SHORT-WAVE TIME-TABLE

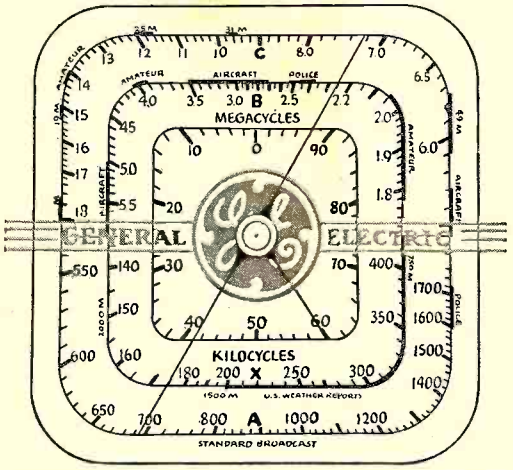
RADIO NEWS and The SHORT-WAVE

NRA CODE

NOVEMBER, 25¢

The SHORT WAVES and AVIATION

www.americanradiohistory.com



GENERAL ELECTRIC BAND-SPREAD DIAL

General Electric's new Band-spread Dial—by means of a separate scale and needle geared to the main tuning needle—makes possible the accurate recording of dial settings for many short-wave stations, the logging of which otherwise would be practically impossible.

AT LAST!

BAND-SPREAD *AND* ACCURATE LOGGING *FOR* SHORT-WAVE RECEPTION

GENERAL ELECTRIC RADIO — Model M-81 has many other distinctive features:

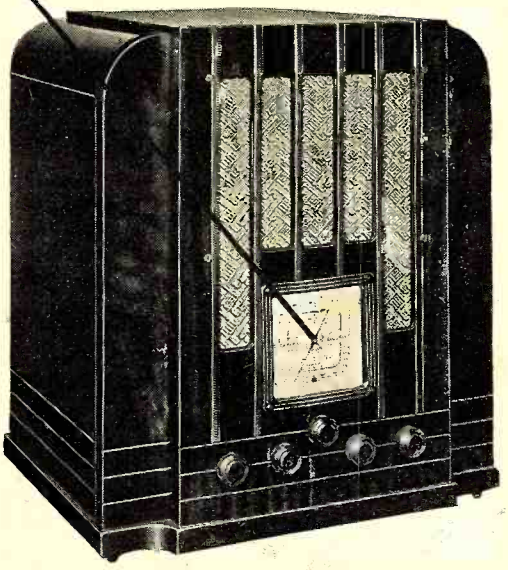
Fine tuning anywhere from 540 to 18,000 kilocycles. Dual tuning ratio of 50 to 1 and 10 to 1, either ratio being instantly obtained.

This receiver is quickly and easily adapted for C. W. without chassis changes. See the coupon below if you want complete details.

Outside noise may be minimized through the use of a double-doublet receiving antenna, for easy attachment of which provision is made in the receiver.

High-gain 6-watt audio system, feeding a large, built-in, dynamic speaker.

Four frequency bands: 140-410 kilocycles, 540-1720 kilocycles, 1720-5400 and 5400-18000 kilocycles. The band indicator identifies at a glance the frequency range in use.



General Electric All-wave receiver—Model M-81. Priced at $97.50 complete—nothing else to buy. (Prices slightly higher in West, Mid-West and South, subject to change without notice).

NRA CODE

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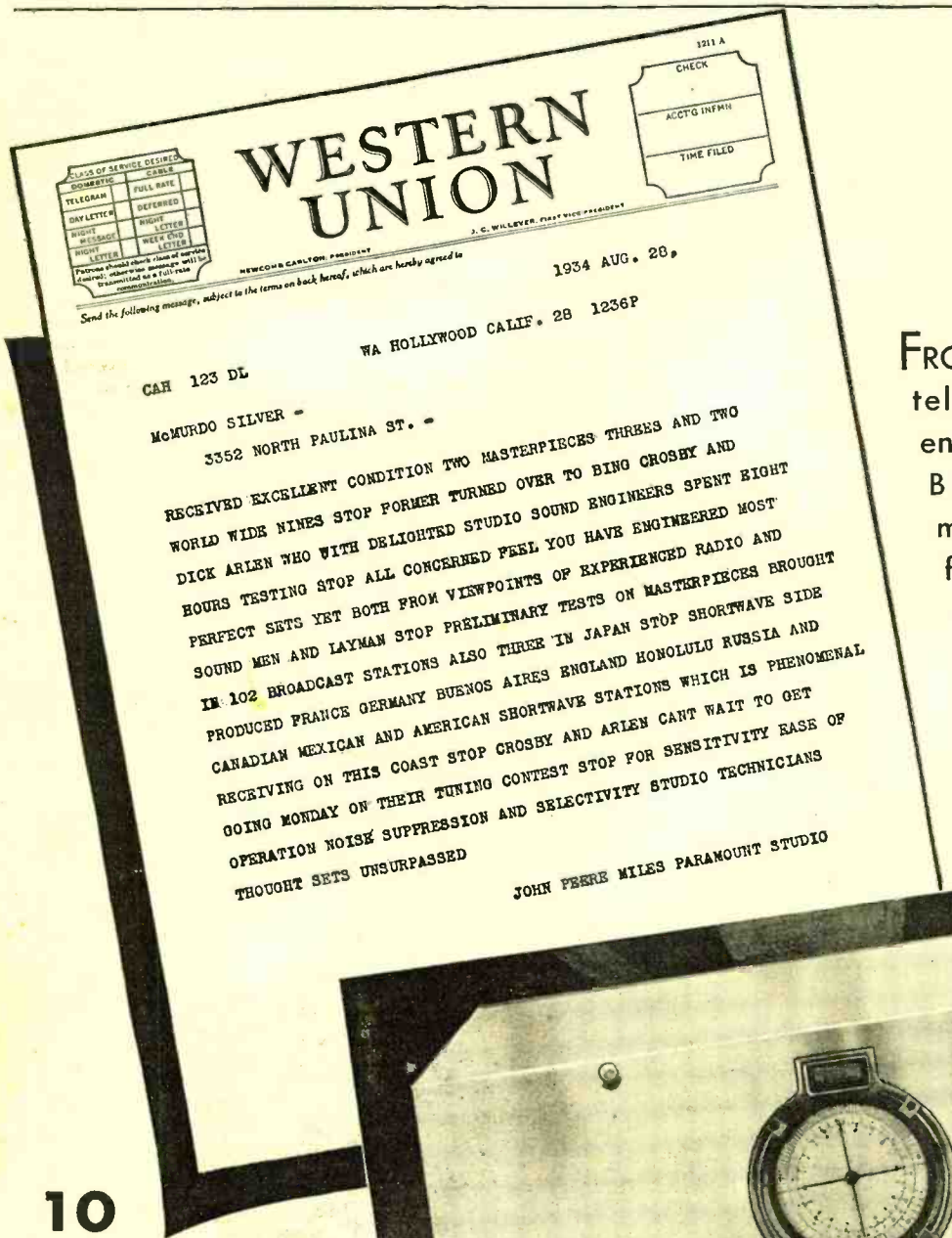
MASTERPIECE III *gets greatest praise*

ever accorded a radio receiver



WESTERN UNION

1211 A

CHECK

ACCT'G INFM'N

TIME FILED

CLASS OF SERVICE DESIRED

DOMESTIC: TELEGRAM, DAY LETTER, NIGHT MESSAGE, NIGHT LETTER

CABLE: FULL RATE, DEFERRED, NIGHT LETTER, WEEK END LETTER

Patrons should check class of service desired; otherwise message will be transmitted as a full-rate communication.

NEWCOMB CARLTON, PRESIDENT J. C. WILLEVER, FIRST VICE-PRESIDENT

Send the following message, subject to the terms on back hereof, which are hereby agreed to

1934 AUG. 28.

WA HOLLYWOOD CALIF. 28 1236P

CAH 123 DL

McMURDO SILVER -

3352 NORTH PAULINA ST. -

RECEIVED EXCELLENT CONDITION TWO MASTERPIECES THREES AND TWO WORLD WIDE NINES STOP FORMER TURNED OVER TO BING CROSBY AND DICK ARLEN WHO WITH DELIGHTED STUDIO SOUND ENGINEERS SPENT EIGHT HOURS TESTING STOP ALL CONCERNED FEEL YOU HAVE ENGINEERED MOST PERFECT SETS YET BOTH FROM VIEWPOINTS OF EXPERIENCED RADIO AND SOUND MEN AND LAYMAN STOP PRELIMINARY TESTS ON MASTERPIECES BROUGHT IN 102 BROADCAST STATIONS ALSO THREE IN JAPAN STOP SHORTWAVE SIDE PRODUCED FRANCE GERMANY BUENOS AIRES ENGLAND HONOLULU RUSSIA AND CANADIAN MEXICAN AND AMERICAN SHORTWAVE STATIONS WHICH IS PHENOMENAL RECEIVING ON THIS COAST STOP CROSBY AND ARLEN CANT WAIT TO GET GOING MONDAY ON THEIR TUNING CONTEST STOP FOR SENSITIVITY EASE OF OPERATION NOISE SUPPRESSION AND SELECTIVITY STUDIO TECHNICIANS THOUGHT SETS UNSURPASSED

JOHN PEERE MILES PARAMOUNT STUDIO

FROM Hollywood comes this telegram . . . voicing the enthusiasm of Richard Arlen, Bing Crosby and Paramount Sound Technicians for the performance of Masterpiece III. Read it . . . then send coupon for full specifications of this remarkable new receiver.

10 DAY TRIAL

Masterpiece III is unconditionally guaranteed to out-perform any other receiver ever built. Its performance exceeds even that of the famous Masterpiece II now serving Byrd in the Antarctic. Try Masterpiece III yourself. Put it to test alongside of others for 10 full days. See for yourself why Richard Arlen and Bing Crosby chose it for the Hollywood International DX contest. See for yourself why Columbia Broadcasting System has installed a Masterpiece III in its Chicago studios. Either you think Masterpiece III is the greatest all-wave receiver ever built or it doesn't cost you a cent. It's just as simple as that. Send coupon for full particulars.

McMURDO SILVER, INC.

3352 N. Paulina Street Chicago, U. S. A.

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Vol. XVI
No. 5

RADIO NEWS

November, 1934

Edited by LAURENCE M. COCKADAY

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Associate Editor

JOSEPH F. ODENBACH
Art Editor

THIS MONTH—

Aviation Radio

●

Service Meters

●

Set Building

●

S. W. Time Tables

●

NEXT MONTH—

For Inventors: The December issue will contain important information for inventors the world over.

For Servicemen: Articles on new service instruments, also Service Bench items.

For the Technician: Articles dealing with technical phases of design and application.

For the DX Fan: The DX Corners will include new information and time schedules available only in RADIO NEWS.

For Everybody in Radio: No one can afford to miss the next issue for its varied and helpful contents.

[redacted], Inc., *Washington and South Avenues, Dunellen, N. J.*
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NEW TRIPLETT MASTER UNIT LINE

Sets Higher Standard of Precision Instrument Values!

DEALERS and service men will welcome Master Unit precision instruments because of their advanced design, precision construction, absolute dependability, permanent accuracy and many exclusive features. They are regarded as today's most modern precision measuring units . . . regardless of price. Dealers and service men, who are equipped with Triplett Master Units can handle every servicing operation quicker and more accurately than ever before . . . and make every hour spent in servicing return a bigger profit.

MASTER UNIT VOLT-OHM MILLIAMMETER....MODEL 1200

This unit features the exclusive Triplett double AC-DC instrument, which can be tilted to any desired reading angle. NO TESTER IS MODERN WITHOUT THIS FEATURE! The instrument reads up to 1,000 volts, 250 milliamperes and 3 megohms. Provides for output measurements. DC volt meter has 2,000 OHMS PER VOLT RESISTANCE. Dealer's net price.....$21.67

TRIPLETT MASTER UNIT TUBE TESTER NO. 1210

This unit has large English-reading instrument scale. One of the four controls tests all shorts and makes tube selection. Other controls are used for line volts, filament volts and load regulation. Two push buttons are used for Diodes and tube test values. Easily operated by inexperienced users. Dealer's net price on 1210....$20.00. Can be furnished as counter tube tester in Oak case with sloping panel No. 1211 or, as a portable unit, No. 1201. Dealer's net price.....$24.00

MASTER UNIT TESTER NO. 1220

Used in connection with 1200 unit for analyzing radio sets. Tests voltages, current, resistance, continuity, capacity and point-to-point. Has plug and adapters for socket connections. Lead wires are furnished. Dealer's net price $8.34

MASTER UNIT ALL-WAVE SIGNAL GENERATOR NO. 1230

This extremely accurate instrument supplies continuously variable signal. Frequencies from 100 KC to 18 Megacycles. Either modulated or unmodulated. Batteries and two type "30" tubes are furnished. Connecting wires and six individual graphs, on large size charts, are supplied. Dealer's net price.....$15.33

The above illustration shows four Triplett Master Units in Portable Case No. 1204 Dealer's net price, Case only.....$6.00

The new Triplett Master Unit Line of radio servicing instruments includes four fundamental units: No. 1200 Volt-Ohm Milliammeter; No. 1210 Tube Tester; No. 1220 Free-Point Tester; No. 1230 All-Wave Signal Generator. (No. 1210 unit may be used in the No. 1211 Oak case, which has a sloping panel for counter tube testing.)

The Triplett Electrical Instrument Co
86 Main St. • • • Bluffton, Ohio

Send Coupon For Literature

The Triplett Electrical Instrument Co.
86 Main St., Bluffton, Ohio

Gentlemen: Please send me literature on the new Triplett Master Line of Radio Servicing Instruments.

Name.....

Street Address.....

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

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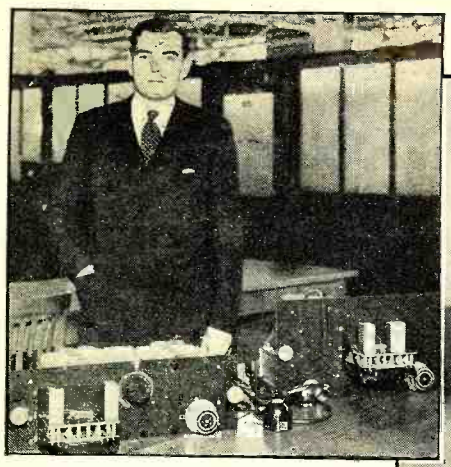
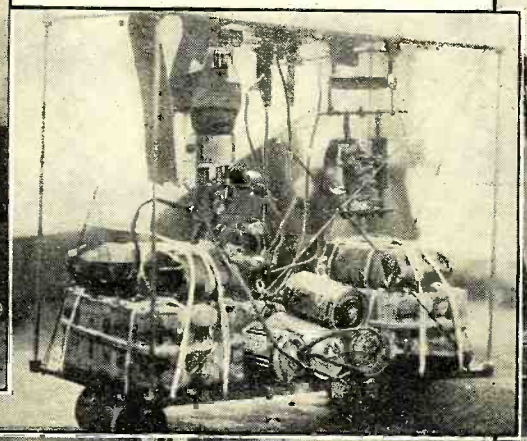
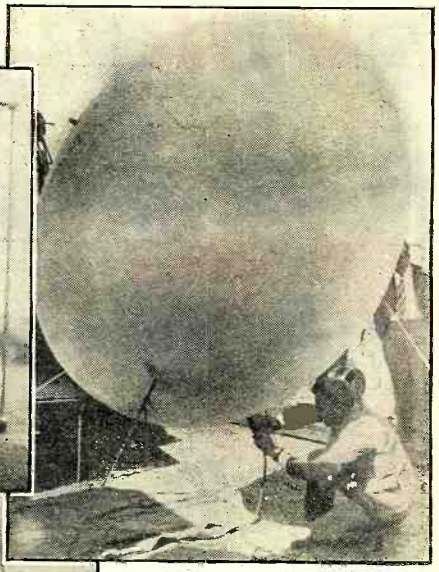
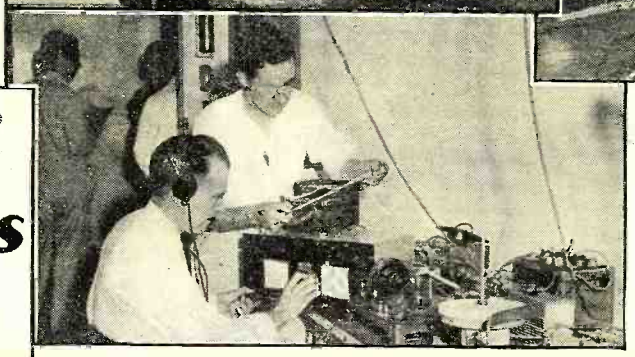
RADIO IN THE SKY



NEW PLANE RADIO
Herbert Hoover, Jr., demonstrates new aviation transmitter and receiver to G. E. officials







ROBOT FLIGHT
Pictured above is the automatic stratosphere balloon of Prof. Compton as he inflates it. To its left is the transmitting "gondola" showing the powerful oscillator tubes and batteries. At left is the automatic receiving set recording scientific measurements, from the balloon, on a printer tape

DOTS • • • • • and — — — DASHES

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

Improved Large-Screen Television

NEW YORK, N. Y.—William Hoyt Peck recently gave a demonstration, here, of his vastly-improved film television apparatus. His new units apparently do not embody radically new ideas but his definition was of high quality. The Peck equipment is designed for the transmission and reception of standard 35 mm. talkie film. The inventor perfected a gearless, vibrationless projector for use with his transmitter. He utilizes a 60-line mechanical scanner at 24 frames per second. This is standard talkie projector speed. The receiver employs a mirror-back scanner which throws the image on a translucent screen measuring about 14 inches square. A standard 6-volt automobile headlight lamp is used as the light source. The light is modulated through a Kerr-type cell. Best reception results were noted when the viewer stood about twelve feet from the screen.

Radio Signals from 18 Miles Above the Earth

CHICAGO, ILLINOIS—A balloon carrying radio apparatus recently soared 18 miles into the stratosphere. It was sent up by Professor Arthur H. Compton, Nobel Prize winner. It carried a short-wave radio transmitter which automatically sent scientific recordings back to earth where they were received on a specially equipped radio receiver which printed the signals on a tape.

WHAT HO! YOU TELEVISION FANS
Here is a new television transmitter demonstrated by its inventor, P. T. Farnsworth, at the Franklin Institute. The girl pictured at the left is carrying a British portable 2-tube hiker's radio set, with a guaranteed range of 30 miles

Gliding Instruction by Radio

BERLIN, GERMANY—There is a great difference between the instruction of a gliding pilot and pilots for motor-driven aeroplanes. The pilot in an aeroplane makes his first flight in a two seater aeroplane with double controls while the teacher sits beside him and instructs him in the proper manipulation of the rudders. The student makes many such flights before he is allowed to fly alone. Learning to glide is entirely different. After the first theoretical instruction on the ground the student must make short flights alone immediately. These first flights have often led to costly damages to the glider if not to injuries of the pilot. In order to overcome these difficulties a German radio company has developed a transmitting and receiving apparatus for use by the instructor and pilot. The instructor, remaining on the ground can advise the student while he is in the air and tell him how he may correct false movements of his rudder and ailerons.

Manchukuo to Use Radio to Teach Illiterate

MUKDEN, MANCHURIA—The Manchukuo government recently announced its intention of installing public-address systems, in meeting places throughout the country, for broadcasting official news, speeches and educational materials.

Auto Sets in Use

NEW YORK, N. Y.—The market research department of the Columbia broadcasting System has gathered data from eighteen radio set manufacturers to determine the number of automobile radios sold during the first half of 1934. The figures range between 400,000 and 600,000 sets—an average of 486,550 motor car radios sold between January and July.

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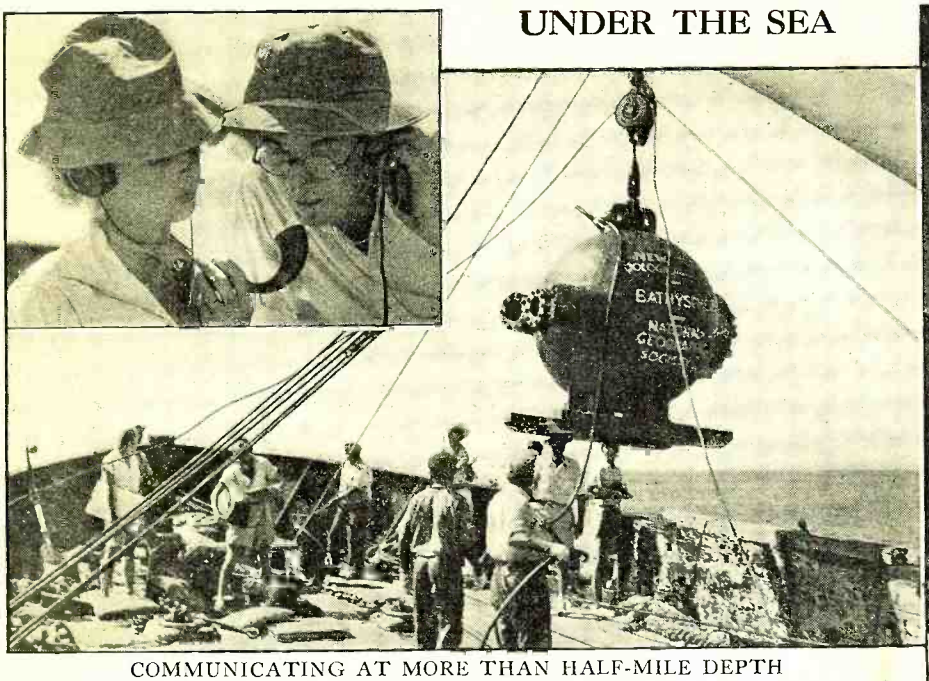
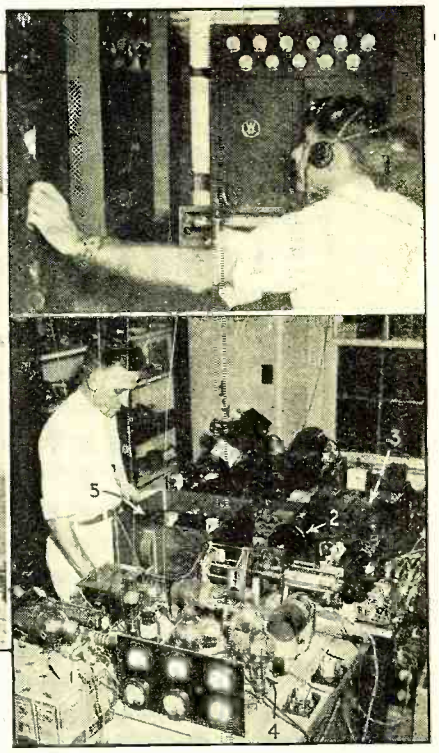
UNDER THE SEA



COMMUNICATING AT MORE THAN HALF-MILE DEPTH

Scene shows Dr. Wm. Beebe, noted deep sea explorer, being swung "over the side" in his Bathysphere. Insert shows his assistants, Miss Gloria Hollister and Mr. John Tee-Van, phoning down to him and taking notes



TWO NEW DEVELOPMENTS

Upper picture hows the new high-powered aviation station recently installed at Washington, to communicate with the planes of the American Air Lines. The installation comprises a 400-watt radio telephone and a 100-watt c.w. unit. The picture below this shows S. S. Kirby, associate radio physicist in the Bureau of Standards with a machine for recording radio echoes. No. 1 is the recorder, No. 2 is the motor-driven cam. No. 3 the broadcast receiver, No. 4 the transmitter, and No. 5 is the converter. The whole machine is automatic and makes a record on photographic paper

CBS further announced that, through a manufacturer of equipment used on all automobile radio sets, it was learned that actual production for the first six months of 1934 was approximately 600,000 sets. Together with the statistics of 1933, these figures denote that there are about 1,500,000 radio sets now installed in automobiles.

Einstein Theory "All Wet"

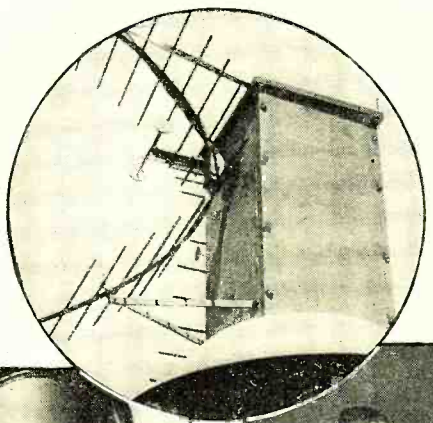
PARIS—The Einstein Theory, declares Professor Emmanuel Carvallo, is now a back number. He claims that Einstein's Theory collapses without the support of Michelson's findings which, he says, are disproved by 200,000 recent experiments. When Professor Albert Einstein was told about Carvallo's contention, he is reported to have said, "Nonsense."

New Station for WOR

CARTERET, N. J.—Ground was recently broken for a new $300,000 station of 50 kw. power here. The plant will be ready to go on the air toward the end of next month. The site is 12 miles from Newark and the present radio transmitter will be set up as an emergency transmitter. Two radio towers, 385 feet high, will form what is known as a "triple array" antenna system. The entire plant will occupy 34 acres, the ground wires alone covering 10 acres, using 35 miles of copper wire.

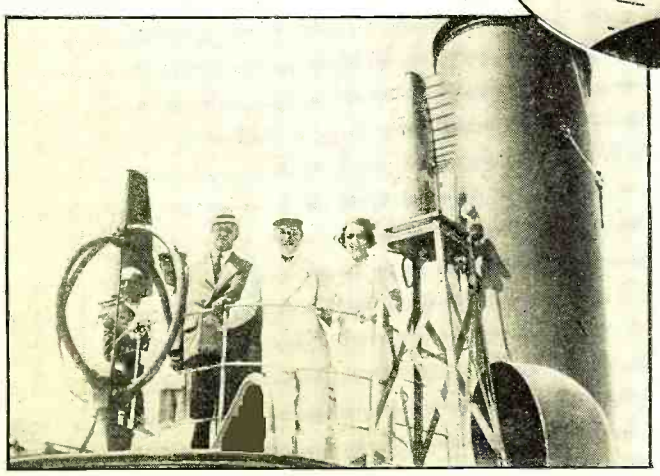
Radio Stations as Calamity Insurance

WELLINGTON, N. Z.—Nineteen new short-wave stations have been created by the Government of New Zealand to prevent possible breakdown of communication through earthquake or for major calamity.



TO GUIDE SHIPS IN FOG

Senator Marconi demonstrates his new device to enable ships to approach a foggy harbor in safety. The two receivers are shown on either side of the Senator's party, with the coils of the radio direction-finder in front. Insert shows close-up of transmitter



SHORT-WAVE ENVOYS

Dutch school children visit New York and broadcast by short waves back to the Netherlands. At left: holding the microphone, is W. P. Montyn, Dutch Consul General, and at right is Dr. J. S. Roberts, Assistant Superintendent of Schools of New York City

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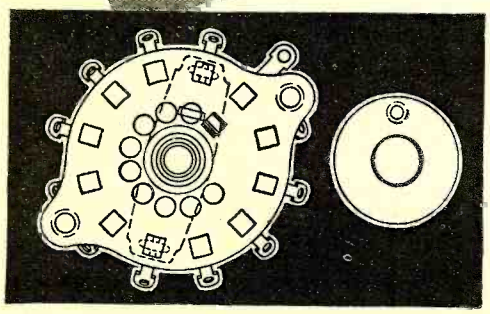
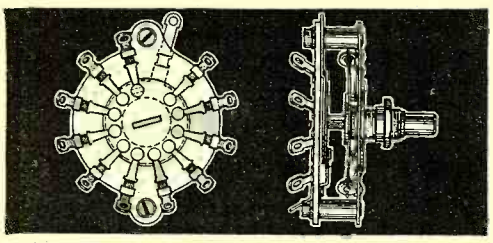
NEW YAXLEY

TAP SWITCHES
CIRCUIT SELECTOR SWITCHES
SHORT WAVE SWITCHES
are unequaled in Quality, Flexibility, and Performance

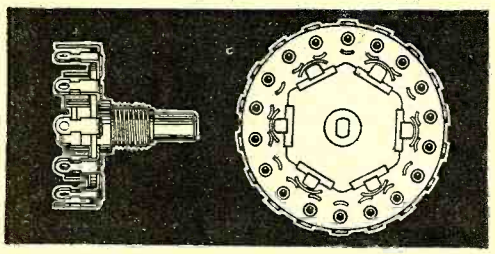


Showing adjustable stop arrangement on locating plate.



Single gang switch showing contact and circuit arrangement.

Four gang switch giving assembly.



2700 type switches showing assembly and contact arrangement.

The new adjustable stop feature provides many additional combinations in each switch and makes it possible to use a single switch for many different specifications. Switches may be wired in circuit experimentally, then adjust the stop for permanent installation.

NEW YAXLEY 1200 and 1300 TYPE SWITCHES

The new design used in the Yaxley 1200 and 1300 type Switches is identically the same construction as are used and specified by the largest percentage of manufacturers making all wave receivers. Set designers demand the lowest contact resistance and capacity between circuits, which requirements are supplied in this type of Yaxley Switch.

All contacting members of the Yaxley Circuit Selector Switches are silver plated with a hard finish which will withstand the wear throughout the life of the apparatus in which the switch is used.

The unique design of the 1200 and 1300 type switches provides circuit combinations on each section which answers practically every requirement. They supply these circuits in a minimum amount of space.

The special Bakelite Insulation in these Switches is of the best quality obtainable for Switch purposes. It has the lowest moisture absorption of any Bakelite available.

NEW YAXLEY 2700 TYPE SWITCHES

The new Yaxley 2700 type Switches are supplied only in single gang and in two sizes—one 1½" in diameter and the other 2" in diameter. These are designed for the simpler circuit functions.

The 2742—with the 1½" base can be used in combinations from single pole, single throw to four pole, double throw.

The 2762—with the 2" base includes all of the above combinations and provides from a five pole, single throw to six pole, double throw in addition.

Completely listed and illustrated in Yaxley Catalog Y-203. Write today for your free copy!

YAXLEY

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MALLORY ELKON

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Radio News

November, 1934

SHORT WAVES *and* AVIATION

(The Editor—To You)

Radio is expanding, largely, into the field of Aviation. In fact the two are becoming so inseparably attached it is sometimes difficult to determine whether some of the new jobs created are for aviation-in-radio or for radio-in-aviation. If you are interested in either of these fields, read this editorial and tell you friends or acquaintances about it

NOW that radio has been so definitely established as an essential part of aviation, there are thousands of important posts waiting for radiomen as technicians and operators. The short waves are tied up with aviation, inseparably, because of the long distances over which signals must carry effectively and because of the space requirements for the transmitters, receivers and antennas, not to mention the legislative limitations placed on the frequencies of operation. Short waves are now being used in aviation, for dispatching, for position reports, for weather reports, for guiding planes with direction fingers and for landing beams. Commercial aviation would not be safe without short-wave radio, manned and operated by radiomen and serviced by technicians who thoroughly understand their work and perform it in a reliable manner.

Aviation, therefore, is drawing trained radiomen into its field and aviators are taking up radio technique as a study. In fact, aviation-radiomen are gleaned from these two sources; either a radioman is drafted into the aviation field for his knowledge or an aviator studies radio.

Just what kind of jobs are there in the aviation field for radiomen? Perhaps the greatest field lies in installing, repairing and servicing of aviation equipment on planes and ground stations. The great advantages of radio on planes is quickly making it imperative to have all planes equipped with radio (*Continued on page* 321)

AN IMPORTANT AVIATION JOB FOR AN EXPERIENCED RADIO MAN

The radio dispatcher of the United Air Lines, at Newark, N. J., a fast-moving post in constant radio communication with all air pilots. The clock shows the three different times of the various states in his jurisdiction

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FLIERS! *Here's How—*

—to use the signals from any broadcasting station to guide a plane in a straight line toward that station

Chas. E. Planck

THE AIRPLANE GUIDE AND A STANDARD RECEIVER

Figure 1. The wooden ring is the loop antenna; the instrument held in the hand is the indicator which is mounted on the dashboard. The cabinet at the left contains the new direction-finding device and the one at the right houses a standard aircraft radio receiver

IN its first great service to the private flier, aside from establishing safety requirements and locating airports, the government has produced a homing device that takes all the headache out of accurate cross-country navigating.

Radio scientists at the U. S. Bureau of Standards developed the radio direction finder by which a pilot can tune in on any radio broadcasting station, and fly a straight line toward that station, merely by watching a needle on an instrument on his instrument panel. Commercial adaptation of that development has appeared as the "Direct-Aire", made in a new laboratory of the Washington Institute of Technology on the famous old College Park Airport, near Washington.

The "Direct-Aire" is the first adaptation, and a further improvement of the Bureau of Standards device, and is directed first at the needs of the private owner and itinerant flier, who does not always follow the airways, and thus cannot always use the facilities provided by the government for the airlines.

Briefly, it operates as follows: The pilot tunes in his aircraft receiver to a broadcast station in a city toward which he is to fly. When he is on a straight course toward that station, the meter needle registers "zero" or "on course". If his plane veers to the right, the needle swings to the right and vice versa. If he is flying away from a station, the needle gives a reverse indication, swinging to the left when the plane is veered to the right, and vice versa.

There are almost 600 commercial stations in this country, so distributed that it would be difficult for any pilot to lay down a course of 200 or 300 miles on which this new device would not prove useful. The veteran pilot with a number of navigating instruments, and a wealth of experience in flying by map and compass, finds the device valuable as a supplementing instrument, enabling him to check all his other observations, and to steer a straight course toward a point not having a broadcasting station by combining the functions of the compass and the device and using a map.

This direction finder employs a loop antenna, the normal figure of eight pattern of which is distorted and periodically switched so that the large lobe of the distorted pattern lies first on one side of the plane and then on the other. With the loop set at right angles to the axis of the fuselage, the intersections of these distorted patterns lie directly ahead and directly behind the airplane. The course indicator is switched synchronously with the loop pattern, so that the signal received when the larger lobe of the pattern is to the right of the airplane deflects the course indicator to the right and vice versa, the switching being done thousands of times every second, so that the eye does not notice any vibration of the indicator needle. As a result, the indicator reads "On Course" or zero whenever the received signal comes from a direction for which the two loop patterns intersect, that is, have equal magnitude. This, of course, occurs when the plane is headed directly toward or directly away from the transmitting station. To determine which way it is headed, the plane is turned momentarily, say to the right: If the course indicator shows "Off Course" to the right, the plane is headed toward the transmitting station; if the course indicator goes off to the left, the plane is headed away from the transmitting station. Thus it is possible to fly directly to any radio station that can be tuned in.

It is also possible to use the device in conjunction with the compass to take bearings of two or more stations and thus locate the position of the airplane. By position checks of this sort it is possible to fly to a destination that does not have a radio station of any kind.

This equipment is designed to operate in conjunction with any aircraft radio receiver, although its physical dimensions are correct for mounting alongside the Lear Radio-Aire receiver, as it is 4½ inches by 6½ inches by 8½ inches, the 4½ inches by 6½ inch panel being toward the pilot. Differences in receiver characteristics require slight modifications in the direction finding unit but these are readily made during construction. (*Continued on page* 321)

Broadcast Stations as Radio Beacons

THIS new development enables equipping any plane with a receiving unit for piloting the plane to any broadcasting station. In this way known broadcasters in known cities can be used as individual radio beacons. The pilot simply tunes to a broadcast signal and a meter shows when he deviates to right or left of the exact course leading to the station from which the signal originates.

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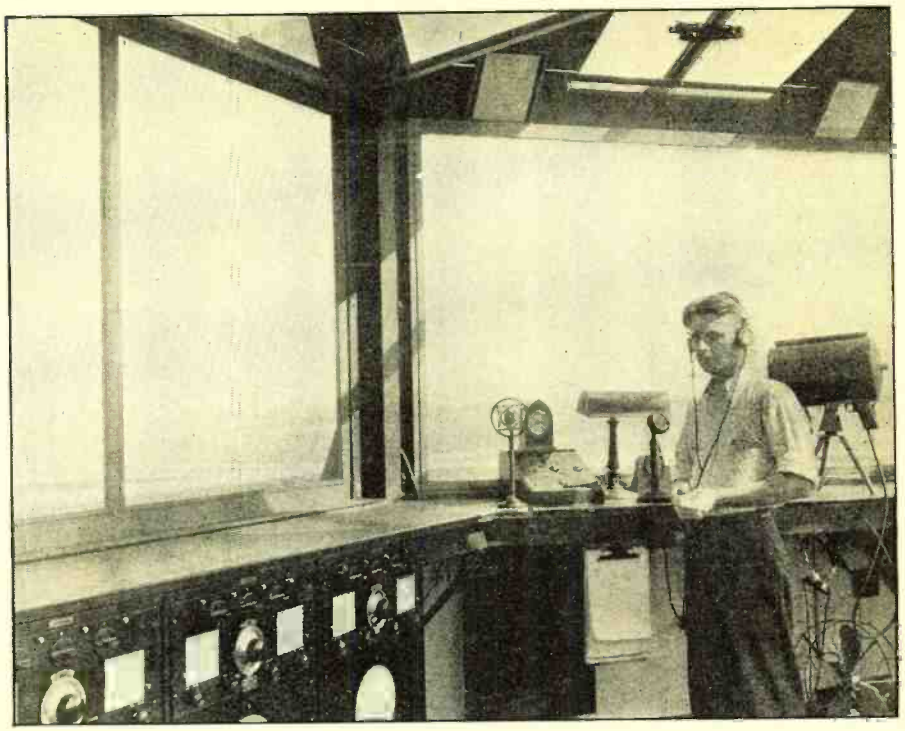
The Radioman

DIRECTS AERIAL TRAFFIC

How the radio man at an airport accomplishes the difficult task of aerial traffic cop

Gilbert Princell

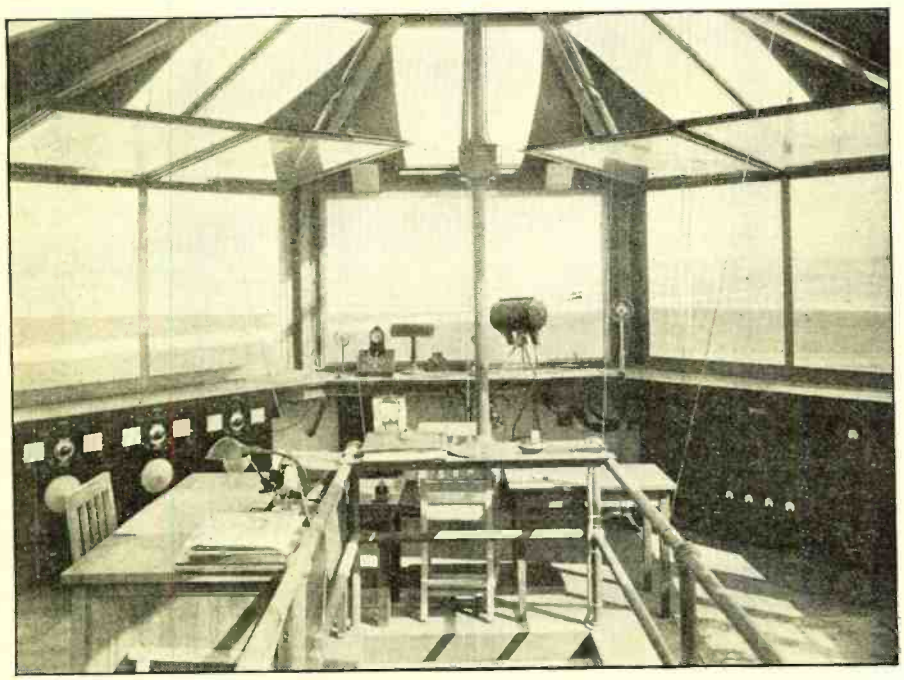


MASTER OF THE FIELD

This is A. W. League, "air cop" at the Lambert-St. Louis Municipal Airport, surveying his "domain" from the radio tower

A VOICE—"Seaboard airline now arriving on runway No. 3"—boomed over my startled head. Looking up I discovered a set of loudspeakers located just under the eaves of the large hanger near where I was standing. "Sounds just like an announcer at a railway depot", I remarked to my friend, guide and general informer, who, at the time of speaking, was busy explaining the intricacies of an airliner. "Yes", echoed my friend, "Just like a railway depot announcer, but this announcer is *more* than just that, for he is really a radio air-traffic policeman". Now, inasmuch as radio is to me what flowers are to honey bees, we were soon climbing an endless flight of stairs, leading to the radio traffic control room. It must be said that it was to my smug satisfaction that I learned that the rapid development of Radio in the last ten years had made possible a number of remarkable achievements in aviation.

