity. All of the power represented by the shaded area is used up to produce heat in the resistor. Looking at this from the physical point of view, it means that the power expended in the circuit when the current and voltage are in one direction is just as much as when they are both in the opposite direction.

When the current and voltage variations are not exactly 90 degrees out of phase, as is the case in an inductive circuit containing some resistance, (B) of Figure 1, or a capacitive circuit containing some resistance, a different power-curve results, although the power at any one instant is still equal to the product of the instantaneous values of current and voltage.

The power curves for the inductive and condensive circuits have been drawn for the same values of e.m.f. and current as that of the pure resistive circuit. The part of the power curve below the axis line is the result of multiplying a positive current by negative instantaneous values of voltage or vice versa. The product is negative, so that the power at that instant must be considered as a negative power. This means that during these intervals the reactive device was returning power to the line. The power consumed in the device is considered as positive power. A pure resistance circuit consumes all of the power fed to it by the generator. A reactive circuit returns a part of it to the generator. In the case of an inductance, power is returned to the line when the current is falling to zero and the magnetic field collapses. In a condensive circuit power is returned to the line when the applied e.m.f. falls to zero and the negative condenser plates begin to discharge the excessive negative electrons back around through the circuit to the positive plates. Notice that in the case of the inductive and capacitive circuits, the total useful or effective power supplied to the circuit (represented by the shaded area above the axis minus that below the axis) is less than in the case of a similar circuit with pure resistance.

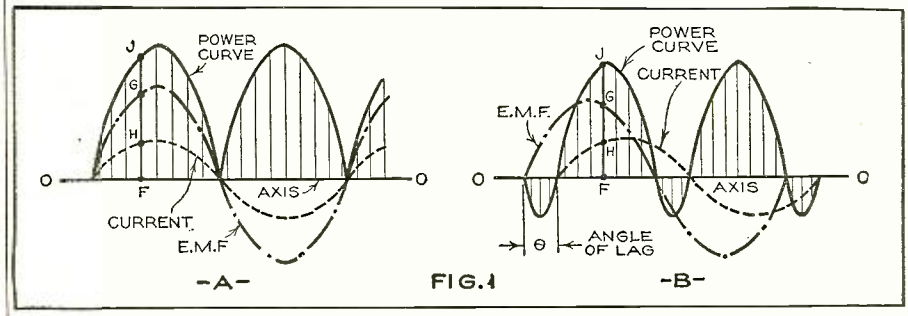


Figure 1. Curves of e.m.f., current, and power in a circuit containing (a) resistance alone, (b) inductance and some resistance.

The "Ham" Shack

(*Continued from page* 473)

given twice daily (10 to 12 a.m. and 6 to 9 p.m.) five days a week.

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 transmissions for practice. A daily schedule is given for the present month (beginning January 1st and ending February 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

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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.	W1AMH	56,100-3536½
10:00 A.	E.	W3AEJ	3785
4:00 P.	E.	N1FNM	3510
5:00 P.	P.	W7WE	3637-7274
6:00 P.	E.	N1DUZ	3638
6:00 P.	E.	W8MHE	3830
6:00 P.	E.	W8EEZ	3598
6:30 P.	C.	W9LKK	3757
7:00 P.	E.	W2HCP	3786
7:00 P.	E.	W3AEJ	3785
7:00 P.	C.	W9SFT	3585
8:00 P.	E.	W8MCP	3580

TUESDAY

8:15 A.	E.	VE3UU	3865
3:30 P.	C.	W9TE	7012
4:00 P.	E.	N1FNM	3510
6:00 P.	E.	W8MHE	3830
6:00 P.	E.	W8EEZ	3598
6:30 P.	C.	W9LKK	3757
7:00 P.	M.	W9HHW	7276
7:00 P.	M.	W6IQY	7090
7:30 P.	C.	W8HKT	3750
8:00 P.	C.	W5CPV	7149
8:00 P.	E.	W8MCP	3580
8:00 P.	M.	W7DBP	3607

WEDNESDAY

6:00 A.	C.	W5DDC	7200
10:00 A.	E.	W3AEJ	3785
3:30 P.	C.	W9TE	7012
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
7:00 P.	E.	W2HCP	3786
7:00 P.	E.	W3AEJ	3785
7:00 P.	C.	W9SFT	3585
7:00 P.	M.	W9HHW	7276
8:00 P.	M.	W7DBP	3722

THURSDAY

8:15 A.	E.	VE3UU	3865
3:30 P.	C.	W9TE	7012
6:00 P.	E.	W8MHE	3830
6:00 P.	E.	W8EEZ	3598
6:30 P.	C.	W9LKK	3757
7:00 P.	M.	W6IQY	7090
8:00 P.	M.	W7DBP	3607

FRIDAY

10:00 A.	E.	W3AEJ	3785
3:30 P.	C.	W9TE	7012
5:00 P.	P.	W7WE	3637-7274
6:00 P.	E.	W8MHE	3830
6:00 P.	E.	W8EEZ	3598
6:00 P.	E.	N1DUZ	3638
6:30 P.	C.	W9LKK	3757
7:00 P.	E.	W2HCP	3786
7:00 P.	E.	W3AEJ	3785
9:30 P.	E.	W4BHR	3867

SATURDAY

8:15 A.	E.	VE3UU	3865
8:30 A.	E.	W1AMH	56,100-3536½
6:00 P.	E.	W8MHE	3830
11:50 P.	P.	W7WE	3637-7274

SUNDAY

8:15 A.	E.	VE3UU	3865
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
7:00 P.	ED.	W2HZJ	3577
7:00 P.	C.	W9LUS	3631
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.

W5DDC—Herbert Leo, 1420 Hawthorne St., Houston, Texas.

(*Turn to page* 507)

"K.H."

in *Electronics* says about

"MODERN RADIO SERVICING"

"THERE WAS A TIME when practically anyone could service a radio receiver. If it didn't "play" you whacked the detector tube and if a bong came out of the loud speaker you felt sure the audio amplifier was not in trouble. Then you took the antenna wire and put it successively on the grid of the detector, the first and second r-f tubes until you had found which was the dead stage.

This was before Trube, Ballantine, Wheeler, Jarvis, Travis, et al., including those at Camden, got busy with perfectly good radios and put a.v.c, intercarrier noise suppression, diode detection, variable-mu tubes and other tricks into everybody's set. Furthermore they were unsatisfied with a straightforward (from the standpoint of service) t.r.f. job and made nearly everyone own a much more complicated superhet. Then someone got the all-wave idea, and now they are to have wide-band receivers.

The result is that practically no one can service a radio nowadays without expensive tools, vast patience and intuition, and a rather complete knowledge of these more modern receivers.

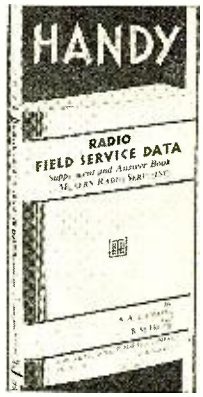
Mr. Ghirardi, whose "Radio Physics Course" is well known, has assembled ***a tremendous book of dope for servicemen.*** In its 1,300 pages he has described servicing equipment, told how to make much of it, what makes radio wheels go round and what makes them stop and how to start them running again. ***It is up to the minute*** with a chapter on high-fidelity receivers (anticipating the day when such will be a bit more plentiful than now), much material on cathode ray tubes, 100 pages in a chapter on aligning superheterodynes, data on testing and repairing components, how to diagnose and remedy troubles in automobile sets.

This reviewer spent the better part of a day looking over this book. He now understands why servicemen often feel like daring a chief engineer to try to service one of his own creations. And while this reviewer does not offer to take on practically anybody's radio which has something wrong with it, he does feel that within the pages of this huge book there is ***all that a service man needs to know to tackle the worst of today's receivers.***

As a companion to the text there is a smaller volume by the same author with the aid of B. M. Freed. It is called "Radio Field Service Data" and it gives the i.f.'s of 2790 models of receivers, grid bias resistor chart, wiring diagrams of automobile ignition systems, trouble symptoms and remedies of over 750 receiver models, etc.

With these two books it seems possible that one of the engineers mentioned above could go out and make a living at servicing."—K. H.

Nov., 1935



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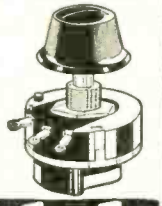

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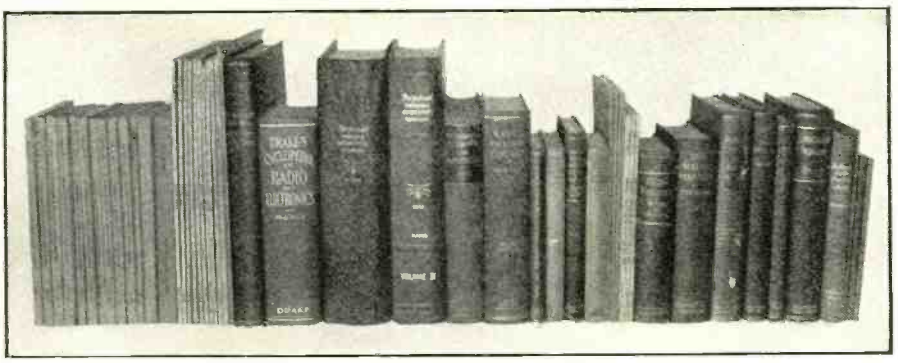

THE TECHNICAL REVIEW

CONDUCTED BY ROBERT HERTZBERG

Modern Acoustics, by A. H. Davis; The Macmillan Company, 1934. In this volume the author explains the essentials of acoustics as the subject is practiced today. This means that the use of electrical apparatus has been emphasized. The book is intended for students and engineers and all those who wish to understand the principles of acoustics and who are familiar with higher mathematics.

In the first few chapters the fundamental laws of sound waves and vibrating systems are stated. Thereafter the author discusses sources of sound and electrical apparatus, including speakers, phones, a.f. amplifiers, oscillators, etc. Measurements of sound intensity, and frequency are discussed in detail.

The remainder of the book contains chapter on the analysis of sound, dissipation and absorption, the ear and hearing, noise, acoustics of buildings, recording and reproduction of sound, applications.

The author uses some original technical terms. Realizing that the decibel is a unit of power ratio and not of loudness, he expresses the loudness above zero level in a unit named "phon". A loudness of one phon means that the power is a decibel above zero level. Further, other quantities than sound energy may be compared logarithmically but it would not be proper to call the unit decibel since this term refers to sound only. So the author uses the term "decibrig" (—brig from Brigg's logarithms).

The Radio Engineering Handbook; Keith Henney, Editor-in-Chief; Second Edition; McGraw-Hill Book Co., 1935. This book aims to bring within the covers of a single volume the essential information of radio engineering, describing the theory and practice of present-day radio design. Since no one man could possibly know the details of all branches of the industry, sections have been written by some 28 engineers and physicists who are recognized authorities in their line. So, for instance, one can read among others: the section on loudspeakers by Irving Wolff; vacuum tubes by J. M. Stinchfield, receivers by G. L. Beers; short-wave transmission and reception by A. Hoyt Taylor and Robert Kruse, etc.

The new edition has been considerably enlarged, now amounting to over 800 pages. A new section on antennas has been added and the television section has been entirely rewritten. Also the other sections have been brought up to date and additions were made to most of them. In this second edition are 24 sections. The first one is a compilation of tables and other useful data, such as wire tables, decibel chart, inductance charts, etc. Then follow individual sections on resistance, capacity, inductance and the theory of combined circuits ending up with filters. This is followed by a section on measurements. Besides the section on vacuum tubes, there are two more dealing with such specialized subjects as oscillation, detection and modulation.

In addition to the sections on amplifiers and receivers, there are special sections on code transmission and reception, broadcasting, facsimile transmission, aircraft radio, photo cells and sound motion pictures.

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

An Unattended Ultra-Short-Wave Radiotelephone System, by N. F. Schlaack and F. A. Polkinghorn. Some of the factors involved in the application of an ultra-short-wave radio link to wire telephone circuits are discussed. A description is given of the interesting radio circuit between Boston and Provincetown, Mass., on the tip of Cape Cod. This equipment remains in operation over considerable periods without attention or adjustment.

Radio-Frequency Distributing Systems, by F. X. Rettenmeyer. In crowded urban areas, with scores of individual antennas on a single roof, broadcast reception is frequently very unsatisfactory because of coupling effects and noise interference. The author suggests the use of suitable r.f. distribution systems, with a common antenna, as a solution of a growing problem. He describes the complex installation in the Waldorf-Astoria Hotel, New York, as a good example of what can be done in this direction.

Development of Cathode-Ray Tubes for Oscillographic Purposes, by R.T. Orth, P. A. Richards, and L. B. Headrick. Some typical characteristics of a cathode-ray tube electron gun are shown and the function of the various gun elements described. A few general precautions in the operation of these tubes are given.

Review of Contemporary Literature

Problems of All-Wave Noise Reducing Antenna Design, by Julius G. Aceves. Proceedings of the Radio Club of America, November, 1935. A frank and honest discussion of a subject of great importance to every user of a short-wave or all-wave receiver. The writer's wide experience in this field makes this paper extremely valuable.

Luminescent Materials for Cathode-Ray Tubes, by T. B. Perkins and H. W. Kaufman. This paper describes the manufacture, characteristics and utilization of three kinds of luminescent materials which are employed for cathode ray tube screens.

Cathode Ray Tube Terminology, by T. B. Perkins. With the growing use of the cathode-ray tube has come a large addition to our technical vocabulary. This paper offers tentative definitions of many terms commonly employed by engineers, and will undoubtedly serve as a convenient standard for everyone in the industry.

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Radiometeorography as Applied to Unmanned Balloons, by William H. Wenstrom. The study of upper-air conditions, highly necessary in successful meteorology (particularly in the aeronautical field) is greatly simplified by the use of free balloons carrying tiny short-wave transmitters. Upon being released, the balloons rise, and their progress is followed by means of directional receiving systems.

Eclipse Effects in the Ionosphere, by J. P. Schafer and W. M. Goodall. It is concluded from measurements of virtual heights and critical ionization frequencies of the various regions of the ionosphere which were made during two solar eclipses at Deal, N. J., that ultra-violet light is an important ionizing agency in certain regions of the ionosphere.

Correlation of Radio Transmission with Solar Activity, by A. M. Skellett. A daily "character figure" for radio transmission is obtained from the data of the short-wave transatlantic telephone circuits of the A. T. & T Co. This shows a positive correlation with character figures of terrestrial magnetism and earth currents.

High Power Outphasing Modulation, by H. Chireix. Description of an economical and efficient modulating system for high power broadcast stations. The method devised by the author is in use at several European stations.

Crystal Filter for Radio Receivers, by C. F. Nordica. Radio Engineering, November, 1935. The possibility of using crystal filters to limit the side-band response of wide-band receivers is discussed at length in this article, and the limitations of crystal filters in the light of present knowledge are described.

Secondary Emission Electron Multipliers. Electronics, November, 1935. This article describes a remarkable development of Dr. V. K. Zworykin—an electron multiplier tube that will detect, modulate, oscillate and amplify by the successive use of secondary emission effects, with tremendous amplification and improved signal-to-noise ratio.

A Radio Beacon Transmitter for WOR, by A. A. Skene. Bell Laboratories Record, November, 1935. Description of a special radio beacon transmitter installed at WOR, in Carteret, N. J., for the purpose of warning passing pilots of the presence of WOR'S large masts.

High-Fidelity Radio Transmitter for Ultra-High Frequencies, by J. W. Smith. Bell Laboratories Record, November, 1935. Although no strict requirements as to frequency stability, percentage modulation and total overall distortion have been imposed yet on ultra-high frequency stations, the Western Electric Company is anticipating this possibility by bringing out a new combination 50 and 500 watt transmitter having satisfactory characteristics in these regards. Crystal control is used, and the outfit will operate between 30 and 42 megacycles.

Free Bulletins

Copies of four different issues of the "Aerovox Research Worker," containing valuable information on a variety of radio subjects, are available free of charge to readers of RADIO NEWS. The March, 1934, number is devoted to the uses of concentrically-wound electrolytic condensers; April, 1934, number to the proper use of condensers in high-voltage filter circuits; May, 1934, to resonant circuit calculations; and June, 1934, to a detailed description of a modern amateur transmitter.