I, and all other amateurs or radio fans with a short-wave receiving set, have at some time listened to the fascinating conversation between some aviator high in the sky and a ground station at the flying field. Their short staccato sentences, reporting the conditions of the air, the direction and velocity of the wind, and other data necessary for the good flying of the ship, have frequently served to stimulate the imagination of many a listener-in.



THE RADIO ROOM

The radio receivers on the left and the transmitter on the right with microphones and pickups in the radio room atop the Demonstration Building

As I soon learned, the job at the St. Louis Lambert Field of directing air traffic is handled by a young man, one Arch W. League, who is manager and operator of Station KSGA, operating at 278 kilocycles. The broadcasting range of the station is small—only twelve miles or so, but this is considered sufficient to reach all airplanes wishing to land at the airport. The station itself is located on top of the Administration Building, in what seems to be an octagon-shaped "sun parlor". This solarium-like structure (glass enclosed) permits an unobstructed view of the entire sky and enables the operator to locate, visually, the ship he is talking with, and so aid him to land.

The transmitter set is a Western Electric Model 10-A, whose unmodulated carrier power, supplied to a short antenna, is approximately 10 watts. For receiving, there are three permanently tuned sets, each on a different wavelength. These sets, hooked to individual loudspeakers, are continuously "on". A head-set is available, but is rarely used, as the reception from ships flying in the immediate vicinity of the airport is entirely satisfactory on the speakers. Also located in this room, is the public-address system, which is connected with every building on the field.

To illustrate how the station operates, let us suppose that an airliner has left Chicago and is bound for St. Louis, Mo. The radio operator first tunes in on the radio beam from St. Louis, which is operated by the Department of Commerce. This radio beam transmits a set of dot-and-dash signals, sent out continuously on a definite wavelength from a station located near the flying field at St. Louis.

When the operator in the airship hears this (*Continued on page* 327)

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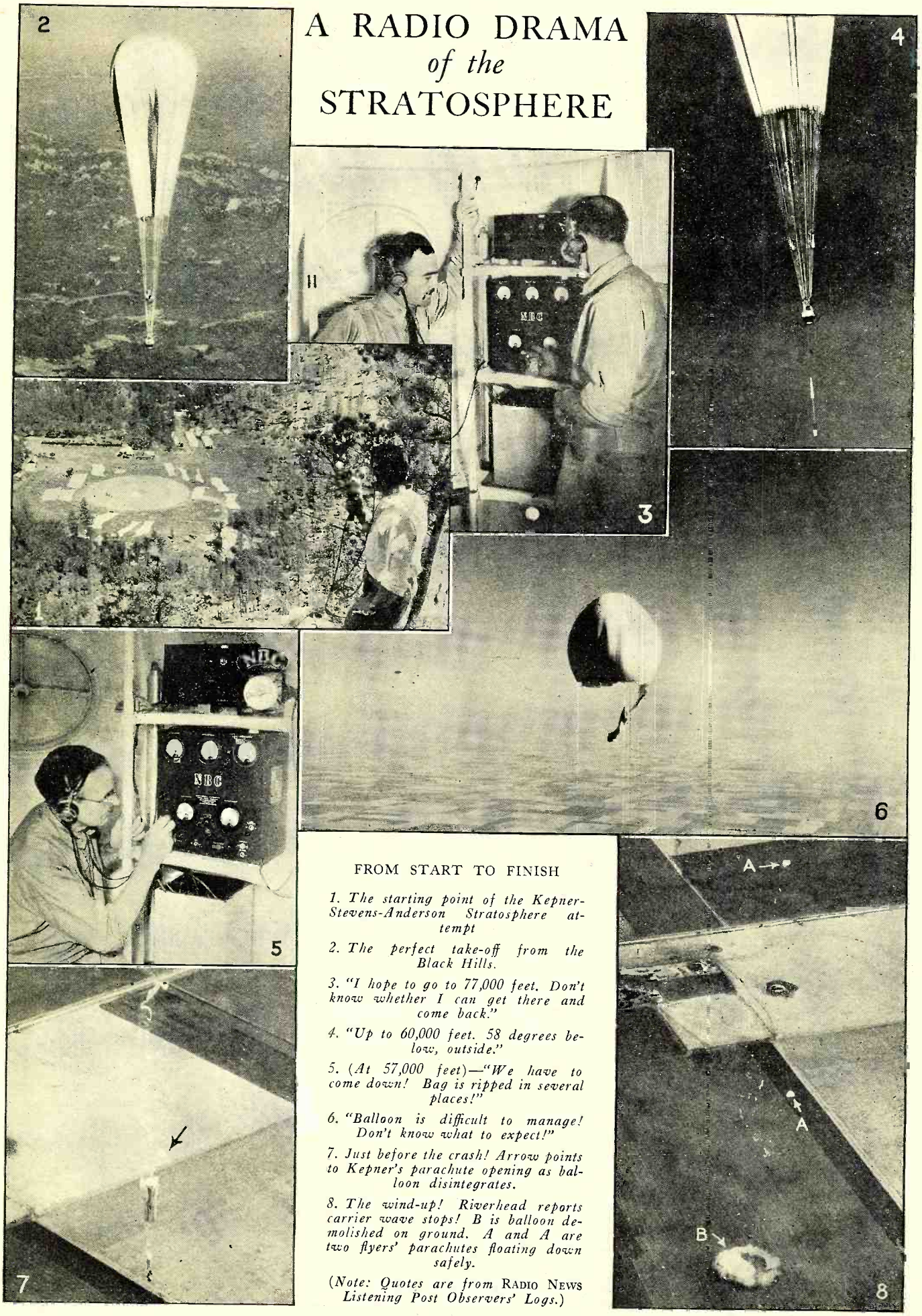
A RADIO DRAMA *of the* STRATOSPHERE



FROM START TO FINISH

1. The starting point of the Kepner-Stevens-Anderson Stratosphere attempt

2. The perfect take-off from the Black Hills.

3. "I hope to go to 77,000 feet. Don't know whether I can get there and come back."

4. "Up to 60,000 feet. 58 degrees below, outside."

5. (At 57,000 feet)—"We have to come down! Bag is ripped in several places!"

6. "Balloon is difficult to manage! Don't know what to expect!"

7. Just before the crash! Arrow points to Kepner's parachute opening as balloon disintegrates.

8. The wind-up! Riverhead reports carrier wave stops! B is balloon demolished on ground. A and A are two flyers' parachutes floating down safely.

(Note: Quotes are from RADIO NEWS *Listening Post Observers' Logs.)*

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Exploring The PLAYGROUND *of* RADIO WAVES

(Radio, 60,613 Feet Up!)

Consolidated information regarding the recent Army stratosphere flight and the wonderfully successful part radio played from start to finish

Samuel Kaufman

GREETED BY THE GOVERNOR

The governor of South Dakota, the Honorable Thomas Barry, is escorted through the "Strato" camp by Major Kepner and Captain Stevens, two of the Army fliers

SCIENTISTS' desires to solve the mysteries of the Stratosphere, that "playground of radio waves," have brought to listeners an unusual group of broadcasts packed chockfull of drama and thrills.

Soaring high above the life-bearing atmospheric levels in air-tight gondolas, several of the intrepid stratosphere explorers of various recent flights were able to maintain constant two-way radio communication with the earth. Although the balloons were higher than man had ever before ascended, the flying scientists' exploits were momentarily followed by an anxious populace on terra firma. Being tossed about by the elements while some eleven miles above the earth certainly represents isolation in every sense of the word. But, through the media of small, but efficient, transmitters, the balloonists' every movement was known to every radio listener.

Thus, radio—itself a masterful achievement of science—was recruited by the stratosphere explorers to play an important rôle in the penetration of the layer of atmosphere surrounding the earth.

One of the important reasons for the high-altitude ascents was to search for definite data regarding the location and thickness of the enigmatic ozone layer in the upper atmosphere which scientists believe makes life possible on the earth. Another objective was the study of the cosmic ray and other forms of radiation which are much more numerous and virulent in the rare upper atmosphere, before the dense lower atmosphere has had an opportunity to absorb the weaker ones. Intricate devices for recording the scientific observation were carried in the flights. Many of these instruments utilized electronic principles in their design. For example, a low-grid-current electron tube was used to count cosmic rays. Thus, apart from the important duty of providing communication between the gondolas and the earth, radio contributed much to scientific studies of the stratosphere.

The ascent made on July 28 by the stratosphere balloon "Explorer" under the joint sponsorship of the United States Army Air Corps and the National Geographic Society was preceded by the most elaborate preparations ever undertaken for an exploration of the mysterious ozone layer. Radio's rôle in this flight was conceded to be the most successful phase of the endeavor.

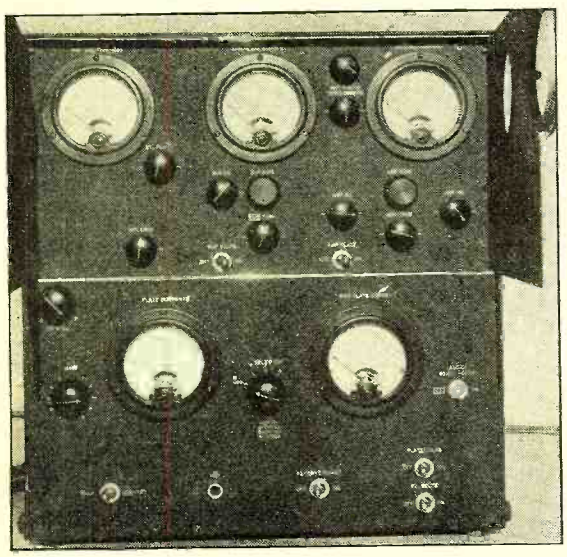
Leaving the stratocamp in a natural bowl of the Black Hills, near Rapid City, South Dakota, at dawn, the largest free balloon ever built soared to a barograph-recorded height of 60,613 feet and, due to a torn gas-bag, crashed on a farm at Loomis, Nebraska, in the afternoon. Fortunately, the intrepid crew of three expert Army fliers leaped to safety with parachutes. From the time of the take-off, until the balloon crashed to earth, radio listeners throughout the nation were able to tune-in on the two-way conversations between the gondola and the earth.

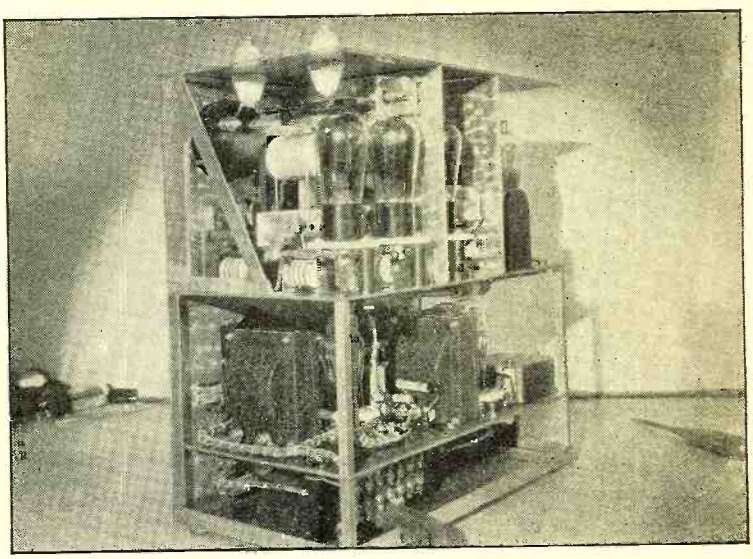
Even after the balloonists leaped out of the falling gondola, the carrier wave remained on the air until the balloon was demolished by the collision with the ground. When the R.C.A. receiving station at Riverhead, Long Island, reported the carrier wave off the air in the early evening, it was known that the balloon had crashed.

Throughout the entire flight, including the anxious and trying period follow-

THE RADIO TRANSMITTER

At left is the front view of the Stratosphere transmitter and at the right is a rear view, with the shields removed





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KEEPING IN TOUCH
Special tent ground station of the NBC, near takeoff point, which acted as primary receiving location during the flight

ing the accidental tearing of the gas-bag, the calm voices of the intrepid soldiers were heard by listeners from coast-to-coast. Major William E. Kepner, pilot; Captain Albert W. Stevens, scientific observer, and Captain Orvil A. Anderson, co-pilot, were heard intelligibly throughout the day. Calmness, coolness and assurance were reflected in their voices during the ascent and the dangerous descent.

Short-wave listeners had the advantage of being able to hear the entire day's transfer of voice signals between the balloon and the ground. Certain portions of the two-way conversations were relayed to broadcast listeners over the regular chain facilities of the National Broadcasting Company. The NBC had full charge of the radio end of the flight. The designing, building and operation of the stratosphere radio equipment was supervised by O. B. Hanson, NBC manager of technical operations, and George McElrath, the network's operating engineer. McElrath and three engineering assistants lived at the stratocamp for the several weeks in which the explorers awaited perfect weather for the ascent. He was assisted by Robert M. Morris, New York division engineer; Charles K. Atwater and F. V. Becker. Announcers recruited from Midwest NBC stations were utilized for various broadcasts from the bowl. The location of the stratocamp was so far from a populated section that it was essential to erect special telephone poles leading to the bowl to carry the essential landlines required for the feeding of the several preliminary programs to the chain.

The transmitter installed in the gondola was designated as Station W10XCW. It was constructed by Mr. Atwater especially for the unique requirements of the strato-balloon. It was essential to keep within weight and space limitations and yet provide radio apparatus that would function perfectly on the high altitude flight. All of the balloon's radio equipment weighed 192.8 pounds. The set was an 8-watt unit utilizing tourmaline crystal frequency stabilizers. Seven tubes were employed in the circuit. The balloon transmissions were on the 13,050 kilocycle band. Power was supplied by batteries exclusively. The use of tourmaline crystal control eliminated the need for heavy multipliers.

The transmitting antenna was attached by a pulley arrangement to lines on the lower catenary band of the balloon. The receiving antenna was of the trailing wire type often used in heavier-than-air machines.

The receiver in the gondola was a 4-tube, tuned-radio-frequency, multi-wave unit designed with a single dial to permit easy tuning of the ground stations. The stations conveying messages to the balloon were W10XCX, Indian School, near Rapid City, South Dakota, on 6350 kilocycles; W9XF, Downers Grove, near Chicago, Illinois, on 6100 kilocycles, and W3XL, Bound Brook, New Jersey, on 6425 kilocycles.

Special land receiving points stood by for the W10XCW signals from the balloon. In addition, NBC associated stations throughout the country were requested to tune in the signals. The plan was to route the received signals from the point where they were strongest to the NBC chain. The main receiving point was on the rim of the bowl at the stratocamp and it was here that the signals were best heard. Riverhead, Long Island, also received strong signals, and it was between these two points that the programs were keyed to the chain. Other stations reporting good pick-up of the balloon signals were WGY, Schenectady; KDKA, Pittsburgh; KOA, Denver; WREN, Lawrence, Kansas; WSM, Nashville; the Chicago NBC headquarters, and the Point Reyes, California, R.C.A. station. In all, NBC reported thirty stations were in contact with the balloon. The General Electric Company, at Schenectady, utilized a directional reception antenna aimed at the balloon. The results were so good that the point was designated as an emergency chain pick-up spot. But it wasn't necessary to utilize the G.E. pick-up on account of the efficiency at the previously arranged reception points.

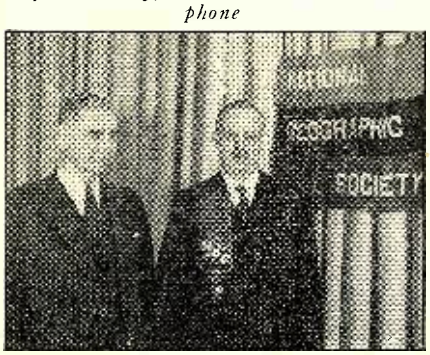
During the five weeks prior to the flight, fourteen stations conducted tests with the NBC engineers at the stratocamp. At the bowl, equipment identical with that used in the balloon was set up under McElrath's supervision. The stations, through the tests, were able to adjust their receiving equipment so that messages from the balloon crew could be brought in clearly.

The stations which aided in these advance preparations were presented with souvenirs of the flight by Mr. McElrath. Stations participating in the tests were KFYR, Bismarck; WDAY, Fargo; WHO-WOC and KSO, Des Moines; WREN and WDAF, Kansas City; KWCR, Cedar Rapids; WLW, Cincinnati; KOA, Denver; KWK, St. Louis; WSM, Nashville; WKY, Oklahoma City; and KTSP, Minneapolis.

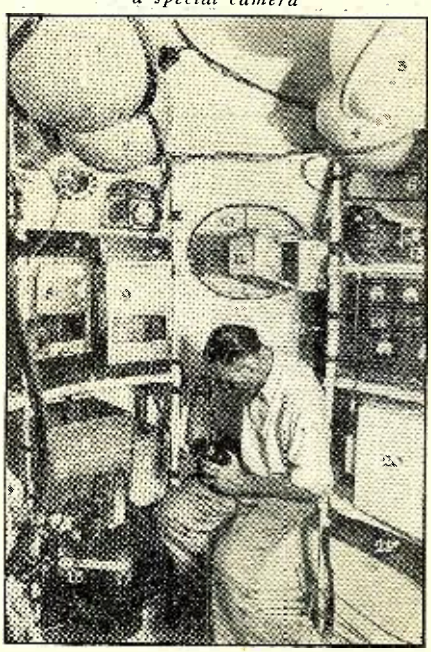
Special equipment was installed by each of these stations at points outside their respective cities in order that the balloon's messages may have been picked up with maximum strength and relayed to the NBC in the event that the giant bag drifted toward any station's particular area or landed near it.

The writer was stationed at the NBC New York headquarters where the master controls were situated. It was from this point that William Burke Miller, director of NBC special event programs, directed every point connected with the complicated stratosphere broadcasting assignment. (*Continued on page* 318)

SPONSORS OF THE TEST
The flight was under the auspices of the United States Army and the National Geographic Society. The Honorable George Dern, Secretary of War, and Dr. Herbert Grosvenor, president of the Society, are shown at the microphone



INTERIOR OF THE GONDOLA
The scientific equipments are as follows: 1, 2, 3, 4, air-sample flasks; 5, unshielded electroscope; 6, observation port holes; 7, balloon valve hose; 8 and 9, recording cameras; 10, Captain Stevens manhole; 11, camera for recording barometers; 12, barometer box; 13, motion picture camera; 14, radio transmitter; 15 and 16, battery boxes; 17, liquid oxygen flask; 18, pressure dial; 19, pressure dial for bumper; 20, radio batteries; 21 (in shadow), observation port hole. Captain A. W. Stevens is shown adjusting a special camera



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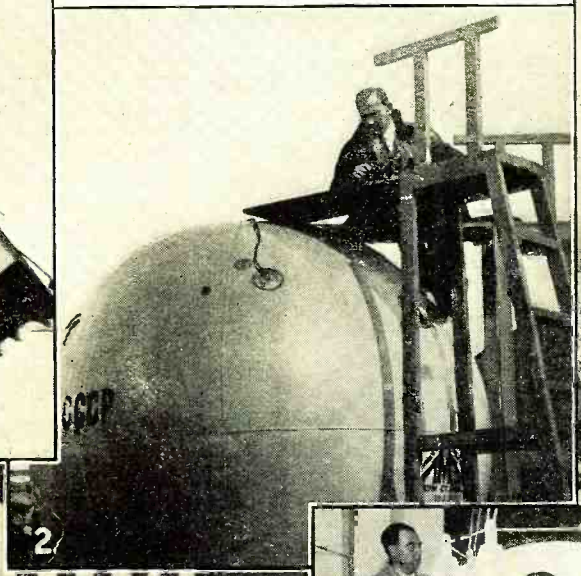
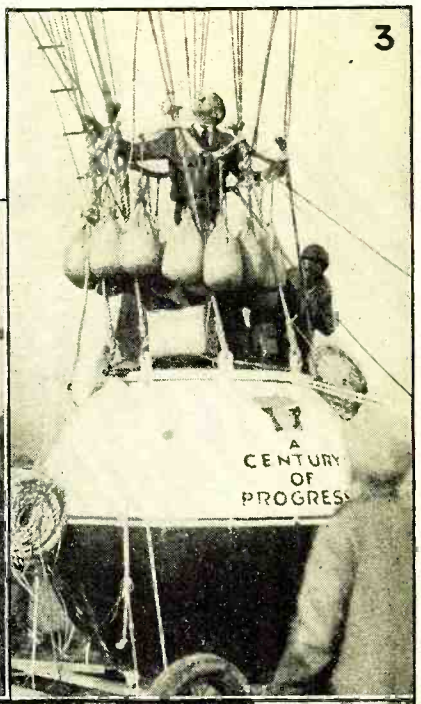
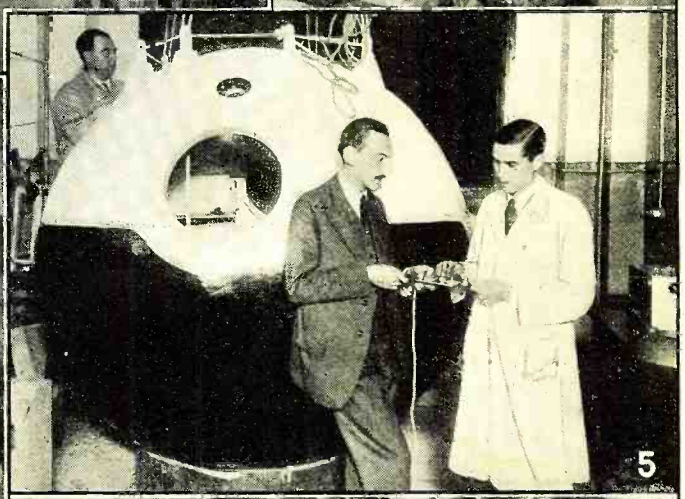
The History of STRATOSPHERE EXPLORATIONS







PIONEER STRATOSPHERE FLIGHTS

1. *Auguste Piccard, pioneer stratosphere explorer, examining radio equipment for contemplated American ascent.*
2. *Ill-fated Soviet stratosphere gondola which ascended to an unofficial record altitude, but ended in fatal disaster.*
3. *The record holder, Commander Settle, in final check-up of gondola fastenings before flight.*
4. *The Explorer's christening.*
5. *Max Cosyns and Van der Elst testing automatic control equipment for their recent Belgian flight.*
6. *A "robot" stratosphere adventure. Professor Arthur Compton inspecting ionization chamber for his radio-equipped crewless balloon.*

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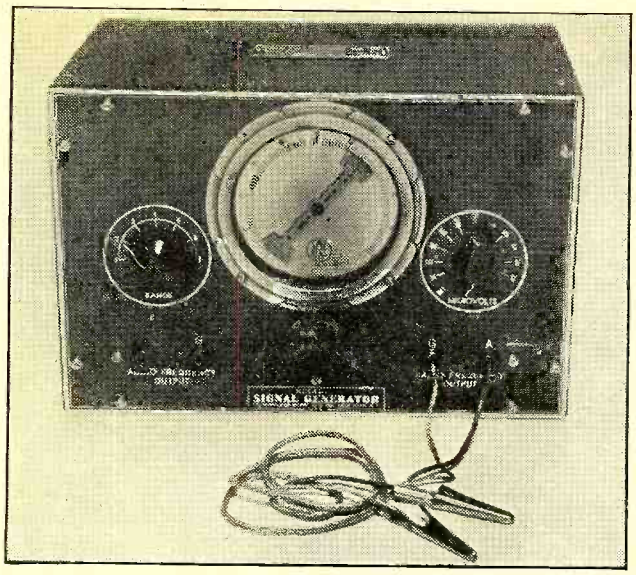


A Fundamental Frequency 100-2100 Kc. SIGNAL GENERATOR

This compact, self-contained instrument will be found particularly useful for servicemen and technicians, due to its wide frequency range, thorough shielding and attenuator

Samuel Egert
and
S. Bagno

THE model No. 99 all-wave oscillator has been designed to meet the current need for an instrument to check the new all-wave receivers. Every serviceman by this time is becoming acquainted with the complexity of design of these receivers. Aside from the necessity of lining up the oscillator, there are a multitude of additional trimmers to assure that all the radio-frequency and intermediate-frequency tuned circuits are in line.

It is necessary to have an oscillator which will give a wide range of frequencies, quickly and accurately. To accomplish this, it is far better to have a test instrument which provides fundamental frequencies throughout the entire radio-frequency spectrum. The instrument described in this article gives fundamental frequencies from 14 meters to 3000 meters or from 21,000 kc. to 100 kc., and thus eliminates the necessity of depending on harmonics for the higher test frequencies.

There is another important test oscillator requirement, imposed by the a.v.c. circuits which are being included in all modern receivers. To really line up a.v.c. circuits closely, it is necessary to be able to attenuate the signal of the r.f. test oscillator to a very low value at all frequencies. This requirement has been accomplished in the Egert signal generator by means of an entirely new development. This development consists of a new, non-inductive attenuator which has many interesting characteristics, including a constant input and output impedance. Attenuation is logarithmic and continuously variable.

The writers are illustrating the circuit diagram and describing the functions of each item used in the oscillator to further acquaint the reader with the ideas of design which have been incorporated to meet the exacting present-day needs for a good general all-around instrument.

Figure 1 illustrates this circuit diagram. Coils L1, L2, L3, L4, L5, L6 and L7, in conjunction with a 2-gang, 7-point, low-capacity switch are employed in the oscillating circuit of the –30 tube to generate fundamental radio frequencies shown in Table 1.

Condenser C1 is the main tuning condenser across these coils. The r.f. signal generated by this combination of coils and condensers lends itself to accurate maintenance of calibration as the coil inductances and the condenser capacities are adjusted to extremely close limits.

The signal generated by the –30 tube is fed into the fourth grid of the 1A6 tube. This fourth grid and the plate of the 1A6 tube act as a radio-frequency buffer stage for the radio-frequency signal before it is fed through a .006 mfd. condenser and finally into the output attenuator mentioned above. The r.f. buffer stage, in conjunction with the new attenuator, is an ideal arrangement, as it allows the fundamental signal generated by the –30 tube to remain unaffected in any way by changes in the output circuit. Also as the output impedance of the attenuator is fixed at 100 ohms, it becomes ideal for use in general radio set test work.

The oscillator also generates a thousand-cycle audio note which can be obtained separately at the "audio" pin-jack terminals. This thousand-cycle note, however, has been primarily introduced to be employed for modulating the radio-frequency signal. The reader will notice from the diagram that grids 1 and the plate (with grids 2, 3 and 5 in parallel) of the 1A6 tube, in conjunction with (*Continued on page 325*)

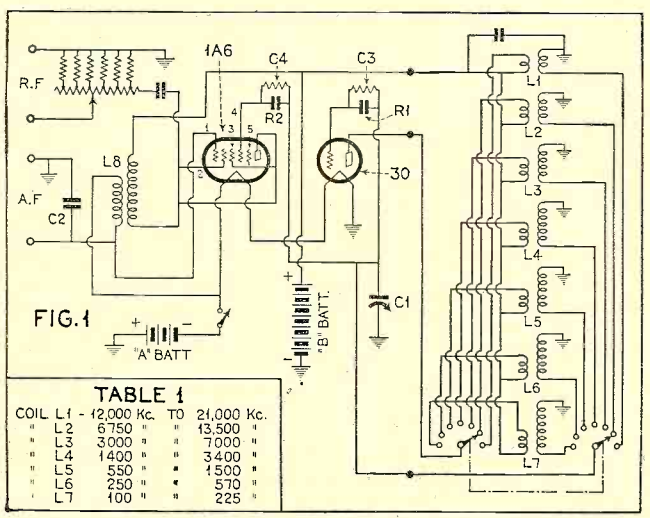


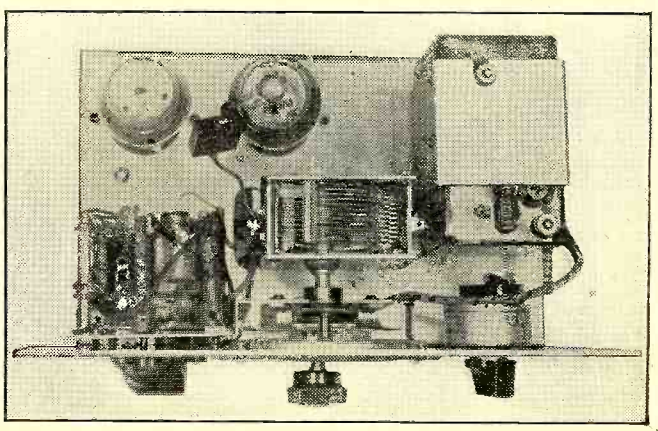
FIG. 1

TABLE 1

COIL	L1	- 12,000 Kc.	TO	21,000 Kc.
"	L2	6750 "	"	13,500 "
"	L3	3000 "	"	7000 "
"	L4	1400 "	"	3400 "
"	L5	550 "	"	1500 "
"	L6	250 "	"	570 "
"	L7	100 "	"	225 "

THE SCHEMATIC CIRCUIT AND TOP VIEW

The –30 tube is the r.f. oscillator and the 1A6 functions as the audio oscillator, mixer and r.f. buffer. This latter feature isolates the r.f. oscillator and results in stability



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Latest British
LILLIPUT TUBES
(Applied to Police Radio and Hearing Aids)

R. W. Hallows

VERY interesting developments in police radio are taking place at the present time in England. There is no standard equipment for the whole country, since we have no State Police. The famous Scotland Yard is purely a detective and criminal investigation department which the local police may call in to assist in solving crime mysteries if they wish to do so, though there is nothing to compel them to take this line.

Each county and each large city has is own self-contained police force, though all are in close touch with one another and with the big detective centres at Scotland Yard and Wakefield. Extensive use is made of short-wave radio by police headquarters all over the country for making inquiries, for disseminating information and in some cases for the transmission of facsimile documents and fingerprints.

As in America, the automobile flying squads maintain contact with their headquarters and with one another by radio, each vehicle being provided with transmitting and receiving equipment.

The most recent development is to provide police constables who go about their beats on foot, with midget portable receiving sets so light and of such tiny proportions that they are easily carried either in the helmets that the English police wear or in pouches attached to their belts. Several different kinds of equipment have been designed, and it is very interesting to note that in numerous instances a great part of the experimental and designing work has been carried out by amateurs. What a debt radio does owe to the fan!

Among the pioneers in this class of police radio were the authorities of Brighton. For some time past every constable on duty has carried a miniature radio receiver and headquarters have thus been able to keep in the closest touch with every one of their men.

The system in Brighton has proved extraordinarily satisfactory: in one case a stolen automobile was stopped and the thieves arrested less than five minutes after the owner had reported his loss to the police station. There has been a marked diminution in crime and the Chief Constable is enthusiastic about the way in which radio helps him to concentrate his men with the minimum loss of time at any point where they may be required.

For use in these miniature receiving sets, two special tubes have been developed by the Marconi Company of England. The main problem, naturally, is to design tubes as economical as possible in the matter of both A and B current, for batteries are inevitably by far the heaviest part of any portable radio equipment.

The problem has been tackled most ingeniously. In the first place, these tubes have been made with filaments requiring only .1 ampere of current at 1 volt. It is thus possible to run two of them in series from a single storage cell of very small size and light weight.

The constable is on duty for eight hours at a time, and if his receiving set is kept continuously switched on, so that he is always on the alert for messages, the total A current consumed is only .8 watt-hour. Hence a storage cell of test-tube size with jelly-acid electrolyte can be used.

Both of the tubes are triodes and they are intended for use in a simple detector and a.f. circuit. Since the output tube is required to work only a telephone receiver, it has been possible to cut down the plate voltage and the plate current to remarkably small figures.

The tubes are designed for a maximum plate voltage of 45, and actually the B battery used has generally an e.m.f. of 30 volts. With this the plate current of the detector valve is about .7 milliampere and that of the output tube, with 3 volts negative bias on the grid, about .6 milliampere. The total B current is thus of the order of 1.3 milliamperes and the B wattage of the two tubes works out at about .039. Owing to the tiny consumption of B current, dry cells of cigarette size can be used and since only twenty of these are needed to produce an e.m.f. of 30 volts, the weight of the B battery is trifling.

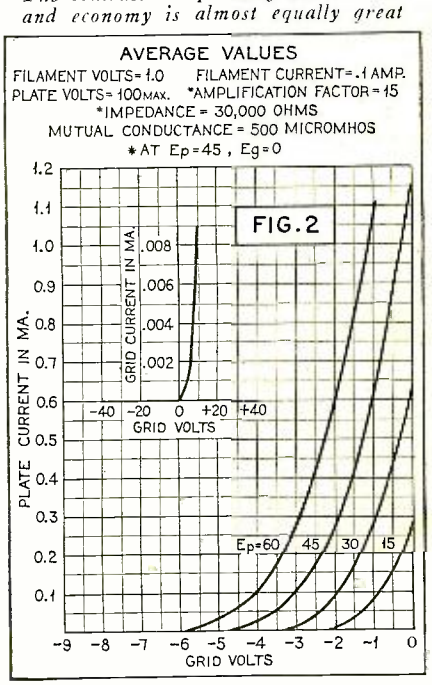
Figure 1 shows how one of these little tubes compares in size with a standard type –30 tube. They are only 50 m/m in height by 20.5 m/m in width at the widest part. Instead of pins, the bases are fitted with side contacts and fit into a special miniature socket with a diameter of 26 m/m and a depth of 10 m/m.

Naturally, with a filament rating of but .1 ampere at 1 volt the characteristics display nothing in the way of super efficiency! They are, however, more than adequate for the special purpose for which they are designed. The tube intended for use as detector has an amplification factor of 15 against an anoded impedance of 30,000 ohms, whilst that used for output purposes has an amplification factor of 5 for an impedance of 12,500 ohms. The characteristics are shown in Figures 2 and 3.

It has been found that with a small loop antenna of flexible wire sewn into the seams of his uniform jacket, a police officer (*Continued on page* 326)

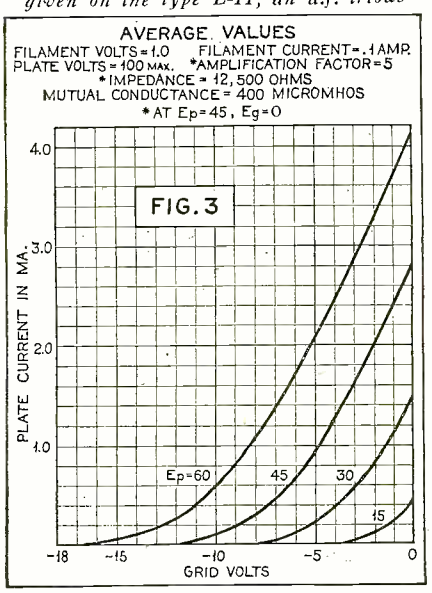
THE NEW TINY TUBE

Figure 1. One of the miniature triodes beside a standard American type –30 tube to show the contrast in size. The contrast in operating convenience and economy is almost equally great



OPERATING CHARACTERISTICS

Figure 2. Characteristics of the Marconi type H-11 miniature detector triode. In Figure 3 the same data is given on the type L-11, an a.f. triode



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FIRST AID *to*

Here is a new series that is bound NEWS readers, for even the most (during his experimentation) an the fact or not. Start this new serial NEWS. It may be the cause of your

OH! WHAT SHALL I DO WITH IT?

Many an inventor racks his brains, after he has originated some new idea, trying to decide just what he will do with his invention. How can he protect it? How can he get a patent that will be a good one and (more important) how can he dispose of the invention for his profit

By E. E. Free, Ph.D.

MOST inventors are afraid of the wrong thing. They fear that someone, usually one of the "great corporations", will steal their inventions. I know that this sometimes happens, although perhaps not often by anyone, person or corporation, important enough to be called "great". But *it certainly is extremely rare!* Theft is not what inventors need to fear. The proportionate chance of being struck by lightning on your vacation is certainly many times the chance that anyone ever will steal your invention.

The real danger, responsible for millions of times more loss than all the stolen ideas in human history, is the danger of spending money and effort on some idea which is commercially valueless. Most people who get what they think is a new idea in science or technology first ask themselves "is it patentable?" The answer is almost certain to be yes. Practically anything is patentable, if one has a skillful patent attorney and does not care too much just what details of the idea the patent is to cover.

C. FRANCIS JENKINS

Pioneer Inventor of moving-picture machines and television

The real question to ask about a new invention, especially your own invention, is "will it be worth money?" This is something vastly different. The chance that you can get a patent is practically one hundred percent. The chance that your patent will be worth anything, computed on the cold, hard-boiled basis of business statistics, figures out as something like one-twentieth of one percent. Which is to say that only about one invention in 2,000 pays back to the inventor, or to anybody, what it costs to make the invention and to protect it.

Mining men used to have a saying that only one prospector out of a thousand ever found gold, that only one prospect out of a thousand ever became a mine and that only one mine out of a thousand ever made money. Perhaps that was a bit exaggerated, but it expressed a sound idea. One might say similarly that only one idea out of a thousand is really an invention, that only one invention out of a thousand is really practical, and that only one practical invention out of a thousand is likely ever to make money.

So we come to the essence of this series of articles, which we hope to make a practical and useful series. It is that *the first thing to consider about any invention is not how to get a patent but whether you want a patent!* You certainly do not, unless the invention has a good chance of being *valuable commercially!*

A common idea about patents is that they provide, in some obscure fashion, some kind of sure commercial "protection". They do not. A patent is merely official, dated evidence of what the alleged inventor believes that he invented, plus a further record that the Patent Office officials then knew of no valid objection to this claim.

It is much like the record of a civil marriage. Both parties tell the marriage clerk that they are single and free to marry. They state that they accept marriage with each other. The clerk is not responsible if, unknown to him, one or both of the parties lie and commit bigamy or some other crime. If anything like that ever is proved, the marriage is dissolved.

A patent is an even weaker bond. In the United States, the government does not guarantee patents in any way whatsoever. If the validity of an invention is questioned, that validity must be established by the inventor in court almost as though the patent did not exist. If anyone can find a record of a prior invention of the same kind, the patent is upset even though the search by Patent Officials had not disclosed this prior invention. If anyone can prove that the thing covered by the patent is not an invention in the somewhat technical meaning of the patent law, the patent is void even though officials of the Patent Office may disagree. Until a United States patent has been passed on by the Supreme Court, no one knows whether it is valid or not.

And in patent law, as elsewhere in real human affairs as distinct from imagined Utopias, the victory is apt to go to the side with the heaviest battalions of high-priced attorneys, skilled court experts and the always-necessary dollars. I know of no actual statistics to prove the point, but I suspect that for every poor inventor who had his invention stolen, there have been hundreds who had their supposed patents proved invalid in later litigation with richer rivals; often, it must be admitted, with considerable justice, and always with perfect legality.

That these facts prove serious weaknesses of American (and other) patent laws often is urged. I doubt it. In this imperfect world, all laws are probably unjust to someone. Anyway, these limitations of patents, just or unjust, are

These Men Invented Big Things!

THE well-known inventors, shown on this page, did not waste their time on foolish inventions that had no commercial possibilities. They picked ideas, for research, that would be important commercially and from a humanitarian viewpoint. And their big inventions were not just accidents because they have kept on producing newer and bigger inventions! Be sure that you read every article in this important series so that you too will have the knowledge regarding inventions that it is necessary to have to become successful.

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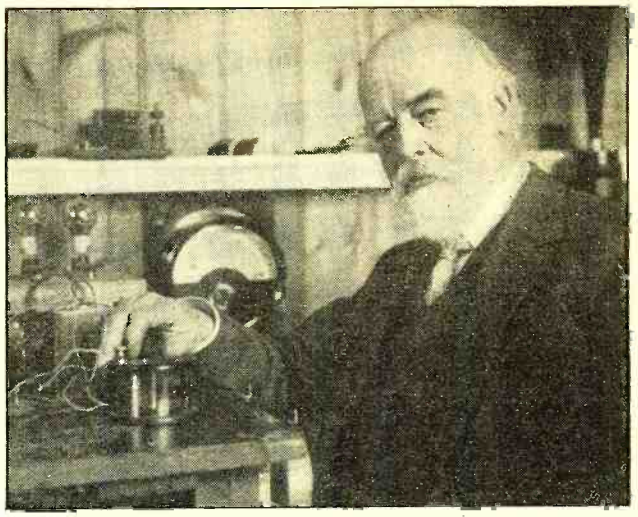
INVENTORS

to be of great interest to all RADIO lowly experimenter is at sometime inventor, whether he is conscious of now and follow it up in RADIO making a fortune, instead of losing



A PIONEER RADIO INVENTOR

Sir Oliver Lodge, who has to his credit the invention of inductive tuning and many other important inventions in Physics. He not only knew how to invent but to dispose of his inventions so that they would be of the greatest good to mankind and to himself

facts and must be reckoned with. It has been said that no patent is more than a license to litigate, and there is much truth in it.

Why, then, go to the expense and trouble of trying to get a patent at all? The answer is that it provides tangible and definite evidence of the inventor's beliefs, acts and intentions. It is "something to sell." It gives a definite basis for manufacturing or other licenses. In most instances it provides *the most and the best protection which the inventor is permitted by modern society;* not much protection, perhaps, but still the best. But let no inventor imagine for an instant that the problem of making money out of his brain-child is over when the Patent Office marks his claims "allowed". Instead, his troubles may be only beginning.

The patent is not the end of the trail. It may be one highway to prosperity, but there are other possible highways; other ways in which the value of inventions sometimes may be protected. All should be considered. Many inventors have preferred another form of protection which is as old as mankind. This is Secrecy.

A brief historical parenthesis may be interesting. The whole idea of government patents is to circumvent the natural tendency of inventors to keep secrets. Time was when most industrial arts and processes were closely-guarded secrets, handed down by word-of-mouth, from master to apprentice, or often from father to son, and guarded by the most Sacred and Terrifying of Oaths. Metal workers who knew how to convert soft copper into hard bronze, printed no technical articles about it. Experts who made, for Roman emperors, the Tyrian purple dye extracted from Mediterranean shellfish, took out no patent the terms of which were posted on the walls of Tyre for every imitator to read. Instead, such things were secrets guarded with the possessor's lives. This was good for the initiated, but bad for the public. Industrial progress was stifled. Monopolies became many and oppressive. The patent system was invented to cure these ills. Its idea is that the inventor makes public at once any useful secret which he has learned. Thus others are supposed to know all about it and can go on immediately from that point to something still better. In return for this public service and for abandoning his natural policy of Secrecy, the original inventor is promised by the state a limited period, usually seventeen years, of exclusive enjoyment of financial benefits from his invention. That he seldom gets it is not, officially at least, a part of the theory.

People think of patents as intended chiefly to protect the inventor. In connection both with patents and with copyrights, one hears much about "protection of intellectual property". That puts the cart, precisely, in front of the horse. The whole idea of the patent system is to protect and benefit the public against the inventor. What the patent system pays the inventor in the way of limited monopoly is a grudging payment made to him by society to keep him in the game at all, because otherwise the average inventor would keep his invention secret and would refuse to play.

It may be heresy to say so, but I still am firmly of the opinion that the old-time makers of bronze and compounders of Tyrian purple had the right idea. Secrecy (about an invention) still seems to me the best possible commercial policy, when and where it will work at all.

Unfortunately for inventors, it seldom will work. One obstacle is that apprentices no longer can be bound to secrecy by Terrible Oaths. Most oaths have lost both terror and binding power and no one has provided an adequate substitute. Very few modern inventions can be utilized by one man alone, or even by one man plus the extremely few individuals whom he can trust absolutely.

Another obstacle is that secrecy is so fragile. If you invent a new form of radio coil or a new type of condenser, the first example that you sell disposes of your secret. Anyone then can copy your device, and since you have rejected the government's offer to trade you a patent for your secret, *you have no kind of redress!* A still more serious obstacle is that the man with a secret has nothing he can sell. If he refuses to tell the purchaser all of his secret, no one will buy it. If he does tell, he no longer has a secret.

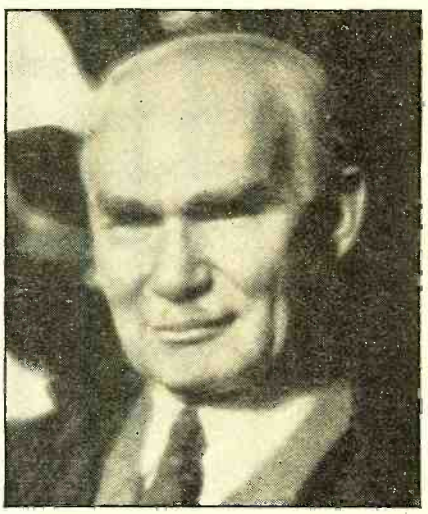
It must be concluded, I think, that the policy of protecting one's brain children by secrecy seldom is applicable to practical affairs. If it is applicable, certainly, surely and indefinitely, it undoubtedly is (*Continued on page* 317)

MAJOR EDWIN H. ARMSTRONG

Inventor of the superheterodyne, regeneration, super-regeneration and other important devices

DR. LEE DEFOREST

He invented the triode, electron vacuum-valve commonly known as the radio vacuum tube



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RADIO NEWS LABORATORY EQUIPMENT No. 1

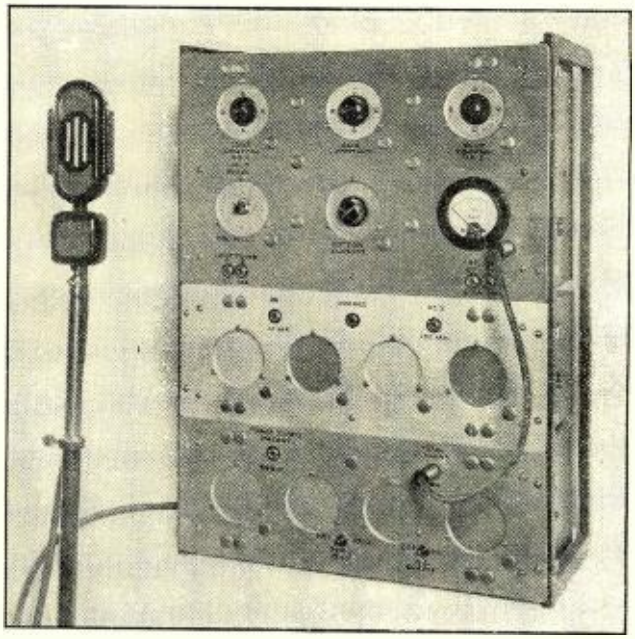
A High-Fidelity

LABORATORY AMPLIFIER

Last month the authors discussed the actual measured characteristics of this amplifier, which was recently constructed for use in the RADIO NEWS Laboratory. This month the electrical design is considered.

J. M. Hollywood *and* M. P. Wilder

Part Two



THE FINISHED AMPLIFIER

All controls are carried on the front panel. The meter with its plug and jack arrangement provides an instantaneous check on each individual stage. Each jack has its own shunt or multiplier and the range of the meter when plugged into any circuit is indicated immediately below the jack

THE circuit diagram of the amplifier is shown in Figure 6A. It is built in three sections of a General Radio rack-and-panel assembly, with the power supply on the lower panel. power amplifier on the second panel, and a three-stage voltage amplifier on the upper panel. Detailed photographs of the individual sections will be shown next month. An extra "deck" is placed in the center of the large upper box. Cable plug and socket arrangements on the ends of the shield boxes. with interconnecting cables, permit use of the amplifier out of the rack. Many of the constructional details are evident in the photographs.

Incidentally, when operating at the full gain of 124 d.b., there is appreciable hum. caused by coupling between the power transformer and the microphone transformer. If the large box with the first stages is taken out of the rack and placed a few feet away, this hum becomes negligible even at full gain. For most uses, the gain employed is much less than maximum and the hum level is not objectionable with the rack mounting.

A one milliampere meter and a system of jacks allows checking of several currents, namely, current through each microphone button, plate current of each 57, the 56, and the two 45's, total current output of the power supply, and voltage of the power supply. Meter shunts are permanently connected across each current jack to automatically provide the appropriate meter range for each measurement and a multiplier is in series with the voltage jack to check the power supply output voltage which is adjusted to a value of 350 volts. A jack is also provided for inserting headphones in the 56 output. The correct current values are 1st 57-0.9 ma., 2nd 57-0.45 ma., 56-2.4 ma., 45's-70 ma., total –75 ma. Any important variation from these values indicated gives instant warning of something wrong.

Two tone controls are used, each consisting of several condensers and a selector switch, shunted across coupling circuits on two resistance coupled stages. These were not ganged because of shielding difficulties. The other controls are a gain control, microphone current control. an on-off line switch, a microphone battery switch (not installed when photos were made), and a switch to shift the power supply from the amplifier to binding posts for external apparatus. Binding posts are provided

VOLTAGE AMPLIFIER CIRCUIT

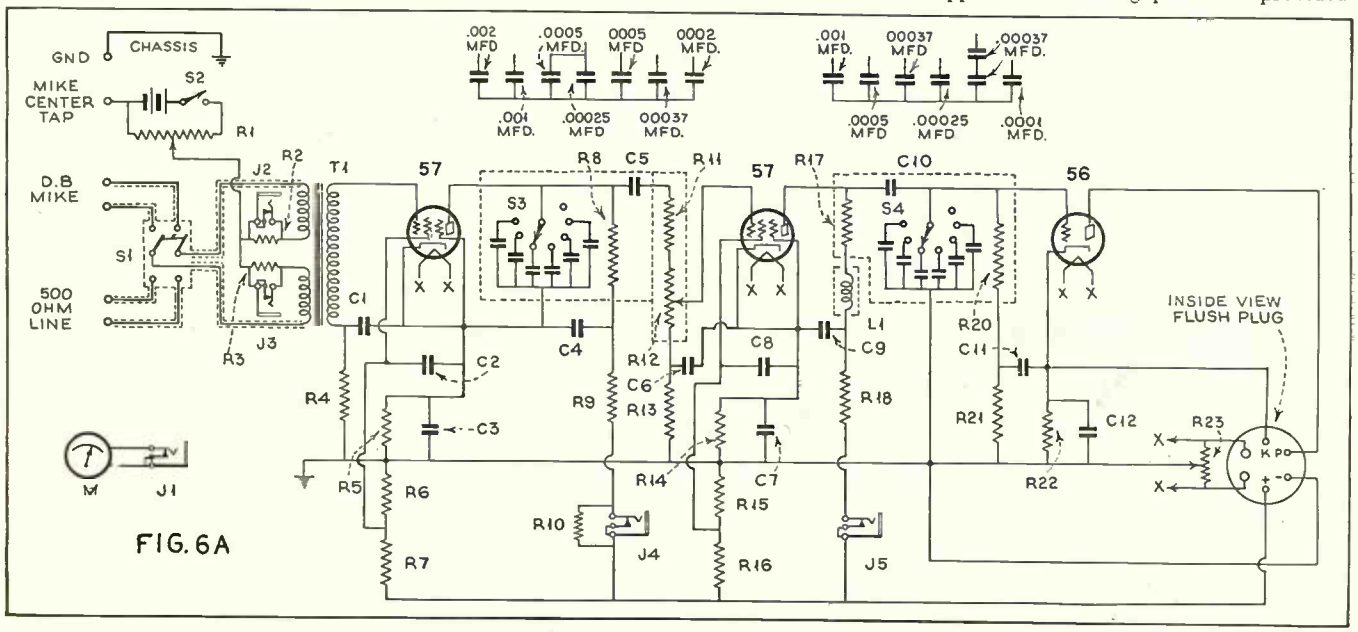


FIG. 6A

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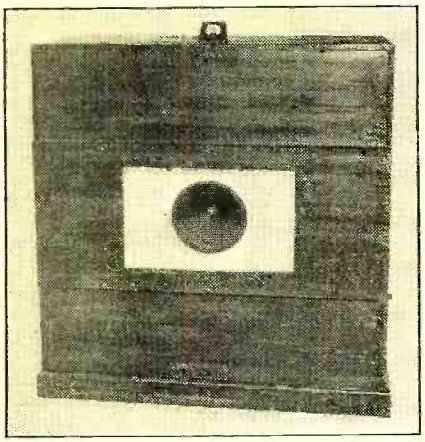


LABORATORY ACCESSORIES

The Wright-DeCoster Model 306 speaker, mounted on a 5-foot baffle, constitutes the output circuit of this amplifier, as used in the RADIO NEWS *"Lab." The Bruno velocity microphone shown with the amplifier is one of the permanent input sources*

for input from a 500-ohm line or carbon microphone (with jack switch at lower left of top panel to change from one to the other), and for 200 and 500-ohm output. If desired, binding posts can be added later for additional inputs of 17, 50, 125, 200, 250 and 333 ohms; and outputs of 1.3, 3, 4, 5, 7.5, 15, 50, 125, 250 and 333 ohms, as the input and output transformers provide all these values.

Shielding is quite thorough. The General Radio assembly furnishes ample shielding between most stages. All tone controls, coupling resistors, coupling condensers, etc., are enclosed in shield cans. Originally all plate and grid leads were run with shielded wire, but this shielding had to be removed because it caused excessive by-passing capacity which attenuated the high frequencies too much. Without it, the amplifier is still stable, although at very high gain there is a peak in the frequency response curve, as shown in Figure 1 last month, which indicates a tendency toward feedback. Shielded compartments for each stage would remedy this, but were not considered necessary.

High gain amplifiers are often subject to "motorboating," or oscillation at a very low frequency. This was avoided in the present amplifier by use of decoupling filters of large time constant in most grid and plate circuits. Electrolytic condensers were used for this purpose, and although it was anticipated that trouble might be expected from these, in the form of noise or voltage fluctuations, the noise level is well below the tube noise level, and voltage fluctuations are not severe. High grade electrolytic condensers must be used. Another precaution against motorboating was the use of an extra filter circuit for the plate supply voltage of the first two tubes, the following stages being operated with less filter. This reduced interstage coupling due to the common power supply. Separate voltage dividers or series resistors were used for all screen grid or plate circuits. The amplifier is perfectly stable at gains up to 110 db., but shows a slight tendency to motorboat for a few seconds if "shocked" while operating at full gain. This could be eliminated by using even larger filter condensers for decoupling; use of push-pull stages throughout would also reduce the tendency.

The frequency response curve was made sufficiently flat at low frequencies by the use of large decoupling filters in grid and plate circuits. The bypass condensers in all cases should be connected to cathodes rather than ground. It was found important to keep unbalanced direct current out of the transformers. For this reason, a combination of resistance and transformer coupling was used between the 56 and the 45s. The 1-microfarad condenser in series with the primary of this transformer tends to cause low frequency resonance and flatten the frequency response curve. Use of push-pull stages throughout would also have improved the curve slightly. To obtain flat high frequency response, stray capacity from plate or grid circuits to ground must be kept as small as possible, particularly in the resistance coupled circuits, and feedback between stages must be prevented by good shielding. If the tone controls were omitted, the leads could be made shorter and a better curve obtained. Good transformers are absolutely essential, being the chief factor limiting the frequency range.

Harmonic distortion is negligible in stages where the a.c. voltage handled is small and (as shown in the oscillagrams last month) in the power amplifier stage up to 4 watts output, but becomes serious if this stage is overloaded. The circuit constants in the 56 stage are such that it introduces very little

(*Continued on page 322*)

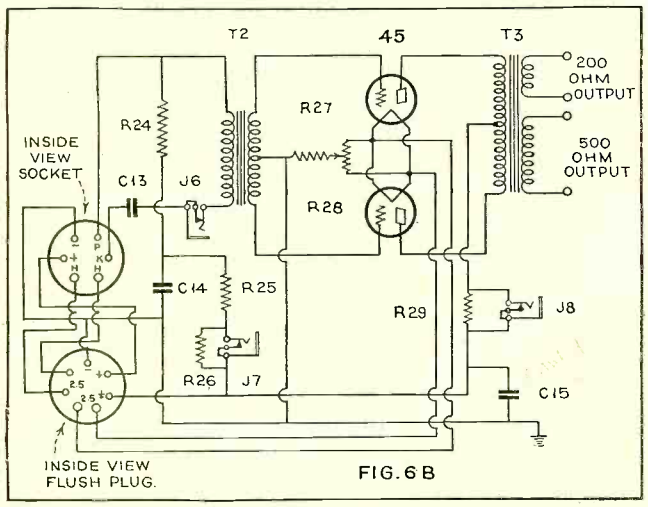


FIG. 6B

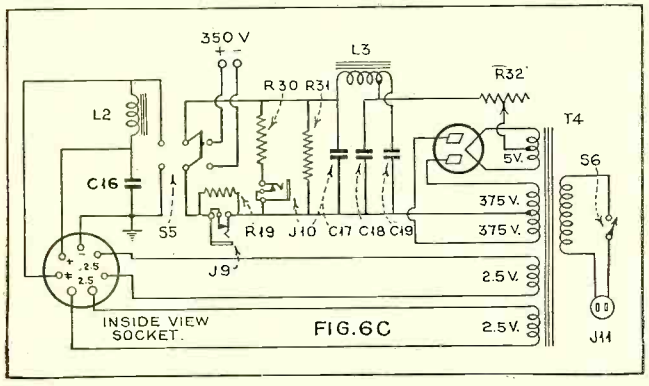
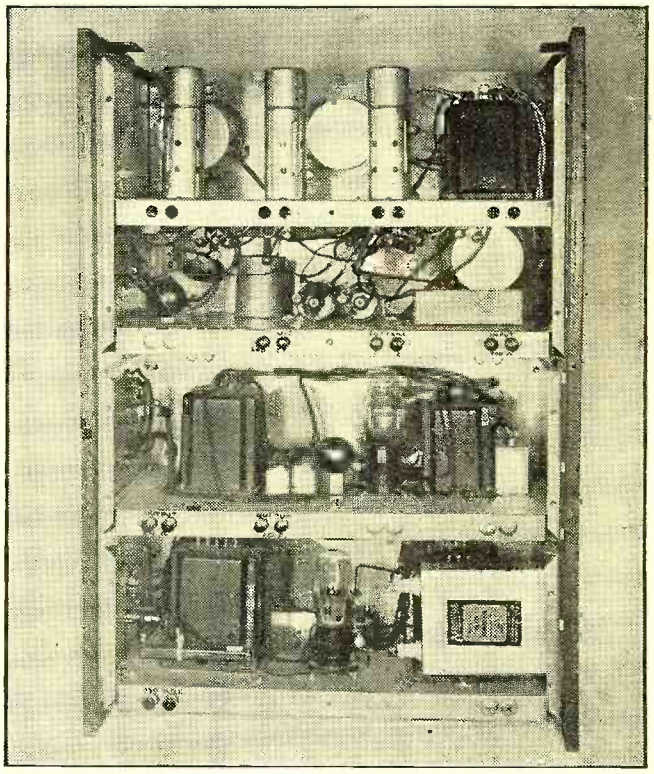


FIG. 6C

THE "WORKS"

Here the three dust covers have been removed to disclose the layout. In the top shield is the 3-stage, high-gain voltage amplifier. Below it is the power output stage and, at the bottom, the power supply. At left, Figures 6 (b) and 6 (c), are the schematic circuits of the power stage and power supply



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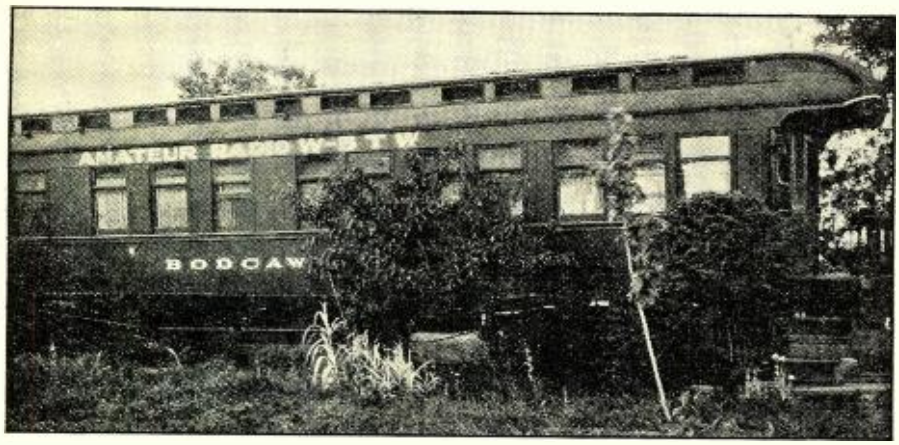


NOVEL "HAM" SHACK

Here is something new in amateur portables. W5TW, a 100-watt, 14 mc. 'phone owned and operated by Ed. Harris Hugo, Oklahoma. Shack, in picture, is standing in winter storage on private railroad siding. Staterooms provide living quarters while on the road. Shack is equipped with running water, electric refrigeration and gas for cooking and heating.

THE "HAM" SHACK

CQ CQ CQ

THERE are reports afoot that an effort is being made to further limit the maximum transmitter power, for amateur stations in the United States, to 100 watts input. Reports from Washington say that the suggestion has been made to the Federal Communications Commission, and that the proposal has the sanction of an amateur organization. Whether it is true or not that a person or group of persons has had the ear of the commission and recommended such a proposal, it certainly should not be allowed to be written into the rules and regulations of the regulating authority, and it is entirely up to the amateur to *fight any such action!* The amateur already is limited to a power of one kilowatt. One kilowatt is *not* a great deal of power. Commercial interests, that now have at their disposal the lion's share of the high-frequency channels which at one time belonged entirely to the amateur, talk in terms of five and ten kilowatts.

AFTER all, it is the amateur who is responsible for the opening up and development of short-wave communication. If they had not been pushed down to 200 meters (and below) in 1912 "to get rid of them," it is probable that nobody would have known or discovered so soon the effectiveness of short waves. In all fairness to the amateur for his contribution to the development of radio (and this is acknowledged among a certain group of officials that exert an influence over the regulation of radio) he *should be allowed to retain his present power limitation of 1 kilowatt and the channels or bands he now is allowed to use.*

While various reasons have been offered for the effort to reduce amateur power, the most plausible is that the number of stations is growing so fast, that they are overcrowding the present bands, and power should be reduced to accommodate the greater number of stations. It is argued that such a proposal would benefit them! In answer to that argument, *why not widen the amateur bands?* There *is* space available! A number of high-frequency channels are assigned—either side of the present bands, but there also are a number held by various commercial interests that are not used at all! These channels apparently are being wasted until active services are found for them.

If there is to be any limitation of power, it should be done entirely by the amateur himself. The "hams," perhaps, are among the best of rule and law-abiding citizens in the country. They are adept in policing themselves and have adopted precedents and a code of standards that demonstrate their ability to *do the right thing!*

On the other hand, it can be said that the amateur sometimes does waste large amounts of power. Stations have been heard using a half-kilowatt input for communicating over distances of only several miles, at the same time causing interference to stations several hundred miles away. Why burn kilowatts when a few watts will suffice? *The amateur should adopt a policy of using only the amount of power necessary to maintain satisfactory communication!* There are a number of stations that do this, but sadly enough they are in the minority. If every amateur would make this the rule of his station, it undoubtedly would put an end to this talk of limiting power, and at the same time would solve a lot of the QRM problem.

Every amateur transmitter should be designed so that power may be reduced in several stages. Some arrangement should be provided so that an input (not exceeding fifty watts) is available for local communication. The simplest method of having several power inputs available, is several transmitters, but also it is the most expensive. However, operators of stations having an input of the order of the legal maximum usually are in a position to have available a low-powered "rig" for "local" contracts.

On the other hand, owners of medium-powered stations usually have gone the limit of their pocketbooks and cannot afford the separate transmitter. The answer is to equip the transmitter so that its input *may be regulated* to the desired amount. Of course, there are a number of rules that have to be followed in any form of power regulation, particularly with telephone transmitters which require a certain input to match the modulator output impedance, but even with such transmitters there are simple ways to meet the problem.

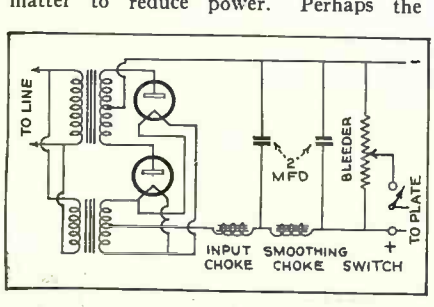
With a C.W. transmitter, it is an easy matter to reduce power. Perhaps the easiest method (and one of the most effective from the standpoint of reducing QRM) is to open the antenna coupling to a point where the desired input is obtained on the final amplifier (or oscillator) if the set is self-excited. This, in addition to decreasing power, probably will have the effect of "sharpening" the signal. In cases where coil coupling arrangements are used in the antenna circuit, the coil of course, is moved further away from the tank coil. With a *pi* network, the coupling condenser should be varied to reduce input. The point is, that settings should be noted where the input is desirable for two or three steps of power, and, when the transmitter is shifted from one amount of power to another, it should be returned to one of the two or three settings each time a shift in input is made. This will enable the operator to know his input, without having to calculate each time, so he may determine the effectiveness of each. It will serve to "raise" a station called, within approximate distance zones determined by experiment.

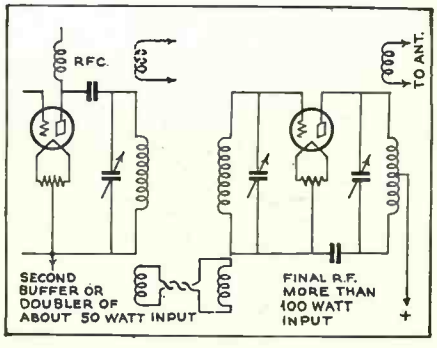
Another effective method of reducing power is to tap the "bleeder" resistor (connected across the power unit supplying the final amplifier) at points so that two or three steps of input may be obtained. This may be accomplished by a switch. If only two steps of power are desired, the switch may be a single-pole, single-throw affair.

While for the C.W. transmitter the value of the input is not of great importance, with a 'phone transmitter the input has to be arranged to match the impedance of the modulating equipment. For this reason the power steps for the Class C amplifier have to be arranged to match the two or three steps of output impedance available in the modulator. In a Class B modulator, usually two output impedances are available. One usually provides for dropping the Class C input to half of normal. In such cases the switch suggested above may be a double-pole, double-throw type, in which case the shifting of power may be accomplished in one motion.

The double-pole switch will function all right on transmitters of low power, but in cases of high power, it is possible that having the Class B and Class C power supply leads (if separate supplies are used) close together may cause feedback. It shouldn't, but it sometimes does. If this

(*Continued on page 324*)





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SOME NEW AND USEFUL SWITCHES *for* EXPERIMENTERS

Paul G. Andres

THE experimenter in designing apparatus and circuits invariably finds need for simple and effective devices to change circuit conditions or to allow substitution of devices under test. Test equipment and measurement devices are equipped with switches which allow the experimenter to insert easily various values of the standard. Frequently, commercial equipment for the particular purpose is not available in the specific laboratory or often special values and combinations are desired.

Toggle, snap and jack switches are used extensively where only single-pole or double-pole, double-throw circuit switching is required. Even in this application, however, it is frequently desired to mount the switch on a panel, in which case a switch with a rotary movement and front-panel appearance of the knob is identical with other equipment, such as variable condensers, etc. The development of circuit-selector switches for broadcast and short-wave radio receivers has resulted in a new switch which is ideally adapted for this purpose. Figure 1 shows a switch of this type. It consists of a 4-section switch, each one of the bakelite plates, supporting a group of terminals, being termed a section. The central portions of the plates are rotatable by means of a flat shaft. The terminals are solid integral pieces of special spring material permanently fastened to the plate. One or more small silver contactors, as required, float in the central disc and contact between the terminals and the common or ground terminal located beneath the plate as shown in Figure 2. The mechanical action is achieved by means of two rollers held on opposite sides of a flat spring and which index the switch by locating in depressions on the index plate. The initial or zero position of the switch is fixed by a stationary stop embossed out of the metal of the index plate while the final switch position is obtained through the use of an ingenious method of using an adjustable stop which can be easily set to the desired position by the experimenter. Figure 3 shows this feature of the switch.

Some of the electrical features which are incorporated in the switch are of interest. As mentioned, all parts entering into the circuit, that is, terminals and contractors, are either silver plated or solid silver. This prevents possibility of loose and intermittent contacts between parts and consequently eliminates noise particularly when used on ultra-high frequencies. The terminals are mounted on a special high grade bakelite of low loss and which has negligible change and low water absorption under high-humidity conditions. Figure 4 shows a single section having two circuits and providing five double-circuit channels. There are a total of twelve available positions per section which provide numerous combinations. Many special and individual circuit functions can be obtained by using a number of contactors either in sequence or placed in appropriate contact slots in the movable central disc but these are generally required in those cases where the switch becomes a part of some special instrument or equipment such as in short-wave receivers where the switch short-circuits, or grounds successive sections of a common coil or individual coils.

In simple substitution circuits the 8-circuit 5-position switch meets practically all conditions. The switch can be so wired and connected to allow adequate separation of circuits of any number up to (*Continued on page 323*)

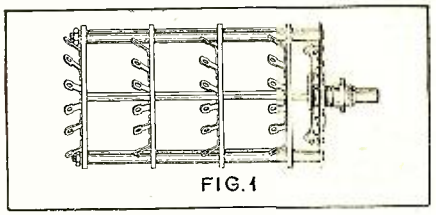
FIG. 1

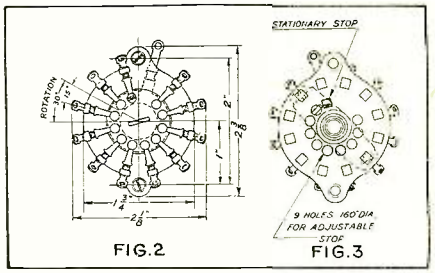

FIG. 2 FIG. 3

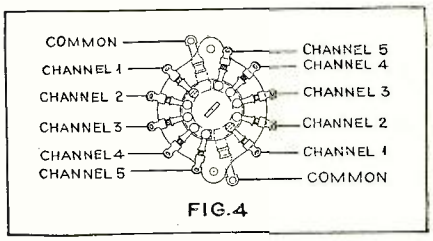

FIG. 4

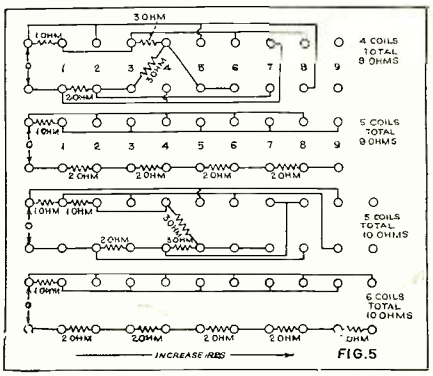

FIG. 5

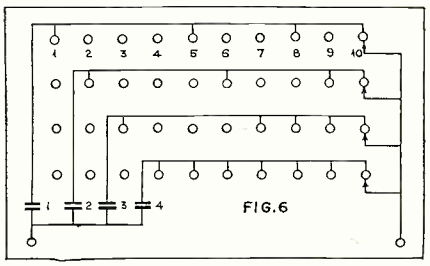
FIG. 6

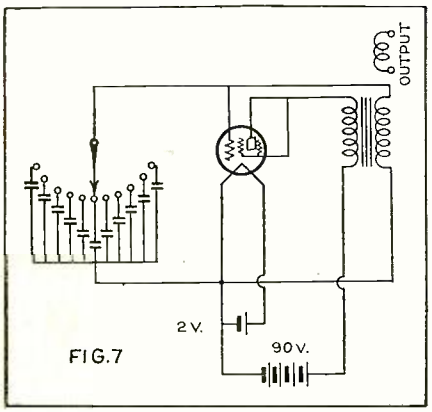

FIG. 7

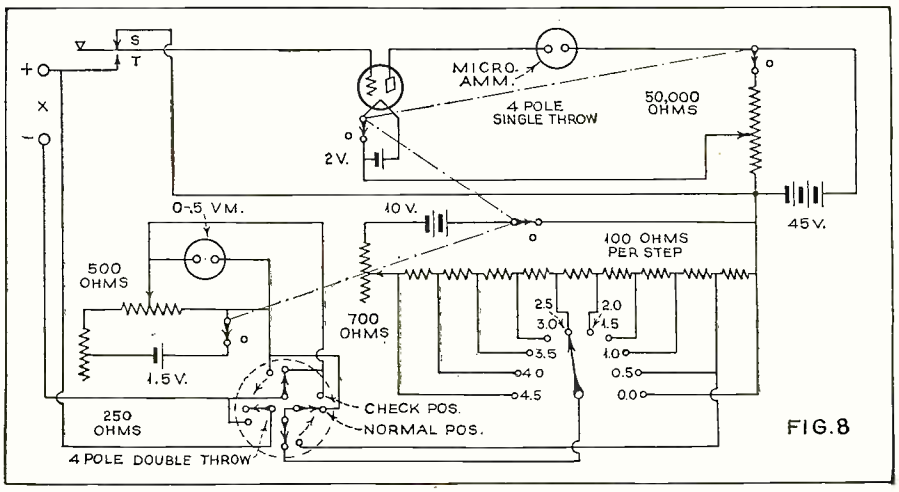

FIG. 8

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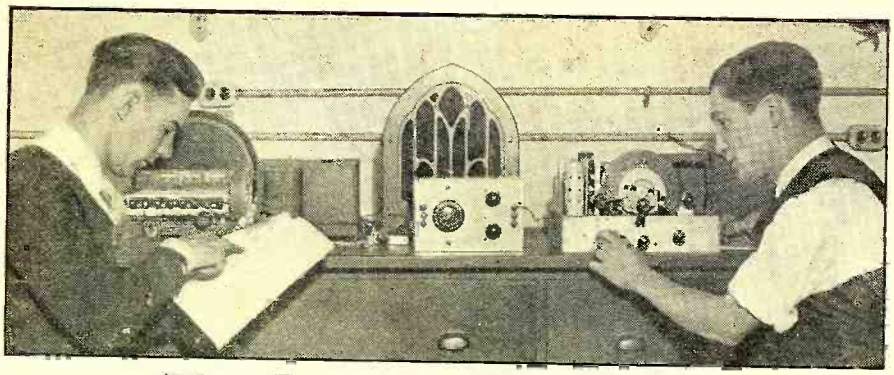

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FOR BROADCAST WAVES

Official Listening-Post Appointments

NO further appointments are being made this month, but it is hoped that in the next issue it will be possible to definitely announce the appointment of a number of those whose applications are on hand. Most of those who have applied for appointment have been slow in sending in a sufficiently complete record of their qualifications and this accounts for the apparent slowness in making official appointments. It is believed that by the time the real DX season gets well under way, however, that numerous appointments will have been made, insuring regular and frequent reports from all sections of the U. S. and some foreign countries.