To obtain copies, simply specify the issue or issues you desire and send your request to RADIO NEWS, 461 Eighth Avenue, New York City.

Book on the Elimination of Radio Noises

The 75-page book entitled "Radio Noises and Their Cure," published by the Tobe Deutschmann Corporation and originally offered in the June, 1935, issue of RADIO NEWS, has proved so popular among servicemen and experimenters that we are listing it again. Many new readers who did not see the first announcement of this extremely valuable book will undoubtedly want to read it for the information that they can apply to noise problems of their own.

The book measures 8½ by 11 inches and contains a vast amount of instructive data on the subject of man-made interference and its elimination. The publishers are pioneers in the noise-reducing field and have put the results of many expensive field surveys and investigations into this manual.

The price of the book is fifty cents and any reader desiring a copy can obtain same by writing RADIO NEWS, 461 Eighth Avenue, New York City. Postal and express money orders, and also U. S. stamps, may be sent. It is not considered safe to send coins through the mails.

Radio Parts Catalog

Bulletin No. 250 of the National Company, Inc., is a finely printed, two-color, twenty-page catalog of radio parts, accessories and short-wave receivers. Every short-wave fan, amateur and experimenter will want a copy for reference, as it is unusually complete with descriptive in-

formation and illustrations on their line of receiving and transmitting condensers, all kinds of dials, coils and receivers including the new de-luxe model HRO nine-tube superheterodyne. Readers can obtain copies of this catalog free of charge by writing to RADIO NEWS, 461 Eighth Avenue, 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, 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:

A1—Information on new Browning "35" receiver, issued by Tobe Deutschmann Corp. Free.
A3—Data on a multi-testing instrument published by Supreme Instruments Corp. Free.
A4—Condenser catalog prepared by Cornell-Dubilier Corp. Free.
A5—Instructive and interesting information on condensers published by the Sprague Products Company. Free.
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" wire-wound 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.
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.

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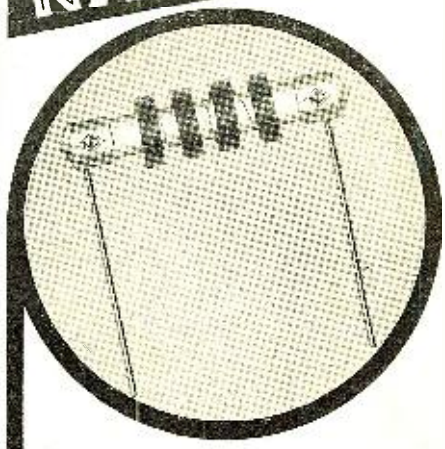

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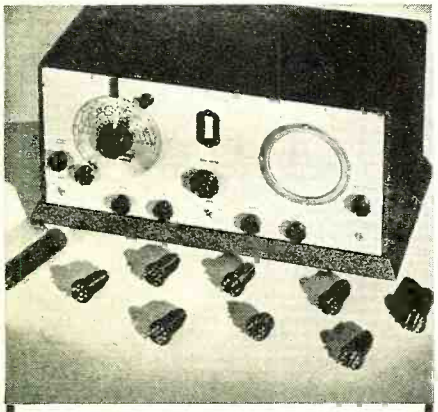

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* Iron Core I. F. system—greatly increased sensitivity and a signal to noise ratio unattainable with an air core system.

* Beat Oscillator with continuous range.

* Duo-Micro-Vernier Band Spread—provide improved logging accuracy—provides electrical band spreading and micro-vernier tuning in an exclusive and distinctive dial.

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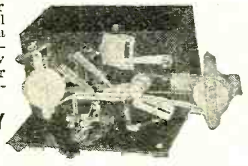

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QRD? QRD?

CONDUCTED BY GY

WHEN the new Department of Commerce rules go into effect, all ocean going passenger vessels of 2500 gross tons will have the added safeguard of motor life boats with radio telegraph equipment capable of communicating at least fifty miles on the international distress frequency. A test was recently made on the SS Pennsylvania in anticipation of this new regulation and one of its lifeboats was completely equipped with the new apparatus. The equipment has been especially designed for this use, and will operate normally when drenched with water. It is possible even to submerge this radio completely for a short period of time without impairing its efficiency. We wonder if it will be put into the regulations that licensed radio men must operate these lifeboats just in case . . . .

Brother H. T. Hart recently wrote in to suggest that the middle west would appreciate some consideration in the commercial operating game in the way of news and visits of representatives of the various organizations such as ARTA and the others. Hart is an operator at Police radio KGPE, Kansas City Police, and we wish to thank him for this suggestion as it coincides with ours of many moons ago. We had suggested this to various organizations but they seem to have been too busy with the coastal situation or, we might say, the immediate present. We believe that as soon as the pressure is relieved on these fronts they will go into the hinterlands to civilize and educate you-all.

According to the ARTA bulletin, the failure of the SS Tachira's third mate-radio op to obtain the widely-radioed warnings of a West Indian hurricane cost her two days of running time. Bound for St. Thomas, he did not pick up the warnings due, perhaps, to his inability to man a regular watch and run the ship at the same time. The Tachira could have avoided the hurricane if she had received notice in time of the danger ahead. Needless to say that from the standpoint of human lives and the ship itself, had a disaster occurred, it would have been much more costly than the price of a full-time operator doing only that one duty aboard the ship.

Tut, Tut, and again a tut. We have hurt some one's feelings and we wish it publicly known that we did not do so intentionally, nor do we play favorites. In a recent issue we remarked that so and so was one of the few good ops left at such and such station, and some one wrote in chastising us for this crack. He opined that every Jack man op working at that station was an up-to-the-minute man. This we do not deny and we are sorry that we have hurt some one's pride in his work. We hope that this paragraph will help to soothe his feelings and that he will accept our apology.

The Atlantic Coast was outstanding recently during the strike of the ARTA, full strength directed towards more wages and better conditions. Charges were hurled back and forth between this organization and shipping companies. Scabs were recruited hurriedly from everywhere to man ships which had been struck. The United Fruit company's Chiriqui, her holds jammed with bananas, was declared struck at Los Angeles in sympathy. Longshoremen refused to touch a single stalk of the cargo. At this time President Hoyt Haddock of the ARTA charged that the UFC had tried to bribe him with an offer of $5,000 to release the Chiriqui. This charge was denied by the United Fruit. Charges that the scabs on most of the struck vessels were inexperienced and incompetent brought denials from shipping owners, but testimonials and affidavits produced by the ARTA stated that they were true to a great extent. The main thing, outside of signing up many of the shipping companies, was the great showing made by the men of the ARTA who struck in a complete body and showed that the strength manifested by these plucky ops could actually get them results. This is the first time that an organization of radio operators has stuck together for a common purpose. In the past, organizations have sprung up but they eventually broke down, carrying with them the morale and hearts of those doughty ops who stuck with them to the last until they themselves believed that they were just doomed to be nothing but flunkies and downtrodden humans. But today things look plenty brighter and we believe that the time will come when ops will be given billets thru their organization only.

Brother T. R. McElroy struts his stuff again. And that should be a heading for any kind of paragraph with 24 point type. Yeh, this time the new speed record is 69 words-per-minute. His last record was 57.3 —and there's a guy who thinks 35 wpm is slow! Well, it's the old story of the outlook of the individual. For the layman it doesn't mean anything, but to us radio operators it sounds practically incredible. Ye Ed was also fairly good, having held down some pretty fast lines, receiving 35 from bug and 40 from tape, but today . . . well . . . to us it would just sound like a series of dots, occasionally deciphering some easy word or letter, but 69 wpm . . . wheeeeeeeee! Well, there's sure no telling what the next high will be next time.

During the recent strike, a telegram was received at the N. Y. office of the ARTA from President Frank Powers of the Commercial Telegraphers' Union of North America, in which he warmly commended the officers of the ARTA in their leadership against unfair employers and added that he would be happy if Mr. Haddock and he could get together for the purpose of affiliating with his organization which is under the banner of the A. F. of L. This affiliation, if consummated, would, of course, add the strength of about 17,000 men to the ARTA which is not a bad idea from any angle, and would be in line as they are also communications men. Not a bad idea, what . . . .

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So it seems as tho' past predictions are coming true. In doing any predicting, the predicter who has been sitting on the sidelines watching his predictions materialize gains some satisfaction—his inner ego feels satisfied with the tangible results obtained. To those who can look back to those dark, dreary days in the basement of the Irving Street house, there is a heap of pride and exaltation over the improvement that has been wrought in the few short, hard years until the present time. Ye Ed remembers well, and so far his predictions have come true with the exception that the ultimate goal has not yet been reached—that is, the complete withdrawal of the RMCA in the matter of the placement of ops and the affiliation with an organization under the AFL banner. We hope we have not outdone ourselves, but the future now holds some brightness and, therefore, we believe we may be right again, so with 73 . . . ge . . . GY.

Backstage

(*Continued from page* 487)

NBC Tuesdays. The series succeeds to the spot formerly occupied by Eddie Duchin's Orchestra and, still farther back, by Ed Wynn. The programs are based on the New York show, "Jumbo," which is a huge spectacle combining the features of a circus and a musical comedy. No performance is given on Tuesdays and the arena of the Hippodrome is given over to broadcasting exclusively. The sponsor invites some 4,500 listeners to each broadcast on account of the huge seating capacity of the auditorium. This is a record free audience for a regular weekly series. Jimmy Durante, the stage star, already well known to listeners, shares the microphone billing with Donald Novis, another established radio name, Gloria Grafton, Arthur Sinclair, and others of the show's regular cast.

AL GOODMAN has succeeded Lennie Hayton to the baton of the Lucky Strike Hit Parade broadcast Saturdays over NBC. In addition to the Goodman musical organization of forty-five pieces, the full-hour program features Loretta Lee, blues singer, and Willie Morris, soprano, in the vocal spots. All these new names on the program are well known to fans and the combination makes the series an outstanding one.

The Perfect 20-Watt Amplifier

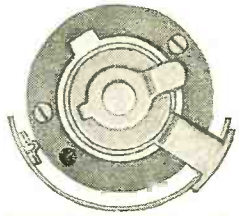
(*Continued from page* 469)

power is obtained with Class A operation with economy and simplicity of circuit design not obtainable with other types of power tubes. They are manufactured by Sylvania and Triad. Samples from both manufacturers have been tested in this amplifier and also in receivers with uniformly good results. The Sylvania type differs slightly in construction from that of the Triad, but tubes of either manufacture may be used interchangeably without circuit alterations.

The general layout, as shown in the photograph, makes all controls conveniently accessible. The output transformer taps, as well as the various input terminals are brought out to connector strips located at the front. The apparatus may be set up and installed in short order and the connections may be checked at a glance during operation.

The complete circuit diagram, with full constructional information will follow in a succeeding article. The testing and operating procedures used will be covered in detail.

The DIRECT-CONTACT, CARBON VOLUME CONTROL *With* ONLY ONE MOVING UNIT



Complete mechanism of the control showing straight-path travel of contact shoe on resistance element.

SIMPLICITY is the keynote of Electrad design—simplicity which performs efficiently without waste motions.

Direct floating contact on the carbon resistance element, with only one moving unit in the entire assembly, mean freedom from mechanical complications, longer life and *more positive, finer variation of current regulation.*

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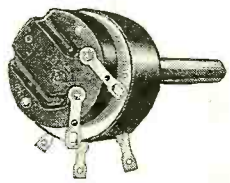

Complete control, showing new-type power switch interchangeable with standard end cover.

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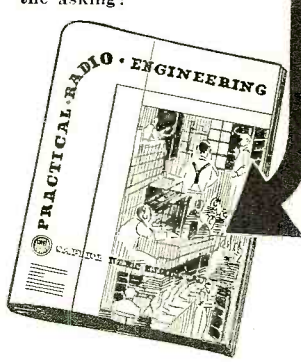

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Fully assembled, soldered and ready to put up in half an hour, the R9+ will prove to be the greatest value you have ever obtained, for **$8.85 net**

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SPRAYBERRY'S PRACTICAL MECHANICS OF RADIO SERVICE

A DX CORNER "WHAT CERTAINLY AM" A DX CORNER

The Listening Post of J. V. McMinn, a member of the New Zealand Short-Wave Club and a representative of the I.D.A., N.Y.S.W.C. and the W.W.R.L. He has heard all continents, receiving signals from 66 countries; started s.w. listening in '27.

The DX Corner (Short Waves)

(*Continued from page* 484)

heard on 6070 kc., 8-10 p.m. (Anca.)

SOUTH AMERICA

YV12RN, Maracay, Venezuela, 6300 kc., reported heard 5-11:30 p.m. E.S.T. (Hammersley.)

YV12RC, Caracas, Venezuela, 5800 kc., reported heard 7:10 p.m. (Twomey.)

YV2RM, Maracay, Venezuela, 6290 kc., reported heard 8:30-10:30 p.m. E.S.T. (Johnson.)

HJN, Bogota, Colombia, 5940 kc., heard between 8 and 11 p.m. E.S.T. (Johnson.)

HIJ, Bogota, Colombia, 5940 kc., reported heard evenings daily. (Seright.)

HKV, Bogota, Colombia, 33 meters, reported heard 9-11 p.m. (Williamson.)

HJABN, Medallin, Colombia, 6049 kc., heard evenings until midnight irregularly (Gavin.)

HJ2ABC, Ibaque, Colombia, 46.503 meters, 6451 kc., reported heard weekdays 8-10 p.m. E.S.T. (Chambers.) Dr. Twomey reports this station located at Pereira, Colombia on y090 kc. to 9:30 p.m. E.S.T.

HJ2ABD, Bucaramanga, Colombia, 5990 kc., heard irregularly (Chambers.)

OCJ, Lima, Peru, 14860 kc., heard Sundays 5-7 p.m. (Craft, Messer.)

OCEANIA

KGMB, Honolulu, Hawaii, heard on about 7500 kc. relaying programs to C.B.S, 12:30-1 p.m. (Seright.) Is this KKH?

KIO reported transmitting on 11710 kc. at midnight. (Marshall.)

AMATEUR CALL LIST

SHORT-WAVE listeners are oftentimes curious as to the location of stations heard in the 10, 20, 75 and 150 meter amateur bands. A book is available giving the call letters, names and addresses, of amateurs throughout the world. This is a good husky one approaching a city telephone book in size and is universally used by the amateurs themselves. RADIO NEWS has arranged to supply copies of this book to readers who may desire them for the regular price of $1.25. Orders should be addressed to the DX Editor, RADIO NEWS, 461 Eighth Ave., New York City and should be accompanied by money order or postage.

CLUB NEWS

Short Wave Club of New York

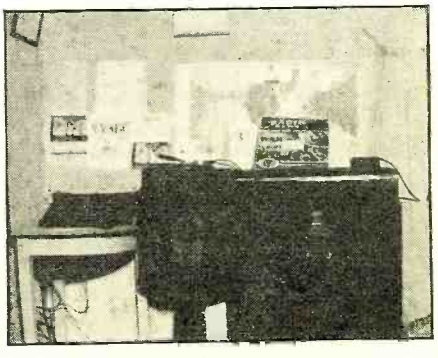
At the last meeting of this Club Mr. Robert Hertzberg gave a demonstration of the new RCA Model AR-60-S communication receiver. Hans Merx, radio vocalist, told of his experiences singing for several foreign short wave stations. On January 2nd, 1936, there will be a special broadcast dedicated to the Short Wave Club of New York from Station TIRCC, 8-11 p.m. EST, on 6550 kc. and on 13100 kc. The Club invites any radio manufacturer to demonstrate its short wave equipment at its meetings.

International Short Wave Club, London

Mr. Arthur E. Bear writes that he regretted that RADIO NEWS was unable to call readers' attention to the special short wave broadcast celebrating the seventh anniversary of the International Short Wave Club. (This information reached us too late for publication to catch the actual broadcasts. Such news should be received at RADIO NEWS Office no later than the 25th of the month preceding the date the magazine will

ALSO FROM MASSACHUSETTS

This is the DX Corner of George W. Brinck of Worcester, Mass., who sends greetings to his fellow short-wave listeners all over the world.



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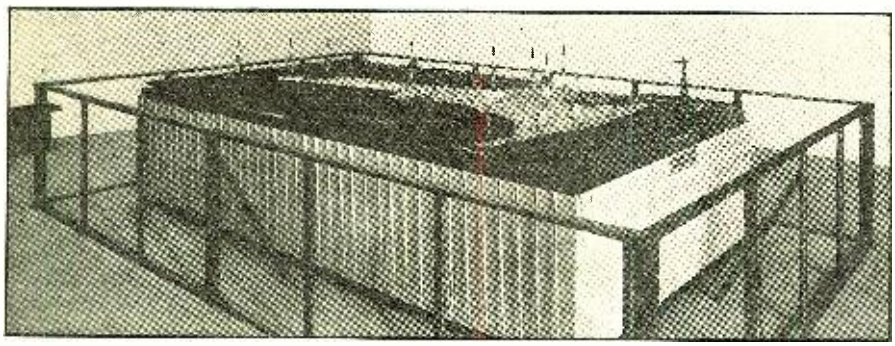


EXACT SCALE MODEL OF THE GERMAN SHORT-WAVE SYSTEM

This model of the antenna and transmitting arrangement for the German "D" stations was shown at the Berlin Radio Exposition and was so perfect in every detail that it excited great interest on the part of visitors.

appear on the newsstand. The February issue appears January 1st or thereabouts—Editor.)

The Globe Circlers' DX Club takes this opportunity to express their appreciation to the members of the Courtesy Programs Committee who have worked out the special broadcasts for this Club. The Club welcomes the following new members: J. L. Black of Cleveland, Floyd Hammond of Dexter, Maine, Carl Eder of Willmar, Minnesota. The membership drive is still going on.

International DX'ers Alliance, Calgary Foothills Chapter

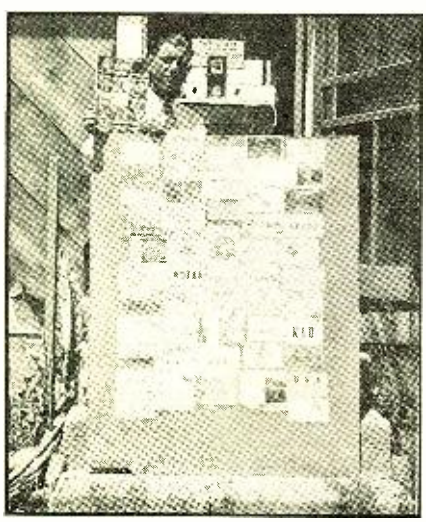
The Secretary of this Club writes to the Editor of RADIO NEWS: "The article on the elimination of interference by Captain Hall in your November issue is on a subject which for a long time has been radio's Public Enemy No. 1. We wish to compliment both you and Capt. Hall. At the last meeting of our Club, the article was discussed and a motion was passed to this effect—'We, the Calgary Foothills Chapter of the International DX'ers Alliance, do agree with Capt. Hall in his opinion on electrical interference and its elimination and do hereby offer our wholehearted support toward its elimination.'"

Society of Wireless Pioneers

Dick Rawles trekked recently to the Olympia Radio Show at London, where he had the pleasure of meeting a number of S.W.P. and I.D.A. members, among them Donald Burns, Bob Stewart, Frederick Bell, G6KV, Kenneth Jowers, Will Kempster, Mark Channing and others. He reports that this trip was well worth his while and he was entertained at many radio shacks. Members will find an excellent article by Sumner B. Young, W9XCC, in the forthcoming issue of JOTTINGS, the news bulletin published by this Society.

THE RECEIVER, THE MAN, THE MAGAZINE, AND THE RESULTS

Meet Eric Butcher of Cokeville, Wyoming, the man in our story, who uses a Scott All-Wave 15 receiver, a copy of RADIO NEWS *for the Short-Wave Timetable with the results in verification cards, as shown pasted on the large cardboard sheet. An eloquent story in pictures; these words are merely superfluous.*



La Porte High School Radio Club

The students of the radio class of the La Porte High School have organized this radio club with Donald K. Johnson, W9BVN, President and Walter Hendricks, Secretary-Treasurer. The Club has a 50-watt transmitter operating on 3608 kc. and 7216 kc. CW as well as a 160 meter phone. We are anxious to make schedules and our best time is 9-9:45 mornings and 3-3:45 p.m. weekdays. The magazine RADIO NEWS is proving very valuable in our class work. International DX'ers Alliance—The International DX'ers Alliance cordially greets thirty-eight new members this month and invites others who are interested in both long and short wave reception to apply for membership. The membership has been more than doubled during the present year.

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

Blake H. Page, Russell W. Foss, Floyd Biss, Bill Bundlie, Edward Ayrazian, Harry M. Gordon, C. H. W. Nason, R. S. Houghton, M. Keith Libby, A. H. Dalal, A. C. Pearce, H. Mallet-Veale, Louis Horwath Jr., Harold F. Lower, W. H. Metcalf, Walter F. Johnson, Jorge Izquierdo P., Oscar G. Lomelino, Eric Butcher, J. E. Moore, J. Herbert Hyde, Jack H. Chulley, George E. Thomas, Joseph V. Trzuskowski, Bruce Holmgren, Harold J. Self, Robert B. Hammersley, Augusto Anca, Arthur Hamilton, L. T. Lee, Jr., Leo Herz, Fred M. Craft, Ward Landis, A. Belanger, Edward G. Holland, L. E. Moyer, Jerry M. Hynek, Walter A. Greiner, Leonard Trinkle, L. C. Styles, Anatol Kabatoff, Ted W. Smith, George Munz, John Hubbard, Sidney G. Millen, C. H. Skatzes, Clayton Sands, Jose Perez, E. O. Stafford, J. Wendell Partner, A. D. Golden, Howard Singer, Edward DeLaet, James Brown, G. O. Gallagher, Forrest W. Dodge, Dr. G. W. Twomey, James B. Robbins, Phillip R. Belt, Louis T. Haws, Werner Howald, L. M. Jensen, Dr. Floyd C. Naegeli, Bernard L. Wood, Don E. Sollenberger, Norman C. Smith, Donald A. Robinson, B. L. Cummins, J. Wendell Partner, Merton T. Meade, Hans Andersen, Harry E. Kentzel, Terry A. Adams, Harold H. Flick, Jose Rodriguez Rivas, René Arickx, Heinie Johnson, Kenneth H. Moffett, W. E. Frost, E. R. Wickham, A. B. Baadsgaard, James E. Lynch, Fred A. Pilgrim, S. G. DeMarco, Malcomb L. Gavin, George Sholin, Cyril G. Clark, Walter L. Chambers, C. R. Devaraj, Jack A. Plane, L. D. Brewer, George H. Fletcher, Fred C. Lowe Jr., Edgar J. Vassallo, R. C. Messer, Harold W. Bower, Howard Adams Jr., R. C. Ludewig, Caleb A. Wilkinson, Lewis F. Miller, Arthur B. Coover, Richard H. Graham, Oscar Fawcett, Arthur E. Bear, A. J. Umlauf, George W. Brinck, Dwight Williamson, Corwin Denney, Russell L. Eley, H. H. Rowley, A. E. MacLean, M. Michaelson, Donald K. Johnson, H. Kemp, Stanley Chasin, A. T. Hull Jr., E. Scala, Jr., R. Bennett, Donald R. Bissell, V. D. Scright, Charles B. Marshall Jr., G. L. Harris, Bud Vahle, Robert F. Gaiser, J. F. Fritsch, Gerald N. Peyer, Leonard A. Phillips, Donald Smith, B. A. Peachy, U. L. Jacobs, H. Francis Shen, George Atkins, Orval Dickes, H. H. Parker, William Kochnlein, Mrs. Ibbie Smith.

Radio-Lyon-Tramoyes

LYONS, FRANCE—The new station Radio - Lyon - Tramoyes which replaces Lyon-La Dona has been placed into service. The new transmitter has a power of 90 kw. and works on 1193 kc.

NEW

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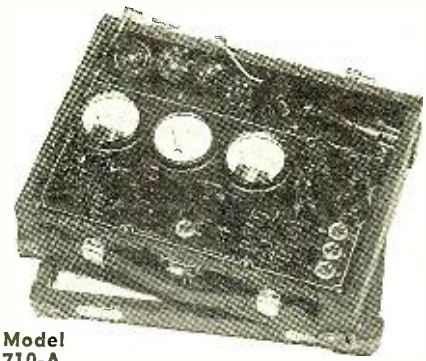
SET TESTERS



Model 710-A Complete Set Tester $16.50 Only

RELIABILITY AT LOW COST

This popular three meter Set Tester checks all parts of radio tube circuits by plugging directly into the receiving set sockets.

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Panel jacks are provided to make individual range connections.

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Complete in Black Leatherette Covered Case.

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Start this very minute! Send for full details of our plan and free booklet that explains how easily you can now cash in on radio quickly. Don't put it off! Write today! **Send now!**

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GENERAL OFFICE: Newark, N. J.

Selling Service

(*Continued from page* 465)

as regular customers in the future.)

(6) *"Making a check on short-wave radio sets."* (Your explanation can be that you have heard so many complaints from this neighborhood on noise and lack of good reception, that you are making an investigation as a service to your customers, and at the same time will be glad to check over her set without obligation and make recommendations for the elimination of noise. Of course *you* will want to do the job which may consist of the installation of a good all-wave noise-reduction type antenna system, line filters, etc.)

(7) *"Making a free tube test as a special introduction to my service."* (There are few sets in use that couldn't be improved with one or more tube replacements, but most people don't realize it until they actually hear the difference when new tubes are inserted. Prove this difference by inserting the new tubes, and if your prospect doesn't want to buy them then, offer to leave them overnight so her husband can judge the difference. Be sure to leave the old tubes too so he can make a comparison—but mark your new ones properly for undisputed identification later.)

(8) *"Making a special offer on a 'tune-up' of your radio set for only $1.50."* (Many large service shops make a feature of this special offer. They find that it is an effective opening wedge in getting them tube replacement and service business—as well as new customers.) The following "12 Services" are good in this connection:

1. Check Aerial Installation.
2. Inspect and clean Lead-in and Ground connections.
3. Inspect Lightning Arrester.
4. Test all Tubes and attach labels (bearing your company name and address) on them to show their condition.
5. Check Tube Sockets for poor prong-contacts, and tighten Tube Shields.
6. Inspect and clean the Chassis.
7. Check all Power Connections.
8. Check Speaker Connections and test it for "rattling."
9. Check Volume Control for noisy operation or "dead spots."
10. Tighten Dial Knobs.
11. Clean interior of Cabinet.
12. Check operation of Set over entire frequency range and submit free estimate for any additional repairs.

(This "special" in itself is not very profitable of course, but the serviceman invariably uncovers a need for replacement tubes, parts or service and makes a real "pay call" out of his visit.)

(9) *"Calling to see how your new set is working."* (This follow-up of a new sale, or after the service guarantee expires [in cooperation with a new-set dealer with whom you have a servicing arrangement], is an excellent way to keep up a friendly contact with your customers.)

(10) *"Announcing a new short-wave adapter* (converter, or antenna or an attachable record-player). It will enable you to do so-and-so." (Carry the equipment with you and offer to leave it twenty-four hours on trial—calling for it when the man of the house is at home.)

(11) *"Offering a complete set of brand new tubes with each repair job."* (By quoting a lump price for the repair job together with all new tubes, you can often break down the resistance you meet on making single tube sales. While a few tubes may still be good in the receiver, you can point out that it is only a question of time before they will go too, necessitating another service call and another charge, so the prospect will probably save money by getting a complete replacement now.)

(12) *"Distributing free radio logs."* (Unless overdone in your neighborhood, this is always a good method of sales promotion, whether it is done purely as advertising [the logs being distributed by school boys] or for the purpose of giving you an opening. One large tube manufacturer recently laid out for his dealers an elaborate plan along this line and achieved unusual success through it. This plan called for postcards to be mailed out two days in advance of the salesman's call. The card stated that a representative would call in a few days to deliver a new radio log free, providing the postcard was retained and given to the salesman when he called. His name and photograph were on the card for identification. When the salesman called, he asked for the card, requesting permission to wait inside while it was being fetched. When the prospect returned with the card, the salesman opened up his kit [in which he purposely kept the logs] gave her one and explained the kilocycle index by making a practical demonstration on her radio. This gave him the opportunity to check the set and take out his tube tester, explaining its purpose, and make a free tube check-up. Attractive logs bearing your name, address and a short sales message may be obtained at fairly low cost from several of the large tube manufacturers.)

When the Prospect is Not at Home

If the prospect you call on is not at home, keep the name reserved for another call either first thing in the morning or just after dinner at night. In any case leave your card in the mail-box, stuck in the door just above the lock, or as a last resort, under the door, but *try to "personalize" it to make it stand out from all the tradesmen's cards that are left!* Otherwise you're just wasting good cardboard. As an example of "personalizing" a card, you might write across the face of it in red pencil—"Called to make a complimentary radio inspection." Something like that might intrigue the prospect to phone and see "what it's all about." In this case, you are one step ahead; and in any case you haven't lost anything.

If the prospect *is* in, but is not interested or does not invite you in, it is usually best to hand her your card with a request to call you if her radio ever gets out of order, and courteously terminate the visit then and there. Also cut your visit short when you meet a "crab." Don't waste your time on that type of prospect, and above all, don't become irritated or use high-pressure methods on such people. Some day you may find them among your best customers—life is uncertain that way!

Selling Service by Telephone

Some servicemen are able to make very effective use of the telephone in selling both their service and new receivers. The advantages of this method are that it is personal; that it assures you of a direct contact with the prospect; and that it takes less time than personal canvassing. On the other hand, there are disadvantages—your call may reach your prospect at an inconvenient time causing him or her to resent the interruption; unless your prospect is sufficiently interested or gracious to give you plenty of time, you are not likely to be able to tell your whole story; and finally, every call costs a nickel, which is small compared with a personal call but large as against direct-mail solicitation. Even so, if you are able to develop a real telephone sales-technique, you may find your sales cost lower in this medium than in any other. Call on the "business agent" of your local telephone office; he will be glad to give you pointers on the effective use of the telephone for your work. If only *one* of his suggestions prove helpful, your visit will have proved valuable to you.

Where will you secure the names and phone numbers of prospects for phone-selling? Use your own lists of past customers, and any prospect lists you may have. The telephone directory will also furnish names. In some cities a "Telephone Address Directory" is published, which lists all subscribers according to street and number, so you can pick the good residential districts or just those streets in your neighborhood. These directories are rented by the telephone company. If no such directory is published in your community, go to your telephone "business agent" and he will have other suggestions for you.

In all telephone selling, take care to develop the right approach. Plan your sales talk ahead of time so you will know exactly what you are going to say. Practice condensing your story until you get it down to the minimum number of words. Talk pleasantly and clearly, without hesitation, and without rushing. Remember that "the voice with the smile wins." If you haven't a good "telephone voice," hire someone who has, and who can put your message over effectively. It will not cost much, and will be more than worth while. Be natural and friendly, but make your voice carry conviction and genuineness. Don't do all the talking—ask some questions—make it a *conversation*, not a monologue. *Don't try to do too much selling on the telephone!* If you can get the prospect into your store or arrange an appointment for an inspection at his home. that is enough. Make the telephone bell act merely as the opening wedge for you.

Avoid calling at inconvenient times. Make some of your calls in the evening, on Saturdays, or on holidays, when the man of the house is at home. If your prospect is busy, make an appointment for a time that is more convenient for him.

Have some specific offer or proposition to make—a free premium, a "special," a free test. If you haven't any really attractive offer to make, it is usually better to avoid telephone selling, except in conjunction with other sales methods—for example, to follow up a direct-mail campaign, or to "break the ice" for a personal call. Used in this connection, telephone selling can be very useful, especially in suburban communities.

The telephone is also good for following up old customers. With them the major selling has already been done, and a reminder is usually enough to keep their business coming your way. If you adopt this plan, do it consistently—call up the customer first just a few days after you have made a repair or sold him tubes, and merely inquire how the set is working. Call him again five or six months later, and inquire about the set's performance, reminding him how long it has been since you did the job. Then keep calling up every few weeks if necessary, to suggest another set inspection or tube test.

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Keep a "tickler file" of all your customers, which will automatically show you when these various phone calls are due.