Increasing the Log

Following is the up-to-date monitoring schedule of the Federal Communications Commission. These stations are on the air for a period of 20 minutes each, beginning with the hour shown. The transmissions take place during the first week of each month and during the transmissions no stations are operating on the monitored channels except the stations listed here. Each station announces its call letters at 3-minute intervals during its transmission. This schedule provides an excellent opportunity to log these small, low-power stations which normally cannot be heard at a distance due to other stations operating at the same time and blanketing their channels.

First Monday Each Month

E.S.T. (a.m.)	Freq.	Call	Location	Watts
2:00	1500	WCNW	Brooklyn, N. Y.	100
	1310	WJAC	Johnstown, Pa.	100
2:10	1210	WFAS	White Plains, N. Y.	100
	1370	WRAK	Williamsport, Pa.	100
2:20	1500	WNBF	Binghamton, N. Y.	100
	580	WCHS	Charleston, W. Va.	
2:30	1420	WAGM	Presque Isle, Me.	100
	1370	WBTM	Danville, Va.	100
2:50	1420	WHDL	Tupper Lake, N. Y.	100
	1310	WHAT	Philadelphia, Pa.	100
3:00	1200	WCAX	Burlington, Vt.	100
	1370	WLVA	Lynchburg, Va.	100
3:10	1500	WSYB	Rutland, Vt.	100
	1310	WTEL	Philadelphia, Pa.	100
3:20	1200	WIBX	Utica, N. Y.	100
3:30	1370	WQDM	St. Albans, Vt.	100
3:30	1210	WKOK	Sunbury, Pa.	
3:40	1310	WMBO	Auburn, N. Y.	100
3:50	1370	WGLC	Hudson Falls, N. Y.	100
	1210	WBAX	Wilkes-Barre, Pa.	100
4:00	1220	WCAD	Canton, N. Y.	500
	1500	KPQ	Wenatchee, Wash.	100
4:10	1210	WBBL	Richmond, Va.	100
	900	KGBU	Ketchikan, Alaska	500
4:20	1290	WNBZ	Saranac Lake, N. Y.	50
	1310	WBRE	Wilkes-Barre, Pa.	100
	1200	KGVO	Missoula, Mont.	100
4:30	1200	WNBO	Silverhaven, Pa.	100
	1370	KOOS	Marshfield, Ore.	100
4:40	1310	WRAW	Reading, Pa.	100
	1210	KGY	Olympia, Wash.	100
4:50	940	WAAT	Jersey City, N. J.	300
	1370	KRKO	Everett, Wash.	50
5:00	570	WSYR	Syracuse, N. Y.	250
	1200	KFXD	Nampa, Idaho	100
5:10	600	WCAC	Storrs, Conn.	250
	1370	KVL	Seattle, Wash.	100
5:20	1310	KGEZ	Kalispell, Mont.	100
5:30	1370	KUJ	Walla Walla, Wash.	100
5:40	1310	KGCX	Wolf Point, Mont.	100
5:50	600	KFQD	Anchorage, Alaska	250
6:00	890	KSEI	Pocatello, Idaho	
6:10	1200	KVOS	Bellingham, Wash.	100
6:20	1310	KIT	Yakima, Wash.	100
6:30	1120	KRSC	Seattle, Wash.	100
6:40	1310	KXRO	Aberdeen, Wash.	100
6:50	1120	KFIO	Spokane, Wash.	100
7:00	1210	KFJI	Klamath Falls, Ore.	100
7:10	1310	KMED	Medford, Oregon	100
7:20	1420	KORE	Eugene, Oregon	100

First Tuesday Each Month

E.S.T. (a.m.)	Freq.	Call	Location	Watts
2:00	1210	WQDX	Thomasville, Ga.	100
2:10	1200	WBHS	Huntsville, Ala.	100
2:20	1370	WHBQ	Memphis, Tenn.	100
2:30	1420	WEED	Greenville, N. C.	
2:40	1500	WOPI	Bristol, Tenn.	
2:50	1320	WSMB	New Orleans, La.	
3:00	1370	WMBR	Tampa, Fla.	100
3:10	1420	WNRA	Muscle Shoals City, Ala.	
3:20	1310	WSJS	Winston Salem, N. C.	100
3:30	1500	WHEF	Kosciusko, Miss.	100
3:40	1200	KMLB	Monroe, La.	100
3:50	1370	WAGF	Troy, Ala.	
4:00	1210	WKFI	Greenville, Miss.	100
	1200	KWG	Stockton, Calif.	100
4:10	1310	WTJS	Jackson, Tenn.	100
	1500	KPJM	Prescott, Ariz.	100
4:20	1370	WPFB	Hattiesburg, Miss.	100
	1370	KERN	Bakersfield, Calif.	
4:30	1420	WGPC	Albany, Ga.	
	1500	KXO	El Centro, Calif.	100
4:40	1200	WBNO	New Orleans, La.	
	1210	KIEM	Eureka, Calif.	100
4:50	1310	WROL	Knoxville, Tenn.	100
	1440	KLS	Oakland, Calif.	250
5:00	1500	WDNC	Durham, N. C.	
	1420	KGIX	Las Vegas, Nev.	100
5:10	1200	WJBW	New Orleans, La.	100
	1320	KGMB	Honolulu, Hawaii	250
5:20	1310	WAML	Laurel, Miss.	100
	1370	KRE	Berkeley, Calif.	100
5:30	1210	WSIX	Springfield, Tenn.	100
	750	KGU	Honolulu, Hawaii	2500
5:40	1420	WAMC	Anniston, Ala.	
5:40	1370	KGAR	Tucson, Ariz.	100
5:50	1310	KCRJ	Jerome, Ariz.	100
6:00	1100	KGDM	Stockton, Calif.	250
6:10	1200	KSUN	Lowell, Ariz.	
6:20	740	KTRB	Modesto, Calif.	

First Wednesday Each Month

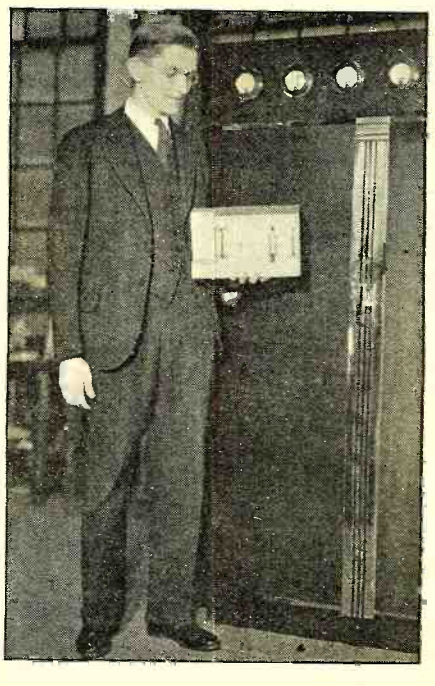
E.S.T. (a.m.)	Freq.	Call	Location	Watts
2:00	1310	WEBR	Buffalo, N. Y.	100
2:10	920	WPEN	Philadelphia, Pa.	
2:20	1310	WSAJ	Grove City, Pa.	100
2:30	1410	WHIS	Bluefield, W. Va.	250
2:40	1310	WFBG	Altoona, Pa.	100
2:50	1200	WPHR	Petersburg, Va.	100
3:00	1310	WKBB	E. Dubuque, Ill.	100
	1370	WDAS	Philadelphia, Pa.	
3:10	1410	WRBX	Roanoke, Va.	250
	1200	WHBC	Canton, O.	100
3:20	1420	KGIW	Trinidad, Colo.	100
	1210	WMBG	Richmond, Va.	100
	1310	WTRC	Elkhart, Ind.	50
	1370	KICA	Clovis, N. M.	100
3:30	1370	WSVS	Buffalo, N. Y.	
	1410	WBCM	Bay City, Mich.	500
	1200	KGHI	Little Rock, Ark.	100
3:40	1420	KIDW	Lamar, Colo.	100
	1310	WGH	Newport News, Va.	
	630	WGBF	Evansville, Ind.	
3:50	1210	WOCL	Jamestown, N. Y.	50
	1410	WROK	Rockford, Ill.	500
	1200	KBTM	Paragould, Ark.	100
4:00	1310	WBOW	Terre Haute, Ind.	100
	880	WQAN	Scranton, Pa.	
	1280	KFBB	Great Falls, Mont.	
4:10	1430	WHEC	Rochester, N. Y.	
	570	WOSU	Columbus, Ohio	
	1370	KGFL	Roswell, N. M.	100
4:20	1310	WBEO	Marquette, Mich.	100
	1190	WSAZ	Huntington, W. Va.	
4:30	1500	WGAL	Lancaster, Pa.	
	570	WKBN	Youngstown, Ohio	
	1250	WCAL	Northfield, Minn.	1000
4:40	1070	WCAZ	Carthage, Ill.	50
	1200	KFJB	Marshalltown, Ia.	100
4:50	1400	WKBF	Indianapolis, Ind.	
	1420	WACO	Waco, Tex.	100
5:00	1070	WDZ	Tuscola, Ill.	100
	1200	KGDE	Fergus Falls, Minn.	100
5:10	900	WLBL	Stevens Pt., Wis.	2500
	1250	WLB	Minneapolis, Minn.	1000
5:20	1400	WBAA	Lafayette, Ind.	
	1200	WIL	St. Louis, Mo.	100
5:30	1440	WTAD	Quincy, Ill.	
	1320	KGHF	Pueblo, Colo.	250
5:40	1240	WXYZ	Detroit, Mich.	

First Thursday Each Month

E.S.T. (a.m.)	Freq.	Call	Location	Watts
2:00	1210	WSOC	Charlotte, N. C.	100
2:10	1420	WSPA	Spartanburg, S. C.	100
2:20	1200	WFBC	Greenville, S. C.	100
2:30	1310	WSGN	Birmingham, Ala.	100
2:40	1420	WJBO	Baton Rouge, La.	100
2:50	1210	WGCM	Mississippi City, Miss.	100
3:00	1500	WRDW	Augusta, Ga.	100
	1200	WHBY	Green Bay, Wis.	100
	1310	WDAH	El Paso, Tex.	100
3:10	1240	WKAQ	San Juan, P. R.	1000
	1420	WJMS	Ironwood, Mich.	100
	1370	KLUF	Galveston, Tex.	100
3:20	1360	WCSC	Charleston, S. C.	500
	1210	WEDC	Chicago, Ill.	100
	1310	KTSM	El Paso, Tex.	100
3:30	1440	WBIG	Greensboro, N. C.	500
	1370	KGKL	San Angelo, Tex.	100
3:40	1340	WCOA	Pensacola, Fla.	500
	1210	WSBC	Chicago, Ill.	100
	1310	KFPM	Greensville, Tex.	15
3:50	1360	WQBC	Vicksburg, Miss.	500
	1420	KFIZ	Fond du Lac, Wis.	100
	1370	KMAC	San Antonio, Tex.	100
4:00	580	WDBO	Orlando, Fla.	250
	1210	WEBQ	Harrisburg, Ill.	100
	1310	KFYO	Lubbock, Tex.	100
4:10	1430	WNBR	Memphis, Tenn.	500
	1500	WMPC	Lapeer, Mich.	100
	1370	KONO	San Antonio, Tex.	100
4:20	560	WQAM	Miami, Fla.	1000
	1210	WHBF	Rock Island, Ill.	100
4:30	1220	WDAE	Tampa, Fla.	1000
	1500	WKBZ	Ludington, Mich.	100
	1370	KFJM	Grand Forks, N. D.	100
4:40	990	WJEM	Tupelo, Miss.	500
	1210	WCBS	Springfield, Ill.	100
4:50	880	WCOC	Meridian, Miss.	500
	1500	WKBV	Connersville, Ind.	100

WBZ-WBZA FREQUENCY STANDARD

During the past five months these two stations have not varied more than 5 cycles from their assigned frequency of 990 kc. This unusual degree of accuracy was made possible through the use of a new crystal oscillator developed by Westinghouse, one of which is shown here in the hands of one of the engineers.



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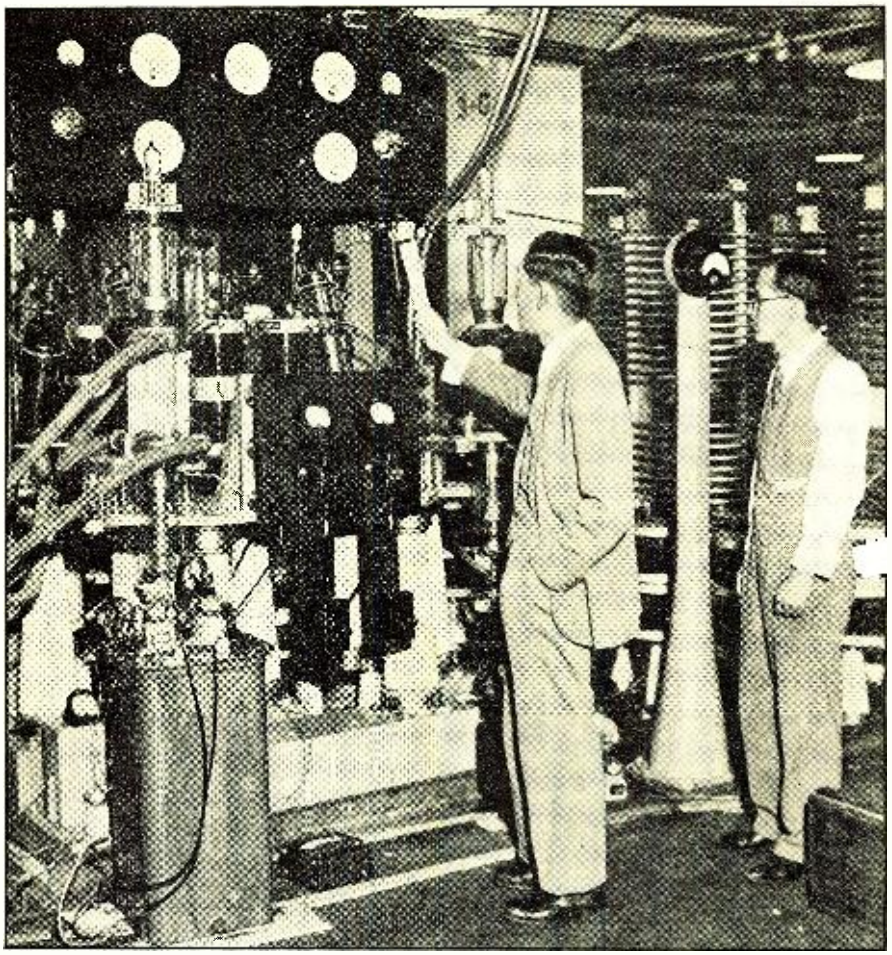
E.S.T. (a.m.)	Freq.	Call	Location	Watts
5:00	1210	WTAX	Springfield, Ill.	100
	1310	KGBX	Springfield, Mo.	100
5:10	1260	WTOC	Savannah, Ga.	500
	1370	WHBD	Mt. Orab, O.	100
	1420	KCMC	Texarkana, Ark.	100
5:20	1210	WHBU	Anderson, Ind.	100
5:30	1370	WIBM	Jackson, Mich.	100
	1420	KGFF	Shawnee, Okla.	100
5:40	1210	WOMT	Manitowoc, Wis.	100
	1500	KNOW	Austin, Tex.	100
First Friday Each Month				
3:00	1210	WJW	Akron, O.	100
	1310	KRMD	Shreveport, La.	100
3:10	1420	WPAD	Paducah, Ky.	100
	1500	KOTN	Hot Springs, Ark.	
3:20	1210	WSEN	Columbus, O.	100
	1310	KFXR	Oklahoma City, Okla.	100
3:30	1420	WELL	Battle Creek, Mich.	50
	1200	KGEK	Yuma, Colo.	100
3:40	1210	WALR	Zanesville, O.	100
	1310	KFPL	Dublin, Tex.	100
3:50	1420	WMBC	Detroit, Mich.	100
	1200	WCAT	Rapid City, S. D.	100
4:00	1310	WFDF	Flint, Mich.	100
	1240	KGCU	Mandan, N. D.	250
4:10	1200	WFBE	Cincinnati, O.	100
	1370	KWYO	Sheridan, Wyo.	
4:20	1450	WGAR	Cleveland, Ohio	
	1240	KLPM	Minot, N. D.	250
4:30	1200	WCLO	Janesville, Wis.	100
	1370	KGFG	Oklahoma City, Okla.	100
4:40	1310	WCLS	Joliet, Ill.	100
	1420	KABC	San Antonio, Tex.	100
4:50	1200	WJBL	Decatur, Ill.	100
	1370	KFJZ	Fort Worth, Tex.	100
5:00	1370	WJBK	Detroit, Mich.	50
	1420	KWCR	Cedar Rapids, Ia.	100
5:10	1210	WIBU	Poynette, Wis.	100
	1500	KGFI	Corpus Christi, Tex.	100
5:20	1370	WHDF	Calumet, Mich.	100
	1420	WLBF	Kansas City, Kans.	100
5:30	1210	WCRW	Chicago, Ill.	100
	1500	KGKB	Tyler, Tex.	100
5:40	1330	WTAQ	Eau Claire, Wis.	
	1420	WMBH	Joplin, Mo.	100
First Saturday Each Month				
2:10	1210	WBRB	Red Bank, N. J.	100
2:20	1500	WWRL	Woodside, N. Y.	100
2:30	1210	WGNY	Chester Twp., N. Y.	50
2:40	1500	WMBQ	Brooklyn, N. Y.	100
2:50	1210	WGBB	Freeport, N. Y.	100
3:00	1430	WOKO	Albany, N. Y.	500
	1200	WJBC	La Salle, Ill.	100
	1330	KTRH	Houston, Tex.	1000
3:10	1370	WGL	Ft. Wayne, Ind.	100
	1210	KFPW	Ft. Smith, Ark.	100
3:20	1200	WWAE	Hammond, Ind.	100
	1120	WTAW	College Sta., Tex.	500
3:30	1310	WLBC	Muncie, Ind.	100
	1210	KASA	Elk City, Okla.	100
3:40	1200	WFAM	South Bend, Ind.	100
	1270	KWLC	Decorah, Ia.	100
3:50	1280	WCAP	Asbury Park, N. J.	
4:00	610	WJAY	Cleveland, O.	500
	1270	KGCA	Decorah, Ia.	100
4:10	1280	WTNJ	Trenton, N. J.	
	1210	KFVS	Cape Girardeau, Mo.	100
	1430	WBNS	Columbus, Ohio	
4:20	950	KGHL	Billings, Mont.	1000
	920	WWJ	Detroit, Mich.	
4:30	1210	KDLR	Devils Lake, N. D.	100
	1380	KQV	Pittsburgh, Pa.	
4:40	1420	WLAP	Lexington, Ky.	
4:50	1200	KFXJ	Grand Junction, Col.	100
	1380	WSMK	Dayton, Ohio	
5:00	560	KFDM	Beaumont, Tex.	500
	940	WAVE	Louisville, Ky.	
5:10	1210	KWTN	Watertown, S. D.	100
	1320	WADC	Akron, Ohio	
5:20	760	WEW	St. Louis, Mo.	1000
	1340	WSPD	Toledo, Ohio	
5:30	1210	KWEA	Shreveport, La.	
5:40	880	WSUI	Iowa City, Ia.	500
5:50	1230	KGGM	Albuquerque, N. M.	250
First Sunday Each Month				
3:00	1290	KLCN	Blytheville, Ark.	100
3:30	1440	KXYZ	Houston, Tex.	250
3:50	1400	KTUL	Tulsa, Okla.	
4:00	1260	KPAC	Brownsville, Tex.	500
4:10	1340	KGDY	Huron, S. D.	250
4:20	1260	KRGV	Harlingen, Tex.	500
4:50	890	KARK	Little Rock, Ark.	250
5:00	570	KGKO	Wichita Falls, Tex.	250
5:20	1010	WNAD	Norman, Okla.	500
5:40	1260	KUOA	Fayetteville, Ark.	1000

Australian DX'er Wants Correspondents

George F. Ingle, Maitland Street, Narrabri, New South Wales, Australia, writes that he would like to correspond with DX listeners of the U. S. His full address is given above for anyone who may desire to write to him.

British Columbia DX Programs

The National Radio Club *DX News* for September 5 includes an interesting paragraph concerning regular monthly DX broadcasts from CJAT, Trail, B. C. These broadcasts are to take place from 3 to 5 a.m. (E.S.T.) on the third Sunday of each month, beginning October 21. F. E. Robinson, manager of the station, believes the programs will be well received in the East, as the 910 kc. channel on which they operate is practically a clear channel. Their power is 250 watts. All correct reports on the transmissions will be verified if mailed within 48 hours, with a 3-cent stamp inclosed.



NEW STATION FOR FAR EAST

This is part of the transmitter under construction at Hsinking, Capitol of Manchuko. When completed this station will operate with a power of 100 kilowatts, making it the most powerful of the Far Eastern stations

National Radio Club

This club was organized in September, 1933, and in the relatively short time since then has grown to surprising proportions, due partly to the fact that the Atlantic Radio Club merged with it last January, and the Central DX Club amalgamated with it in February.

The club issues its *DX News* bulletins weekly from September 1 to May 31, and monthly during the Summer, to all members. This bulletin consists of 4 pages and is alive with interesting news and notes for the DX'er. The membership fee is $1.25 per year, with no initiation fee. Club stationery and stickers are available to members at a small cost. Any readers of this department interested in joining the club may do so by forwarding the required membership fee to Robert H. Weaver, President, 603 West Market Street, York, Pennsylvania.

Mississippi Heard From

Mrs. L. R. Ledbetter of Vicksburg, Miss., modestly sets forth her claims to DX distinction. Consideration her location on the edge of the "static belt," the foreign stations which she has verified constitute an enviable record. Following are the stations, together with Mrs. Ledbetter's remarks on each:

2UE, Sydney, Australia; heard often until after daylight, last spring.

Poste Parisien, Paris; consistently received during January and February, often with great volume.

5CK, Crystal Brook, Australia; heard often last autumn—up to 6:30 a.m.

2CO, Corowa, N. S. W.; reception erratic, best in autumn months, heard to 7 a.m.

4TO, Townsville, Australia; consistent for several months this year, but weak.

4BC, Brisbane, Australia; consistent during autumn.

3AR, Melbourne, Australia; inconsistent.

4RK, Rockhampton, Australia, inconsistent.

4QG, Brisbane, Australia; varying signal strength, but consistent.

2YA, Wellington, N. Z.; inconsistent.

JOIK, Sapporo, Japan; consistent during the whole DX season.

In addition to these, but not verified, the log shows 3LO, Melbourne; 2BL, Sydney, and 21 Japanese stations. Mrs. Ledbetter reports that the Japanese stations were better during the 1933-1934 season than the year before, but that the Australians were not as good as during the 1932-1933 season.

Notes for Buffalo DX'ers

From John C. Kalmbach, Jr., Official RADIO NEWS Listening Post Observer at

(*Continued on page 328*)

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S.W. PIONEERS

Official RADIO NEWS Listening Post Observers

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

United States of America:

Alabama, J. E. Brooks; **Arkansas**, Don Pryor, Jas. G. Moore; **California**, E. G. DeHaven, C. H. Canning, E. S. Allen, A. E. Berger, Ralph Leavitt, Geo. C. Sholin; **Colorado**, Wm. J. Vette, F. Erich Bruhn; **Connecticut**, Geo. A. Smith, H. Kemp; **Florida**, E. M. Law, James F. Dechert; **Georgia**, James L. Davis, C. H. Armstrong, Guy R. Bigbee, John McCarley; **Idaho**, Bernard D. Starr, Lawrence Swenson; **Illinois**, Phillip Simmons, E. Bergeman, Robert L. Weber, Floyd Waters; **Indiana**, Freeman C. Balph; J. R. Flannigan; **Iowa**, J. Harold Lindblom; **Kansas**, C. W. Bourne, Wm. Schumacher; **Kentucky**, Wm. A. McAlister, George Krebs; **Louisiana**, Roy W. Peyton; **Maine**, R. I. Keeler; **Maryland**, Howard Adams, Jr., James W. Smith, J. F. Fritsch; **Massachusetts**, Armand A. Boussy, J. Walter Bunnell, Harold K. Miller, Donald Smith, Elmer F. Orne, Arthur Hamilton, Roy Sanders; **Michigan**, Stewart R. Ruple; **Minnesota**, Dr. G. W. Twomey, M. Mickelson; **Mississippi**, Dr. J. P. Watson, Mrs. L. R. Ledbetter; **Missouri**, C. H. Long; **Montana**, Henry Dobrovalny; **Nebraska**, P. H. Clute, G. W. Renish, Jr., Harold Hansen; **New Hampshire**, P. C. Atwood, A. J. Mannix; **New Jersey**, William Dixon, R. H. Schiller, William F. Buhl; **New Mexico**, G. K. Harrison; **New York**, Capt. Horace L. Hall, S. G. Taylor, John M. Borst, Wm. C. Dorf, R. Wright, I. H. Kattell, Donald E. Bame, Albert J. Leonhardt, Wm. Kochnlein, Edmore Melanson, H. S. Bradley; **Nevada**, Don H. Townsend, Jr.; **North Carolina**, H. O. Murdoch, Jr., W. C. Couch, E. Payson Mallard; **North Dakota**, Dr. F. C. Naegeli; **Ohio**, Oker Radio & Electric Shop, R. W. Evans, C. H. Skatzes, Donald W. Shields, Albert E. Emerson, Samuel J. Emerson, Clarence D. Hall; **Oklahoma**, H. L. Pribble, Robert Woods; **Pennsylvania**, Edward C. Lips, K. A. Staats, C. T. Sheaks, George Lilley, John A. Leininger, F. L. Stitzinger, Hen F. Polm, Chas. Nick; **South Carolina**, Edw. F. Bahan; **South Dakota**, Paul J. Mraz; **Tennessee**, Charles D. Moss, Adrian Smith; **Texas**, Heinie Johnson, Bryan Scott, John Stewart; **Utah**, Harold D. Nordeen; **Vermont**, Joseph M. Kelley, Eddie H. Davenport; **Virginia**, Gordon L. Rich, G. Hampton Allison, D. W. Parsons; **Washington**, A. D. Golden, Glenn E. Dubbe, Chas. G. Payne; **West Virginia**, Kenneth Boord, R. E. Sumner; **Wisconsin**, Willard M. Hardell, Walter A. Jasiorkowski.

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

20 Months of Service

THE 20th installment of the DX Corner for Short Waves features a "World Short-Wave Time-Table" for 24-hour use all over the world. The list starts at 08 G.M.T., which is 3 a.m. E.S.T., and runs through 07 G.M.T., or 2 a.m. E.S.T., right around the clock. The Time-Table contains a list of short-wave stations, logged during the last month in the RADIO NEWS Westchester Listening Post, as well as at other Official RADIO NEWS Short-Wave Listening Posts throughout the world. It provides an hour-to-hour guide for short-wave fans whether experienced or inexperienced. The Time-Table also contains a list of station locations and gives Wavelength, Call Letters, Frequency and Location.

S. W. TIME SCHEDULE

LAURENCE M. COCKADAY

Affiliated DX Clubs

We are inviting the reliable DX clubs to become affiliated with the DX Corner as associate members to act as advisers on short-wave activities in promoting short-wave popularity and reception efficiency. The first Association to respond and become an affiliate is the Society of Wireless Pioneers. Invitations have been sent out to the following short-wave organizations: The United States Radio DX Club of Shrewsbury, Mass.; The Radio Club Venezolano of Caracas, Venezuela; The Pacific States Short-Wave Club of Fallon, Nevada; the Quixote Radio Club of Hendersonville, N. C. Other clubs who wish to become affiliated should make their applications to the Short-Wave DX Editor.

We have received from M. Mickelson, the vice-president of the Society of Wireless Pioneers, the following news notes: "To members of the Short-Wave Pioneers: Don't miss the weekly Saturday night chinfest from KDKA or W8XK from 10 to 10:30 p.m., C.S.T., on short-wave information. D. R. D. Wadio of Bombay, India, has been appointed as Director General of Asiatic Affairs for the Club. Emil V. Olson, of Spokane, Washington, is a new member of the 20-year class. Please note the permanent QRA of the VP, P.O. Box 2754, Bloomington Station, Minneapolis, Minnesota, U. S. A. Another new member is the Vicomte de la Brosse of Paris, France. We have asked His Highness to direct the affairs of the Society for France."

Reception Conditions This Month

O.R.N.S.W.L.P.O.'s report some *very bad* and some *very good* conditions this month. There have been some days at a stretch that the 25-meter band could not be heard and then in the next few days it came in like a thunderbolt. The 31-meter stations are getting louder and the static is beginning to clear up from the 49-meter band. The short-wave stations seem to be leaving the 16- to 19-meter bands for higher wavelengths.

Listening Post Observers and Other Fans, Please Note!

Listed below is this month's partial information regarding short-wave stations heard and reported by our World-Wide Listening Posts. Can you supply actual Time-Schedules, actual Wavelengths, correct Frequencies and any other information regarding them? There are some hard ones to pull in here, so, get busy and try your skill in logging these stations and getting correct information about them. When you are satisfied you are correct, send this information in to the Editor. The list follows:

New station in Lima, Peru, OA4AC on 7820 kc., 38.36 meters, heard from 9 to 11:30 p.m., E.S.T. Some other reports give call as OA4AB, as OA4J and as OA4K. OA4K was reported on 41 meters, but we believe the first one is correct. Other reports give OCN as Lima, Peru, on 38.3 meters, the same time. Another one reports OCP, Lima, Peru, on 10980 kc. and OCJ, Lima, Peru, on 15720kc. OA4AC was also reported heard irregularly on 5780 kc., 51.90 meters and on 61 meters.

Many listeners report *not* hearing XETE.

HJ4ABB on 42 meters reported as 7138 kc. and 7150 kc. from 7 to 11 p.m., E.S.T.

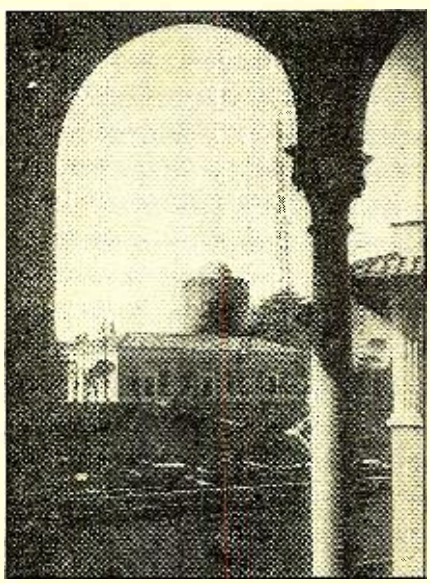
KAY reported on 14980 kc., 5 p.m., E.S.T.

Japanese stations: JVS, JYT reported 8 to 10 p.m., E.S.T.; JVM, on 10740, signs off at 7 a.m., E.S.T.; JVN reported on 10660 relaying JOAK, 4:30 to 7:30 a.m., E.S.T.; JVH, 20.54 meters, reported at 10:30, G.M.T.; JVH on 14600 kc. reported at 13 G.M.T.; JYT reported on 15760 kc.; JYK reported on 13610 kc.; JYS reported heard working KWO, 15344, and KKL, 15410.

HJO, Bogota, Colombia, on 23 meters, reported heard 8:45 to 9 p.m., E.S.T.

SHORT-WAVE STATION HVJ

Looking through the cloister arches at the antennas of station HVJ, of the "Collegio Etiopico" in Vatican City



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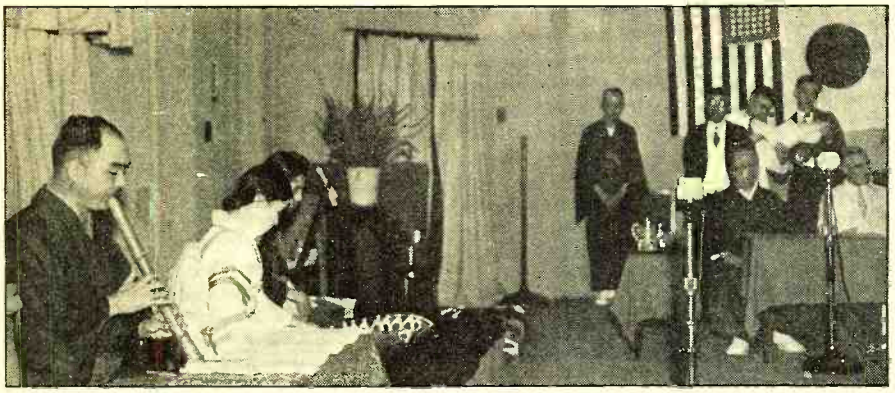


A SCENE IN JAPAN'S BROADCASTING STATION

A special broadcast for America in the studios of JOAK, at Tokyo, broadcast through short-wave station JVM and heard by hundreds of listeners in the United States. Notice the Flags of the United States and Japan draped side by side

YV3RC heard testing with HJ1ABB, 4 to 5 p.m., E.S.T., or near 32 meters.

ZFA, Hamilton, Bermuda, reported heard.

Here is one! La Voz del Topica, 44.7 meters, reported heard. Talks a lot about Costa Rica and says it is a new Central American station and further says they are testing a new Collins transmitter. Call not obtained. We are wondering if this might be T1GP or TI4NRH back on the air. Who knows?

DJE reported heard on 16.89 meters.

There seems to be some mix-up about the call of La Press Nacionale of Rio de Janeiro. Is it PRBA or PRA3?

XEBT can be identified by a long siren wail and cuckoo calls. (Some have mistaken this for CT1AA on a new wavelength.)

DJM reported on 49 meters, testing.

TGW is soon to start on 5940 kc., 50.47 meters, with 125 watts.

W10XEA, Schooner *Morrisey*, heard testing with W2XX, W2GOQ, 4 p.m., E.S.T., on the 20-meter "ham" band.

KNRA heard, on way to Galapagos, 9800 kc., call W1OXG.

DJO on 9540 kc., 31.45 meters, heard relaying the German programs. Heard at 5 p.m.

PHI reported testing with PLE on 25.2 meters, 8 a.m., E.S.T.

HJ3ABD, Bogota, Colombia, reported on 40.54 meters.

CP7, La Paz, Bolivia, reported on 19.6 meters.

HI1A, 47.8 meters, testing for DX, 1 to 2 p.m., E.S.T.

The new call of YV4BSG is YV4RC.

HKE, Bogota, 41.5 meters, reported heard 8 to 9 p.m., E.S.T., Tuesday and Saturday.

A new Roman station, reported relaying IRM programs, on about 9820 kc.

Who has heard FYA, for a number of hours in the late afternoon, on both 25.2 and 25.6 meters, simultaneously?

Listening Post Observers Wanted!

We are especially desirous of locating reliable listening post observers in the following remaining states in the United States of America. Any one feeling that they would like to undertake this work and that they have the necessary qualifications and interest in Short Waves to be able to log stations for us accurately, should make their application for appointment immediately, sending in at the same time a sample log, made at their receiving apparatus: **Arizona, District of Columbia, Rhode Island, Wyoming.**

We also want to locate reliable listening posts in the following countries outside of the United States: **Alaska, Algeria, Argentina, Austria, Belgium, Bolivia, Central America, Colombia; Czechoslovakia, East Indies, Ecuador, Egypt, Finland, Greece, Holland, Hungary, Irish Free State, Italy, Java, Japan, Malay State, Manchuria, Norway, Paraguay, Portugal, Poland, Siberia, Spain, Sweden, U. S. S. R.**

All applications should be accompanied with a statement as to qualifications, the kind of receiving set used, antenna, etc., and a sample log. Appointments will be made as the individual cases are considered and passed upon by the Editor.

The German Transmissions

An official communication from Reichsrundfungesellschaft states that the "D" stations will be on the air as follows: North American programs, DJB from 13 to 16:30, DJD from 22:30 to 3:45, DJC from 22:30 to 3:45; Asia programs, DJD from 5:15 to 7, DJA from 13 to 16:30. A special program is being sent to Australia on Sundays only, DJB and DJA from 9 to 10:30; African program, DJD and DJC from 17 to 21:30; South American programs on DJA from 22:15 to 2:15. All times are G.M.T.

Their letter also states, "It was with much interest that we read of the developments made in your short-wave department in response to the growing vogue in overseas logging and of your Organization of Listening Posts. We shall, of course, be most happy to collaborate with you in keeping you exactly informed of current arrangements as far as German short-wave transmissions are concerned and will see that our schedules are sent to you regularly in advance." They also asked us to relay to our readers their request for reports on their transmission.

TGW Transmissions

An official report from Radiodifusora Nacional, Republica de Guatemala, Centro America, states that TGW is *not* on the air at present on short waves. But they will be on the air shortly on 5940 kc., 50.47 meters, with a power of 100-125 watts. This transmitter is now under construction.

COC Back on Air

An official communication from short-wave radio station COC, Havana, Cuba, states that the station was damaged by fire, but they plan to start transmitting again on August 15, with presumably the same schedule.