Whenever an outstanding "national" or "special" program is scheduled to be broadcast, there is always a good opportunity for a telephone solicitation. Call up your prospects and customers and say something like this: "Tomorrow night is the big Such-and-Such Broadcast, Mrs. Jones. I just thought I'd remind you—it's on Station XXX at 9 P.M. I hope you're planning to listen in." Then after her reply, add, "And by the way, how's your set working these days?" If this lead doesn't produce a sales opening for you, you might continue in this manner—"You know, I'm so anxious to have the Such-and-Such program come in well on your radio that I'm going to do something very special for you, Mrs. Jones. I'm going to loan you a complete new set of tubes. No, there won't be any charge or obligation of any kind. I just want you to try these at my expense on this broadcast. Do this, and then just notice how much better it comes in than the reception you're getting now. I'll bring them right over now."

When you or your assistant goes over to Mrs. Jones' to install the new set of tubes, *don't try to do any selling at that time,* but merely test and label the old tubes (leaving them there) and mark your new ones "positively" for identification. The time for the selling is the next day when you come back to pick up the tubes. At that time try to sell the tubes to her, along with what repairs you can see are necessary.

Armstrong's Invention

(*Continued from page* 459)

corresponding to Figure 1 for the amplitude modulated case, while "II" is a representation by means of vector diagrams. The vector "a" shows the unmodulated current, rotating with the angular velocity of the carrier, 2 F. To this, in small-deviation frequency modulation, is added a sinusoidally varying vector "b" making a right angle with the carrier. The frequency at which the vector "b" is changing is equal to the modulation frequency, f. The frequency with which the resultant of "a" and "b" called "c" in the diagrams, is rotating is the frequency of the frequency modulated wave, or, better, its angular velocity. The diagrams show the vector for successive positions of the modulating cycle, and indicate that the carrier frequency is increased and decreased about its normal value, periodically.

A numerical example of a frequency modulated signal will make this clear. Assume that a frequency modulated transmitter is available, with a carrier frequency of 10,000,000 cycles per second. Assume also that, with a certain intensity of sound at the microphone, the frequency can be changed by 50,000 cycles either side of the carrier; this frequency change is independent of the modulation frequency. The carrier frequency must now vary between 9,950,000 cycles and 10,050,000 cycles, this variation occurring at the rate of the modulation frequency. If the *intensity* of the sound at the microphone is doubled, the frequency *deviation* will also be doubled, that is, the carrier will change between 9,900,000 and 10,100,000 cycles, but a change in the modulation *frequency* will not affect the frequency deviation.

Mathematically, a frequency modulated current can be represented by

$$i = I \sin \left(2\pi Ft + \frac{\Delta F}{f} \sin 2\pi ft\right) \qquad (3)$$

where the notation is the same as in the preceding equations, and ΔF is the frequency deviation. If this is expanded in a manner analagous to the case of amplitude modulation, a result is obtained which shows that the current is made up of terms having the following frequencies,

$$F, F + f, F - f, F + 2f, F - 2f, F + 3f, F - 3f, \text{etc.}$$

That is, there is an infinite number of side bands, spaced symmetrically about the carrier. The magnitudes of these side-bands is determined by certain mathematical functions, the details of which we will not consider, except to state that, while the actual number of the side bands is infinite, after a discreet number has been considered, the remainder are small enough to be negligible. For practical purposes, if f is smaller than ΔF, the band width may be taken as $2\Delta F$. This is a wider band width than that occurring in amplitude modulation, and is one of the reasons why frequency modulation has not been used in the past.

In the past, several methods have been suggested for obtaining frequency modulated signals, in particular with some telegraph installations, notably those using the Poulsen arc transmitter. One simple means of obtaining frequency modulation in a telephone transmitter is to shunt a condenser microphone directly across the tuned

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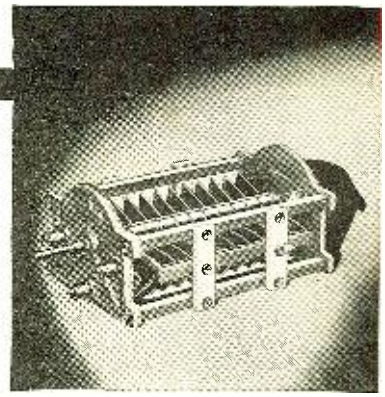

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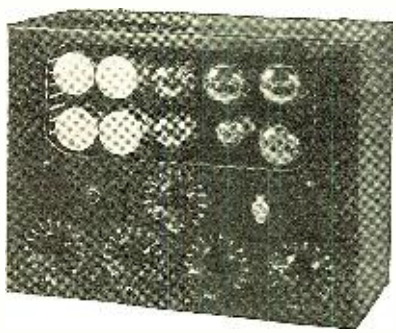

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The "*Rebroadcaster*" is a complete miniature radio transmitter of extremely flexible design. Features include: *tunable* output frequency; additional oscillator coils permit use as experimental S. W. phone transmitter, or as beat oscillator and signal indicator for all-wave receivers. **Net price, $8.95** less tube; **kit—$7.95.** Send now for **FREE Literature.**

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circuit of the oscillator. If the microphone is actuated, the frequency of the transmitter signal is made proportional to the amplitude of the sound at the microphone. However, such methods, and others that have been suggested of similar nature, are not satisfactory for use in practice.

The method by which Major Armstrong obtains frequency modulation in his transmitter is somewhat complicated; a transmitting system may employ 50 or 60 tubes. This discussion must be limited to include only the essentials. Figure 3 shows the simplified circuit diagram, while Figure 4 is the corresponding "block" diagram.

The crystal oscillator is the usual form of quartz-controlled circuit, operating at about 50,000 cycles. The oscillator output is divided between two circuits, one an amplifier (b), the other a balanced modulator (f), as shown. The balanced modulator circuit has been developed extensively in connection with single side-band communication systems, such as are used on some of the trans-Atlantic telephone channels. The coils (g) and (h) are connected in opposition, making the characteristic of the balanced modulator such that voltage is induced in the coil (e) only when the modulation transformer (d) is excited. Furthermore, the induced voltage consists only of the two side-bands that result from amplitude modulation [the last two terms of eq. (2)], the carrier having been suppressed. The arrangement shown also incorporates a phase-shift device, since the coil (e) is inductively coupled to (g) and (h), the induced voltage being nearly 90° out of phase with the oscillator voltage. A more complete treatment of the balanced modulator can be found in textbooks of radio engineering.

Since the side-band voltage is at right angles to the carrier, the arrangement corresponds to the vector diagrams, Figure 2 (II) for a small-deviation, frequency-modulated system. Examination of eq. (3) will show that, in addition to the phase relations illustrated by the vector diagram, the change in the maximum angle (d) of the vector diagram must be inversely proportional to the modulation frequency. To accomplish this the circuit includes a correction amplifier (m) following the speech amplifier. The amplifier output is inversely proportional to the frequency at the microphone. If the correction amplifier were not included, the transmitter would have a "phase-modulated" characteristic, which is a third type of modulation.

During the process described, a certain amount of undesirable amplitude modulation is introduced. To eliminate the amplitude fluctuations, a current limiter tube (t) is introduced after the amplifier (n). This is a tube operating in the saturated plate-current region, with low heater, plate and screen voltages. The current limiter, in addition to smoothing out amplitude fluctuations, introduces distortion, in the form of higher harmonics in the output. These harmonics are removed by the low-pass filter (p).

The amount of frequency deviation which can be introduced by the balanced modulator, described, is limited by a type of amplitude distortion which occurs, and the angle, d, of the vector diagrams cannot be made very large. A large frequency deviation is desired, however, to obtain the noise-reducing characteristic of the system, and, to produce this large frequency deviation, the frequency-multiplying stages (r) are employed. The multiplier consists of a series of frequency doubler stages, five to ten in number, which step up the carrier, and at the same time, the frequency deviation, to the value desired.

Up to and including the frequency multiplying stages, the transmitting apparatus is constructed entirely of small receiving tubes. The output of the multiplier is passed into the power amplifier (s), which is of the ordinary transmitter type, except that it is designed to pass the wide band required by the signal, and from there to the antenna. It is seen that the system is a highly ingenious one for the production of a wide-band, frequency-modulated signal, at frequencies above 30 megacycles.

The Strato Flight

(*Continued from page* 456)

special transmitter and receiver, were designed to function efficiently with minimum weight and bulk.

The transmitter, with call signals of W10XFH, was a 7-tube unit with a capacity of 8 watts. It was crystal controlled, with a dual equipment of two crystals, slightly staggered, permitting stable operation at 13,046 and 13,055 kilocycles.

Power for both sending and receiving was obtained from thirty-six A and B dry batteries. Due to the shifting positions of the men in the gondola, who were obliged to operate numerous scientific instruments while broadcasting, an audio automatic gain control was installed. This kept the modulation level close to 100 per cent regardless of the speaking positions of Stevens and Anderson.

Combined weight of the transmitter and receiver was approximately sixty pounds.

A 6-tube superheterodyne circuit was employed in the receiver. It covered the band of 6,000 to 6,500 kilocycles. All ground stations contacting the balloon were adjusted to operate between these two points. It was a single control receiver and utilized earphones instead of a loudspeaker. It was reported that the signals were so loud, though, that it was possible to copy all messages with the headsets hanging loosely on the receiver.

Transmitting antenna equipment consisted of a quarter-wave radiator suspended from the lower catenary band of the balloon, with a pulley system to draw in the slack. This was linked by a two-wire transmission line to the transmitter. The receiving antenna was of the usual trailing airplane type. It was dropped out from the bottom of the gondola about 70 feet. It entered the gondola through a soft rubber insulator, this type being used so that the air pressure in the chamber would tend to seal the passage.

Special treatment had to be accorded some of the apparatus. To insure that the dry battery power supply would be absolutely fresh at the start of the flight, the cells were kept in cold storage until a short time before the take-off. The transmitter and receiver tubes, of RCA Radiotron manufacture, were energized just forty-five minutes before the balloon left the ground. This was expected to provide a constant temperature so that maximum stable operation would be attained.

So many locations were selected for participation in the stratosphere program that a network of ground communication telephone trunk lines was set up. Any point could contact another, and everything that was said went out simultaneously over three transmitters so that the strongest signal could be chosen by the balloon.

The special hookup, termed a "full-talk" circuit, ran from New York to W3XL, Bound Brook, New Jersey; thence to the Washington headquarters of both the National Geographic Society and the United States Army Air Corps; thence to W9XF, Chicago; and finally to the strato bowl and W10XF at Indian School, a few miles distant.

Wave frequencies and power employed by the transmitters follow: W3XL, 6425 kilocycles, 20 kilowatts; W9XF, 6100 kilocycles, 5 kilowatts; and W10XF, 6350 kilocycles, 200 watts.

Receiving points were all over the continent, the main ones being the Riverhead, Long Island, and Point Reyes, California, RCA Communications stations; Chicago NBC headquarters and the strato camp base. All points were used, but Chicago was drawn on for the bulk of relayed material.

Broadcast stations standing by for signals, dependent on the path taken by the balloon, were: KFYR, Bismarck, N. D.; KOA, Denver; WOW, Omaha; WHO, Des Moines; WDAF, Kansas City, Mo.; KVOO, Tulsa; WKY, Oklahoma City; WFAA, Dallas; WOAI, San Antonio; KTAR, Phoenix; WDAY, Fargo, S. D.; WMT, Cedar Rapids, Iowa; WLW, Cincinnati; WBAP, Fort Worth; KGIR, Butte; KSTP, St. Paul; WIBA, Madison; WCKY, Covington; WAPI, Birmingham; KPRC, Houston; KGHL, Billings, Montana; WTMJ, Milwaukee; WSM, Nashville; WMC, Memphis; KTHS, Hot Springs, Arkansas; KOIL, Council Bluffs, and WJDX, Jackson, Mississippi. The Government Monitoring Station at Grand Island, Nebraska, also stood by for signals.

Many scientific instruments, other than radio equipment, were carried on the flight. One of these was a cosmic ray machine to measure the intensity and direction of the cosmic rays arriving at the gondola. Three cameras were used, one to obtain pictures of the curvature of the earth at high altitudes (yielding visual proof that the earth is round), the second to make a map of the surface of the earth every two minutes, the third to snap all the instruments in the balloon. The last camera made a photographic reading of the numerous instruments due to the impracticality of physical recording during the ascent.

Mr. O. B. Hanson, chief engineer of NBC, declared that the radio success of the stratosphere flight upheld his staff's theory in regards to short wave propagation.

"The waves," he said, "behaved according to the theory of short wave frequencies at these altitudes. We expected that certain receiving positions would receive a better signal than others at times, due to the variations in radiation of the waves to the ionosphere and back again to the earth.

"Not knowing the exact altitude that the flight would take, nor its direction, we could not tell what receiving position would procure the best signal. If we do broadcast another stratosphere flight, and use the same shortwave frequencies, we will have a better idea of where to establish better receiving positions. But, the efficiency of these positions will again be dependent on the direction of flight of the balloon."

The Radio Corporation of America announced that a great mass of information was obtained during the flight as to the propagation of electromagnetic waves through the atmosphere.

Thus, listeners had a day of radio thrills on man's adventure into the stratosphere. It is most appropriate that the microphone should be in the equipment of every scientific expedition.

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S. W. Antenna

(*Continued from page* 479)

volume on any given short-wave band. It is not necessary to reset the tuner dial for each different station in this band.

Looking at the basic circuit of Figure 1, the total length of both flat tops is 25 plus 25 ft. equals 50 ft. total. By the usual formula of flat-top length in feet divided by 1.56 equals lowest resonant wavelength, the flat-top is found to resonate at 32.5 meters, or 9200 kc. approximately. To effect an impedance match between antenna flat-top and transmission line, the two wires of the latter are formed into a triangle 10½ inches on a side, and connected to the flat-top center 10½ inches apart, which separation gives an impedance match between flat-top and transmission line productive of maximum energy transfer to the line, and hence to the receiver at 9200 kc., without external tuning.

At all other wavelengths the two wire transmission line may be considered as a part of the resonant antenna system as a whole. In such a case the total antenna length is 50 feet in the flat-top, plus twice the transmission line length of 131 feet. This total of 312 feet divided by 1.56 gives 200 meters as the longest wavelength at which it will resonate as a one-half wave antenna. It will also resonate in effect at harmonics of this wavelength.

However, by means of the circuits in the tuner-switch box the antenna may be accurately tuned to any wavelength between 9 and 200 meters irrespective of local conditions. All of which is merely another way of saying that this antenna takes full advantage of resonance to deliver maximum short-wave signal voltage to any receiver.

Noise reduction benefits are too numerous for simple analysis. The twisted pair leadin results in cancellation of noise and signal voltages striking it, as do all such leadins, leaving signal pickup to the flat-top alone, where it belongs. The length of 131 ft. or more, allows the signal collecting 50 ft. flat-top to be placed well out of local noise fields to reduce noise pickup.

Thus the "R9+" antenna is really three antennas in one—the totally new tuned system, the usual simple noise reducing doublet (still tunable by the variable antenna condenser in the tuner box) and a simpler L antenna.

Prize Contest

(*Continued from page* 489)

able opportunities for building up customer acceptance and good-will.

"Of course, one should not donate the use of the equipment to any person or organization benefiting financially from the service. However, there exist many opportunities to advertise one's self by setting up the outfit at gatherings where sound reinforcement is desirable but where

DON'T TRUST YOUR RADIO TO JUST ANY SERVICE MAN.
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25 King Street PHONE 1142-M Pottstown, Pa.
—have your radio repaired "right the first time."

FIGURE 2

any cost is prohibitive to the sponsors. Such events are free athletic meets, out-of-door church services, picnics or an old-fashioned pie-auction-supper. The announcing at such get-togethers should be informal, and a clever barker will find many opportunities to mention and plug the donor of the public-address system, his generosity, radio services, etc.

"The layout with which I have provided myself for such promotional work is rugged, simple and inexpensive. It is foolproof enough in its set-up and operation that I have no fear in trusting it even to inexperienced hands." *Murl E. Beauchamp.*

What the serviceman is really doing when he loans his P.A. equipment under such conditions is merely taking advantage of his own services. Which is logical enough, and will often lead to general radio service work and specific public-address rentals.

FIFTH PRIZE

The Receiving Studio Idea

"I have arranged a reception studio as a feature of my radio service work. It consists of comfortable chairs and a settee, an all-wave antenna system that will take simultaneous care of from three to five receivers, and a high-grade set of my own in perfect condition. This studio has been advertised by circulars and other means, and the general public is invited to bring their receivers to see just how they work under conditions known to be ideal. Many customers bring in their sets purely out of curiosity, others because of noise, inability to get DX, or other symptoms I have publicized, which lead them to suspect that their receivers are not functioning properly. There is no charge for this service and inspection. (If I have to call and deliver the set, it becomes a general service routine, and of course I make a minimum charge in such cases. However, I always endeavor to have the customer listen to his set in my studio before returning it to him.)

"Nine out of ten receivers brought in result in a paying service of some kind—tube replacements, alignment or a new antenna. Once a customer hears his receiver working properly, he will never be satisfied until he can duplicate the results in his own home—which almost invariably means a good, all-wave antenna, at least.

"Over the door there is a sign which reads—PUBLIC LISTENING POST, NO CHARGE, HONEST ADVICE, FREE INSPECTION BY AN EXPERT. Above the wall-panel there are several items on display, including noise eliminators, antenna kits, tubes and a short-wave converter."—*Eugene J. Borsattino.*

The Service Bench

(*Continued from page* 489)

ber 2 above.) 3. Connect this lead to the point where the 100-ohm resistor and the 275-ohm resistor are joined in series."

G. E. Auto Radio B-40

"I recently serviced one of these receivers which was giving some vibrator trouble. I cleaned all points and lined them up, but the output continued erratic, and considerable sparking occurred at the secondary points. I found it possible to correct this by shunting tubular .1 mfd. condensers across the .04 mfd. condensers already connected across these points and ground. This practically eliminated the sparking, speeded up the vibrator and brought the output up to normal. The inner vibrator shield was discarded to provide room for the tubular condensers."—James L. Hoard, Providence, R. I.

SERVICE NOTES

We have received several letters in reference to the badge shown in the lead photograph of the *Service Bench* for November, 1935. This badge identifies an interference inspector, and is furnished by the Tobe Deutschmann Corp., Canton, Mass., to servicemen and utility companies using their specialized apparatus in the tracking down of man-made static.

New Radio Course

A radically-different sort of a course in radio servicing is being introduced by Frank L. Sprayberry, author of the familiar lessons on the *Practical Mechanics of Radio Servicing.* The new course will be limited to students with the equivalent of a high-school education, the theory being that students with so excellent a fundamental background can be developed rapidly into radio experts with superior qualifications. Full servicing equipment—tools, small hardware, complete manuals, an all-wave oscillator and receiver analyzer—are included in the course. In addition, each student will receive a current model of a well-known all-wave set, and arrangements will be made, upon the completion of his course, for him to serve a short apprenticeship in the shop of a jobber in his immediate vicinity.

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When filter condensers fail to supply the proper voltage—when cheap, inferior condensers are used—nothing about a radio can be wholly right. To test this assertion we only ask that you take a "sick" radio and equip it THROUGHOUT with Sprague. You'll be amazed at the improvement in "pep," volume and tonal quality.

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The RADIO WORKSHOP

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

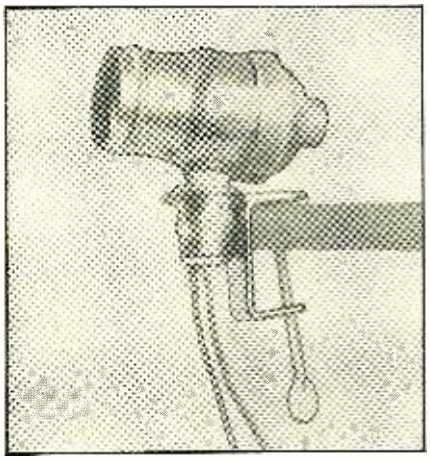
A Lamp for Photo-cell Experimenters

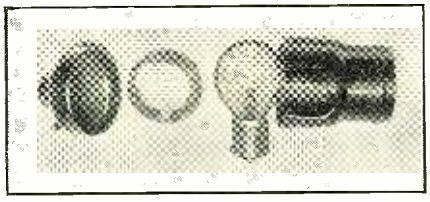
A small light source for use with photo-cells may be made from an old light socket case and a 6-volt headlight bulb.

By enlarging the chain or key slot in the case to accommodate the base of the headlight bulb, it will be found that the lamp can be enclosed in the case very neatly. A small concave metal disk may be inserted in the top of the case as a reflector and the whole unit held in a small clamp such as is sold for use on automobile dashboards. If a concentrated spot of light is desired, a flashlight lens may be fitted on the front by means of an improvised wire support.

I run my light source from a small transformer and have found this means of illumination much more convenient than an electric lamp.

JOHN W. DEELY,
Springfield, Mass.



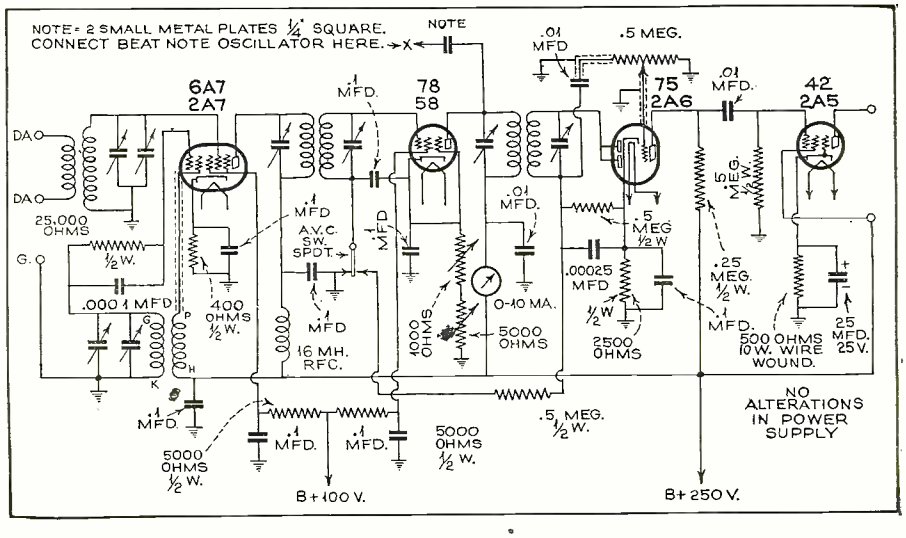


Adding a Tuning Meter and A.V.C. to the All-Star Receiver

Owners of the All-Star All-Wave Senior receiver, which was described in the September 1934 issue of RADIO NEWS may be interested in the revisions that I made in this circuit so as to obtain the additional features of automatic volume control, a tuning meter, and manual audio volume control. With the assistance of these circuit revisions and the use of a doublet antenna I was able to improve reception results on all bands and especially so on the 20 meter phone band.

A reference to the schematic circuit diagram will show that I am employing only 4 tubes in the revised circuit, having eliminated one i.f. stage. A single i.f. stage provided ample gain, consistent with a good signal to noise ratio. The tone control has also been eliminated, but for those who want to retain this feature it can be incorporated in the plate circuit of the power tube.

The sensitivity or r.f. volume control R2, is a 5000 ohm linear unit instead of the



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25,000 ohm unit previously used. The 1000 ohm rheostat is employed to adjust the C bias to the i.f. tube for best results, also to adjust the tuning meter to full scale reading with no signal tuned in. The sensitivity control R2 should be advanced to the extreme point, that is, with all the resistance out, when the automatic volume control switch is turned to the "on" position. This is necessary in order to make the a.v.c action complete, it also permits maximum retardation of the tuning meter when signals are tuned in. This meter is not only an advantage in tuning but it also serves as a direct indicator of signal strength.

The audio volume control, R3, is a ½ meghom left-hand tapered potentiometer, which can be mounted on the front panel in the place previously occupied by the tone control. This control is of material assistance in holding down very powerful signals. All leads to this control and to the 2A6 grid cap must be shielded and the shields grounded.

The beat note oscillator is connected at the point marked "X" instead of to the detector plate in the original set. A small coupling condenser can be made from two small ¼-inch metal plates, or from two small pieces of push-back wire twisted together. The a.v.c. switch should be thrown to the "off" side when receiving code on the beat oscillator. The tuning meter will give quite a wide swing on strong signals and will be helpful in centering DX broadcast stations for best quality, although the very weak signals will hardly move the meter.

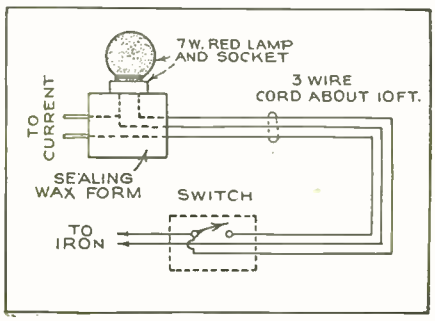
The doublet type antenna is 16 feet each side of the center and is erected in the attic of the house. I use a Lynch "Giant Killer" lead-in cable approximately 18 feet long. The small matching coil for the antenna input circuit is made of two turns of No. 20 d.c.c. wire approximately 2 inches in diameter, placed right around the antenna inductance. The two ends of this coil are connected directly to the two leads of the lead-in cable. My tests indicated that this type of antenna matching gave best results in noise elimination for my particular location.

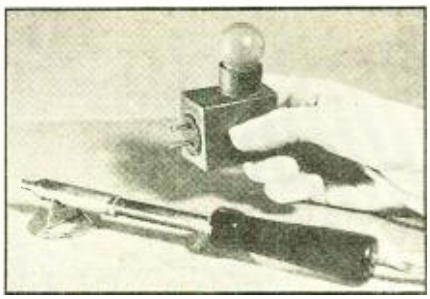
JOHN T. WILCOX,
New York, N. Y.

Pilot Light for Soldering Iron

An efficient little pilot light device for the electric soldering iron can be made up by building a small cardboard form and arranging an electric light plug in one side and an electric light socket in the top and holding them together by filling the form with sealing wax (usually saved from old B batteries) after wire connections have been made as per sketch. The three-wire lamp cord is connected in such a manner to the switch that the third wire, leading from the red (7-watt) lamp is connected to the iron side of the circuit.

The form with the lamp fastened in it can be plugged into any standard socket of suitable size and with the operator it will become second nature to keep the iron at the proper operating temperature while





doing the work by being able to observe out of the corner of his eye if the current is on or off.

WESLEY W. KUHLMANN,
Woodcliff, N. J.

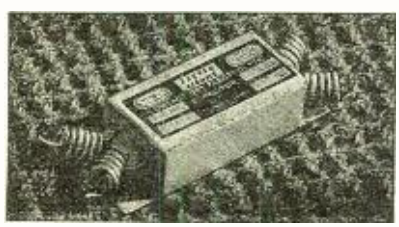
Oscillator with Full-Vision Dial

The outstanding feature of the Webber model 20, battery operated service oscillator is the new fan-shaped dial with full-vision direct reading scale. Effective scale length of the dial is 47 inches covering the

intermediate, broadcast and short wave frequencies from 90 kc. to 25 megacycles, all on fundamental frequencies. Calibration is standardized with crystal controlled frequency standard at 48 points.

Tiny Electrolytic Condensers Now Made in Dual Units

The "Little Giant" dry electrolytic condensers introduced by the Solar Mfg. Corp. some months ago are now made in dual type. The new series afford the same space saving economy and offer the additional



factor of lower cost over two single units. Also, in the new type there is the convenience of the flange mounting. Four types are available with dual 4 and 8 mfd. capacity each section, at 250 and 525 volts surge peak rating.

A New Station at Madagascar

PARIS, FRANCE—A small radio station, Radio-Betsileo, has been erected in the city of Fianarantsoa which covers the province of Betsileo. The station is highly satisfactory and it is planned to build more small transmitters in the most important towns of the island.

A New Station in Tunisia

TUNIS, TUNISIA—The government has granted a concession for a radio station at Bizerta. The station works on the wavelength of 209 meters with a power of 100 watts. It is hoped to increase the power in the near future.

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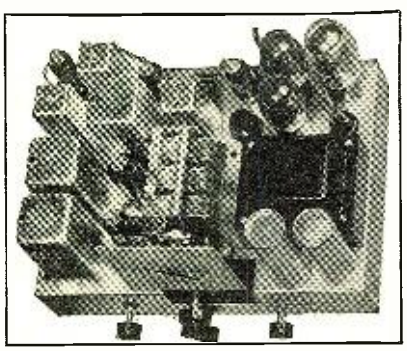

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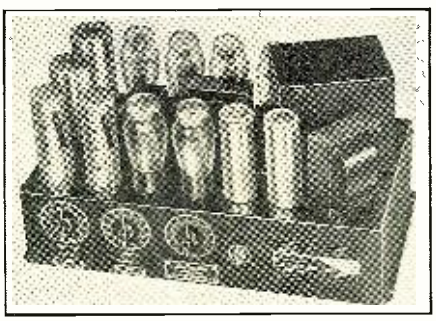
Public-Address Systems

(*Continued from page* 466)

sound-cell or velocity microphones can be connected directly to its input terminals, and controlled by means of the mixer. At public meetings, fairs, athletic events or other occasions where synthetic music is desired, a high impedance phonograph pickup can be plugged into one of the two input channels, and microphone announcements superimposed upon the music by means of the second channel and the mixer.

The output transformer is tapped for 2, 4, 8, 15, 250 and 500 ohms output, permitting almost any speaker arrangement that may be required. In combination with the speaker field supply incorporated in this amplifier, the output transformer permits the use of two d.c. speakers for all ordinary purposes, and the addition of two a.c. speakers whenever a scattered audience is encountered. The fact that the speaker chokes are not a part of the amplifier filter, and can be switched out of circuit without the slightest effect on the amplifier's operation, also makes possible the use of numerous small a.c. dynamics or magnetic speakers, which are connected in parallel or in series-parallel to the 500-ohm output when the amplifier is operated in connection with a call system in a school or industrial plant. The same amplifier,



connected to a number of headphones in parallel or in series-parallel, is used in churches, schools or picture theatres as a hearing aid.

Among the uses to which this amplifier may be put is that of a call and communicating system in which magnetic speakers located at distant points are operated as microphones for talking back. In such systems the amplifier is usually mounted on a metal rack together with a central or monitor speaker, and a switchboard by means of which any of the distant speakers can at will be switched from the amplifier output to its input circuit, and back again. Dummy resistors are provided as substitute impedances for speakers switched out of use, or for any particular speaker momentarily switched into circuit as a microphone. The school principal, or factory executive, switches any station he desires into circuit, speaks into his microphone, and with a flip of one finger switches the same station into the amplifier input. The answer is given, at the distant point, by talking directly into the speaker.

The importance of continuous operation in any of these services emphasizes the necessity for the large, conservatively rated parts used in this amplifier, the power stage grid bias arrangement that prevents any tube being overloaded even at extreme volume, the husky chokes and chassis and the specially wound transformers that minimize hum. In such work not only is unfailing reliability of the most vital importance, but the cost of the amplifier used is so small, in proportion to the total cost of the installation, as to make skimping on the ratings of amplifier parts entirely unreasonable.

There are almost endless uses to which P.A. amplifiers can be put, and the first sale or rental may lead to a dozen others, from the most unexpected sources, provided only that the equipment does not disgrace itself and its sponsor by breaking down.—*Hubert L. Shortt, Chief Engineer, Wholesale Radio Service.*

Complete P.A. System

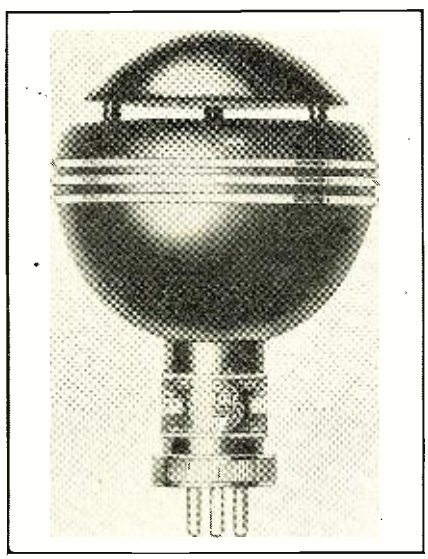
(*Continued from page* 467)

a driver; and four 2A3's, connected in a push-pull parallel Class AB power-output stage.