Radio Coloniale Transmissions

Official communication from the Ministere des Postes, Telegraphes et Telephones states that they will be on the air as shown in the World Short-Wave Time-Table.

British Transmissions

Official Communication from the British Broadcasting Corporation states that the Empire short-wave transmitters at Daventry will be on the air as shown in this month's Time-Table with the following alternatives: GSC may be substituted for GSB; GSD may be substituted for GSE

(*Continued on page 293*)

S.W. PIONEERS

Official RADIO NEWS Listening Post Observers

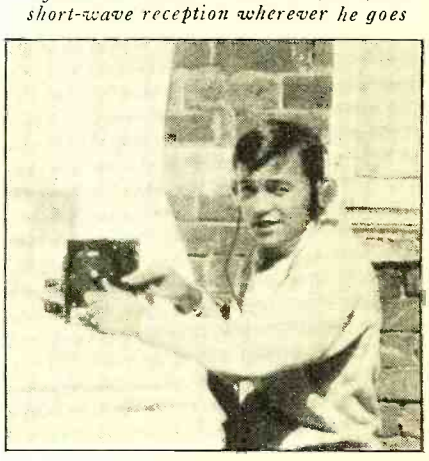
LISTED below by countries are the Official RADIO NEWS Short-Wave Listening Post Observers who are serving conscientiously in logging stations for the DX Corner:

Australia, C. N. R. Richardson, C. Arthur Matthews, A. H. Garth.
Brazil, W. W. Enete, Louis Rogers Gray.
British Guiana, E. S. Christiani, Jr.
British West Indies, E. G. Derrick, Edela Rosa.
Canada, Douglas Wood, Jack Bews, W. H. Fraser, Robert Edkins, Charles Eugene Roy, J. T. Atkinson.
Canary Islands, Manuel Davin.
Chile, Jorge Izquierdo.
China, Baron P. D. N. von Hoyningen-Huene.
Cuba, Frank H. Kydd.
Curacao, R. J. Van Ommeren.
Denmark, Hans W. Priwin.
Dutch East Indies, A. den Breems.
England, Kenneth Judd, C. L. Wright, John J. Maling, Alan Barber, Donald Burns, L. H. Plunkett-Checkemian, L. H. Colburn, Norman C. Smith and John Parkinson, Norman Nuttall, L. C. Styles, Frederick W. Gunn, R. Lawton, R. Stevens, W. P. Kempster, R. S. Houghton.
France, J. C. Meillon, Jr.
Germany, Herbert Lenwartz.
Honduras, R. Wilder Tatum.
Hawaii, O. F. Sternemann.
India, D. R. D. Wadia.
Japan, Masali Satow.
Mexico, Felipe L. Saldaña.
New Zealand, Dr. G. Campbell MacDiarmid, Kenneth H. Moffatt.
Philippine Islands, Victorino Leonen.
Scotland, Duncan T. Donaldson.
South Africa, C. McCormick, Mike Kruger.
Switzerland, E. J. de Lopez, Dr. Max Hausdorff.
Venezuela, Francisco Fossa Anderson.

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

DESIGNS NEW RECEIVER

C. H. Allison, our wide-awake observer for Virginia, shows a tiny new short-wave set he has recently designed and built so that he can have short-wave reception wherever he goes



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WORLD SHORT WAVE TIME-TABLE

The schedule of short-wave broadcasting stations listed below includes only those that are received best in RADIO NEWS LISTENING POSTS. This new schedule is from 8 G. M. T. right around the clock. Both wavelength and frequency are noted for each station. Station locations are found on pages 292 and 293.

International Short-Wave "Best Bets"

Wavelengths in Meters	*Call Letters*	*Frequency in k.c.*
08 G. M. T. 3 A. M. E. S. T.		
25.5	GSD	11750
27.9+	JVM	10740
30.4 Irregular	JYS	9840
31.3 Except Sun.	VK3LR	9580
31.4+ Sun.	LKJ1	9540
31.5 Wed., Sat.	VK3ME	9510
31.5	GSB	9510
38.0+ Irregular	JYR	7880
48.9+ Except Sun.	ZTJ	6122
49.4+ Tues.	VQ7LO	6060
70.2 Except Sun.	RV15	4273
09 G. M. T. 4 A. M. E. S. T.		
19.7 Sun.	DJB	15200
25.5	GSD	11750
27.9+	JVM	10740
28.1	CEC	10670
30.4+	JYS	9840
31.2 Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3 Wed., Sat.	VK3ME	9510
31.3+ Sun.	DJA	9560
31.4+ Sun.	LKJ1	9540
31.5	GSB	9510
38.0+ Irregular	JYR	7880
48.9+ Except Sun.	ZTJ	6122
49.9+ Ex. Tu., Th., Sat.	RV59	6000
70.2 Except Sun.	RV15	4273
10 G. M. T. 5 A. M. E. S. T.		
19.7 Sun	DJB	15200
19.8+ Except Sun.	HVJ	15123
27.9+	JVM	10740
28.1	CEC	10670
30.4+	JYS	9840
31.2+Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3+Sun.	DJA	9560
31.4+	LKJ1	9540
31.5 Wed., Sat.	VK3ME	9510
38.0+ Irregular	JYR	7880
48.9+ Except Sun.	ZTJ	6122
49.4+ Mon., Wed., Fri.	VQ7LO	6060
49.8+ Mon., Wed., Thur	ZHI	6012
50.2 Sun.	HVJ	5969
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
11 G. M. T. 6 A. M. E. S. T.		
14.2+	LSN	21020
16.8 +	GSG	17790
19.8	GSF	15140
25.1+ Sun.	RNE	11924
27.9+	JVM	10740
30.4+	JYS	9840
31.2+ Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3+	W1XAZ	9570
31.3+ Irreg.	VUB	9565
31.4+ Irregular	LKJ1	9540
31.5 Wed., Sat.	VK3ME	9510
38.0+ Irregular	JYR	7880
48.9+ Tu., Fri., Sun.	ZGE	6130
48.9+ Except Sun.	ZTJ	6122
49.4+ Mon. Wed., Fri.	VQ7LO	6060
49.4 + Except Sun.	W8XAL	6060
49.8	CQN	6020
49.8+ Mon.,Wed., Thu.	ZHI	6012
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
12 G. M. T. 7 A. M. E. S. T.		
13.9+	W8XK	21540
14.2+	LSN	21020
16.8+	GSG	17790
16.8 Ex. Tues., Wed.	PHI	17775
19.6+	FYA	15243
19.8	GSF	15140
23.3+ Sun.	CNR	12830
24.8+ Sun.	CT1CT	12082
26.0	XGR	11530
27.9+	JVM	10740
31.2+ Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
31.8	PLV	9415
38.0+ Irregular	JYR	7880
48.9+ Tu., Fri., Sun.	ZGE	6122
49.4+	W8XAL	6060
49.8	CQN	6020
49.8+ Mon., Wed., Thu.	ZHI	6012
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
13 G. M. T. 8 A. M. E. S. T.		
13.9+	W8XK	21540
14.2+	LSN	21020
16.8 +	GSG	17790
16.8+ Ex. Tues., Wed.	PHI	17775
19.6+	CP5	15308
19.6	FYA	15243
19.7	DJB	15200
19.8	GSF	15140
23.3+ Sun.	CNR	12830
24.8+ Sun.	CT1CT	12082
25.1+ Sun.	RNE	11924
26.0	XGR	11530
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+ Irregular	LKJ1	9540
31.8	PLV	9415
48.9+ Sun.	ZTJ	6122
49.2 Thurs., Fri., Sat.	VE9GW	6095
49.3+ Tues.,Thurs.,Irreg.	OER2	6070
49.4+ Thurs.	VQ7LO	6060
49.4+	W8XAL	6060
49.4+ Sun.	OXY	6062
49.8	CQN	6020
49.8+ Mon., Wed., Thur	ZHI	6010
52.9+ Irregular	XQAJ	5663
70.2	RV15	4272
14 G. M. T. 9 A. M. E. S. T.		
13.9+	W8XK	21540
14.2+	LSN	21020
16.8+	GSG	17790
16.8+	W3XAL	17780
16.8+ Ex. Tues., Wed.	PHI	17775
19.6+	CP5	15308
19.6+	FYA	15243
19.7	DJB	15200
19.7+ Irregular	RKI	15170
19.8	GSF	15140
26.0	XGR	11530
31.2+ Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+ Irregular	LKJ1	9540
31.8 Except Sat., Sun.	PLV	9415
48.9+	ZTJ	6122
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.0+ Irregular	VUC	6109
49.2 Thurs., Fri., Sat.	VE9GW	6095
49.3+ Tues.,Thurs.,Irreg.	OER2	6072
49.4+ Irregular	W8XAL	6060
70.2	RV15	4273
80.0 Sun.	CT1CT	3750
15 G. M. T. 10 A. M. E. S. T.		
13.9+	W8XK	21540
14.2+	LSN	21020
15.2+	IkW	19700
16.8+	GSG	17790
16.8+	W3XAL	17780
16.8+ Ex. Tues., Wed.	PHI	17775
19.6+	W2XE	15270
19.6+	FYA	15243
19.7	W8XK	15210
19.7	DJB	15200
19.8	GSF	15140
19.8	VE9DN	15130
19.8+ Irregular	HVJ	15123
25.1+ Sun.	RNE	11924
25.2+	GSE	11860
25.4+ Sun.	W1XAL	11790
30 0+	KAZ	9990
30.5+ Irregular	IRM	9820
31.2 Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+ Irregular	LKJ1	9540
31.8 Irregular	PLV	9410
48.9+	ZTJ	6122
49.0+	YV2RC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.0+ Irregular	VUC	6109
49.2 Thu., Fri., Sat.	VE9GW	6095
49.3+ Tues., Thurs., Ir.	OER2	6072
49.4+ Sun.	VQ7LO	6060
49.4+	W8XAL	6060
49.8+ Sun.	ZHI	6012
49.8+	XEBT	6010
16 G. M. T. 11 A. M. E. S. T.		
13.9+	W8XK	21540
14.2+	LSN	21020
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.6+	W2XE	15270
19.7	W8XK	15210
19.7	DJB	15200
19.8	GSF	15140
25.2	FYA	11900
25.2+	GSE	11860
25.4+ Sun.	W1XAL	11790
30.0+	KAZ	9990
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.3+ Irregular	VUB	9565
31.3+	DJA	9560
31.4+ Irregular	LKJ1	9540
36.2+	CM6XJ	8265
46.5	HJ1ABB	6450
47.8 Tues., Fri.	HH1A	6272
48.7+	YV3RC	6150
48.9+ Except Sun.	ZTJ	6122
49.0+ Sun.	YV2RC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.2 Exc. M., Tu., W.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6072
49.4+ Sat., Sun.	VQ7LO	6060
49.4+	W8XAL	6060
49.8+ Sun.	ZHI	6012
49.8+	XEBT	6010
50.2	HJ2ABC	5973

(*Continued on next page*)

THE WORLD SHORT

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WAVE TIME TABLE

17 G. M. T. 12 Noon E. S. T.

13.9+	W8XK	21540
14.2+	LSN	21020
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.7	W8XK	15210
19.8	GSF	15140
25.2	FYA	11900
25.2+	GSE	11860
25.4	I2RO	11810
25.5	DJD	11760
25.6 Irregular	FYA	11720
26.0 Irregular	XAM	11530
30.6+ Irregular	GCW	9790
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.3+ Irregular	VUB	9565
31.4+ Irregular	LKJ1	9540
40.5 Except Sun.	HJ3ABD	7402
45.3+	RV72	6611
46.5	HJ1ABB	6450
47.5 Sun.	HIZ	6315
47.8 Tues., Fri.	HI1A	6272
48.7+	YV3RC	6150
48.9+	ZTJ	6120
49.0+ Ex. Sat., Sun.	VE9HX	6110
49.0+ Sat.	VUC	6109
49.2 Ex. M., T., Wed.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6072
49.4+ Sat. Sun.	VQ7LO	6060
49.4+	W8XAL	6060
49.8	DJC	6020
49.8+ Sat., Sun.	ZHI	6012
49.8+	XEBT	6010

18 G. M. T. 1 P. M. E. S. T.

13.9+	W8XK	21540
14.2+	LSN	21020
15.2 Irregular	IRW	19700
16.5+	LSY	18115
16.8+	W3XAI	17780
17.3+ Fri.	W3XL	17300
19.7	W8XK	15210
22.7+	ORP	13200
25.2	FYA	11900
25.4	I2RO	11810
25.5	DJD	11760
25.5	GSD	11750
29.0+	ORK	10330
30.4 Sat.	EAQ	9860
30.6+ Irregular	GCW	9790
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
31.5	GSB	9510
40.5	HJ3ABD	7402
47.5 Sun.	HIZ	6315
48.7+	YV3RC	6150
48.9+	ZTJ	6122
49.0+ Except Sat., Sun.	VE9HX	6110
49.0+ Sat.	VUC	6109
49.2 Ex. M., T., Wed.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6072
49.3+ Sun.	VE9CS	6070
49.4+ Sat. Sun.	VQ7LO	6060
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8	DJC	6020
49.8+	XEBT	6010
73.0+ Except Mon.	HCJB	4107
84.6+ Mon. Thu., Sat.	CR7AA	3543

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

16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.5 Ex. Tu., Th., Sat.	W2XAD	15330
19.7	W8XK	15210
22.7+	ORP	13200
25.2	FYA	11900
25.3+	W2XE	11830
25.4	I2RO	11810
25.5	DJD	11760
25.5	GSD	11750
25.6	FYA	11720
29.0+	ZFD	10335
29.0+	ORK	10330
30.4 Sat.	EAQ	9860
30.5+ Irregular	IRM	9820
30.6 Irregular	GCW	9790
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
31.5	GSB	9510
36.2+	CM6XJ	8265
43.8+ Irregular	HAS	6840
46.5+ Sun., very irreg.	HJ1ABB	6447
47.5 Sun.	HIZ	6315
47.8	HI1A	6272
48.9+	ZTJ	6122
49.0+ Sun.	YV2RC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.0+ Sat.	VUC	6109
49.2 Except M., T., W.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6270
49.3+ Sun.	VE9CS	6070
49.4+ Sat.	VQ7LO	6060
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8	DJC	6020
49.8+	XEBT	6010
49.9+	RV59	6000
50.2+	HVJ	5969
73.0+ Except Mon.	HCJB	4107
84.6+ Mon., Thur., Sat.	CR7AA	3543

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

16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.4 Sun., Irregular	HC1FG	15440
19.5+ Ex. Tu., Th., Sat.	W2XAD	15330
19.7	W8XK	15210
22.7+	ORP	13200
25.1+ Sun.	RNE	11924
25.2	FYA	11900
25.3+	W2XE	11830
25.4	I2RO	11810
25.5	DJD	11760
25.5	GSD	11750
25.6	FYA	11720
28.9+	LSX	10350
29.0+	ZFD	10335
29.0+	ORK	10330
30.5+ Irregular	IRM	9820
30.6+ Irregular	GCW	9790
31.2+ Tues., Fri.	CT1AA	9600
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
31.5	GSB	9510
37.3 Sun.	CNR	8035
43.8+ Sun.	HAS	6840
46.5+ Sun.	HJ1ABB	6447
48.9+ Sat.	ZTJ	6122
49.0+ Sun.	YV2RC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.1 Ex. M., W.. Sat.	W9XF	6100
49.2 Ex. Mon., Tues., W	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6072
49.3+ Sun.	VE9CS	6070
49.4+ Sat.	VQ7LO	6060
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8	DJC	6020
49.8+	COC	6010
49.8+	XEBT	6010
49.9+ Irregular	RV59	6000
50.1	TGX	5984
84.6+ Mon., Thurs., Sat.	CR7AA	3543

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

15.9+	PLE	18860
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.4 Sun. Irregular	HC1FG	15440
19.7	W8XK	15210
24.8+ Except Sun.	CT1CT	12082
25.2	FYA	11900
25.2	W8XK	11870
25.4	I2RO	11810
25.5	DJD	11760
25.5	GSD	11750
25.6	FYA	11720
29.0+	ZFD	10335
30.5+ Irregular	IRM	9820
30.6+ Irregular	GCW	9790
31.2+ Tues., Fri.	CT1AA	9600
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
31.4+	DJO	9540
31.5	GSB	9510
31.8+	PLV	9415
37.3+ Sun.	CNR	8035
43.8+ Irregular	HAS	6840
46.5+ Sun.	HJ1ABB	6447
47.5	HIZ	6315
47.8 Sun.	HI1A	6272
48.8+	W8XK	6140
48.9+ Sat.	ZTJ	6122
49.0+ Sun.	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1 Ex. M., Wed., Sat.	W9XF	6100
49.2 Ex. M., Tues., Wed.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8	DJC	6020
49.8+	COC	6010
49.8+	XEBT	6010
49.9+	HIX	6000
49.9 Ex. Tues., Thu. Sat.	RV59	6000

22 G. M. T. 5 P. M. E. S. T.

15.9+ Irregular	PLE	18860
19.4 Sun.	HC1FG	15440
24.8+ Ex. Sun.	CT1CT	12082
25.2	FYA	11900
25.2	W8XK	11870
25.4	I2RO	11810
25.4+ Except Sat.	W1XAL	11790
25.5	DJD	11760
25.5	GSD	11750
25.6	FYA	11720
30.4	EAQ	9860
30.5+ Irregular	IFM	9820
31.2+ Tues., Fri.	CT1AA	9600
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3	HBL	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+	DJO	9540
31.5	GSB	9510
31.5 Irregular	PRBA	9500
38.4+ Sat.	HBP	7790
43.8+ Irregular	HAS	6840
45.0+ Sun.	HC2RL	6668
46.1	HJ5ABD	6504
46.5 Sun. Irregular	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.5	HIZ	6315
48.7+	YV3RC	6150
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	YV2I C	6112
49.0+ Sat.	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Sun.	VE9GW	6095
49.3+	CP5	6080
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5I MO	6070
49.4	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8	DJC	6020
49.8+	COC	6010
49.8+	XEBT	6010
49.9+	HIX	6000
49.+ Irregular	RV59	6000
50.1	YV4RC	5980
50.4	HJ2ABA	5880
50.6 Irregular	HJ4ABE	5860

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

15.9+ Except Sat., Sun.	PLE	18864
19.4 Sun.	HC1FG	15440
25.2	W8XK	11870
25.4+ Sun.	W1XAL	11790
25.5	DJD	11760
25.6	FYA	11720
30.4	EAQ	9860
30.5+ Irregular	IRM	9820
31.2+	XETE	9600
31.3	GSC	9585
31.3	HBL	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+	DJO	9540
31.4+	W2XAF	9530
31.5+ Irregular	PRBA	9500
38.4+ Sat.	HBP	7790
40.5	EA8AB	7403
45.0+ Sun.	HC2RL	6668
46.1	HJ5ABD	6504
46.5 Sun., Irregular	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.8 Sun.	HI1A	6272
48.7+	YV3RC	6150
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon. Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Sun	VE9GW	6095
49.3+ Irregular	CP5	6080
49.3+	W9XAA	6080
49.3+	VE9CS	6070
49.3+ Temporary	YV5RMO	6070
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.5	GSA	6050
49.8	CQN	6020
49.8	DJC	6020
49.8+ Sun., Irregular	COC	6010
49.8+	XEBT	6010
50.1	YV4RC	5984
50.6 Tues., Thurs., Sat.	HJ4ABE	5860
51.4+	HJ2ABC	5824
69.4 Irregular	G6kX	4320

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

15.9+ Except Sat., Sun.	PLE	18860
25.2	W8XK	11870
25.4+ Sun.	W1XAL	11790
25.5	DJD	11760
25.6	FYA	11720

(Continued on next page)

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SHORT-WAVE TIME TABLE

28.9+	LSX	10350
30.4 Sat., Sun.	EAQ	9860
30.5+ Irregular	IRM	9820
31.2+	XETE	9605
31.3	GSC	9580
31.3	HBL	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4	W2XAF	9530
31.5+ Irregular	PRBA	9500
32.8+	CP5	9122
38.4+ Sat., Irregular	HBP	7795
40.5	HJ3ABD	7400
42.0	HJ4ABB	7138
45.0+ Sun.	HC2RL	6660
46.1	HJ5ABD	6504
46.5+	HJ1ABB	6447
46.6+ Fri.	W3XL	6425
47.8	HJ3ABF	6275
48.7+	YV3RC	6150
48.8+	W8XK	6140
48.9+	ZGE	6130
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.2 Sun.	VE9GW	6095
49.3+ Irregular	CP5	6080
49.3+	W9XAA	6080
49.3+	VE9CS	6070
49.3+ Temporary	YV5RMO	6070
49.5	GSA	6050
49.8+	CON	6020
49.8	DJC	6020
49.8+ Sun.	COC	6010
49.8+	XEBT	6010
49.9+	HIX	6000
50.1	TGX	5984
50.1	YV4RC	5984
50.4 Irregular	HJ2ABA	5880
50.6 Except Wed., Sun.	HJ4ABE	5860
51.4+	HJ2ABC	5824
69.4 Irregular	G6RX	4320

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

15.9 Except Sat., Sun.	PLE	18800
25.2	W8XK	11860
25.5	DJD	11772
25.6	FYA	11760
25.6	CJRX	11720
31.2	XETE	9600
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+	W2XAF	9530
37.5	HC2JSB	8000
40.5+	HJ3ABD	7402
42.0	HJ4ABB	7138
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri	W3XL	6425
47.8	HJ3ABF	6275
47.8	HI1A	6272
48.7+	CJRO	6150
48.7+	YV3RC	6150
48.8+	W8XK	6140
48.9+	ZTJ	6122
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2+ Except Fri., Sat.	VE9GW	6095
49.3+ Irregular	CP5	6080
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5RMO	6070
49.4+	W3XAU	6060
49.8	DJC	6020
49.8+	COC	6010
49.8+	XEBT	6010
49.9+	HIX	6000
50.1 Irregular	YV4RC	5984
50.1	TGX	5980
50.4 Irregular	HJ2ABA	5880
50.6 Mon., Wed., Fri.	HJ4ABE	5860
51.4	HJ2ABC	5824
69.4 Irregular	G6RX	4320
73.0+ Except Mon.	HCJB	4107

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

25.2	W8XK	11870
25.5	DJD	11760
25.6	CJRX	11720
28.1	CEC	10670
31.2+	XETE	9600
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+	W2XAF	9530
37.5	HC2JSB	8000
38.3+	OA4AC	7820
40.5+ Except Sun.	HJ3ABD	7402
42.0	HJ4ABB	7138
46.6+ Fri.	W3XL	6425
47.5 Sat.	HIZ	6315
47.8	HJ3ABF	6275
47.8	HI1A	6272
48.7+	CJRO	6150
48.7+	YV3RC	6150
48.8+	W8XK	6140
48.9+	ZTJ	6122
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.3+ Irregular	CP5	6080
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5RMO	6070
49.4+	W3XAU	6060
49.4+	W8XAL	6060
49.8	DJC	6020
49.8+ Sat., Sun.	ZHI	6012
49.8+ Sat.	COC	6010
49.8+	XEBT	6010
49.8— Sat., Sun.	ZHI	6012

07 G. M. T. 2 A. M. E. S. T.

22.0	JYK	13610
27.9+	JVM	10740
30.4+	JYS	9840
31.2+	VK2ME	9590
25.5	GSD	11750
31.2+ Irregular	XETE	9600
31.5	GSB	9510

Station Locations

Wavelength Meters	Call Letters	Frequency Kc.	City Country
13.9+	W8XK	21540	Pittsburgh, Pa.
13.9+	GSH	21470	Daventry, England
14.2+	LSN	21020	Buenos Aires, Argen.
15.2+	IRW	19760	Rome, Italy
15.9+	PLE	18860	Bandoeng, Java
16.5	LSY	18115	Buenos Aires, Argen.
16.8+	GSG	17790	Daventry, England
16.8+	W2XAL	17780	Bound Brook, N. J.
16.8+	PHI	17775	Huizen, Holland
17.2+	J1AA?	17380	Kemikawa-Cho, Jap.
17.3+	W2XL	17300	Bound Brook, N. J.
19.4	HC1FG	15440	Riobamba, Ecuador
19.5	W2XAD	15330	Schenectady, N. Y.
19.6+	CP5	15308	La Paz, Bolivia
19.6+	W2XE	15270	New York, N. Y.
19.6+	FYA	15243	Pontoise, France
19.7	W8XK	15210	Pittsburgh, Pa.
19.7	DJB	15200	Zeesen, Germany
19.7+	RKI	15170	Moscow, U. S. S. R.
19.8	GSF	15140	Daventry, England
19.8	HVJ	15133	Vatican City
22.0	JYK	13610	Kemikawa-Cho, Jap.
22.7+	ORP	13200	Ruysselede, Belg.
23.3	CNR	12830	Rabat, Morocco
24.8+	CT1CT	12082	Lisbon, Portugal
25.1+	RNE	11924	Moscow, U. S. S. R.
25.2	FYA	11900	Pontoise, France
25.2	W8XK	11870	Pittsburgh, Pa.
25.2+	GSE	11860	Daventry, England
25.3+	W2XE	11830	New York, N. Y.
25.4	2RO	11810	Rome, Italy
25.4	W1XAL	11790	Boston, Mass.
25.5	DJD	11760	Zeesen, Germany
25.5	GSD	11750	Daventry, England
25.6	FYA	11720	Pontoise, France
25.6	CJRX	11720	Winnipeg, Canada
26.0	XGR	11530	Shanghai, China
26.8	CT3AQ	11180	Funchal, Madeira
27.9+	JVM	10740	Nagasaki, Jap.
28.1	CEC	10670	Santiago, Chile
28.9+	LSX1	10350	Buenos Aires, Argen.
29.0+	ZFD	10335	Hamilton, Bermuda
29.0+	ORK	10330	Ruysselede, Belgium
30.0	KAZ	9990	Manila, P. I.
30.4	EAQ	9860	Madrid, Spain
30.4+	JYS	9840	Kemikawa-Cho. Jap.
30.5+	IRM	9820	Rome, Italy
30.6+	GCW	9790	Rugby, England
31.2+	XETE	9600	Mexico City, Mexico
31.2+	CT1AA	9600	Lisbon, Portgual
31.2+	W3XAU	9590	Philadelphia, Pa.
31.2+	VK2ME	9590	Sydney, Australia
31.3	HBL	9580	Geneva, Switzerland
31.3	VK3LR	9580	Lindhurst. Victoria. Australia
31.3	GSC	9575	Daventry, England
31.3+	W1XAZ	9570	Springfield, Mass.
31.3+	VUB	9565	Bombay, India
31.3+	DJA	9560	Zeesen, Germany
31.4+	LKJ1	9540	Jeloy, Norway
31.4+	W2XAF	9530	Schenectady, N. Y.
31.5	VK3ME	9510	Melbourne, Australia
31.5	GSB	9510	Daventry, England
31.5+	PRBA	9500o	Rio de Janeiro, Br.
31.8	PLV	9415	Bandoeng, Java

(*Continued on next page*)

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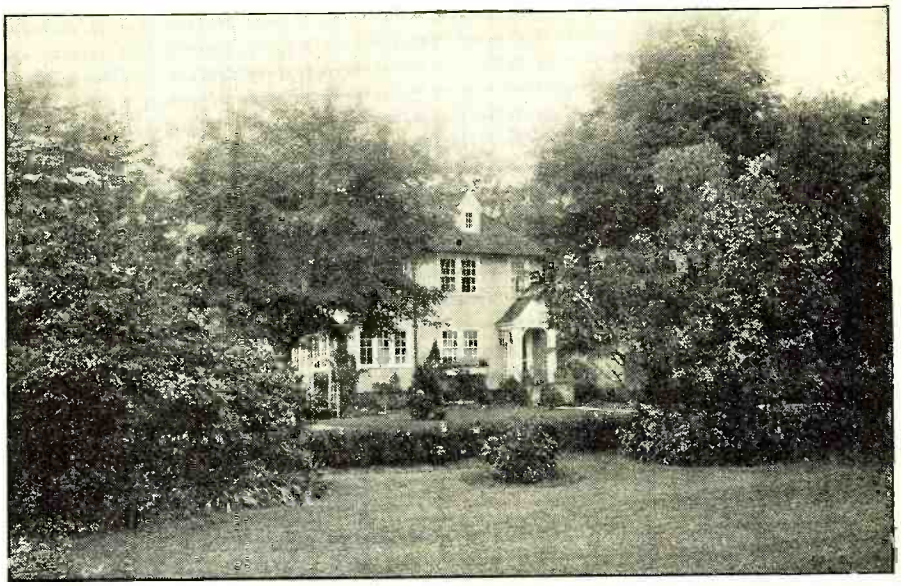
36.2+	CM6XJ	8265	Tuinucu, Cuba
36.6+	PSK	8185	Rio de Janeiro, Braz.
37.3	CNR	8035	Rabat, Morocco
37.5	HC2JSB	8000	Guayaquil, Ecuador
38.0+	JYR	7880	Kemikawa-Cho. Jap.
38.3	OA4AC	7820	Lima, Peru
38.4+	HBP	7790	Geneva, Switzerland
40.5+	HJ3ABD	7402	Bogota, Colombia
42.0	HJ4ABB	7138	Manizales, Col.
43.8+	HAS	6840	Budapest, Hungary
44.8	YNLF	6692	Managua, Nicaragua
45.0+	HC2RL	6668	Guayaquil, Ecuador
45.3	PRADO	6618	Riobamba, Ecuador
45.3+	RV72	6611	Moscow, U. S. S. R.
46.1	HJ5ABD	6504	Cali, Colombia
46.5+	HJ1ABB	6447	Barranquilla, Col.
46.6	W3XL	6425	Bound Brook, N. J.
47.5	HIZ	6315	San Domingo, D. R.
47.8	HJ3ABF	6275	Bogota, Colombia
47.8	HI1A	6272	San Domingo, D. R.
48.7+	CJRO	6150	Winnipeg, Manitoba
48.7	YV3RC	6150	Caracas, Venezuela
48.7	VE9CL	6150	Winnipeg, Man.
48.8+	W8XK	6140	Pittsburgh, Pa.
48.9+	ZGE	6130	Kuala Lumpur, F. M. S.
48.9+	ZTJ	6122	Johannesburg, Africa
49.9	W2XE	6120	New York, N. Y.
49.0+	YV2RC	6112	Caracas, Ven.
49.0+	VE9HX	6110	Halifax, N. S.
49.0+	VUC	6109	Calcutta, India
49.1+	W3XAL	6100	Bound Brook, N. J.
49.1+	W9XF	6100	Chicago, Ill.
49.2	VE9GW	6095	Bowmanville, Can.
49.3+	CP5	6080	La Paz, Bolivia
49.3+	W9XAA	6080	Chicago, Ill.
49.3+	OER2	6072	Vienna, Austria
49.3+	VE9CS	6070	Vancouver, B. C.
49.3+	YV5RMO	6070	Maracaibo, Venez.
49.4+	VQ7LO	6060	Nairobi, Kenya, Afr.
49.4+	W8XAL	6060	Cincinnati, Ohio
49.4+	W3XAU	6060	Philadelphia, Pa.
49.4+	OXY	6060	Skamlebaek, Den.
49.5+	GSA	6050	Daventry, England
49.6+	W4XB	6040	Miami, Fla.
49.8	DJC	6020	Zeesen, Germany
49.8	CQN	6020	Macao, China
49.8+	ZHI	6012	Singapore, Malaya
49.8+	COC	6010	Havana, Cuba
49.8+	XEBT	6010	Mexico City, Mex.
49.9+	VE9DN	6005	Montreal, Quebec
49.9+	HIX	6000	San Domingo, D. R.
49.9+	RV59	6000	Moscow, U. S. S. R.
50.1	YV4RC	5984	Caracas, Venezuela
50.1	TGX	5984	El Liberal, Guatemala
50.2+	HVJ	5969	Vatican City
50.4	HJ2ABA	5880	Tunja, Colombia
50.6+	HJ4ABE	5860	Medellin, Colombia
51.4+	HJ2ABC	5824	Cu Cuta, Colombia
52.9+	XQAJ	5660	Shanghai, China
69.4	G6RX	4320	Rugby, England
70.2	RV15	4273	Khabarovsk, Siberia
73.0	HCJB	4107	Quito, Ecuador
80.0	CT1CT	3750	Lisbon, Portugal
84.6+	CR7AA	3543	Lourenzo Marques, Mozambique



HOME OF THE WESTCHESTER LISTENING POST AT PELHAM, N. Y.

Here is where the apparatus for "our" central Short Wave Listening Post is set up. Five directional antennas are used and any of these can be employed at will

The DX Corner (Short Waves)

(*Continued from page* 289)

and GSA may be substituted for GSD or vice versa.

Radio-Maroc Transmissions

Official communication from Direction de L'Office des Postes, Des Telegraphes et Des Telephones at Morocco states that they will be on the air as shown in this month's World Short-Wave Time-Table. The antenna power of this station is 10 kilowatts.

Report from Tenriffe, Canary Islands

"All our listening is on short waves." Thus does Manuel Eavin, Official RADIO NEWS Short-Wave Listening Post Observer for this Island, begin his report. He reports that Russia, Holland, Germany and England come in like local stations. W3XAL is his best American station. He uses a Philco, model 43, all-wave super and an RCA model 141E super.

Best Bets in North Dakota

W. H. McKinley of Des Lacs reports the following Best Bets on a Silver-Marshall: GSF, FYA, DJD, GSD, EAQ, DJA, XETE, W8XK, CJRX, W3XL, W3XAU, W9XF, VE9GW, W8XAL, W2XAF.

Best Bets from California

O.R.N.S.W.L.P.O. E. G. De Haven, of Los Angeles, reports the following Best Bets on a Howard 8-tube all-wave receiver: CJRX, VK2ME, VK3ME, VK3LR, LSX, PLE, PLV, JVM. He mentions that EAQ is very weak lately.

Report from Canada

Observer C. E. Roy sends in the following Best Bets for his location: All the British stations and German stations, FYA, CJRO, EAQ, HBL, ORK, PRBA, XEBT, HJ3ABI, W8XK, W3AU, W1XAZ, W2XAF, W2XE, VE9GW, W8XAL, PHI. He asks, "Has anyone heard Rugby using the call GPJ, on 13415 kc., testing and sending music?"

Australia Report

Official Observer H. A. Mathews, of Culgoa, Victoria, Australia, reports the following World Best Bets: FYA, GSD, GSB, VK2ME, RV15, DJD, W8XAL. He mentions that W1XAZ, who used to come in very strong, has not been heard lately.

Ohio Reports

The Emerson brothers' (Sam J. and Albert E.) reports have been consolidated. Sam reports DJO on 9540 kc. and OA4AC of Lima, Peru, as valuable new catches, and our own Westchester Listening Post verifies him. Albert E., not to be outdone, sends in verifications from YV4BSG with the information the call is changed to YV4RC. Also, he gives us information on radio station PRBA, at Rio de Janeiro, relaying the program of the Radio Club of Brazil. He also sends in verifications of JVM, CT1AA, IRM, HAT, HI1A, VK2ME, RNE, RV59, as well as a host of other information included in this month's Time-Table. (Hot stuff, you radio brothers! Keep it up.)

Consolidated Report from British Observers

We are grateful to our brother Observers in England and Scotland for the following list of Best Bets and for much of the information included this month in the Time Schedule. The reports were received from D. T. Donaldson, of Kelty, Fife, Scotland; Norman Smith, of Sidcup, Kent, England; R. S. Haughton, of Abram, Lancashire, England; L. C. Styles, of Ingatestone, Essex, England; W. W. Kempster, Rosside, Ulverston, Lancashire, England, F. W. Gumm, of Gossfield, Essex, England. The Best Bets reported are: DJA, DJE, etc., EAQ, HBP, HBL, VUB, W2XAF,

INTERIOR OF THE "SUMMER" LISTENING POST, AT PELHAM

This apparatus is continually being changed and shifted around as new sets are designed, perfected and brought in for test. The Summer Listening Post is in a long room, directly over the regular fixed installation. Feeders run to both Posts

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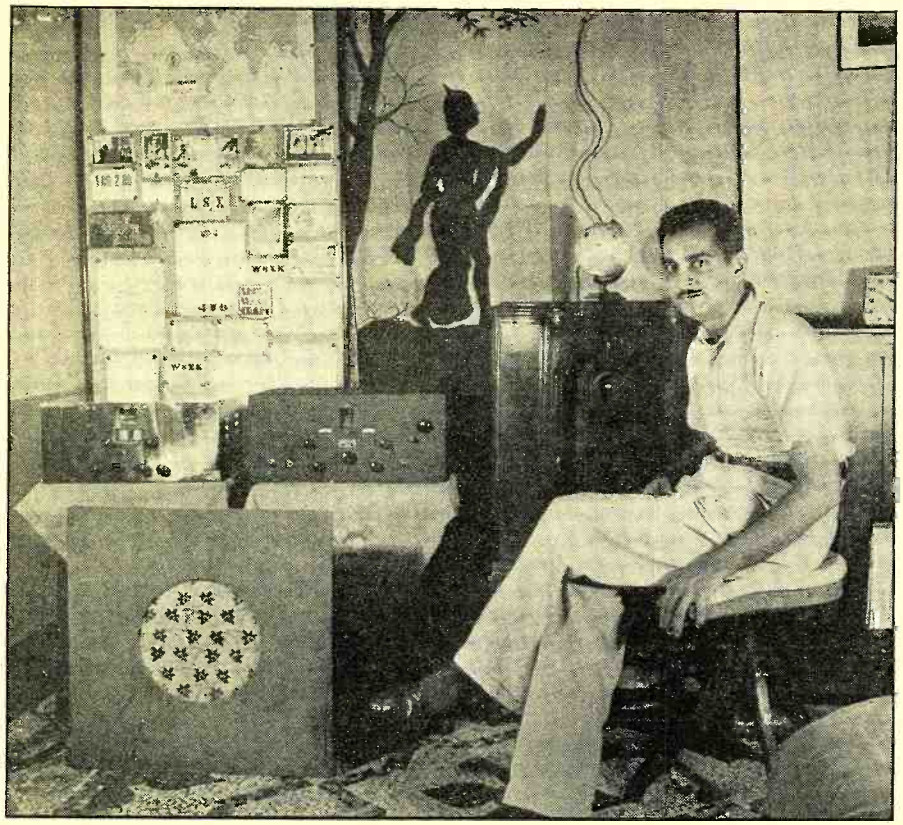

O.R.N.S.W.L.P.O. FOR INDIA

D. R. D. Wadia, seated at his DX Corner with his 11-tube all-wave radio receiver and with two other fine DX receivers on tables at the left. In the background is seen a few of his many verification cards from hard-to-get stations all over the world.