An amplifier of this type should have wide application for use in auditoriums, skating rinks, athletic fields, etc.

Microphone of Unusual Design

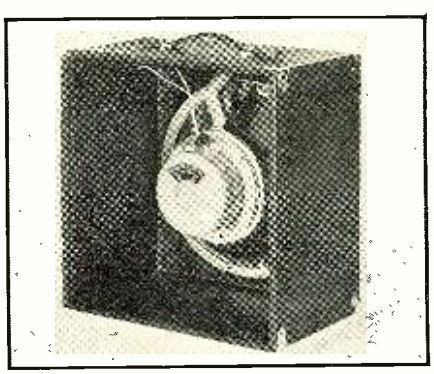
The new Shure "Spheroid" non-directional crystal microphone is only 2½ inches in diameter. Sound enters the unit through a horizontal annular slot at the top and because of this symmetry of construction, pick up is non-directional



throughout a complete angle of 360 degrees. The output level is rated at approximately minus 55 db, and its wave response within 5 db from 40 to 10,000 cycles.

The Latest in Portable Speakers

The new Wright-DeCoster "Port-A-Case" should find wide application in the



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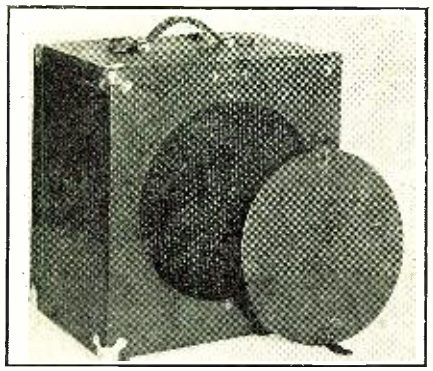
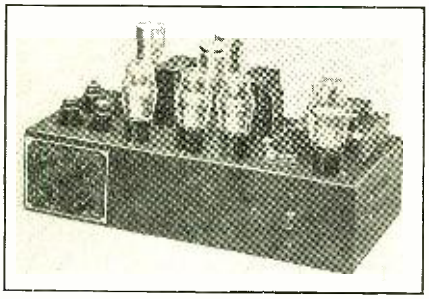


portable sound reproducing field. It is economically priced and is furnished complete with either a 10- or a 12-inch speaker. There is ample room in the bottom of the case to house a portable type P. A. amplifier and still allow room for the speaker field supply. The case is large enough to provide an efficient baffle to bring out the quality of the reproducer. The pack cover is of the sliding type providing easy access to the equipment.

Amplifier for Universal Application

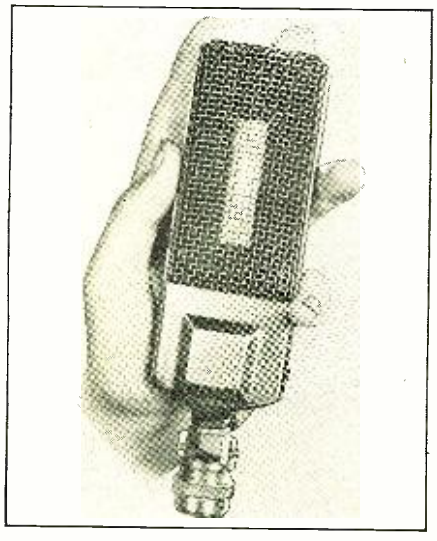
The Federated Acratest 8-tube, 15-watt high-fidelity amplifier providing a choice of 4 input circuits, is one of their most popular sound reproducing systems. It is designed to have an overall voltage gain of 120.5 db. The tube equipment comprises two type 6J7's and two type 6C5 metal



tubes, one 6A6, two 6B5's, and one 5Z3 rectifier.

New Small Size Velocity Microphone

The Bruno Laboratories introduces the model SK4 velocity type microphone, measuring only 6 by 2¼ by ¾ inches. By employing a new design of magnetic circuit and case, it is said that the output level and frequency response have been so greatly improved that the unit provides results practically equal to those of the usual broadcast studio microphone. Another feature in engineering design is the new type of swivel system upon which the unit mounts.



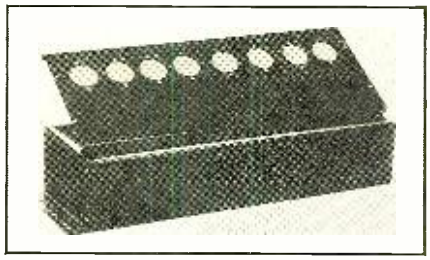
Speaker with Increased Efficiency

The accompanying illustration shows the Rola model K10 dynamic type speaker. This is a 10-inch size reproducer having a net weight of 5 lbs. 8 ozs. It is available in either dustproof or non-dustproof models and curved or straight cones are op-

tional. Field coil and transformer specifications to order.

A Material Aid to P.A. Construction

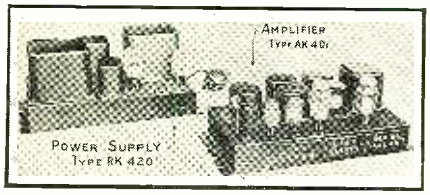
The Kenyon unit chassis will appeal to the sound engineer, amateur and experimenter. They are designed to be applicable to either rack or table mounting installation and provide good electromagnetic and electrostatic shielding. Each chassis is constructed of 5 separate pieces, easily disassembled to perform drilling or other machine operations. The illustration shows a



typical unit chassis with its top deck removed.

Series of Amplifier Kits

An announcement was recently received from the American Transformer Company on their new series 400 high-fidelity public-address amplifier kits, especially suitable as station, recording or audition amplifiers. Detailed wiring instructions and a drilled Amertran chassis are furnished with each



kit. The model AK401A, illustrated, is a three-stage unit with an overall gain of 82 db. and a frequency range from 30 to 12,000 cycles, response uniform within plus or minus 3 db. The tubes used are one 57, two 56's and two 2A3 type tubes.

Three New Amplifier Kits

Sound engineers and all readers who like to build their own sound equipment will be interested in hearing of the 3 new high-gain amplifier kits offered by the Thordarson Electric Mfg. Co. Catering to all manner of public address requirements, the 3

(*Turn to page* 509)

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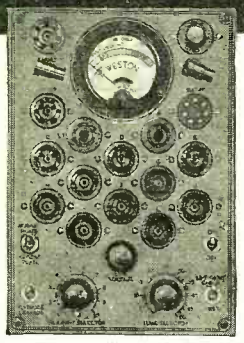

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SHORT-WAVE PAGE

SEVERAL weeks ago we started a drive against that bug-a-boo of the city short-wave listener—man-made interference. The editors of RADIO NEWS and the writer then awaited your reaction. Letters from nearly every state in the Union reached us. With the views of these various short-wave listeners before us, we are now able to enlarge on our previous statements. But before we proceed, a short, condensed version (for those who did not read our other article) will be given.

OUR objective is to attempt to form a league or body of active short-wave listeners who are bothered by local or man-made interference, i.e., motors, automobile ignition, etc. We request them to write us a letter or a post card pledging their support in a drive to eliminate this type of interference. We suggest that with an "army" of listeners with us, we would have a "voice" strong enough to be heard and then action might be taken by the Federal Communications Commission against those people who are causing this unnecessary interference.

The majority of owners and users of electrical appliances of modern design rarely cause this trouble. It is the "antiquated junk" that creates the disturbance. For instance, if a duly authorized amateur when operating his transmitter causes interference on the broadcast band he is informed by the F. C. C. to do so *or else!* But anyone can buy an old worn-out motor and disrupt the entire neighborhood's radio reception—and no one, not even the F. C. C., says anything to him. A law or ordinance making this interference a crime should be put into the F. C. C. regulations. The only way we can accomplish this is with your support. Now we will quote from some of the letters received. Fred M. Craft, San Francisco, informs us that Frank Andrews, of KFI fame, has added his voice to ours and both of these DX'ers are rounding up listeners on the West Coast.

G. C. Gallagher, same city, says, "It is hoped that the bread that you have cast upon the water may come back to you increased, but it is, alas, a national trait to 'Let George do it' and I am afraid you will find many willing to let Horace do it."

Ralph H. Given, Greenville, Maine, has been working on the idea of interference "elimination" since 1928. His conclusions are: "That the electrical utility companies do not practice the amount of interference prevention which they readily agree to in theory. They themselves should refuse to sell appliances which cause interference. A set of standards should be set by which apparatus can be rated for the amount of interference which it produces. Only then could ordinances be formulated to regulate the field strength of stations which serve a given area. *Absolutely no new appliance should be allowed on sale in violation of such ordinances. Only then will a new era in radio reception be at hand.*"

Frank Ballintine, Philadelphia, read our article on "Interference" at a meeting of the Philadelphia Chapter of the International Short-Wave Club, and pledges his support one hundred percent.

Other letters were received from C. C. Hickey, Hollis, N. Y.; E. R. Christensen, Husum, Wash.; C. R. Malingren, Weyerhaeuser, Wis.; George Mayes, Chicago, Ill.; H. E. Sells, Atlanta, Ga.; R. F. Schumacher, Fullerton, Calif.; A. B. Keen, South Pasadena, Calif.; C. E. Gates, Pittsburgh, Pa.; G. C. Akins, Willits, Calif.; J. F. Satterwaite, Toledo, O.; L. W. Shaeffer, El Paso, Tex.; L. Bradney, Chicago, Ill. To each one we wish to say "Thank you" and have enrolled your name on the books of those supporting us. As other readers communicate with us we will write their name into the records and also, from time to time, the latest developments will appear on this page.

Now for our reception report: verifications received and latest schedules. By far the most interesting is the information on the stations operating in the Empire d'Ethiopia. According to our veri, the short-wave telegraph and telephone transmitters of the "E" stations are located at Akaki, near Addis Ababa. The antenna power is 3 kw. Call letters and frequencies are : ETA, 18.27; ETB, 11.95; ETD, 7.62, and ETC, 5.88. The working hours of these stations, for telephone, are irregular, but telegraphy is used on ETA from 1 a.m. to 2 p.m. and ETB from 2 p.m. to 6.30 p.m. The address is: P.O. Box 283, Addis Ababa, Ethiopia.

VK3ZX, "The Voice of the South," will be on the air regularly for the next six months with programs consisting of American recordings, etc., with a bi-weekly schedule. The times of transmission will be; Sundays, 1.30 a.m. to 3.00 a.m.; Wednesdays, 2 to 3 a.m. E.S.T. The frequency used is 7300 kc. Address all reports to: 33 Saturn Street, Caulfield, S.E.8, Australia.

"Radio Oceanie" in Tahiti, South Seas, is on the air Tuesday and Friday from 11 p.m. to midnight E.S.T. with musical selections. They operate on 7100 kc.

VK2IL is going on 48.3 meters very soon.

(*Continued on next page*)

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His license is costing him 250 pounds per annum. No definite schedule has reached us as yet—but its not a bad idea to keep an ear open for this new Australian.

COCH, Havana, Cuba, has been operating a little off frequency and heard calling Prado, Maracaibo, and others of the round robins conducted by numerous Spanish speaking stations. CO9JQ, operating on 8.7 meg. often joins in. This last mentioned station at Camaguey has been active with musical selections from 6.30 to 8 p.m. Announcements are in English.

Several weeks ago we heard and identified a station as ZHI, Singapore. Some listeners candidly informed us that we were probably listening to W8XAL, Cincinnati, Ohio! The verification arrived from Radio Service Co. of Malaya Ltd., Broadcasting House, Singapore. We quote from it: "We thank you for your report on reception from our station ZHI, Singapore. From the particulars given it is evident that you received our station which broadcasts on 49.9 meters (6.01 meg.)" ZHI's schedule is: Monday, Wednesday and Thursday, 5.40 to 8.10 a.m. and Saturday 10.40 p.m. to 1.10 a.m.

Many fans have logged all continents but African and they have requested me to pass along all "dope" of stations operating there. Seemingly Rabat, Morocco, has disappeared, but CNR the commercial telephone station is fairly active on 12.83 meg.

The Cairo phone stations can be logged nearly every day—but you just have to be on "the job" all the time to catch them on the run as it were. For those dxers who do not object to staying up until the wee hours of the morning, here are some really good catches to go after. Johannesberg is really the only regular short-wave broadcasting station operating in the Union of South Africa. It is transmitting on 6.09 meg. with a power of 1000 watts. Durban occasionally uses a "junior transmitter" for short waves on 6.14 meg., but this is irregular and more in the nature of an experiment than anything else. Then there are two stations in Rhodesia at Salisbury and Bulawayo on 6 meg. and 6.12 meg. respectively. In Portuguese East Africa there is Lourenco Marques on 3.55 meg., but are also testing on 6.13 meg. In west Africa, Lobito, Augola, operates on 7.17 meg. Logging any of the above mentioned stations is really dx!

Now to our reception of the Europeans. By far the best heard are those stations operating during the morning hours. The following stations are heard with tremendous volume. GSF, 15.14 meg., Daventry, can always be depended upon to have a fine program from 6.00 a.m. until 9 a.m. At 7.00 a.m. "Radio Coloniale," France, make their initial appearance and from then until 11 a.m. broadcasts musical programs. If it is Tuesday or Wednesday, PCJ, 15.22 meg., Holland, can always be heard with Edward Startz at the microphone. On the other days of the week, PHI, 11.73 meg., is active but has not been coming across with the "kick" that PCJ always has.

During the winter months, DJB, 15.20 meg., will be active from 8 a.m. to 11.30 a.m., but up until the present time this "D" station has not been heard as well as they should be.

Evening reception, which seemingly is confined to the hectic 49 meter band, is often one continuous heterodyne. I2RO, Rome, Italy, is heard on 6.08 meg., free of interference, but what a beautiful signal they radiate when they operate on 9.63 meg.! During their American hour—nothing could possibly be better.

A station that certainly "perked up" is ORK, 10.33 meg., Belgium, that is heard daily from 2.30 to 4.00 p.m. with a program consisting of musical selections, announcements in Flemish and French.

JVN, 10.66 meg., Japan, has been heard nearly every day from 4 to 5 p.m. with a program of native music. JVH, 14.60 meg., from 5 to 7 p.m.

The "Ham" Shack

(*Continued from page* 491)

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.
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.
W9HHW—Denzel Begley, Box 46, Ft. Meade, S. Dak.
W9SFT—Gerald Broughton, CCC Co. 735, Scammon, Kansas.
W9TE—A. L. Braun, 5211 Brookville Rd., Indianapolis, Indiana.
W9LKK—Sidney Schulz, 3132—4th St. S. E. Minneapolis, Minn.
W9LUS—Clarence Read, 3401 Parnell Ave., Chicago.

Calls Heard

By L. T. Lee, Jr., Alabama short wave observer, on 20 meter 'phone (foreigners only): HP1A, VO1I, VP9R, X2AH, LU6AP, G2NH, G6XR, G5NI, G5BJ, G6FS, G5BY, G5ML and HB9AQ.

By Stan Elcheshen, 801 Literary Road, Cleveland, Ohio; on 20 meter 'phone (foreigners only): X2AH, TI2FG, CO2HY, G5ML, LU6AP, CO2WZ, HI7G, CO2SE, CO2LL, K4SA, X1K, HP1A, CO6OM, CO2PC, CT1BY, VO8OA, TI2NR, X1G, X1W, K6KKP and K6BAZ.