HVJ, FYA, EAQ, CT1AA, LKJ1, W8XK, W9XF, W3XAL, W8XAL, VQ7LO, RV59, RV72, HBP, RV15, VK3LR, HJ4ABB, VK2ME, HCJB, HC1FG, RNE, W1XAL, PRBA, HJ1ABB, W3XL, YV2RC, VUC, ZTJ, HIZ, ZHI, CJRX, YV3RC, W1XAZ, HJ3ABF, CP5, XETE, JVH, CT1CT, LSX, ORK, OXY, COC, W3XAU, W1OXDA.

Report from Arkansas

O.R.N.S.W.L.P.O. Don Pryor reports the following Best Bets on a 7-tube all-wave superhet: GSB, HIZ, HJ1ABB, JVM, VK2ME, VK3ME, XETE, DJD, FYA, W3XAU, and the other American short-wave stations.

Best Bets from Oregon

Observer G. R. Johnson, of Medford, who is also senior radio operator of the Air Navigation Division, United States Department of Commerce, radio station KCX, reports the following Best Bets: W8XK, W2XAF, W1XAZ, W3XAU, FYA, GSA, GSC, GK3ME, VK3LR, XETE, CJRX, W9XF, W3XAL, W8XAL, YV1RC, VK1RC, VK2ME, JVM.

Best Bets from Tennessee

C. D. Moss, of Dyersburg, reports the following Best Bets for his location: GSD, DJD, FYA, CJRO, EAQ, VK2ME, VK3ME, DJA, CT1AA, GSC, GSB, XEBT, VK3LR and the American stations.

Honduras Report

Observer R. W. Tatum, of Trujillo, reports the following Best Bets in his location: W3XAL, W3XL, W8XK, GSF, GSD, DJD, FYA, EAQ, GSC, W2XAF, HJ1ABB, YV3RC, YV5RMO, W8XAL.

Mexican Report

O.R.N.S.W.L.P.O. F. L. Saldana, of Huamantla, Tlax, Mexico, reports the following Best Catches for this month: JVM, HI1A, Las Voz Del Tropico, 44.7 meters, GSD, CJRX, VK2ME, YV4RC, DJC, COC, RV15, KFZ.

Report from Denmark

Official Observer Hans W. Prinwin, of Copenhagen, Denmark, reports great improvement in South American reception with the following Best Bets in his location: PRBA, HJ1ABB, CP5, XGD2 (Shanghai on 22.2 meters), W8XK, W2XE, W2XAB, W2AF, W1XAL, W1XAZ, W3XL, VE9GW, DJO, OER2.

Readers Who Helped Log Stations for This Month's Report

We are indebted to the following readers of RADIO NEWS who furnished important information in their reports of short-wave reception this month: Albert Emerson, Cleveland, O.; Tositado Matuyuki, Kemikawa-cho, Chiba-ken, Japan; George Zaphir, Hollywood, Calif.; P. Trautner, Nairobi, Kenya Colony; R. Wynn, London, England; Wm. Arbrey, Paris, France; Luis Caras, Jr., Havana, Cuba; D. A. Myer, Pittsburgh, Pa.; Wm. A. Oker, Cincinnati, O.; J. C. Kalmbach, Jr., Buffalo, N. Y.; J. M. Kelley, N. Bennington, Vt.; J. T. Spalding, Louisville, Ky.; J. Colby, Hamilton, Ont., Can.; A. E. Stewart, Charlotte, N. C.; F. L. Saldana, Huamantla, Tlax, Mexico; (Mrs.) L. R. Ledbetter, Vicksburg, Miss.; R. W. Peyton, Shreveport, La.; J. Bews, Revelstoke, B. C., Can.; F. W. Gunn, Gosfield, Essex, England; W. Koehnlein, New York City; G. A. Smith, New London, Conn.; B. T. McCoun, Quogue, N. Y.; C. Miller, Covington, Ky.; F. N. Howell, Middletown, Del.; H. G. Dage, Jr., Highland Park, Mich.; F. F. Anderson, Caracas, Venezuela; R. S. Houghton, Abram, Lancs., England; H. W. Priwin, Copenhagen, Denmark; D. T. Donaldson, Kelty, Fife, Scotland; G. E. Deering, Jr., Shrewsbury, Mass.; N. Smith, Kent, England; C. D. Hall, Chillicothe, O.; J. Ma. Maranges, Madrid, Spain; P. J. Mraz, Keystone, S. D.; H. Adams, Jr., Baltimore, Md.; M. Mickelson, Bloomington, Ill.; R. L. Weber, West McHenry, Ill.; G. H. Fletcher, Bartow, Fla.; A. den Breems, Lindeteves Stokvis, Batavia; W. P. Kempster, Ulverston, Lancs., England; M. Davin, Santa Cruz of Teneriffe, Canary Islands; J. G. Moore, West Memphis, Ark.; S. Solon, Ottawa, Kans.; H. Kemp, Waterbury, Conn.; E. Melanson, Albany, N. Y.; K. R. Boord, Smithfield, W. Va.; M. Berglund, San Francisco, Calif.; E. S. Allen, Berkeley, Calif.; H. Bass, Princeton, Ind.; F. H. Kydd, Ceballos, Cuba; R. Wilder Tatum, Trujillo, Honduras; C. Moss, Dyersburg, Tenn.; R. H. Illson, Auburn, N. Y.; L. G. Chavez, Los Angeles, Calif.; J. T. Atkinson, Minnedosa, Man., Can.; G. C. Sholin, San Francisco, Calif.; H. L. Nix, Ft. Worth, Tex.; J. P. Klein, Milwaukee, Wis.; S. J. Emerson, Cleveland, O.; H. Johnson, Big Spring, Tex.; R. J. Van Ommeren, Otrabanda, Curacao; C. Nick, Philadelphia, Pa.; G. R. Johnson, Medford, Ore.; J. Latta, Buffalo, N. Y.; R. Woods, Sand Springs, Okla.; S. Millen, Roxbury, Mass.; H. Lenwartz, Essen, Germany; J. L. Davis, Savannah, Ga.; L. Swenson, Eden, Idaho; L. C. Styles, Essex, England; C. H. Skatzes, Delaware, O.; D. A. Gilfoy, Needham, Mass.; Baron von Huene, Tientsin, China; D. W. Shields, Roseville, O.; H. Holmes, Philadelphia, Pa.; E. Kaszynski, Southbridge, Mass.; Dr. G. W. Twomey, Fort Snelling, Minn.; J. Emerson, Detroit, Mich.; C. A. Steele, Port Arthur, Tex.; D. R. D. Wadia, Bombay, India; F. Hilburn, Yoakum, Tex.; J. E. Brooks, Montgomery, Ala.; J. F. Fritsch, Baltimore, Md.; H. Arthur Matthews, Victoria, Australia; P. Simmons, Chicago, Ill.; W. H. McKinley, Des Lacs., N. D.; C. E. Roy, Montreal, Can.; R. Thompson, Cowden, Ill.; E. G. De Haven, Los Angeles, Calif.; F. Waters, Charleston, Ill.; F. C. Balph, Indianapolis, Ind.; J. McCarley, Decatur, Ga.; B. D. Starr, Buhl, Idaho; W. Schumacher, Ellis, Kans.; C. Michalczyk, Phil-

(*Continued on page* 317)

"PEDRO EL GAUCHO"

This is Peter, the tango singer, featured on short-wave station XEBT of Mexico City.

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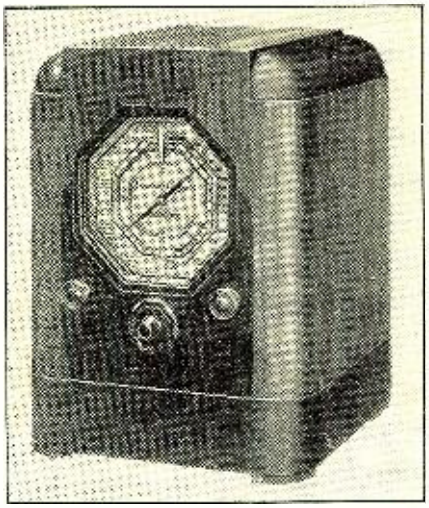
ADAPTING BROADCAST SETS TO SHORT WAVES

with a

S. W. CONVERTER

(Stromberg-Carlson No. 69 Selector)

A good broadcast-band receiver, plus the converter described here, results in all-wave performance equalling that of the best of all-wave receivers



WHILE the great majority of radio sets sold today are of the all-wave" type, there are many thousands of radio listeners who are equipped with high-quality receivers which were purchased before the short waves became popular and which therefore do not cover the short-wave ranges. Where such receivers are still providing highly satisfactory service in the broadcast band, the owners, logically enough, do not feel justified in discarding them in favor of new all-wave models.

It is for just such situations that the Stromberg-Carlson No. 69 all-wave selector was developed. This is a short-wave converter which, when connected ahead of a standard broadcast receiver (of either the superheterodyne or tuned r.f. types), permits the standard receiver to function just as before but in addition permits all short-wave ranges from 12 to 200 meters (25,000 kc.-1500 kc.) to be tuned in. The four-tuning ranges thus made available are:

Range A—Standard broadcast—540 to 1500 kc.—in regular receiver (555 to 200 meters).

Range B—1430 to 4200 kc. (209.7 to 7.4 meters).

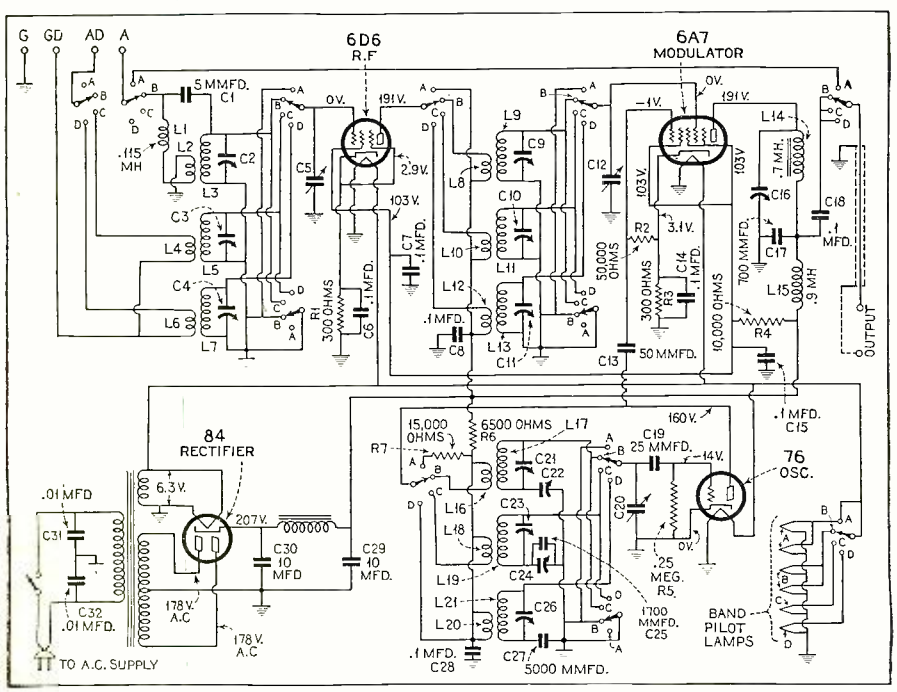
Range C—3.7 to 10.5 megacycles (81 to 28.5 meters).

Range D—9 to 25 megacycles (33.3 to 12 meters).

The locations of the police bands and the 14-, 16-, 19-, 25-, 31- and 49-meter short-wave broadcast bands are indicated by heavy black lines and designations on the dial.

The lower frequency range of the No. 69 selector is calibrated in kilocycles, while the two higher frequency ranges (C and D) are calibrated in megacycles (1000 kilocycles = 1 megacycle).

These ranges are quickly selected by means of a rotary switch on the front panel. Ease and convenience of operation are assured by the vernier drive with double knob, and the "selectorlite" dial that indicates which range is in service by illuminating the corresponding portion of the dial. The left-hand large-scale sector carries condensed instructions for operation and remains illuminated as long as the selector is turned "on," but when only that portion of the dial is illuminated, it is an indication that the antenna circuit is connected straight through to the regular receiver for standard broadcast reception. When the selector is turned off, all dial lights are out. The range switch should be left in the all counter-clockwise position when turning off the selector so that the regular receiver will be operative. It need be turned "on" only when it is desired to tune in short-wave stations.



An automatic antenna selector is provided in conjunction with the range switch, so that if it is desired to use two different antennas, one for the two short-wave ranges and another for the broadcast and police ranges, they will be automatically selected with the desired range.

From the circuit operation standpoint every effort has been made to obtain the highest efficiency. An r.f. amplifier stage (6D6 tube) is used ahead of the modulator or first detector tube (6A7 tube), and a separate oscillator tube (–76) is used to excite the control grid of the oscillator portion of the 6A7 modulator tube rather than using it as a self-oscillator. This latter arrangement avoids degenerative effects at the higher frequencies.

The sensitivity is made as uniform as possible over each range in the selector by a special arrangement on the range switch, which shorts out the secondary coils of the next lower frequency band to the one in use.

A trimmer condenser in the tuned output circuit of the selector provides an adjustment whereby the maximum transfer of signal between the selector and the input of the broadcast receiver is obtained. This adjustment should be made with a fairly weak station when the dial of the broadcast receiver is set to 545 kilocycles, the output frequency of the selector.

The selector is entirely self-powered when connected to a source of 105-125 volts, 50-60 cycle current. This eliminates any tampering with the circuits of the broadcast receiver.

Report on Tests

One of these No. 69 selectors was set up at the RADIO NEWS Listening Post at Fairfield, Connecticut, for test. It was connected up to a high-grade broadcast receiver and next to it was set up one of the best of the modern all-wave sets, for purposes of comparison. Every effort was made to have all conditions equal for the two installations.

In actual (*Continued on page 327*)

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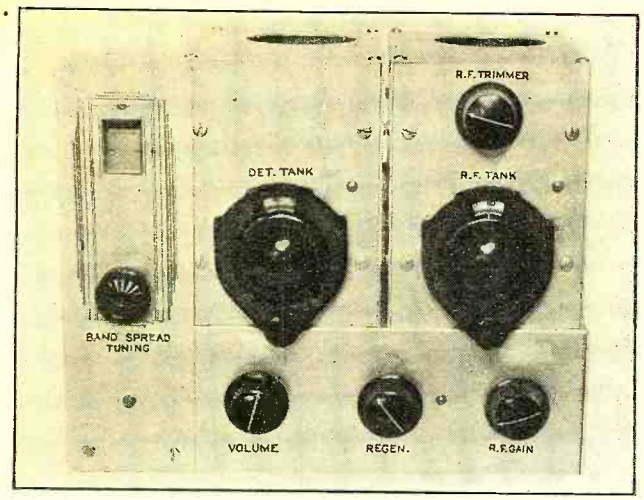


SHORT-WAVE BROADCAST BUILD THIS

(Three-Tube Tuned R. F.

A highly developed short-wave and regeneration are combined to low noise level. The second part month and will give all

Dale Pollack and

Part

RADIO NEWS Laboratory Receiver No. 2

THIS, the second of the series of receivers being developed in the RADIO NEWS Laboratory, is not unusual in so far as the circuit employed is concerned. It is the attention to design detail that makes it an outstanding performer. Included among its features are:

1. Continuous band spreading.
2. Extreme sensitivity.
3. Two tuned circuits for selectivity.
4. Battery or power pack operation.
5. Flexible control of sensitivity and volume.
6. Complete freedom from r.f.-detector interlocking.
7. Single dial band-spread tuning.
8. Most favorable L/C ratios for all important bands.
9. Covers from 9.4 meters to 560 meters continuously.
10. Ample output for loudspeaker operation. Outputs for headphones, magnetic speakers or dynamic speakers.
11. No body capacity.
12. Complete freedom from hum when a.c. operated.

THE advantages of a really good stage of r.f. amplification, ahead of a regenerative detector are not fully appreciated by the average short-wave constructor. The outstanding ability of such receivers as the National SW-3 and a few other such commercial receivers are widely recognized but as a rule the home constructor has not been very successful in applying r.f. tubes in regenerative receiver circuits. The outstanding reason for this failure has been the lack of proper shielding and filtering, and a contributing cause has been the use of coils of unsuitable design.

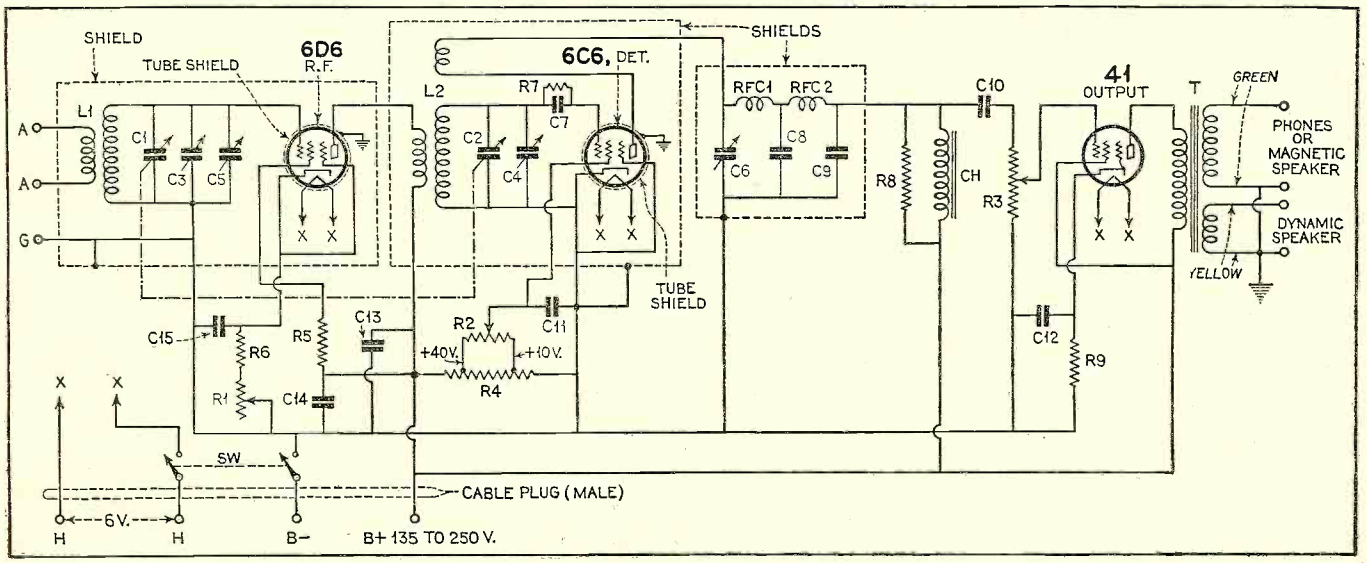
In the "Skyscraper" receiver the single stage of tuned r.f. amplification provides decidedly worthwhile gain and at the same time is absolutely stable. These advantages have been gained through careful attention to design details. First of all the parts employed were carefully selected to avoid losses; then these parts were laid out in such a way as to keep leads short and avoid undesirable coupling. Finally the shielding was planned to provide maximum isolation of the r.f. and detector stages, at the same time introducing as little loss as possible. (Some loss is always introduced by the metal mass of shields.)

The tuned r.f. stage, as used in this receiver, provides greatly improved selectivity, as would be expected from the addition of another tuned circuit. The control of regeneration is made much more consistent and stable, due to the presence of the r.f. tube which acts as a buffer ahead of the regenerative circuit and thus prevents antenna absorption. Thus several distinct advantages are gained through the use of the r.f. stage.

After several weeks of testing on actual reception of short-wave signals the "Skyscraper" has worked out remarkably well and has in some respects even exceeded expectations. In the matter of r.f. gain, for instance, it is found that many signals which ordinarily would be considered only moderately strong, are brought up to such a level in the r.f. stage (if the sensitivity control is turned on full) as to overload the detector. Other signals which were weak on an ordinary regenerative receiver, were reproduced by the "Skyscraper" with more than adequate loudspeaker volume. The European and South American short-wave broadcast stations, for instance, were many times tuned in with far more than normal room volume. "Ham" stations were good on all bands. Perhaps the most outstanding of all was the reception in the 20-meter "ham" band. Lower power 'phones from all over the western half of the United States and Canada were brought in with loudspeaker volume in the heart of

THE CIRCUIT DIAGRAM

Figure 1. The picture-wiring diagram will be given next month, for the benefit of those who find wiring easier when such a drawing is followed



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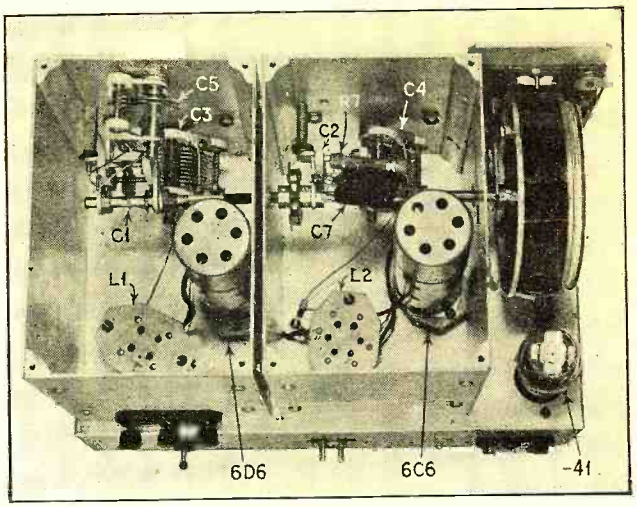
FANS AND AMATEURS

"SKYSCRAPER"

Regenerative Receiver)

receiver in which a tuned r.f. stage provide unusual sensitivity and of this article will appear next details of construction

S. Gordon Taylor



One

down-town New York, under local noise conditions which offered a serious handicap to reception. In suburban tests the sensitivity of the receiver seemed to be such as to bring in any signals which were above the low level of the local noise.

At first glance it may seem that an unnecessarily large number of controls are included on the front panel. If this receiver were designed exclusively for the use of inexperienced short-wave listeners this would perhaps be true. However, for the experienced "ham" or short-wave broadcast fan each one of these controls will be found to offer a definite advantage, as will be seen from the following description of their functions.

The two vernier dials control the tank condensers of the r.f. and detector stages. These are the band-setting condensers (C3 and C4) and are employed only in bringing the circuits into resonance at the particular range in which it is desired to tune. The illuminated drum dial at the left is the band-spread tuning control. This controls the two small condensers C1 and C2 which are ganged on one shaft. The actual selection of individual stations is accomplished with this control and tuning is therefore "single dial" after the tank condensers have once been set for any desired range. Above the r.f. tank control is a vernier (C5) the purpose of which is to permit such slight variations of the r.f. tuning as may be necessary to maintain exact resonance when tuning through wide ranges with the band-spread control, and to make the tank dials read alike. This condenser is not absolutely essential but will be found helpful, due to the sharp tuning characteristics of the r.f. circuit.

The three knobs along the bottom control sensitivity and volume. At the left is the audio-volume control, in the center the regeneration control and at the right the r.f. gain control. The reasons for employing both regeneration and r.f. gain controls will be explained later.

The tubes employed are all of the 6-volt heater type. These have several features which make them preferable to the 2½-volt type. They may be operated (in parallel) from either a storage battery or a 6-volt transformer winding; or their low current drain makes it practical to operate the filaments in series from a d.c. line, using a suitable series voltage dropping resistance and a shunt across each of the .3 ampere filaments to by-pass the extra current required by the heater of the type -41 tube. When operated on alternating current the hum level is very low—considerably lower than with equivalent tubes of the 2½-volt heater type.

As this receiver is designed, the heaters are connected in parallel for operation from a 6-volt a.c. source or a storage battery. For the high voltage supply either B batteries or a power pack may be used. In either case only one high-voltage lead is needed, as a voltage-divider network is included in the receiver, and the tubes are all self-biased. If the receiver is to be operated permanently from B batteries, the voltage-divider resistor R4 may be eliminated and the potentiometer, R2, connected across a 45-volt section of the battery if desired.

If complete freedom from hum is to be obtained when operating from the a.c. line it will be necessary to employ a power pack having a good filter. An inexpensive power pack suitable for this use will be described in a later article on this receiver. This power pack will supply both the high voltage and the heater voltage and will permit absolutely humless operation.

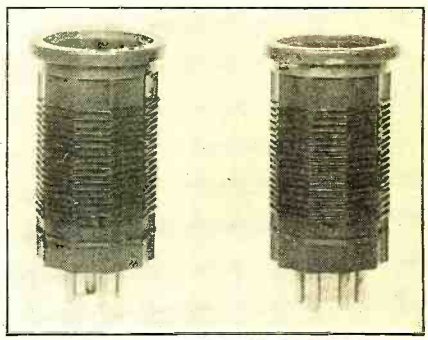
The excellent operating characteristics of the "Skyscraper" are accounted for to a considerable extent by the coils employed. These are the new Hammarlund plug-in coils in which XP-53, a newly developed dielectric, is employed for the forms. This new material rates among the best yet is sufficiently inexpensive to permit the coils and forms to be marketed at ordinary prices. The XP-53 is moulded in the shape of a ribbed form which permits air spacing of the windings. The windings themselves are carefully designed for maximum efficiency, with proper attention to the kind of wire (silver-plated in the case of the high-frequency coils), wire sizes, turns spacing, form factor, coefficients of coupling, etc. With the receiver in operation different types of coils were tried and the selection of the Hammarlund coils was based on the fact that with them greater signal strength was obtainable on test stations than with any of the other coils tried. It was rather surprising that so much difference was actually found among the standard coils of recognized makes.

In addition to the efficiency of the coils themselves, the frequency ranges covered have been selected to provide the most favorable L/C ratios on the more important short-wave bands. Thus all of the amateur bands and the broadcast bands are tuned in at low capacity settings of the tank condensers—a condition which provides for the highest signal voltages and therefore the greatest signal strength.

Both the 2-circuit coils and the 3-circuit coils come in standard sets of 4 each and cover a range from 16.4 megacycles to 1.0 megacycle (18.3-300 m.). In addition there are separate coils available to extend the high-frequency range to 32 (*Continued on page* 315)

THE COILS USED

The coils employed are a new type, recently developed, which showed unusual efficiency in competitive tests. More is said about them in the text



Complete Construction Details for the "Skyscraper" (Set No. 3)

COMPLETE Skyscraper blueprints, including a picture-wiring diagram and chassis layout, both full size, may be obtained for the nominal sum of 25 cents to cover cost of preparation and mailing. Address orders to the Blueprint Department, RADIO NEWS Laboratory.

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SHORT-WAVE PAGE

THE lazy, elusive South American stations will be with us nightly now that atmospheric conditions have cleared up. Short-wave broadcasting stations bordering on the equator, whose transmissions were literally saturated with truly South American static, are now coming to the fore and their programs are being received here and on the West Coast with a fair amount of satisfaction. Just give us a few snappy, cool days and in will "step" the Latin-speaking stations with a bang!

It seems to be a weakness on the part of all of us to automatically classify all Spanish- or Portuguese-speaking stations as "South Americans" whether they are in Santo Domingo, Mexico or Central America. We shall list here the "garden" variety of Latin (root) speaking stations. We all like the lively tunes radiating from the "twins" in Caracas. As we sit beside our loudspeaker and hear the various selections coming through, we can almost visualize the dark-eyed señoritas and picturesquely dressed señors who really try so hard to entertain their foreign listeners. One of the best heard is YV3RC (48.78 meters), at Caracas, Venezuela. We can be fairly sure of always hearing an entertaining program from this station when they are in operation. With a schedule of about 5 to 9:30 p.m., E.S.T., and operating on a frequency that just borders on the "roaring forty-niners," we can easily tune them in. The other Venezuelan that many a fan has difficulty in pulling in is YV2RC (49.04 meters), also at Caracas. With our own high-powered short-wave stations practically overriding this "Spaniard," we rarely hear them. The average regenerative receiver rarely can separate the 49-meter band. That is where the superheterodyne receives shines. With the newer supers "sporting" band-spreads on the admittedly congested bands, i.e. 31 and 49 meters, we find these bands made "presentable."

Station CP5 (49.3 meters), La Paz, Bolivia, is back on the air regularly from 8 to 9 p.m., E.S.T. But who can pull them in when YV5BMO, 49.39 meters, Maracaibo, Venezuela, is on? In fact, VE9GW (49.2 meters), Bowmanville, Canada, causes havoc on the higher frequencies of the 49-meter band.

Station HJ1ABB (46.5 meters), Barranquilla, Colombia, cleverly chose a fairly clear wavelength. Then with his increased power he has been heard well all during the summer. His programs are always spicy and announcements are made in English.

Just a few kilocycles below Barranquilla is HJ5ABD, Cali, Colombia (operating on 46.3 meters), usually heard until 11 p.m., E.S.T. One can listen in comfort to this station's transmissions.

Now we come to one of the most reliable of all the South Americans. That is PRADO in Riobamba, Ecuador. This is a "Thursday" special, transmitting from 9 to 11:30 p.m. on that day only. "Mrs." PRADO favors us by announcing some of the selections. Few listeners have not logged this station.

Still staying in Ecuador, we will easily hear HC2RL (45 meters), Guayaquil. But this is a station that concentrates on bi-weekly programs. Sunday afternoon from 6 to 8 p.m. and Tuesday nights from 9:15 to 11:30 p.m., E.S.T. It is easy to identify this station, as the announcer always says "Hello, America," followed by a talk in English and reading reports of reception.

Station HJ1ABE (42.8 meters), Cartagena (pronounced Cartehena), Colombia, has not decided if it is worth while to transmit nightly, so when you log this chap, you can consider yourself lucky.

Then we have those small-powered Haitian stations. HI1A, Republica Dominicana (47.8 meters), certainly "cuts" up his program to suit everyone's hours and tastes. Their evening schedule is (according to his veri) 8 to 10 p.m. Repeatedly he has been heard as late (or should we say as early?) as 2 a.m., roaring in like a 100-watter instead of the lucky *seven and half* watts that HI1A employs to transmit with.

Station HIX (on 49.5 meters), Santo Domingo, holds forth in fine style. A visitor to this station brought us back the good news that they intend to increase their power and will be "heard everywhere!"

Where is TI4NRH? This station that was once heard round the world has vanished and Cespedes Marin, the owner and operator, has gone into seclusion. When and if he returns to the air, who will be the first one to hear his station? (Maybe he is building a new power pack!—EDITOR.)

Station XETE (31.25 meters), Mexico City, was heard with fair volume during the summer months, but seems to have lately vanished. Listeners on the West Coast tell us that this station "pounded in," but we, in the East, can hardly say that.

With fair regularity and transmitting until the "we sma' hours" of the morning, XEBT (49.9 meters), Mexico City, added to the "synthetic" uproar on the 49-meter band. With announcements in Spanish and an identifying signal which consisted of a cross between an automobile horn and a coocoo, we have blissfully listened to this station's broadcasts.

Station COC (49.9 meters), Havana, Cuba, had the misfortune of being burned down, but expects to return to the air as soon as construction plans permit.

When fans get together, the first question that they ask each other is, "What have you been hearing?" Well, here is my list of what I heard for the last few weeks. Asiatics and long-distance catches have and always will hold my interest. Staying up all night or rising in the morning has no terrors for me, if I even think something worth while is to be heard.

Station JVM, 27.93 meters, Japan, was heard every morning when tuned for. The earliest they were logged was 3:55 a.m. and the latest was 7:41 a.m., E.S.T. The morning that they were picked up at 3:55 they were deep in the meshes of a play.

Station RKI, 19.94 meters, Moscow, U.S.S.R., was heard several mornings around 5:50 a.m., E.S.T., contacting Tashkent. This phone circuit is very active, as is R1M, 19.68 meters, Tashkent. Tashkent is an Asiatic, by the way, as it is a city in Turkestan and almost directly north of Bombay, India.

None of the Australians came up to my expectations. VK3ME (31.5 meters), Melbourne, was more consistent. VK2ME (31.28 meters), Sydney, was not heard every Sunday. Their first transmissions were fair but not like we were used to. VK3LR (31.31 meters), Melbourne, was logged on various occasions. According to a veri just received, this station intends to continue transmitting for an indefinite period between the hours of 3 and 8 a.m., E.S.T.

The League of Nations, still moored at Geneva, has been heard on 20.64 meters at odd hours—1:13 p.m. and 5:40 a.m. Their regular Saturday transmissions have been up to standard.

One station that was heard with truly remarkable volume, considering the distance involved, was VWY, 33.5 meters, Kirkee, India. This station was picked up at 9:40 p.m., and held at R-6 until 10:11 p.m., E.S.T. The writer was able to make a recording of the program. At first we understood the announcer to say Turkey, but a correspondent definitely identified the station as Kirkee, as he had heard the station in operation three nights in succession.

The new German station at Doaberitz, 49.35 meters, has not been heard yet. Reports reached us that they were heard on about 31 meters plus.

KWE, 19.4 meters, Bolinas, California, heard nightly for two weeks around 9:45 p.m., calling Tokyo.

The South Americans heard (static considered) were: HJ1ABB, PRADO, HC2RL, LSX, YVQ, YV3RC; XETE and XEBT were logged and verified.

Now to the new station in Lima, Peru. George W. Daly sent us full information on this newcomer, which is said to be the most powerful in South America, utilizing 20 kw. output, using 38.36 meters for short-wave transmission and 220 meters for long waves. The call letters of the short-wave transmitter are OA4AC. Lima was heard nightly from 10:20 to 11:20 p.m., E.S.T. American songs, Spanish rhumbas and announcements in Spanish as "Radio—La Voz del Peru" were frequently heard.

Germany was rarely poor, except on humid nights. England fell below par, but soon leveled herself, and France, heard

(*Continued on page* 326)

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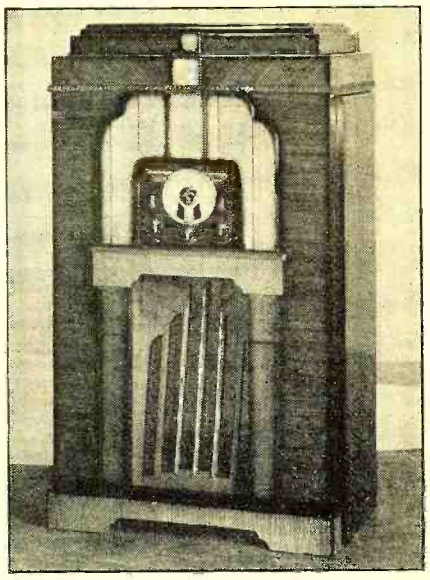
Describing a 9 to 2400 Meter

16 TUBE "SUPER"

(Midwest 1935 DeLuxe Model)



THE latest Midwest receiver incorporates so many new features that it does not look at all like last year's model. The receiver is a superheterodyne covering from 125 to 350 kc. and from 530 to 33,000 kc. in five bands, but it now has an ingeniously devised new dial, a tuning indicator, a radically-new tone control, the "Fidel-A-Stat", an automatic tone compensator, an improved high-fidelity audio section and a "Micro-tenuator" which is a device for changing the coupling between the primary and secondary of the first i.f. transformer. Finally, the oscillator and r.f. sections have been redesigned. There are no more tapped coils and the set has provisions for the use of a doublet antenna. Shielding has been improved too; the entire i.f. amplifier is now within the shielded compartment which helps to eliminate interference from code stations, working on the intermediate frequency. The tube shields are of a new and improved design.

The sixteen tubes are of the following types and purpose; radio-frequency amplifier, 6D6; first detector, 6D6; oscillator, 6D6; two i.f. amplifier tubes, 6D6; second detector, 76; first audio amplifier, 76; driver, 2A5; output stage, four 45's in parallel push-pull. The rectifier is a 5Z3; automatic volume-control tube, 6B7; automatic tone compensator, 6C6; pilot light dimmer, 76.

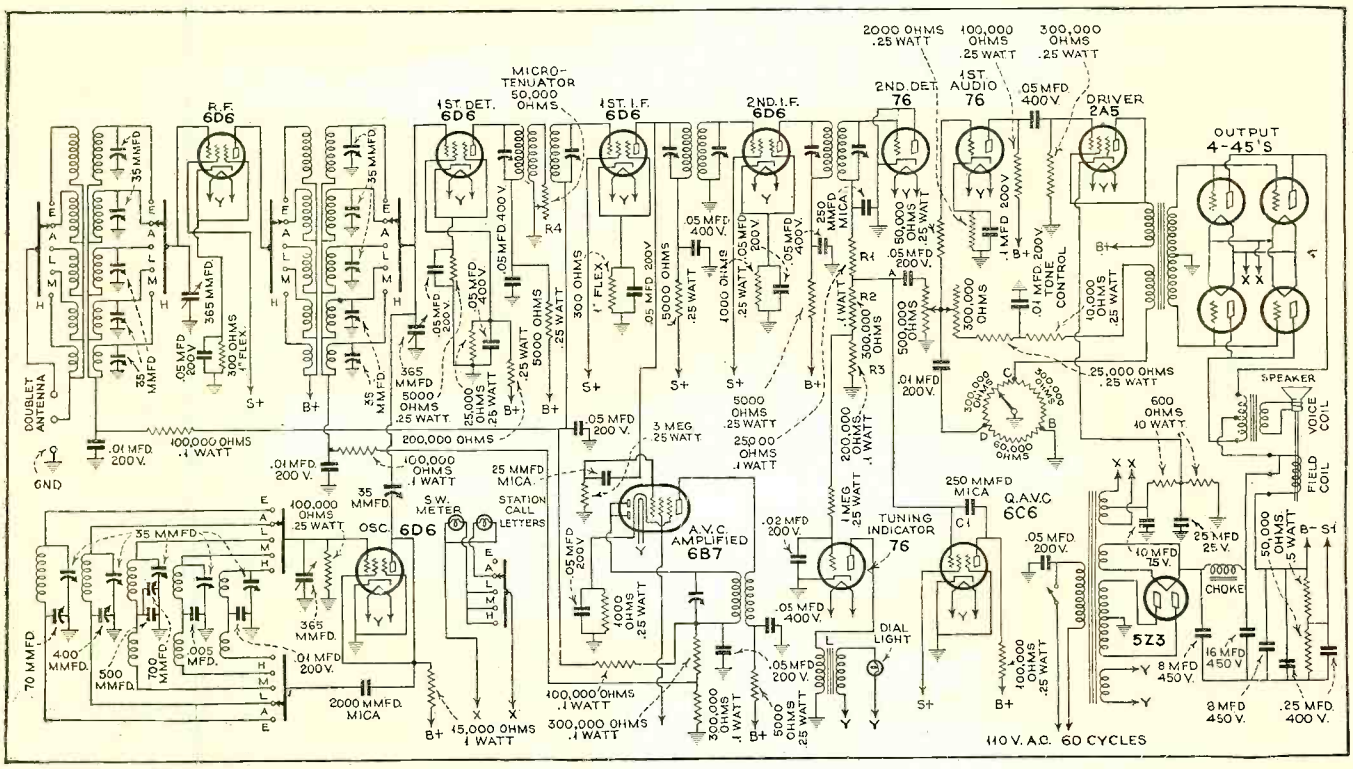
The individual frequency bands cover the following ranges and identification letters: E, 125-350 kc. (800-2400 m.); A, 530-1500 kc. (200-565 m.); L, 1.5-4 mc. (75-200 m.); M. 4-12 mc. (25-75 m.); H, 12-33 mc. (9-25 m.).