By Richard Sweetland, 19811 Stagg Street, Canoga Park, Calif., on 20 meter 'phone: W1DL, W1CAH, W2BS, W2EG, W2FA, W2FF, W2MB, W2TP, W2ZB, W2BSB, W2BSD, W2BSV, W2EUG, W2FOZ, W2FWK, W2GBN, W2GFH, W2GYA, W2HFS, W2HHV, W2IWT, W3AB, W3BS, W3IS, W3MD, W3APO, W3BEF, W3DCK, W3EHS, W3EVL, W3EXC, W3FAL, W3FEU, W3HEO, W4FK, W4FQ, W4KH, W4ZF, W5EL, W5FJ, W5MB, W5UN, W5SF, W5ZA, W5ACF, W5AGP, W5AHJ, W5AOP, W5AUS, W5AVM, W5AXA, W5BMP, W5BVK, W5CEW, W5CXG, W5EDX, W5DND, W5DXP, W5EBU, W5ECL, W5EUX, W5FCE, W5FDD, W7BDY, W7RY, W7ARK, W7BHT, W7BVI, W7CEO, W7DAW, W8BW, W8AHW, W8ATQ, W8BFD, W8COG, W8DLD, W8DLA, W8GCP, W8HAF, W8HEO, W8HXV, W8IMS, W8IMU, W8LAC, W9AR, W9FJ, W9BJ, W9JB, W9LD, W9OC, W9PA, W9WO, W9DZ, W9ARK, W9ATP, W9BHO, W9CCU, C9CJJ, W9CPE, W9CPT, W9CRQ, W9DVM, W9DXP, W9ELK, W9FGO, W9GH, W9GUB, W9GYK, W9KIY, W9HBD, W9HBG, W9HCO, W9HRQ, W9HRS, W9JIR, W9JKL, W9FKA, W9FNH, W9LAI, W9LBM, W9LDJ, W9LEJ, W9LMO, W9LNA, W9LNB, W9LVJ, W9LZU, W9MBM, W9MXM, W9OJC, W9OJP, W9PEP, W9PIY, W9POB, W9PSD, W9PSP, W9RBG, W9RJY, W9RNX, W9RUW, W9TPZ, VE2BG, VE3OX, VE3QD, VE5DH, K6CMC, K6KKP and X1G.

Forecasts for 1936

(*Continued from page* 461)

In the laboratory sets television is here, but as a system for the transmission of pictures it is not here, nor is it even around the corner . . . the manufacturers of television equipment, therefore, must be absolutely sure they are right before they can go ahead. As a result of field tests which the radio industry is now preparing to make, we are sure that, well, let us say within a couple of years, we will be able to produce standardized transmitters and receivers that will provide the people with satisfactory television for quite a number of years.

Servicing as a Business

By John F. Rider

The advances which are being made in radio receiver design, force corresponding advancements in radio servicing technique. If receivers become more technical, servicing of these receivers automatically becomes a more technical problem. That such is the case is evidenced by the wide-spread appeal to the cathode-ray oscillograph. In order that this device be properly employed, additional equipment, hitherto not used in the servicing industry, is being developed for use by these men. Simultaneously with the development of technique, is the greatly increased interest focussed upon the proper business administration of a servicing establishment and it is my forecast that the future radio service station will be a business-like organization patterned after successful commercial establishments—operating in a scientific manner with equipment which heretofore has been classified as suitable only for the laboratory.

NEXT MONTH

These forecasts will be added to by other authorities in our next issue.

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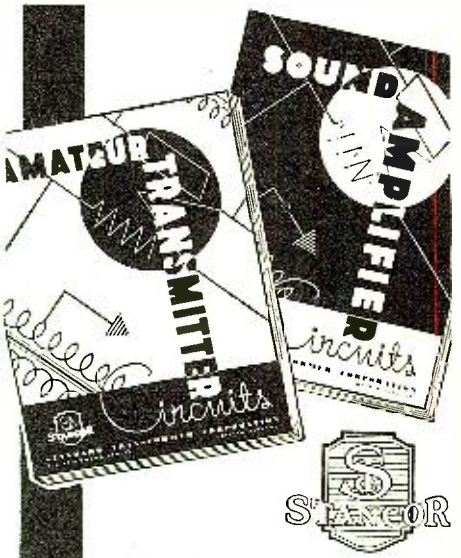

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These books should be in every amateur's technical library. They are invaluable for reference purposes. Just 22 cents in stamps brings them both to you. Send for your copies today.

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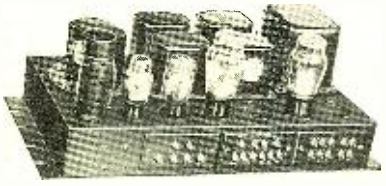

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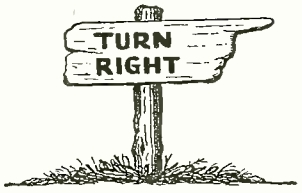

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119 S. Broom St. Madison, Wisconsin

5 meter Oscillator

(*Continued from page 472*)

which would be available and the tubes themselves are ordinary copper pipe, available at any plumbing supply house. Most plumbers are equipped to cut the pipe to desired lengths and all you have to ask for is the number of required lengths of standard ½-inch copper pipe. Do not ask for copper tubing; it will cost more and will not be as easy to work. Standard ½-inch copper pipe is a very ordinary commodity and it is surprisingly cheap. The plumbers measure the inside diameter, not the outside diameter of pipe and you will find that ½-inch pipe really has an outside diameter of 9/16 inch.

In the descriptions of oscillators of this general type which have appeared previously, it has generally been suggested that the pipes be 4 feet long for operation in the five-meter band. Our own experience indicates that this is a great waste of copper as well as space. For instance, the oscillator illustrated here is used with a pair of 45 tubes, on 58 megacycles, with the various clips in the positions illustrated. It will be observed that the plate "shorting" bar, the highest of the lot, is but 27 inches from the lower extremity of the plate pipe. A movement of the "shorting" bar in this circuit of little more than two inches, from its present point, will carry the oscillator out of the band, in either direction.

It may be well to say just a word or two about insulation. In the operation of an oscillator of this nature the portion of the pipes near the tubes carries plenty of voltage and good insulation is desirable. For that reason we have chosen National Steatite stand-off insulators and Isolantite tube sockets, to keep the entire assembly away from the wood supporting frame. It will be observed that a small piece of National Victron has been attached to the wooden triangle in such a way as to provide suitable insulation as well as rigid separation for the upper portions of the copper pipes. The Victron in this case is ¼ inch thick and the material itself may be worked so easily that we suggest holes, approximately ½ inch in diameter, be drilled and then reamed out to fit the pipes very snugly so that there will be no tendency for them to rattle.

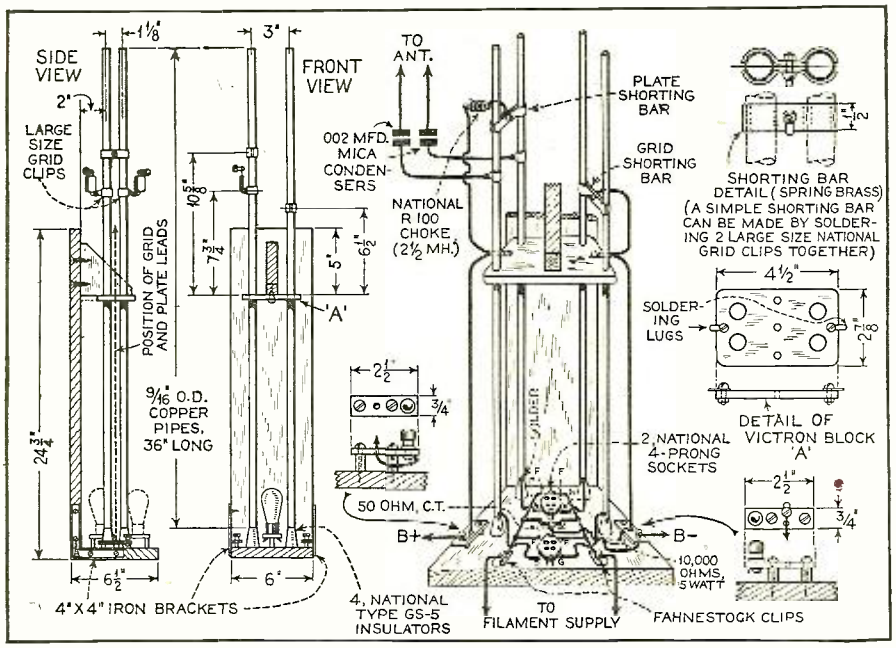
The top of the National type GS5 insulators is just large enough so that the pipes will not slide over the top. Two methods of mounting are thus possible. The lower extremities of the pipes may be reamed out slightly to permit them to drop over the top surface of the insulators or, as we have done, small brass plugs may be turned out on the lathe and inserted in the lower ends of the pipes and a double-ended screw may be employed to bring the bottom of the rod home against the top of the insulator. It is desirable to provide some soft washer between the top of the insulator and the base of the pipe to avoid the possibility of cracking the enamel on the insulator.

It will be observed that the wires running from the base of the completed unit to the "shorting" bars, in both the grid and plate circuits, are carried in as near a straight line as possible and that they are equi-distant from the two pipes whose wavelength they control. This is done to be sure that the feed-wires are in the center of the electrical field and thus prevent them being acted upon more by the current in one pipe than in the other.

It is not suggested that the performance of this type of oscillator is to be considered as the equivalent of either a crystal-controlled unit or an MOPA, but it is so vastly superior to the tuned-plate, tuned-grid type oscillator, that we urge its adoption until such time as the 5-meter band becomes sufficiently congested to require the more elaborate type of circuit.

Our own experience with the "Long-Lines" type of oscillator, described here, began immediately after the first article, describing it and written by Shuart appeared. We believe that the second one of these oscillators in this part of the country was installed at our station, which was then in the Hotel New Yorker, and was described in the March, 1935, number of RADIO NEWS. It was with this outfit that we were able to maintain contact with Philadelphia, for hours at a time, with 40-watts input to the 801 tubes used in the oscillator.

The equipment used at that time was transferred to our present location—the 71st floor of The Bank of the Manhattan Company's Building, at 40 Wall Street, New York City—from which, with an increase to approximately 50-watts, we have been heard consistently as far as Frederick, Maryland, where our signal strength has been reported as R 7 to 8. That is 225 miles away. We are reported as R8 to 9 in Philadelphia, about 85 miles away, almost every time we go on the air. We operate on about 58 megacycles and the stability of our transmitter is causing considerable of comment. As an actual indication of the effectiveness of this type of transmitter, it is interesting to note that the signal from our New York station is heard in Garden City, some 25 miles distant, with at least the signal strength of several of the local stations which are using about the same power. Our receiver is a standard National S R R, which has a rather wide band-spread, because it is made with a 270-degree condenser. The signal, from New York, occupies just about one-half dial division. On the average type of home-constructed super-regenerative receiver with a 180-degree condenser, the space occupied on the dial is reduced to the width of one of the lines on the dial itself.



Parts List

1 block 25 x 6 x ¾
1 block 7 x 6 x ¾
1 block 4 x 4½ x ⅞
2 4" metal angles
8 wood screws for above
2 small pieces bakelite 2½" x ¾" x ⅛"
2 binding posts
2 Fahnestock clips
1 piece National Victron
2 National 4-prong Steatite Tube sockets
4 National Type GS-5 Stand-off Insulators
4 Sections ½" copper pipe—36 inches long—shorter lengths may do, as described in text
1 50 ohm center-tap resistor
1 10,000 ohm, 5 watt resistor
6 National Grid Grips, large size, 4 to be used in place of plate and grid shorting bars
2 .002 mica condensers
1 National Type R-100 choke
4 1½" #8 wood screws (brass)
3 ½" #8 wood screws (brass)
Copper braid is suggested for connecting plate and grid rods to socket terminals

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The BRL-8 Set

(*Continued from page* 471)

wound. Three turns of No. 30 wire should be wound on the dowel about a quarter inch above the grid coil. Two small holes through the dowel will hold the winding in place. Space these holes a little so that the coil can be moved up and down later for correct adjustment. The two leads from this coil should be cut several inches longer than necessary to come out one of the holes in the bottom of the can and a piece of "spaghetti" shoved up over them almost up to the coil.

The bottom view of the receiver should be carefully studied before wiring. It will be noticed that several ground busses of No. 12 tinned wire are used. They should be mounted exactly as shown, about 2¼ inches from the chassis—just enough to clear the bottom plate. Next wire in the filament heaters. One heater prong of each tube socket should be run up directly to its adjacent ground bus. (The same side of the heater wiring each time of course). This precaution prevents common coupling of stages through the heaters. Next ground to the same points the suppressor prong of each socket except the 55 and 59 sockets. Remember that the 59 is being hooked up as a class A triode amplifier.

The next step in the wiring is to wire in all the "hot" RF leads—plate, grid, tuning condenser and coil leads. Then wire in all the by-pass condensers and resistors that go from either the coil or tube sockets to the adjacent ground busses. *Never* use the chassis for a ground connection—use the proper ground bus for this purpose. Also make the ground leads of all parts for any one stage at or close to the same point on the same bus. This prevents any chance of coupling through the busses or chassis, such as might occur if the parts of any stage were grounded to different busses or to one bus and a chassis point. The rest of the wiring should then be done in the order that seems most convenient. Keep other wires or parts away from the r.f. leads.

All that remains is to wind the coils. They should not be doped until the whole receiver is working properly, as they may have to have the turns slid up and down a bit to track properly.

In lining up and adjusting the receiver the i.f. amplifier should be lined up first using a 465 kc. test oscillator. The cathode coil leads should be tried connected both ways to find which way the 1st i.f. stage oscillates best. After this is done it will probably be found that the oscillation point on the cathode regeneration control comes either too far down or possibly can not be reached with the control full on. The 3-turn cathode coil should be slid up or down until the oscillation point is reached with the control turned from two-thirds to three-quarters on. Remember that all i.f. transformer trimmers must be exactly in resonance for proper regeneration. The a.v.c. switch should be turned off during this adjustment.

We can now take the final step and adjust and track the high-frequency coils. With the antenna connected we will find that although not lined up properly some signals will still come in. Tune in a signal near the high-frequency (500 degree) end of the range and line up exactly the r.f. stage panel trimmer knob and the detector coil trimmer. Then swing the dial to the low-frequency (0 degree) end of the range and tune in a steady signal there. Do *not* touch either the r.f. or detector trimmer while tuning in this second station. *After* this station is tuned in reset the detector trimmer to proper resonance. If this trimmer must be *decreased* in capacity for resonance it means that the detector circuit is tuning too wide a range and must have the coil inductance reduced. This is done by spacing the turns of the grid winding further. If the trimmer capacity must be *increased* in capacity the range is too small and the inductance must be increased by moving the turns of the grid coil closer together. After each adjustment of the coil turns check the tracking again until the detector trimmer does not have to be changed from one end of the band to the other. All the trimmers should now be re-adjusted so that the coil range will cover the amateur bands at either end. Always remember that the oscillator trimmer must be set on the high-frequency beat for proper tracking.

The same process should be gone through with the r.f. coil of each set. Due to the antenna load and regeneration we will not be able to keep this r.f. panel trimmer at exactly the same setting through the entire dial swing, but we should adjust the coil so that the control will tune the r.f. stage to resonance at any place on the dial. Another factor entering the adjustment of the r.f. coil is the degree of regeneration to be obtained. Spacing the grid coil turns further apart at the ground end while moving them closer at the grid end to keep the same inductance will reduce the degree of regeneration, and vice-versa. The oscillation point on the r.f. regeneration control should occur in the range from one-half maximum to full. A small trimmer condenser connected externally in the antenna lead will permit of the easiest adjustment of antenna load, which will in turn determine the oscillation point on the r.f. regeneration control. These adjustments are really easier than they sound. The coils can now be doped to hold the turns in place permanently. Use a good lacquer, such as the Victron Q-Max No. 3.

To check the a.v.c. circuit before placing the receiver in service just watch the tuning meter while tuning in a steady carrier with the a.v.c. switch turned on. It should read nearly maximum when no signal is tuned in. With the carrier tuned to resonance it should dip, the amount of the dip depending upon the strength of the carrier. A strong signal should knock it down to about two to four mils. The adjustment of the coupling from the beat oscillator to the diodes should be adjusted for best single-signal effect. This "coupling condenser" consists of a pair of insulated wires twisted together for about two inches. Cutting off a little of either wire or loosening the twist will reduce the coupling and vice-versa. This beat oscillator coupling should be adjusted with the a.v.c. switch turned off, as no single-signal effect will be obtained with the a.v.c. on—in fact the oscillation point will not be reached when using the a.v.c. This condition is quite desirable for 'phone or broadcast reception.

These instructions should cover all the problems that may be encountered during construction and adjustment of this receiver. As has been said before, a strict adherence to these instructions will produce a receiver which will give the builder the fine performance he should rightly expect of it. The stability of operation and exceptionally low noise level should prove a boon to the operator whether he be an amateur or short-wave listener—or a commercial operator. The authors will be only too glad to help builders with any problems that may come up or in actually helping to obtain hard-to-get components. Simply address us c/o RADIO NEWS.