The dial has been considerably improved. It consists of a disc which is rotated by a two-speed drive. The top half of this disc is the same as that of last year's model. It carries calibrations in kilocycles and megacycles for all bands and in addition, the places where amateurs, foreign broadcast, police, etc., are to be found, are marked on it. Also, the band selector switch is so arranged, that it illuminates only the portion of the dial where you are tuning.

The lower half of the disc is calibrated in meters on the short waves. A spot of light falls on the wavelength the set is tuned to. The outer strip of the lower half gives the correct setting of the dial for most of the larger stations' call letters being shown on the dial. This lower strip is illuminated only when it is used—that is, when the band selector switch is set for the broadcast band. These pilot lights are turned "on-and-off" as you turn the band selector switch.

The tuning indicator is the pilot light used behind the top half of the dial—it dims when a station is tuned in and one should tune for the lowest point. This works as follows: The inductor, L, has two windings, one of which is in series with the pilot light. The second winding has the plate impedance of a 76 tube across it. When this plate impedance is increased—because the grid becomes negative—the inductance of the first winding increases because of reflection and the pilot light dims. The controlling voltage for the grid is taken from the second detector.

This second detector is a "hard-working" tube. Another function it performs is operating the automatic tone-compensating device. This is intended to replace the so-called Stat-omit. The condenser, C1, and the internal resistance of the 6C6 tube form a path for the higher frequencies; this path becomes the easier, the lower the plate resistance becomes—hence it is really a tone control. The plate resistance is varied by means of the grid voltage. When a signal comes in, this carrier causes a current to flow through the resistors R1, R2, R3. The point A becomes negative with respect (*Continued on page* 313)



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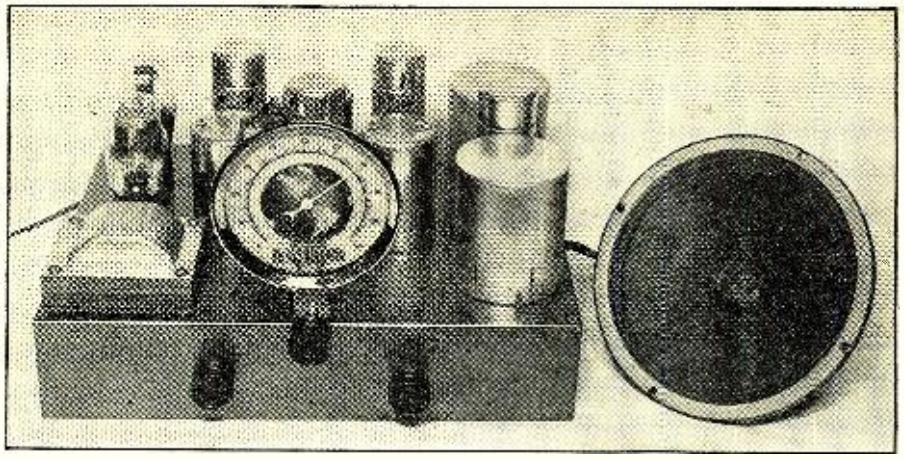
A New 6-Tube ALL-WAVE "SUPER"

(The Powertone)

John Strong



FRONT VIEW OF RECEIVER AND SPEAKER

THE refinements incorporated in the receiver, the newly developed circuit using the latest type tubes, the simplicity of assembly and wiring and the ease of operation and last, but by no means least, the low-cost for the complete kit of parts, are the principal features that will recommend this new Powertone six-tube set to the constructor of short-wave sets.

During tests of the set, conducted at one of the RADIO NEWS Short-Wave Listening Posts, full loudspeaker volume was obtained, without difficulty, from the short-wave broadcast stations of Spain, England, Germany and France and from several South American stations. On two different tests, DJD, Zeesen, Germany and GSC, Daventry, England, on 25 meters were received with loudspeaker volume comparable to a local station. Signals from all the American short-wave broadcast stations were received, as were innumerable aircraft and police signals. The Listening Post referred to is located approximately nine miles (north) from the heart of New York City.

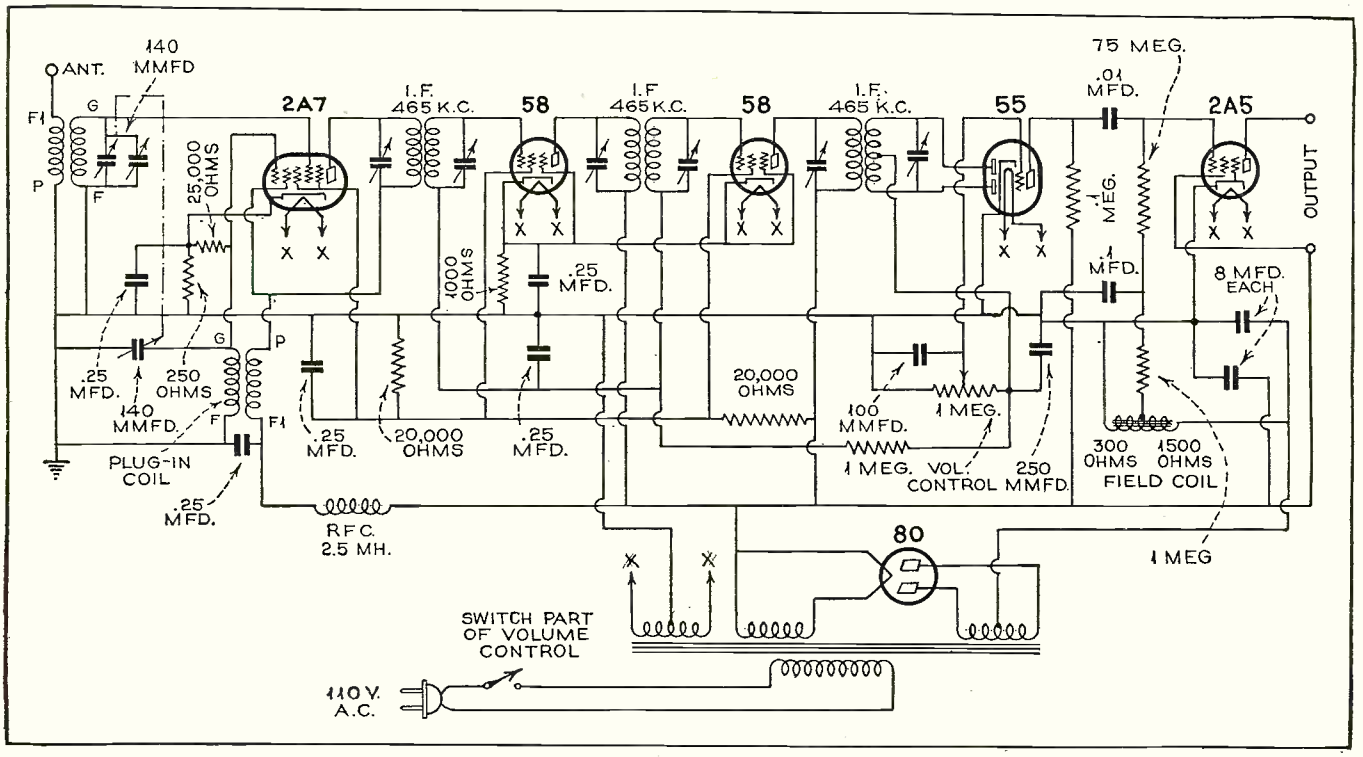
The receiver covers a wavelength range of 15 to 550 meters and incorporates a full-vision airplane type dial calibrated in 100 divisions and covering a 270 degree arc, and automatic volume control. It is equipped with a built-in power supply and an eight-inch dynamic type speaker.

Four sets of plug-in coils (two coils to a set) are used to cover the short-wave bands from 15 to 200 meters. The oscillator and the first detector coils are identical in construction. An additional pair of coils is available for the broadcast range from 200 to 550 meters. The coils are housed in large removable shield cans, mounted to the extreme right on top of the chassis, as shown in the accompanying photograph. These shield cans eliminate coupling between the first detector and oscillator circuits.

The set employs six tubes. A type 2A7 pentagrid-converter functions as a first detector and oscillator and is followed by a two stage intermediate amplifier employing a pair of 58 type tubes. The i.f. amplifier is both plate and grid tuned and the intermediate frequency is 465 kilocycles. A type 55 duplex-diode triode, serves as a second detector, automatic volume control and first audio tube. This tube is resistance-coupled to a type 2A5 pentode power tube. The type 80 is employed for rectification, the output of which is filtered by a 1800 ohm speaker field (tapped at 300 ohms to supply the bias voltage for the 2A5 amplifier tube) and two 8 mfd. electrolytic condensers.

As previously mentioned, the construction of this set should offer no complications. The chassis, measuring 14 inches by 10 inches by 3 inches, is available completely drilled and ready for mounting the various parts. The schematic wiring diagram printed herewith shows all connections and contains the values of all the parts. The connecting leads should be as short as possible, particularly the plate and grid leads to the r.f. tubes and the coil connections to the type 2A7 tube. The intermediate- (*Continued on page* 324)

THE CIRCUIT DIAGRAM



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SHORT-WAVE STATION LIST

(Giving Wavelength, Frequency, Call, Location and Service)

(Continued from the October issue)

meters	kc.	call	location	Service and schedule
51.29	5845	KRO	Kahuku, Hawaii	Phone
51.64	5805	CSN	Rossland, B. C.	Phone
51.78	5790	RV50	Moscow, U. S. S. R.	Broadcast
52.79	5680	VK3LR	Melbourne, Australia	Experimental
52.00	5766	XAM	Merida, Yucatan	Tests with XDA
52.00	5766	CFU	Rossland, B. C.	Phone
52.23	5740	KFZ, KFY	Little America	Phone
52.57	5692	FIQA	Tananarive, Madagascar	Broadcast
52.67	5660	XQAJ	Shanghai, China	Broadcast
53.20	5636	HJ1ABE	Cartagena, Colombia	Broadcast
57.00	5260	WQN	Rocky Point, N. Y.	Experimental
57.99	5170	HJ5ABC	Cali, Colombia	Broadcast
58.17	5154	PMY	Bandoeng, Java	Broadcast and phone
58.27	5145	OK1MPT	Prague, Chechoslovakia	Experimental
58.67	5110	KIKB	Bolinas, Calif.	Phone
58.71	5105	KEC	Bolinas, Calif	Phone
58.79	5700	KIKA	Bolinas, Calif.	Phone
59.13	5070	WCN	Lawrenceville, N. J.	Phone to England
59.37	5050	VRT-ZFA	Hamilton, Bermuda	Phone to WNB and GMBJ
59.96	5000	WWV	Washington, D. C.	Standard Frequency Transmissions Tues. 12-2 P.M.; 10 P.M.-Midn.
60.20	4980	GBC	Rugby, England	Phone to ships
60.94	4920	LCL	Jeloy, Norway	Experimental
61.95	4840	GDW	Rugby, England	Transatlantic phone
62.53	4795	VE9BY	London, Ontario	Broadcast
62.66	4785	CGA	Drummondville, Que.	Phone to ships and England
63.12	4750	WOO	Ocean Gate, N. J.	Phone
63.12	4750	WKF	Lawrence, N. J.	Phone to England
66.48	4510	VPN	Nassau, Bahama Is.	Phone to WND
67.11	4467	YID	Bagdad, Iraq	Phone
67.68	4430	DOA	Doeberitz, Germany	Phone
68.61	4370	.....	Semarang, Java	Broadcast
69.44	4320	G6RX	Hillmorton nr. Rugby, Eng.	Experimental, communicates with listening post at Yamachiche, Canada
69.24	4330	.....	Batavia, Java	Broadcast
70.00	4283	IBEJ	S. S. Conte Rosso	Phone
		ICEJ	S. S. Rex	Phone
		IDLI	S. S. Conte de Savoia	Phone
70.17	4273	RV15	Khabarovsk, U. S. S. R.	Broadcast; early mornings
71.78	4177	GFWV	S. S. Majestic	Phone
		GLSQ	S. S. Olympic	Phone
		GMJQ	S. S. Belgenland	Phone
		GDLJ	S. S. Homeric	Phone
		WNBN	S. S. Leviathan	Phone
		GTSD	S. S. Monarch of Bermuda	Phone
		GKFY	S. S. Minnetonka	Phone
		GMBJ	S. S. Empress of Britain	Phone
		DDAC	S. S. Europa	Phone
		DDAS	S. S. Bremen	Phone
		DDBR	S. S. Berlin	Phone
		DDCB	S. S. Columbus	Phone
		DDCG	S. S. Resolute	Phone
		DDCP	S. S. Cap Polonio	Phone
		DDDT	S. S. Deutschland	Phone
		DDDX	S. S. Hamburg	Phone
		DDDE	S. S. Cap Arcona	Phone
		DDED	S. S. New York	Phone
		DDFF	S. S. Reliance	Phone
		DDFT	S. S. Oceana	Phone
		DDNY	S. S. Albert Ballin	Phone
72.60	4130	DAF	Norddeich, Germany	Phone to ships
72.84	4116	WOO	Deal, N. J.	Phone
73.00	4107	HCJB	Quito, Ecuador	Broadcast
73.13	4100	LCL	Jeloy, Norway	Experimental
73.13	4100	WND	Hialeah, Florida	Phone to VPN
74.67	4015	NAA	Arlington, Va.	Time signals
79.95	3750	CT1CT	Lisbon, Portugal	Broadcast, Sundays 7-9 A.M.
79.95	3750	F8KR	Constantine, Algeria, Africa	Broadcast
79.95	3750	12RO	Rome, Italy	Broadcast
82.82	3620	DOA	Doeberitz, Germany	Phone
84.67	3543	CR7AA	Lourenzo Marques, Port. E. Africa	Broadcast; Mo., Thu., Sat.

AIRCRAFT RADIO STATIONS

MOBILE SERVICE

Location	Call	Freq.
Abilene, Texas	KGUL	k, x.
Albany, N. Y.	WSDM	l, w.
Albuquerque, N. M.	KSX	a, f, q, zz.
Amarillo, Texas	KSV	a, f, q, zz.
Atlanta, Ga.	WQDP	h, n, p, v.
Atlanta, Ga.	WEEA	b, c, d, o, y.
Bakersfield, Calif.	KQX	j, m, u, z.
Baltimore, Md.	WEEB	b, c, d, o, y.
Beaumont, Calif.	KGTV	k, x.
Big Spring, Texas	KGUG	k, x.
Billings, Mont.	KGSK	e, s.
Birmingham, Ala.	WSDE	n, v.
Bismarck, N. D.	KNWD	e, s.
Boise, Idaho	KRA	m, z.
Boston, Mass.	WSDD	l, w.
Brownsville, Texas	KGUE	k, v.
Buffalo, N. Y.	WSDO	l, w.
Burbank, Calif.	KSI	a, f, q, zz.
Burbank, Calif.	KEU	j, u.
Butte, Mont.	KGTV	a, zz.
Camden, N. J.	WAEE	g, r.
Charleston, W. Va.	WNEG	h, p.
Charleston, N. C.	WEEC	b, c, d, o, y.
Cheyenne, Wyo.	KGTT	a, zz.
Cheyenne, Wyo.	KOE	j, m, u, z.
Chicago, Ill.	WAEO	g, r.
Chicago, Ill.	WUCG	i, k, t, z.
Chicago, Ill.	WSDG	h, l, p, w.
Chicago, Ill.	WSDS	e, s.
Cincinnati, Ohio	WSDI	h, k, p, x.
Cleveland, Ohio	WNAK	i, t.
Cleveland, Ohio	WSDQ	h, k, l, p, w, x.
Columbus, Ohio	WHG	g, r.
Columbus, Ohio	WSDP	k, x.
Cresson, Pa.	WAEG	g, r.
Dallas, Texas	KNAT	i, t.
Denver, Colo.	KGSP	a, zz.
Denver, Colo.	KGSS	a, zz.
Des Moines, Ia.	KQM	i, k, m, z.
Detroit, Mich.	WAEI	h, l, p, w.
Douglas, Ariz.	KGUN	k, x.
Elkins, W. Va.	WSDJ	h, p.
Elko, Nev.	KKO	m, z.
Elmira, N. Y.	WAEQ	l, w.
El Paso, Texas	KGUA	k, x.
Evansville, Ind.	WAEN	h, p.
Fargo, N. D.	KNWB	e, s.
Florence, S. C.	WOEF	c.
Ft. Worth, Texas	KGUI	i, t.
Ft. Worth, Texas	KGTF	k, n, v, x.
Fresno, Calif.	KGT	j, m, u, z.
Glendale, Calif.	KGUR	k, x.
Glendive, Mont.	KGSL	e, s.
Goodland, Kan.	KGSJ	a, zz.
Great Falls, Mont.	KGSV	a, zz.
Greensboro, N. C.	WEEG	b, c, d, o, y.
Greenville, S. C.	WEEQ	c.
Harrisburg, Pa.	WAED	g, r.
Helena, Mont.	KGSW	e, s.
Houston, Texas	KGUB	k, n, v.
Indianapolis, Ind.	WSDZ	h, p.
Indianapolis, Ind.	WHM	g, r.
Indio, Calif.	KGUQ	k, x.
Iowa City, Ia.	KQQ	i, m, t, z.
Jackson, Miss.	WSDB	n, v.
Jacksonville, Fla.	WEEJ	b, c, d, o, y.
Kansas City, Mo.	KST	f, g, q, r.
Kansas City, Kan.	KGSI	a, zz.
Kansas City, Mo.	KNAS	i, m, t, z.
Kingman, Ariz.	KGTL	f, q.
Kylertown, Pa.	WNAM	i, t.
Lake Charles, La.	KGTU	n, v.
Las Vegas, Nev.	KGTJ	a, zz.
Lincoln, Neb.	KRF	m, z.
Little Rock, Ark.	KGUU	k, x.
Louisville, Ky.	WSDF	k, x.
McRae, Ga.	WEEH	b, o.
Madison, Wis.	WSDR	e, s.
Medford, Ore.	KGE	j, u.
Memphis, Tenn.	WSDK	h, k, p, x.
Miami, Fla.	WEEM	b, c, d, o, y.
Milwaukee, Wis.	WAEH	e, s.
Missoula, Mont.	KGSY	e, s.
Mobile, Ala.	WAEK	n, v.
Moline, Ill.	WNAU	i, m, t, z.
Murfreesboro, Tenn.	WSDH	h, k, p, x.
Newark, N. J.	WAEF	g, r.
Newark, N. J.	WNAO	i, t.
Newark, N. J.	WSDC	h, l, p, w.
Newark, N. J.	WEEP	c.
Newark, N. J.	WEEN	b, c, d, o, y.
New Orleans, La.	WQDQ	n, v.
North Platte, Neb.	KMR	m, z.
Oakland, Calif.	KFO	j, m, u, z.
Oklahoma City, Okla.	KNAV	i, t.
Oklahoma City, Okla.	KGSC	f, q.
Omaha, Neb.	KMP	i, m, t, z.
Orlando, Fla.	WEEO	b, c, d, o, y.
Pasco, Wash.	KRD	j, u.
Pendleton, Ore.	KIJE	j, u.
Phoenix, Ariz.	KGUP	k, x.
Pittsburg, Pa.	WAEC	g, r.
Pocatello, Idaho	KGTX	a, zz.
Ponca City, Okla.	KGUZ	i, t.
Portland, Ore.	KVO	j, m, u, z.
Pueblo, Colo.	KGSR	a, zz.
Redding, Calif.	KTU	j, m, u, z.
Reno, Nevada	KJE	j, m, u, z.
Richmond, Va.	WEER	b, c, d, o, y.
Robertson, Mo.	KGUT	h, p.
Robertson, Mo.	KGTR	f, h, p, q.
Rock Springs, Wyo.	KQC	m, z.
Sacramento, Calif.	KFM	j, m, u, z.
St. Paul, Minn.	KNWA	e, s.
Salina, Kan.	KGSM	a, zz.
Salt Lake City, Utah	KQD	m, z.
Salt Lake City, Utah	KGTH	a, zz.
San Bruno, Calif.	KGSB	f, q.
San Antonio, Texas	KGUD	k, v.
San Diego, Calif.	KGQZ	j, u.
Seattle, Wash.	KZJ	j, m, u, z.
Seattle, Wash.	KGSZ	e, s.
Shreveport, La.	KGUK	n, v.
Spartanburg, S. C.	WEEF	b, c, d, o, y.
Spokane, Wash.	KGTZ	j, u.
Spokane, Wash.	KGSX	e, s.
Springfield, Ill.	WAEJ	h, p.
Springfield, Mo.	KGTQ	f, q.
Texarkana, Ark.	KGTB	k, x.
Toledo, Ohio	WNAJ	i, t.
Tucson, Ariz.	KGUO	k, x.
Tulsa, Okla.	KNAU	i, t.
Tulsa, Okla.	KSY	f, q.
Vero Beach, Fla.	WEEL	c.
Washington, D. C.	WNEH	p, h.
Washington, D. C.	WEEK	c.
Waco, Texas	KGUH	k, v.
Wichita, Kan.	KGTD	f, q.
Wichita, Kan.	KGTE	i, t.
Winslow, Ariz.	KGTA	f, q.

Symbol	Frequency	Wavelength
a	2906	103.2
b	2922	102.6
c	2946	101.8
d	2986	100.4
e	3005	99.78
f	3072.5	97.58
g	3088	97.10
h	3127.5	95.87
i	3162.5	94.80
j	3182.5	94.21
k	3232.5	92.75
l	3257.5	92.04
m	3322.5	90.24
n	3447.5	86.96
o	4122.5	72.73
p	4917.5	60.97
q	4967.5	60.36
r	4987.5	60.11
s	5377.5	55.76
t	5572.5	53.80
u	5592.5	53.61
v	5602.5	53.51
w	5612.5	53.42
x	5632.5	53.23
y	5652.5	53.04
z	5662.5	52.95
zz	5692.5	52.67

Note. a, f, g, q, r, zz.—blue chain
i, j, m, t, u, z.—red chain
e, k, l, n, s, v, w, x.—brown chain
c, b, d, o, y.—green chain

(*Continued on page* 325)

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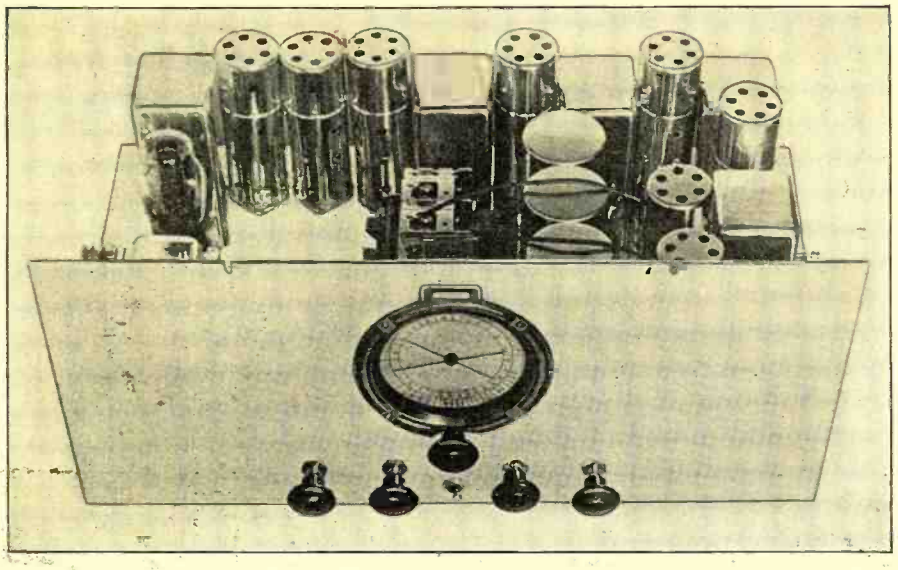


FORWARD LOOKING DESIGN IN 12.8-550 METER *SUPERHETERODYNE*

The author continues his discussion of some of the characteristics and feature of an all-wave superheterodyne embodying the latest principles of engineering and practical design

McMurdo Silver

Part Two

IN the article last month the author provided a general description of the Masterpiece III all-wave receiver. This month the description is continued with some additional details.

Looking at the photograph above, the six-gang condenser and watch dial are seen in the center, with broadcast-band r.f., detector and oscillator inductance shields at the right. The units from right front to rear and left front are: –58 r.f. amplifier tube, 2A7 electron-coupled oscillator and high-efficiency screen-grid first detector, first air-tuned i.f. transformer, –58 first i.f. tube, second i.f. transformer, second –58 i.f. tube, third i.f. transformer, third –58 i.f. tube, fourth i.f. transformer, –56 diode a.v.c. tube, –56 diode second detector, –58 audio beat oscillator, beat oscillator unit, 2A5 first audio driver stage, and push-pull audio transformer.

In the photograph above controls are, left to right: volume control, tone control, beat oscillator switch, wave-change switch and interstation noise suppressor or sensitivity control, with tuning knob just below the "watch dial."

In the power amplifier is the 5Z3 rectifier, two push-pull Class A Prime 2A5 output tubes, dry electrolytic 600-volt filter condensers, large choke and extra large power transformer, on-off switch on flexible cord, and a.c. line fuse. Note the new flat-mounted power transformer and filter choke in the photograph below. This improved mounting permits of one-third the usual number of soldered connections and gives much better heat radiation than the older upright type of transformer and choke mounting. It is stronger and more compact as well. Interconnection is by means of two tuner cables and plugs and one speaker cable, all non-interchangeable and foolproof.

Looking at the photograph of the bottom view, the simple and symmetrical "engine room" below the tuner chassis is seen. Note particularly the tubular vacuum-impregnated and pressure-sealed by-pass condensers, placed for shortest leads and most effective by-pasing, something quite difficult with the older, bulkier and less efficient canned condensers. Again, the number of leads is cut to only one-third the number previously required and efficiency is increased. Note the complete shield box of low-loss alloy enclosing the three sets of nine short-wave coils, and their short trimmer leads.

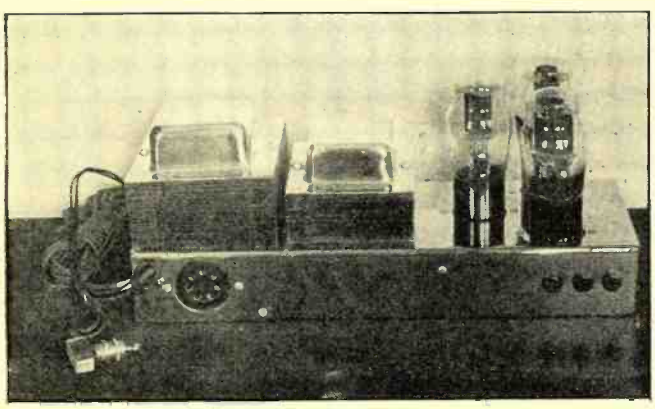
Performance measurements tell the story. Sensitivity is ⅓ microvolt absolute (.075 microvolt per meter), with inherent noise so low this tremendous sensitivity is actually useful in reception of weak stations. Selectivity is 9 kc. at normal, with a band width of 21 kc. 10,000 times down. The automatic volume control slope show a 45-degree rise, with full 18 watts output reached at 70 microvolts (*Continued on page* 311)

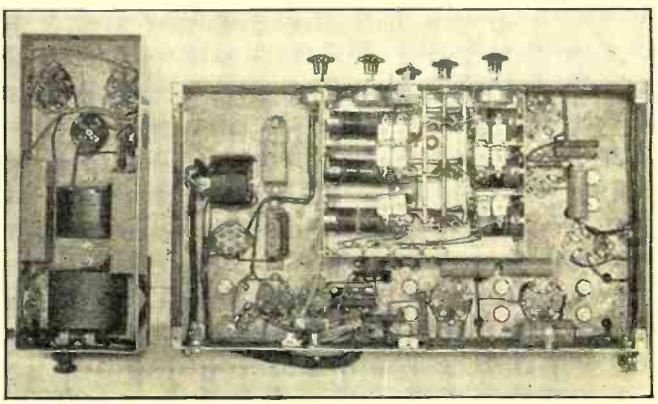
THE TWIN SPEAKERS

Two powerful loudspeakers are used to convert the electrical output to audible energy of surprising power and tone quality

VIEW OF THE POWER PACK AND SUB-PANEL

Below, at left, is the general view of the power panel that furnishes the proper voltages for the new rceiver. Below, at right: underneath views of the receiver and power pack, showing the efficient and compact placing of parts





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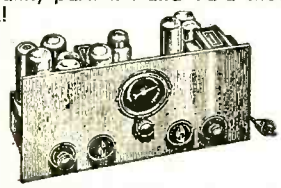

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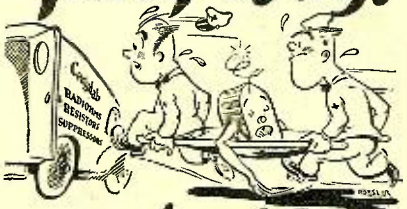

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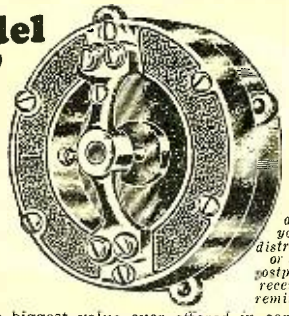

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Your distributor carries this microphone, if not, it will be sent postpaid on receipt of your remittance or C. O. D. plus charges.

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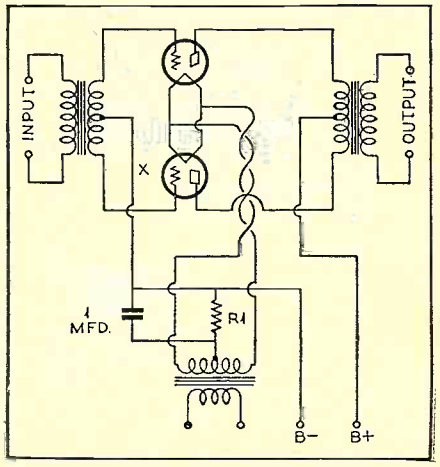
WITH THE EXPERIMENTERS

WILLIAM C. DORF

To Overcome Howling in Push-Pull Amplifiers

I find that a choke coil or a resistance connected in the center-tapped grid-return lead marked X in the circuit diagram will prevent a howling condition in push-pull audio amplifiers. The inclusion of a choke or a resistance will not affect the quality. If a resistance is used it should have a value of about 50,000 ohms. Where a



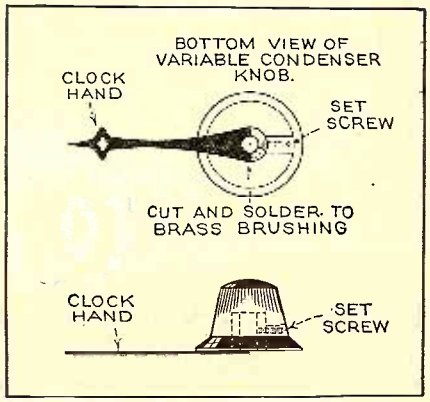
choke coil is employed, its inductance is approximately 10 henries or more.

In some cases it may be necessary to also include a choke coil in the lead from the center-tap of the output transformer and the B plus terminal of the plate supply.

FRANK MCLAUGHLIN,
Jersey City, N. J.

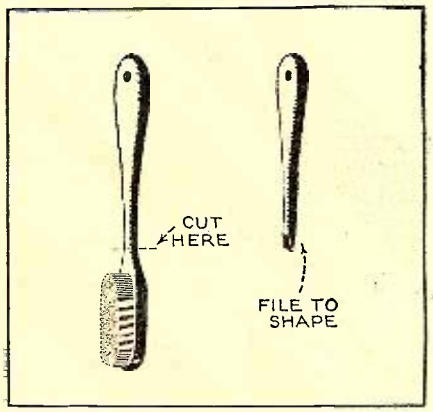
Two Simple Experimenter Kinks

The first item is on a dial knob equipped with a long pointer that anyone can make



and be repaid with an easy reading indicator. I used a standard knob with a ¼-inch bushing and to the flat side of this bushing is soldered a sharp-pointed hour hand from an old clock. This indicator is used on a test oscillator with good results.

The second kink concerns an improved



alignment screw-driver made from a discarded toothbrush. The drawing is complete with the simple instructions required to make this handy tool.

J. S. NAPORA,
Uniontown, Pa.

Sources of Hum and Its Elimination

Readers will welcome this continuation of helpful information for tracing down and eliminating hum in standard universal a.c.-d.c. type radio receivers as disseminated by RCA Radiotron Company. The three previous items on this subject appeared in the Experimenters Department of the February, June and August, 1934, issues.

Modulation hum in small universal sets frequently is due to the fact that the power lines carry the signal voltage into the rectifier tube. Here the signal voltage is modulated with the rectified a.c. hum voltage, and then either re-radiated to the antenna or to other circuits in the receiver.

A .05 to .25 mfd. condenser connected across the power line will usually remedy this difficulty.

The a.c. fields surrounding the filaments or cathodes may sometimes cause hum due to their control effect on plate current. In sets where the heaters or filaments are operated in series, a rearrangement of the heater sequence may reduce hum. The heaters of the more critical tubes should be nearest the side of the line to which the negative plate supply is connected. Usually the second detector is the most critical, then the mixer (first detector), then the output tube. Their heaters should be arranged in that order with respect to the negative side of the

(*Continued on page 328*)

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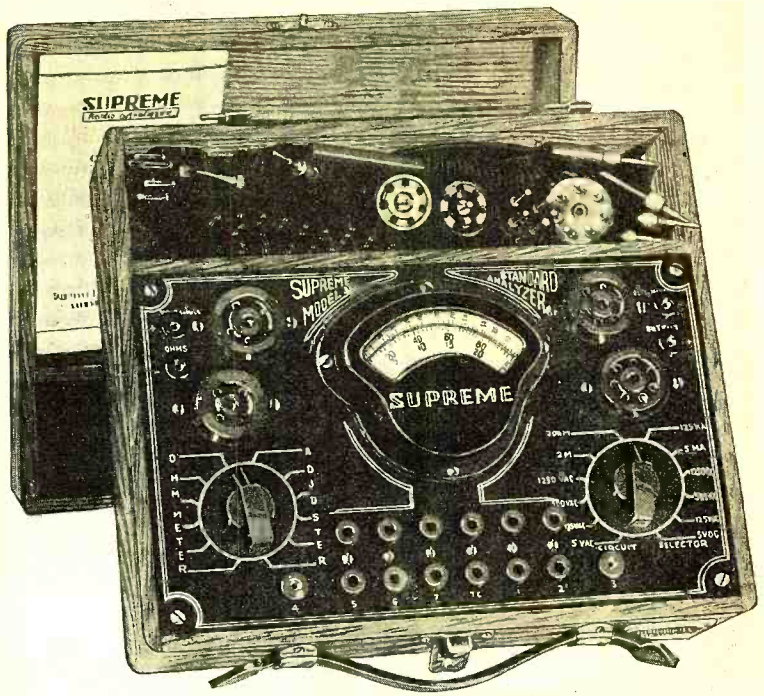

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Go to your jobbers and see Radio's biggest value. Entirely new. Features Supreme's own 5" fan-type Meter with full-vision scale, and the exclusive "Free Reference Point System of Analysis." This new analyzer and tube tester is designed for complete current, potential and resistance analysis of radio circuits. Its compact design makes it the greatest instrument yet for convenient analysis in the home, as well as being ideally constructed for the intricate ramifications of modern laboratory service.

Rapid changes in tube and circuit designs have called for the utmost ingenuity in anticipating tomorrow's needs in today's radio testers. Supreme engineers have met this challenge in the development of the new "Free Reference Point System" of current, potential and resistance analysis and tube testing, the principles of which may be compared to a modern telephone switchboard thru which any subscriber may be connected with any other subscriber and which is easily adaptable to changes in the lists of subscribers. Even a complete change in the location of tube elements cannot render this instrument obsolete. This marvelous new No. 333 has been priced so low, Mr. Serviceman, that you can afford to enjoy its speed and skill without any delay or regret in discarding your present equipment. It's your money-maker for 1934-35 and you should have it. Get a demonstration from your jobber—and send the coupon and get the complete litany of its technical superiority included in the new Supreme 1934-35 catalog.