Parts List

1—Three-gang tuning unit National PW type
1—25 mmfd. Cardwell Trimmair
7—25 mmfd. Hammarlund APC type trimmers
2—5-prong Hammarlund isolantite coil sockets
1—4-prong Hammarlund isolantite coil socket
1—4-prong wafer socket
7—6-prong wafer sockets
1—7-prong wafer socket
3—Hammarlund coil shields
7—58 type tube shields
1—double circuit phone jack
1—Leeds interstage audio transformer, type AU-107
2—465 kc. i.f. transformers, Hammarlund, air-tuned
1—465 kc. i.f. transformer, Hammarlund, center-tapped, air-tuned
1—465 kc. b.o. transformer, Hammarlund, air-tuned
5—binding posts with insulating bushings
4—knobs
2—s.p.s.t. toggle switches
1—0-10 mil. meter, 2-inch diameter
3—Hammarlund SW-4 coil forms
8—Hammarlund SW-5 coil forms
3—350 ohm, 1 watt
6—2,000 ohm, 1 watt
1—20,000 ohm, 1 watt
1—25,000 ohm, 1 watt
4—50,000 ohm, 1 watt
9—100,000 ohm, 1 watt
2—250,000 ohm, 1 watt
1—500,000 ohm, 1 watt
1—1 meg., 1 watt
1—2 meg., 1 watt
1—3 meg., 1 watt
1—5 meg., 1 watt
1—500 ohm, 10 watt
1—1500 ohm, 10 watt
1—500,000 ohm potentiometer
2—50,000 ohm potentiometers
14—.1 mfd., 400 v., paper
2—.01 mfd., 400 v., paper
1—.004 mfd., midget, mica
2—.0001 mfd., midget, mica
1—.0002 mfd., midget, mica
2—.00005 mfd., midget, mica
2—5mfd., 50 v., electrolytic

TUBES

5—type 58
1—type 57
1—type 55
1—type 59
1—19"x8¾" crackle-finish specially drilled panel Bergen Radio Lab.
1—11"x17"x2½" cadmium plated specially drilled chassis—Bergen Radio Lab.
1—black crackle-finish cabinet—Bergen Radio Lab.
1—set of construction plans—Bergen Radio Lab.

P.A. Systems

(*Continued from page* 505)

kits provide 6, 18 or 30 watts power output and an overall gain from 106 to 118 db. They are equipped with flexible input and output connection arrangements. The 18 watt amplifier, model T7518 illustrated uses 8 tubes with 2 type 42's in a push-pull

ALWAYS striving for higher efficiency and greater simplification, Lafayette engineers present this new amplifier which does more (and does it better) than any amplifier available today at anywhere near its price. It actually takes the place of 4 separate units. Its features are too numerous to mention beyond its extremely high gain; two position mixer; 30 watts field supply. Other characteristics: Peak output 38 watts; maximum into 4000 ohm load, 31 watts; maximum into 500 ohm load, 25 watts; harmonic content at rated outputs 5%; gain 124 db; hum level—42 db. Model 260-A complete with output transformer but less (10) tubes $42.50

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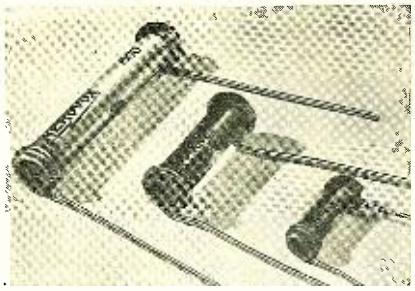

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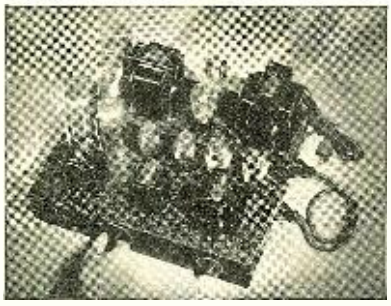

structions are furnished with each amplifier kit.

The BB DX Corner

(*Continued from page* 476)

1150 kc., 250 watts is on 24 hours a day. Their "Night Club of the Air" is the longest sponsored program, running from 12 midnight to 6 a.m. daily. U. S. stamps are accepted by this station when requesting verifications. TIPG, San Jose, Costa Rica broadcasts on 625 and 1000 kc. daily, 6-11 p.m., EST with 1 kw. 3GI, 830 kc., is best heard Australian in my locality. Incidentally, the 830 channel is clear until 7 a.m., EST, which should give eastern DX'ers an excellent chance to hear this station. CKNX, 1200 kc., Wingham, Ontario, will hereafter have its monthly DX special on the first Saturday of each month, 4:30-5:30 a.m., EST.

Observer Gordon (Pennsylvania) has a bone to pick with DX'ers who are reporting South American stations on 810, 890, 913, 1050, 750, and 690 kc. He has been checking these frequencies constantly with his Scott De Luxe receiver and finds that they are occupied by Cuban, Mexican or French speaking Canadian stations. He believes that many DX'ers are in error in claiming South American reception on these particular channels. Has anyone any argument on this?

Observer Hunter (Oregon): A new station, KRNR, Roseburg, Oregon, 1500 kc., 100 watts will begin operations early in 1936. It will be on daytime only.

Observer Van O. Blair (Oregon) reports that CKOV is on every Sunday morning 3-4:30 a.m., EST with a DX special. CKCD will put on DX specials on Tuesday nights if they get enough reports from listeners. He writes further: "I would like to hear from other DX'ers who have tried the broadcast band coils in a National HRO receiver. I have one of these receivers but not the broadcast coils and before buying them would like to know what results others have obtained." His address is Route 11, Box 845, Portland, Ore.

Observer Sholin (California): The Japanese stations are heard best in San Francisco at 4 a.m. and New Zealanders about 3 a.m., PST.

Observer Watson (New Zealand) reports that DX interest is constantly increasing in his country. The NZDX Radio Association chapters throughout New Zealand are now holding fortnightly meetings instead of the former monthly meetings. The membership in the association is now over 900. 7NT has shifted to 710 kc. and 3AR to 580 kc. This shift was the result of QRM existing on the old frequencies.

Observer Chalmers (New Zealand): A new station has been established atop the Princess Theater, Melbourne, Australia. The call is 3XY and it operates on 1420 kc. with 600 watts (unmodulated) in the antenna. 3XY will specialize in "flesh and blood" artists rather than depend on recordings. He reports that the membership of the New Zealand DX Club now totals 1573.

Observer Jurd (Australia) reports a new station 4QN, Townsville, Australia will take the air about the first of the year. Observer Jurd would like to correspond with DX'ers in other countries and will answer every letter received. Address him: A. R. Jurd, Livingstone Street, West End, Townsville, Australia.

Observer Mathie (New Zealand), in a letter received late in November, states that the following new stations are now regularly on the air: 7NT, 700 kc.; 3AR, 580 kc.; 5RK, 850 kc.; 2KA, 1160 kc.; 4AK, 1220 kc.; 3XY, 1420 kc.; 4IP, 1440 kc. New stations now testing are 7BU, 1390 kc.; 4PM, 1360 kc.; 2GZ, 990 kc.; 3GI, 830 kc. A new Japanese station is operating on 590 kc. with the call JOJE.

Observer Pellatt (England): Toulouse Muret, the new French 80-kw. transmitter should commence testing during December on 776 kc. The new transmitter at Lyon-Themoyes is working from 12:00-14:00 GMT and from 18:30 GMT onwards. The 120 kw. station at Villebon-sur-Yvette, 12 miles from Paris, will replace the old Paris PTT on 695 kc. in the next few weeks. The power of the old station in Paris will be raised and it will be retained as a stand-by transmitter.

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Adairsville, Ga.	MT	266, 338	
Albany, N. Y.	BP-RL-DT	320	
Albuquerque, N. Mex.	BRA-DTX	230	
Alma, Ga.	RL	242	
Amarillo, Tex.	BRA-DT	248	
Anderson, S. C.	MT	248, 266	
Anton Chico, N. Mex.	MP	278	
Archbold, Ohio	ML-DT	278	
Ardmore, Okla.	MPT	344	
Ashfork, Ariz.	MRLP-DT	278	
Atlanta, Ga.	B-RL-DT	266	
Auburn, Cal.	MT	242	
Bellefonte, Pa.	BRA-DT	224	
Beowawe, Nev.	MT	391	
Big Spring, Tex.	BRAP-D	326	
Big Springs, Neb.	MT	284	
Birmingham, Ala.	BP-RA-D	224	
Bitter Creek, Wyo.	PV	278	
Blue Canyon, Cal.	MT	242, 254	
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Boston, Mass.	BRA-DT	266	
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Chicago, Ill.	B-RL-DTX	350	
Cincinnati, Ohio	BRA-DT	332	
Cleveland, Ohio	BRA-DTX	344	
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Grantsville, Utah	MT	338	
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Memphis, Tenn.	B-RA-DT	326	
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Milroy, Ind.	MPT	332	
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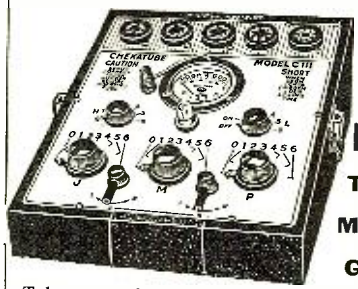

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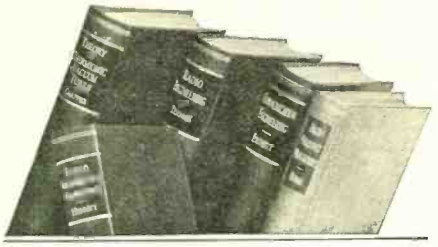

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San Diego, Cal.	RL-T	224	... —.—.
Santo, Texas	MP	365	.—.
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South Boston, Va.	MT	260, 320	..
Spartanburg, S. C.	B-RL-DT	248	...
Spokane, Wash.	BRLP-D	365	...
Springfield, Mo.	BP	254	
Sterling, Ill.	RL-DT	272	...
St. Louis, Mo.	B-RL-DT	290	—..
Strevell, Idaho	MP	272	—..
Syracuse, N. Y.	RL-T	350	...
Tacoma, Wash.	RL	224	.—.
Terra Haute, Ind.	MRL-DT	248	.—.
Texarkana, Ark.	RA-T	320	— .—.
Titusville, Fla.	BRLP-D	254	.—.
Tucson, Ariz.	B-RA-DP	338	..—
Tucumcari, N. Mex.	MRL-DPT	278	.——
Tulsa, Okla.	B-RA-DT	296	.—
Umatilla, Ore.	MT	230, 344	..
Ventosa, Nev.	MT	391	....
Vickery, Ohio	MT	344	...—
Warren, Ohio	MT	344	.—.
Warsaw, Ky.	MT	332	..—
Washington, D. C.	B-RL-DTX	272	—.—
Weiser, Idaho	MT	371	..
Wendover, Utah	MT	391, 338	..
Wichita, Kans.	BT-RA	332	—..
Williams, Cal.	MRA-T	365, V-278	.—.
Wink, Texas	RA-VP	260	....
Woodward, Pa.	MT	224	....
Winslow, Ariz.	BRA-DT	266	.—— ——
Wolcott, Ind.	MT	350, 266	—..
York, Neb.	RL-VT	260, V-278	.. —

SYMBOLS USED TO DENOTE TYPE

B—Radio broadcast station.

RA—Radio range with vertical radiating antenna.

RL—Radio range with loop antenna.

M—Radio marker beacon.

ML—Low powered radio range with loop antenna.

MRL—Medium powered radio range with loop antenna.

MRA—Medium powered radio range with vertical radiating antenna.

V—Voice for communication with aircraft.

T—Teletype station.

TX—Principal teletype station.

P—Point to point radio station.

D—Distantly controlled.

Dependable Communication

The following Air Lines selected Western Electric Aviation Systems as standard equipment on their planes. Contact between plane and ground is by Radio Telephone on frequencies listed opposite each transport line.

TRANSPORT LINE	Kilocycles Day	Kilocycles Night
American Airlines	5602.5 5612.5 5632.5 4917.5	3447.5 3457.5 3232.5 3127.5
Braniff Airways	5042.5	2912
Central Air Lines	5632.5	3232.5
Delta Air Corporation	5707.5	2854
Eastern Air Lines	4122.5	2922
National Parks Airways	5692.5	2906
General Air Lines	5692.5	2906
Northwest Air Lines	5377.5	3005
T. W. A. Inc.	4937.5, 4967.5	3072.5 3088
Pennsylvania Air Lines	3105	3105
United Air Lines	5572.5 5592.5 5662.5 5122.5	3162.5 3182.5 3322.5 3147.5

To convert Frequencies in Kilocycles to Wave Length in Meters, divide 300,000 by Frequency:

Example $\frac{300.000}{5602.5}$ = 53.5 Meters

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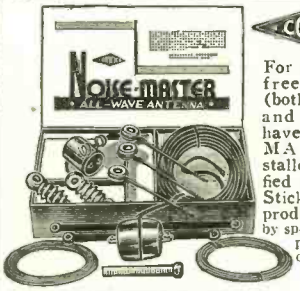

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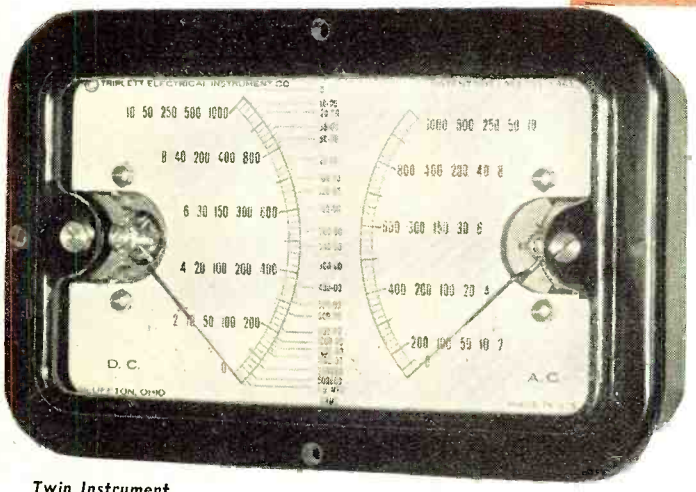

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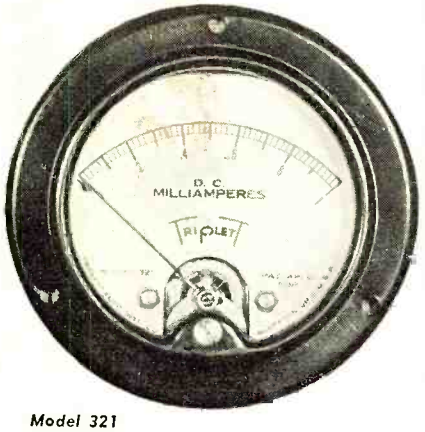

Model 321

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Standard Combination No. 120 (Same dial as used in Triplett Model 1200 Master Volt-Ohm-Milliammeter).

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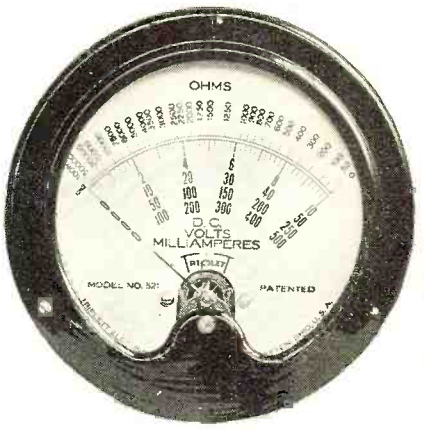

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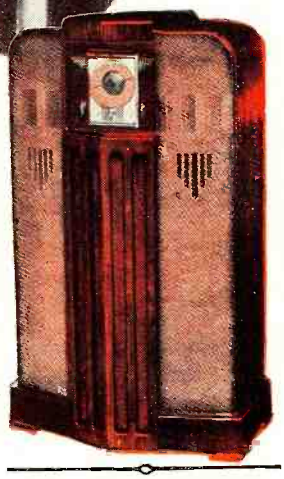

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