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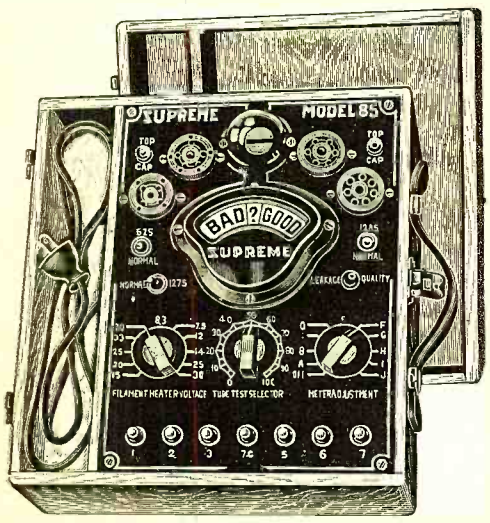
Supreme "Neonized" Leakage Detection Makes You Master Of Any Tube Situation



Reborn in design and efficiency, the famous Supreme No. 85 Tube Tester, portable and counter 1935 Models, are the sensation of the jobbers' displays. The No. 85 has long been recognized as the most complete and accurate of all tube testers. Laboratory comparisons prove the quality tests of the Model No. 85 equal or exceed the best commercial testers. Supreme's 5" full-vision meter indicates true condition of all tubes in terms "good" or "bad". But its detection of leakage and short circuited conditions is what puts the No. 85 in a class by itself. It's really two testers in one, offering a "double check" worth as much as any tube tester alone. As many tubes require replacement because of noisy operation caused by internal leakages and intermittent shorts as for all other reasons. Model No. 85 is so far ahead in detecting these faults that it pays radio servicemen to replace present inefficient testers with this new super-tester. For example, tests show that in the ordinary tester, tubes having leakage across the cathode and heater elements, and tubes with leakage across the plate and screen elements, etc. will test "good" but won't perform in the radio. The Model No. 85 instantly detects this fault and the Neon light flashes the elements between which the leakage exists. Any owner of the No. 85 can relate experiences of increased tube sales resulting from detection impossible in the old style tube testing meters. Equip for profit with this new super-tester. Supreme exclusive Neonized tube testing is added assurance that Supreme 1935 service instruments of every type forecast progress in design, are indeed "Supreme by comparison." See all new Supreme instruments at your jobbers. Send coupon below for detailed Catalog.

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Chatty Bits on Radio Personalities

BACKSTAGE *in* BROADCASTING

Samuel Kaufman

WE'VE often heard it said that "when television arrives" a new crop of radio stars will be created, due to the fact that some of broadcasting's leading personalities do not have appearances that measure up with their voices. This may be partly true, but the crop of girl vocalists on NBC and CBS should be pretty secure when the time comes for their images as well as their voices to be tuned in. On the current schedules there are many girls who can count on continued popularity in the television era. On NBC, for example, there are such comely songsters as Leah Ray, Gladys Swarthout, Frances Langford, Martha Mears, Joy Lynne, Nira Nash, Peggy Healy, Ruby Wright, Kathleen Welles, Annette Hanshaw and Colette Carlay. The CBS can boast of such decorative vocalists as Priscilla and Rosemary Lane, Babs Ryan, Sylvia Froos, Billy Starr, Ruth Robin, Lois Nixon, Dean Janis, Gertrude Neisen, June Joy, Vera Van and Florence Case.

A NEW radio team that looks like a "natural" is the Buddy Rogers-Jeannie Lang combine on the Ward Family Theatre broadcasts Sundays over CBS. The continuity was styled as a musical romance with Buddy and Jeannie as the singing principals. The idea of the sponsor is to create a "sweethearts of the air" designation for the starred vocalists. Both Buddy and Jeannie have been heard on various network features in recent seasons. Buddy Rogers' Green Stripe Orchestra, the dance unit he built up since deserting the cinema, is also billed on the series.

DURING October, the CBS will launch a new Friday night full-hour series chockful of big-name talent. Early plans for the series sponsored by the Campbell Soup Company were so pretentious that the program seemed definitely assured of ethereal success. The feature, known as "Hollywood Hotel," is penned by J. P. McEvoy and adds another well-known name to the ranks of radio writers. Dick Powell has the master-of-ceremonies rôle in the mythical hotel of the series and the leading feminine part was to be filled through a national series of auditions conducted by the CBS. William O'Neal, tenor, has a niche prepared for him in the programs, and El Brendel, Swedish dialect talkie star, has a comic rôle. Ted Fiorito's Orchestra won the coveted musical assignment on this all-star feature.

THE newest British recruit to the stellar NBC roster is Danny Malone, erstwhile headlining tenor of the BBC. Malone's life is that of an Horatio Alger hero. His is the "rags-to-riches" type of career. Just a little over a year ago Danny was singing for chance pennies in London byways. Fame was unthought of; the height of desire was a full-sized dinner. A noted London producer came across the talented lad and obtained an audition for him at Broadcasting House. The rest is history. Danny proved a sensation on the British airlanes and attracted the attention of the

MARTHA MEARS

"AMOS" F. BUCK "ANDY"

PEGGY HEALY

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"BILLY" STARR

rest of the world through his short-wave broadcasts. American listeners heard him on two rebroadcasts over the NBC and the network's scouts promptly signed young Malone, brought him to New York and gave him choice sustaining spots on the air. It is quite likely that Danny will be on a lucrative commercial program by the time this item is printed.

TITO GUIZAR, Mexican tenor, and his harp ensemble, have returned to the CBS Sunday nights under the sponsorship of the Brillo Manufacturing Company. Tito, often called "the Mexican troubadour," gained early fame in his native town of Guadalajara. He studied in Mexico and Italy and, after an operatic career in Mexico City, came to New York five years ago to make phonograph recordings. A contract with the CBS soon followed and Guizar won a tremendous following.

THE popularity of Amos 'n' Andy was partially measured when the team of Freeman Gosden and Charles Correll left the air for the Summer. Radio schedules weren't quite the same without an "Amos 'n' Andy" listing and the fans from coast to coast heartily welcomed the blackface funsters back to the airlanes. A novel Summer fill-in on the Amos 'n' Andy spot was Frank Buck, the "Bring 'Em Back

(*Continued on page* 315)

DANNY MALONE

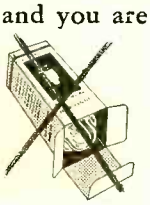
"MAKE SURE THE RADIO TUBES YOU BUY ARE REALLY NEW"—*radio's big stars urge you*

"REMEMBER, FRIENDS, EVEN AN ENGINEER CAN'T TELL A NEW TUBE FROM A USED TUBE. THESE SEALED CARTONS PROTECT YOU AGAINST OLD RADIO TUBES SOLD AS NEW . . . AND THAT'S ONLY THE BEE-GINNIN'. IT MEANS THAT YOU FOLKS WILL HEAR OUR PROGRAMS JUST AS IF YOU WERE ABOARD THE SHOWBOAT WITH US."

Charles Winninger as CAPTAIN HENRY

INSIST ON THIS SEALED CARTON

and you are sure of getting genuine Micro-Sensitive RCA Radio Tubes



BE CAREFUL
Hundreds of thousands of used radio tubes are being sold as new by dishonest dealers—slipped into new open-flap cartons—so you can't tell the difference.

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in your neighborhood. It identifies a dealer selected by RCA to serve your radio tube needs.

Don't be fooled by old worn-out radio tubes palmed off on the public as new. Ask for genuine RCA Radio Tubes that come to you in a sealed, non-refillable carton. They can be tested without removing the carton . . . but the carton *must be destroyed* before tube can be used.

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RCA RADIO TUBES AUTHORIZED AGENT

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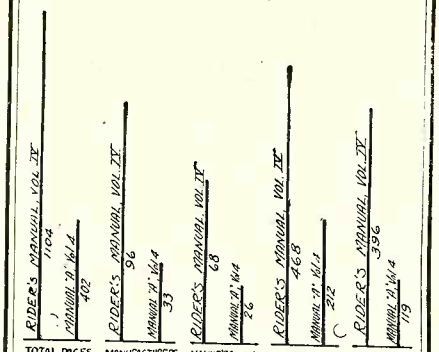

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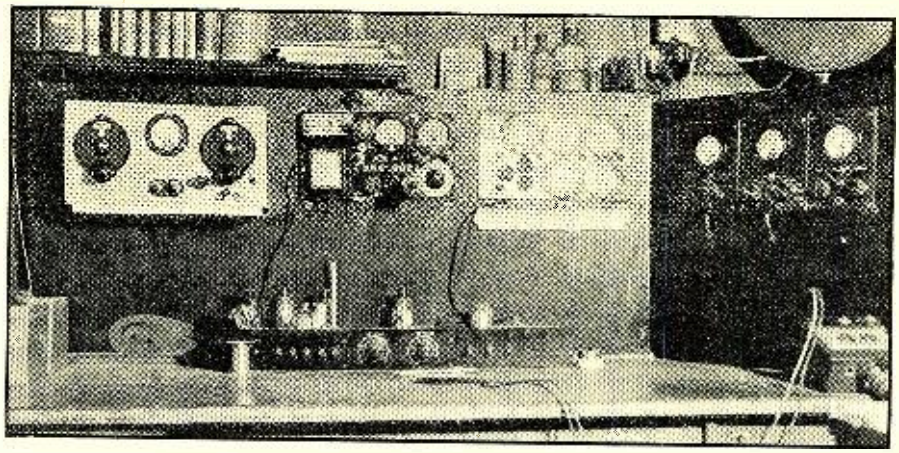

THE SERVICE BENCH

ZEH BOUCK

Servicemen Get Behind *Your* Local Service Organization!

THE purposes behind trade and professional organizations are several and sound. Their aims are all desirable—some of them vital to the general success of their respective industries—and can be achieved only by the *efficient co-operation of those most directly affected!* The primary efforts of consolidation may be applied toward standardization in methods, parts and equipment, the dissemination of common knowledge and the exchange of individual experiences, the establishment of fair scales of compensation, as well as ethical codes, and the building up of an influential organization for protective purposes. At the same time, association with men who are solving your own problems—working along your own lines—provides a stimulus to progress that is by no means subordinate to more concrete considerations.

The radio service game is no exception to the rule, and full advantage can be taken of its possibilities by the individual serviceman only after servicemen, collectively, have exerted their efforts to make the most of the opportunities offered. Join up with your local service organization! If you live in a large city, there is probably a convenient chapter of the Institute of Radio Servicemen (headquarters in Chicago) awaiting your attendance at their weekly, semi-monthly or monthly meetings. In the Southwest, radio servicemen's organizations have sprouted and are flourishing in hundreds of communities. The *Southwest Technician* is their official organ and is published in Dallas, Texas. It features general service news and lists the headquarters of the various associations. If there is no service organization in your vicinity, start the ball rolling *yourself!* Many hotels will be glad to furnish you with free meeting rooms.

Your service editor recently attended a meeting of the I. R. S. M., New York City chapter, held in a ballroom of the Hotel Pennsylvania. It was a hot summer night, but a good crowd of wide-awake servicemen turned out to hear John H. Potts describe the RADIO NEWS "Multimeter," and a Western Electric engineer take the decibel for an airing in relation to mikes and P.A. systems. This was a typical meeting and the sort of thing that sooner or later will ring up on the cash-register!

Noisy Reception

Nosing out hum for prevalence and general cantankerousness are the troubles captioned above. Stimulated by our collective dissertation on the problem in the February department, N. L. Burt writes from Jamestown, N. Y.: "I recently ran into trouble of this nature in a Silvertone. Upon testing the tubes I discovered a 35 intermittently shorting. Replacement helped but did not effect a definite cure; and a contributory cause to the general trouble was finally located in a coupling condenser through point-to-point analysis."

Poor mechanical contacts, resulting in microphonic electrical connections, are often responsible for noise and erratic reception, as is pointed out by Stewart J. Robinson, service expert of Sacramento, California. "Lately we have run across several cases of noisy sets—that is, sets which give a scratchy microphonic response to slight jars when tuned to distant stations. The sound is similar to that caused by a defective tube weld. In each instance, the trouble was traced to metal parts not properly grounded to the chassis. In a Crosley ten tube super, the broadcast to police band wave changing switch was at fault. The shaft of this switch is in two parts, and that portion farthest from the knob is not well grounded. A short piece of flexible braid soldered to both the shaft and chassis cured the difficulty. In the Kolster K-72 the aluminum shields on the r.f. and i.f. coils are grounded through eyelets, which are occasionally slightly loose, permitting oxidation and eventually a 'floating' electrical contact. Drilling out the rivets and substituting nuts and bolts is the most effective and permanent remedy—but rather a task. An easier method, and which seems to work out satisfactorily, is to cut pieces of tin, 1 inch by ¼ inch, and slide these between the shield and the chassis—forcing the strips toward the eyelets. About ½ inch of strip should be permitted to protrude. This is bent against the chassis and soldered in place. Care should be taken, in inserting the strip, not to short the contacts under the shield. We have had several calls to service Kolster 140s on the complaint of motorboating. There has usually been a previous service call taken care of by some other organization, and the trouble is due to over-perfect alignment. These sets will almost invariably motorboat when adjusted for maximum gain. The correct procedure, as given in the Kolster service notes, should be employed if possible. However, this method is often too difficult to accomplish in the home and the following system may be recommended as an effective substitute: The oscillator should be first adjusted for the correct inter-

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mediate frequency. Then adjust for maximum gain around 1400 kc. This will undoubtedly result in motor-boating on weak stations. Detune the i-f primaries by about one quarter turn on the trimming condensers. If this does not provide sufficient stability, repeat the operation. If now the tuning neon light does not give sufficient deflection, go back slowly, watching out for an over-critical trimmer—that is, one which is screwed down so tightly that even a fraction of a turn effects a relatively large variation in capacity. The application of a bit of intelligence to these adjustments will result in a perfectly stable receiver with no perceptible sacrifice of sensitivity or selectivity."

Mr. L. C. Warren of the United Radio Service, Sioux Falls, S. D., carries on with—"Sometimes you will run across a set in which you suspect a condenser to be cutting off. Some of these sets only cut off after you have had them in the shop for a week, pronounced them in perfect health, delivered them and are just in the act of telling the customer that you found so and so wrong, when bing!—and down goes the volume about 40%. One way of tracking these down is to set the voltage on HI, and connect a milliammeter in series with the suspected condenser. Watch the needle and see if it jumps when the set cuts out. Occasionally they have a partial short or open-circuit that will not show up in ordinary tests." (Better fuse the meter!—*The Service Editor*). Mr. Warren continues with the following dope on a—

Majestic Model 50

"The set was dead. All voltages tested normal except screens which showed 75 volts instead of 90 volts. Removing the oscillator tube caused the voltages to return to normal. All .15 mfd. bypasses tested okay. After considerable testing the trouble was located in a little .04 mfd. capacitor connected between the cathode of the r.f. 24A tube and the center tap of the grid winding of the oscillator tube. This condenser tested all right on point-to-point, but was grounded to the case."

SERVICE KINKS

Our Missouri Valley, Iowa, correspondent, Frank W. Bentley, Jr., who photographs as he services, sends us Figures 1

FRANK BENTLEY

and 2. Figure 1 shows a neat and safe way of fastening twisted lamp cord to walls and molding by means of the familiar and economical glass push-pins. The idea represented in Figure 2 is dedicated to the antenna specialist. Double-cared, soft-rubber fruit-jar gaskets slipped over

(*Continued on page 328*)

STOP —read what NATIONAL UNION offers YOU!

MORE PROFIT: The 10 cent higher list price of National Union tubes gives you most profit margin. (Send for Profit Comparison Chart)

PRICE DECLINE PROTECTION: Complete unlimited protection against list price declines on all shelf stock.

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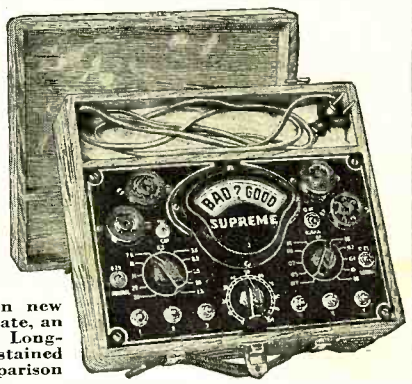
Act quickly! This offer only good for October, 1934! This handsome Supreme tube tester, sturdy, efficient and with BIG quick reading dial, *yours* for only $10.00 deposit and National Union tube purchase contract. Deposit refunded on contract completion makes the tester all yours free and clear, no strings. Ask your jobber or write for details!



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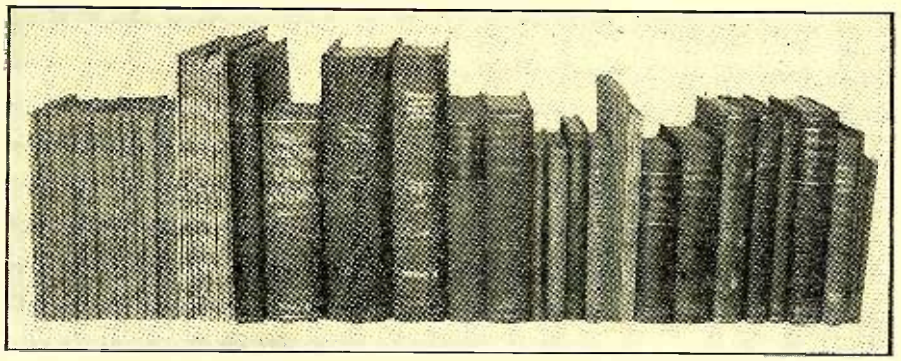

THE TECHNICAL REVIEW

JOSEPH CALCATERRA

"Gateway to Radio," by Ivan Firth and Gladys Shaw Erskine, published by the Macaulay Company, 1934. First-hand information from two writers who have had large experience as writers, performers and broadcasters in radio broadcasting. For a person who is interested in radio or one who wishes to be associated with the industry as a writer, a performer, a sponsor or an advertising agent, the book should prove to be valuable. It includes such material as writing for broadcasting, the entertainment and advertising values of broadcasting, how the writer may use music, the radio drama, etc. It explains the general ideas of program building including recorded programs and spot broadcasting, studio production, the work of the announcer and the actor, the effect of radio on children, the work of the radio engineer and many other activities. It also delves into the intricacies of the sales departments and the press relations departments of broadcasting companies. It tells some little-known facts about the radio audience and their reaction to broadcasting. It also outlines some British production methods, with a chapter on future developments in radio.

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

Observing Long-Delayed Echoes. This announcement describes the steps being taken to check on the possible causes of long-delayed echoes in radio transmission. Information is given on how anyone with a short-wave set can participate in the observations.

Analysis of Air-Condenser Loss Resistance, by W. Jackson. The results of an analysis of the variation of the loss-resistance of a specially constructed variable air condensers, over a range from 35 to 63.5 meters. The condenser and the method of measurement are described, and the expression for the condenser loss-resistance is compared with similar expressions for variable air condensers obtained by previous authors.

Non-Linear Circuits with Large Applied Voltages, by W. L. Barrow. The non-linear properties of vacuum tubes, represented by arbitrary shapes of the current-voltage characteristic. The treatment of the problem, based on a trigonometric representation of the current-voltage characteristic obtained by schedule analysis, allows, computation to be made with much less labor than preceding methods and at the same time possesses all their generality.

On Conversion Detectors, by M. J. O. Strutt. The more common systems which have been proposed and used as first detectors in superheterodyne sets with a view to determining theoretically and experimentally, the relative merits of the various systems.

Dielectric Properties at Very High Frequencies, by J. G. Chaffee. A method of determining the dielectric constant and power factor of solid dielectrics at frequencies as high as 20 megacycles, with an accuracy which is sufficient for most purposes.

Residual Hum in Rectifier-Filter Systems, by Frederick Emmons Terman and Sidney B. Pickles. When filter chokes are placed in the negative lead of a filter circuit whose negative output is grounded, the capacitance of the power transformer to ground by-passes the filter system and produces a residual ripple voltage across the output that may be greater than the ripple voltage passed by a very good filter. The remedy suggested is to place the filter chokes in the positive lead of the filter or to ground the positive output terminal when the chokes are in the negative lead.

Review of Contemporary Literature

Standardizing Basic Electrical Units, by S. J. Zammataro. Bell Laboratories Record, August 1934. The methods by which the whole system of electrical units and electrical unit measurements is built up on the foundation of mercury and silver.

Electrical Constants of the Ground, by C. B. Feldman. Bell Laboratories Record, August 1934. Determining the dielectric constant and resistivity of the ground, as required in selecting suitable sites for transmitting and receiving stations.

Radio Interference from Gas (Neon) Tubes. The Wireless Engineer and Experimental Wireless, August 1934. The causes of interference from neon tubes and the remedies.

Removal of Interference. The Wireless Engineer and Experimental Wireless, August 1934. The methods adopted in a German city to clear up interference, with the result that over 80 percent of the sources of interference were eliminated.

Design of A.V.C. Systems, by W. T. Cocking. The Wireless Engineer and Experimental Wireless, August 1934. A practical review of the various methods now commonly used to obtain automatic volume control.

Chart for Simple Attenuator Design, by W. W. Waltz. Electronics, August 1934. The curves in the chart are for a symmetrical T network of the kind commonly used for volume control, in circuits where the impedance in either direction must remain constant regardless of the setting of the volume control. The use of the chart is said to eliminate excessive mathematical calculations.

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Ignition Diagrams. Radio Retailing, August 1934. A number of electrical diagrams of popular cars are given in this section.

How to Get Copies of Articles Abstracted in This Department

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

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

Review of Technical Booklets Available

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

4. *15 to 200-Meter Superheterodyne.* A description of the outstanding features of the Hammarlund-Roberts high-frequency superheterodyne designed especially for commercial operators for laboratory, newspaper, police, airport and steamship use.

5. *1935 Volume Control and Resistor Catalog.* Data on standard and replacement volume controls, Truvolt adjustable resistors, vitreous wire-wound fixed resistors, voltage dividers, precision wire-wound non-inductive resistors, high-quality attenuators, center-tapped filament resistors, power (50-watt) rheostats and other Electrad resistor specialties.

6. *Line Voltage Control.* Characteristics and uses of a voltage regulator and chart showing the correct Amperite recommended by set manufacturers for their receivers.

7. *Rich Rewards in Radio.* Information on the growth of radio and the opportunities existing in the field of radio manufacturing, radio servicing, broadcasting, talking pictures, television, public-address systems and commercial station operation on land and sea, for men who are trained to fill the many jobs created by radio and allied industries. The book also contains detailed information on the complete home-study courses in radio and allied subjects offered by the National Radio Institute.

9. *Catalog of Resistors.* Specifications of the International Resistance Co. 1935 line of metallized, wire-wound and precision resistors, motor radio suppressors, handy servicemen's kits, technical data and list of bulletins available on the building of servicemen's test equipment.

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

26. *Auto Radio Antennas, Filters and Noise Suppressors.* The complete line of Lynch antennas, filters and ignition noise suppressors especially designed for motor radio installations.

34. *Serviceman's 1935 Volume-Control Guide.* A revised list, in alphabetical order, of old and new receivers showing model number, value of control in ohms and a recommended Electrad control for replacement purposes.

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

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

59. *The IRC Volt-Ohmmeter.* Characteristics and uses of the International Resistance Co. Volt-ohmmeter, a combination voltmeter and ohmmeter specially designed for the point-to-point method of trouble-shooting.

60. *Transformers and Choke Coils for Use in Public-Address and Radio Amplifiers.* Information on the characteristics of a wide variety of Amer-Tran audio and power transformers and chokes.

63. *Moderate-Priced, High-Quality Transformers and Chokes.* Descriptions and prices on the new Amer-Tran Silcor line of moderate priced transformers and chokes designed for original and replacement use.

65. *1935 Line of Testing Instruments.* Information on the 1935 line of Supreme testing instruments including the new Supreme 5 inch fan-shape meter, the new Model 333 de luxe analyzer, the low-priced Model 333 standard analyzer and an improved Model 85 tube tester.

66. *An A.C.-D.C. Tester.* Information November 30, 1934.
about the Supreme 5 inch fan-shape meter, rectifier and resistor kit for the home construction of an inexpensive A.C.-D.C. tester.

November, 1934
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All-Wave Super

(*Continued from page* 302)

absolute and held substantially constant for all stronger signals. Constant *apparent* output is reached at 20 microvolts input. Fidelity from antenna to speaker is flat to 4 db. from 40 to 4000 cycles, and with the speaker is actually within 7 db. at 4000 cycles for "high fidelity," but adjustable to suit taste by the tone control.

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1. 9″ METER. **2.** TRUE MUTUAL CONDUCTANCE TEST. **3.** SPARE SOCKETS. **4.** SHORT TEST. **5.** CATHODE LEAKAGE TEST. **6.** LINE VOLTAGE CONTROL. **7.** INDIVIDUAL TESTS ON DIODES AND FULL WAVE RECTIFIERS.

Here is a tube checker and merchandiser that will help you make friends... help build your business. It does a thorough test job, and does it in a manner that is impressive and convincing to your customers. The design and color scheme are compelling; and the large 9″ meter, set at an easy reading angle, gives direct indication of tube conditions in understandable terms.

And Model 681 has been designed and engineered to end obsolescence worries. Twenty-five sockets are provided in the panel with seven spares for use when and if new tubes are developed. It not only tests all present 4, 5, 6 and large and small 7 prong tubes but also makes individual tests on each section of all double and triple plate combinations. It makes a complete inter-element short test, a high resistance cathode leakage test, and a mutual conductance test on all tubes.

You will want all the facts. Send for bulletin. Weston Electrical Instrument Corporation, 615 Frelinghuysen Avenue, Newark, New Jersey.

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Right now while hundreds are looking for work where there isn't any, the radio service field can use trained men. With the proper training and the necessary equipment, you can enter this field and make a comfortable living. We include with our course this modern set analyzer and trouble shooter without any extra charge. This piece of equipment has proved to be a valuable help to our members. After a brief period of training, you can take the set analyzer out on service calls and really compete with "old timers." We show you how to wire rooms for radio—install auto sets—build and install short-wave receivers—analyze and repair all types of radio sets—and many other profitable jobs can be yours. Teaching you this interesting work is our business and we have provided ourselves with every facility to help you learn quickly yet thoroughly. If you possess average intelligence and the desire to make real progress on your own merits, you will be interested.

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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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All-wave and European range sets, battery, 32 Volt, and electric models—Short Wave Transmitting and Receiving equipment—an amazing P. A. listing—test instruments—thousands of replacement parts, tubes and accessories—are packed into the 1935 ALLIED Catalog. Also "Build-your-own" kits. (As kit specialists we can quote for any circuit appearing in any magazine or handbook.) Write today for your FREE copy of the 1935 ALLIED Catalog.

Allied Radio

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( ) Please send me your FREE 1935 Catalog.
( ) please quote for Kit described in .....
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Name.....
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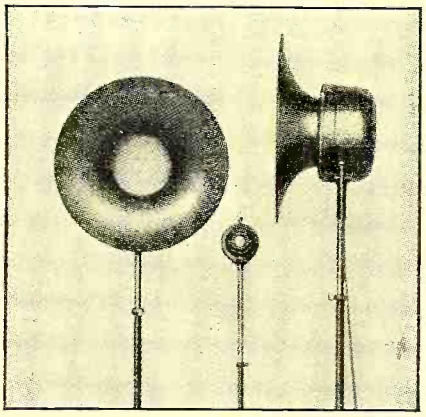
WHAT'S NEW IN RADIO

WILLIAM C. DORF

New Portable Sound System

Perhaps the outstanding feature of the new Bud Speaker Company's P.A. system is its adaptability to a wide variety of indoor and outdoor sound-reproducing applications. The equipment comprises a

combination power supply and amplifier, condenser type microphones available in four different styles, and two 8-inch permanent-magnet dynamic type cone speak-

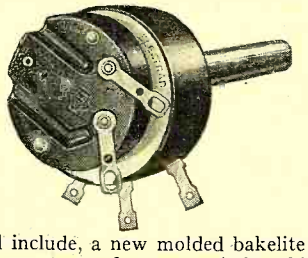


ers. The first illustration shows the desk model condenser microphone, the second photograph illustrates the floor-stand model microphone and the speakers with the new type parabolic deflector baffles.

A New Volume Control

Probably the most outstanding feature of the new Electrad volume control is the graphite resistance element (illustrated below) which provides the ultimate in a smooth surface over which the contact

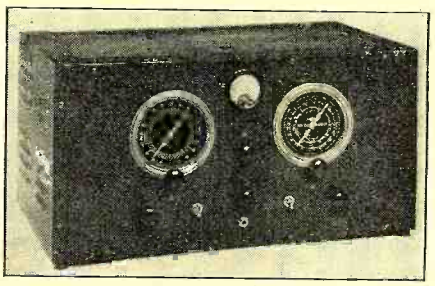
arm may glide with the minimum of noise, to insure an effective, stepless volume control. The resistance element is applied and baked at high temperature to the flat outer rim on a molded bakelite ring, providing a solid base and rigid anchorage for the element. The contact shoe, self-aligning and self-cleaning, is made of a special alloy held by a long bronze tension spring. Additional features of this new



control include, a new molded bakelite case and a new type of power switch, which is readily detached or installed.

Custom-Built All-Wave Receiver

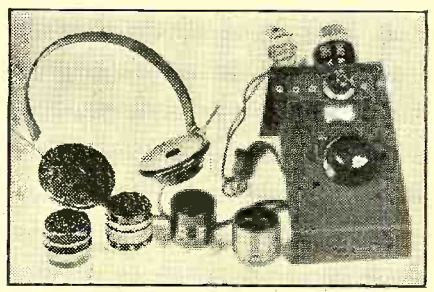
The new Postal 1935 ten-tube, all-wave superheterodyne receiver shown below features the drawer type coils, continuous band spreading, airplane type tuning dials, a tuning meter and an audio beat oscillator for c.w. reception. The tube equipment comprises four –58's, one –57, one –56, one 2B7 and two 2A5's. The i.f. amplifier uses air-tuned condensers and the intermediate frequency is 465 kc. A descriptive circu-



lar and the schematic wiring diagram of the receiver are available to RADIO NEWS readers for the asking.

A Compact Short-Wave Receiver

The Ace Radio Laboratories introduces this compactly designed two-tube, low-cost short-wave kit. It employs the plug-in type coils covering a wavelength range from 15 to 600 meters. The circuit comprises a regenerative detector and one stage of audio amplification. A one-tube model



is available. Both sets use a 1½-volt dry cell for the filament supply. These sets are available, either in kit form or completely wired, ready for operation.

A Four-Band Multi-Wave Receiver

This new Freed-Eisemann seven-tube superheterodyne receiver has a wavelength range from 15 to 2000 meters. The four tuning bands are divided as follows: 15 to 35; 30 to 85; 200 to 560 and 900 to 2000

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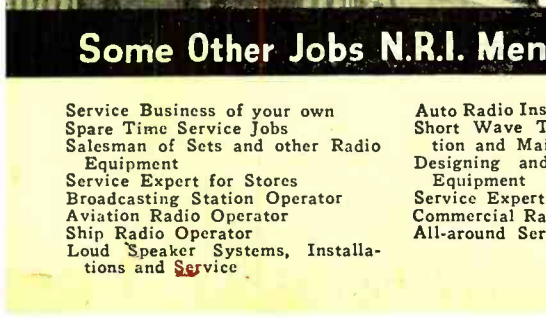

Broadcasting Stations
Employ managers, engineers, operators, installation and maintenance men for jobs paying up to $5,000 a year. The larger stations employ as many as 20 to 60 men. Over 600 Broadcasting Stations now in operation.

Set Servicing
Spare time set servicing pays many N.R.I. men $5, $10, $15 a week extra. Full time men make as much as $40, $60, $75 a week. Almost every community offers trained men opportunities to enter this profitable field.

Loud Speaker Systems
Installing and servicing Loud Speaker Systems in auditoriums, for sporting events, political rallies, in schools, factories, railroad stations, etc., is another growing money-making field for Radio trained men.

The world-wide use of Radio sets for home entertainment—over 18,000,000 in use in the United States today—has opened many opportunities for you to have a profitable spare time or full time Radio service or retail business of your own. I show you an easy, quick way to do most Radio service jobs. The day you enroll I send you instructions for doing 28 Radio jobs common in almost every neighborhood. Many N.R.I. men make $5, $10, $15 a week extra in spare time while learning. I show you how to install and service all types of Radio receiving sets. I give you Radio equipment and instructions for conducting experiments, for building circuits and testing equipment, and for making tests that will give you broad practical Radio experience.

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Broadcasting stations use engineers, operators, station managers, and pay up to $5,000 a year. Radio manufacturers use testers, inspectors, foremen, engineers, servicemen, and buyers, and pay up to $6,000 a year. Radio dealers and jobbers employ hundreds of servicemen, salesmen, managers, and pay up to $5,000 a year. Radio operators on ships enjoy life, see the world, with board and lodging free, and get good pay besides. My book tells you of the opportunities in these fields, also in Aviation Radio, Television, Police Radio, Short Wave Radio, Automobile Radio, and other branches of this fast growing industry. Get it.

(Continued on other side)

Some Other Jobs N.R.I. Men Train for

- Service Business of your own
- Spare Time Service Jobs
- Salesman of Sets and other Radio Equipment
- Service Expert for Stores
- Broadcasting Station Operator
- Aviation Radio Operator
- Ship Radio Operator
- Loud Speaker Systems, Installations and Service
- Auto Radio Installation and Service
- Short Wave Transmitter Installation and Maintenance
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- Commercial Radio Station Operator
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"I am operating Station KTSA. Since I graduated I have operated quite a few stations, in addition to aviation work. My N.R.I. training has been invaluable. I have worked at almost all angles of the Radio game—started out as serviceman, then operator, engineer and pilot." T. L. KIDD, 519 W. Summit Ave., San Antonio, Texas.

$55 to $65 a week

"I am doing lots of repair work on the latest model sets, and am getting along splendidly, thanks to you and N.R.I. training. It has surely helped me to get ahead in Radio. The depression did not seem to hurt me. I have been making an average of $55 to $65 a week." PETER J. DUNN, 901 North Monroe St., Baltimore, Md.

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"I don't think another Course goes as much in to detail and gives such wonderful results. I have been installing a number of automobile Radios. My earnings have increased considerably. They run around $75 a month for spare time work." A. C. HENDRICKSEN, 125 S. Melrose Ave., Elgin, Ill.

With Montgomery Ward $2,000 to $2,500 a year

"I would estimate my yearly earnings at $2,000 to $2,500. I have been with Montgomery Ward for quite a few years—have been able to buy a fine home and a new car. I have advised several to take your Course—men who have since made a big success in Radio." STEPHEN MILLARD, 390 South Dale St., Denver, Colorado.

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Hold your job until you're ready for another. Give me only part of your spare time. You do not need a high school or college education. Hundreds with only common school education have won bigger pay through N.R.I. J. A. Vaughn jumped from $35 to $100 a week. J. E. McLaurine increased his earnings 100 per cent. The National Radio Institute is the Pioneer institution devoted exclusively to training men and young men by home study for good jobs in Radio. Twenty years of experience are behind N.R.I. Training.

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

Many of the 18,000,000 Radio sets now in use are only about 50% efficient. Some are out of date—need modernizing. Many need slight adjustments of tuning circuits—others lack tone quality. Still others need new tubes or need "balancing"—to put them in perfect working order. I will show you how to cash in on these conditions. I will give you the plans and ideas that have enabled many N.R.I. men to make $5, $10, $15 a week in spare time while learning. Ford R. Leary, 1633 Davison Road, Flint, Michigan, writes: "My part time earnings while taking the N.R.I. Course were $651."

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I give you an agreement, in writing, to refund every cent of your money if you are not satisfied with my Lessons and Instruction Service when you complete my Training. And I'll not only give you thorough training in Radio fundamentals, but also ADVANCED TRAINING to enable you to specialize in the branch of Radio that suits you best. Read the outline of this Advanced Training and read my Money Back Agreement. Get my FREE BOOK.

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Mail the post card below for your FREE COPY of my big 64-page book, "Rich Rewards in Radio," which I want to send free to every ambitious person over 15 years old. It tells you all about Radio's spare time and full time opportunities; about my Training; what others who have taken it are doing and making. MAIL THE POST CARD NOW.

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Find out what RADIO Offers

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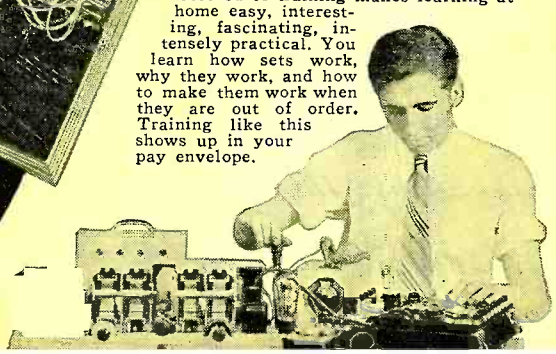

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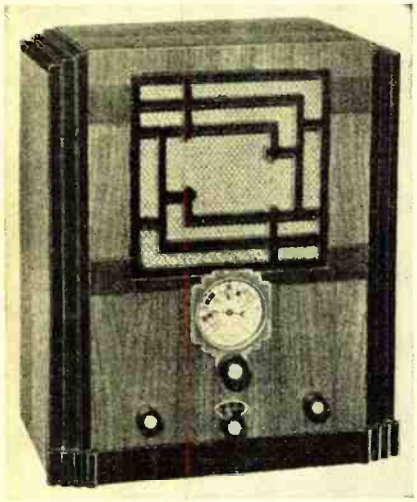
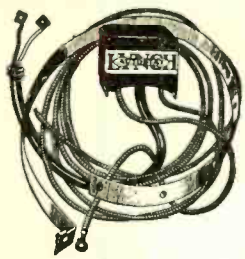
meters. The power output rating of the receiver is 3 watts and the intermediate frequency is 462 kilocycles. The set features a new airplane type tuning dial with a vernier arrangement. The dial is calibrated in meters for the short-wave bands and in kilocycles for the high wavelengths. The tube equipment comprises: one –6D6, one –76, two –78's, one –77,



one –42 and one –80 type rectifier. The dimensions of the set are 15 inches high by 13 inches wide by 8¼ inches deep and it weighs approximately 16 pounds.

New Charge Control Device for Motor Car Receivers

All automobile radio receiver owners will be interested in the Lynch Autostat, a new device which increases the charging



rate of the car generator so as to take care of the additional drain on the car battery imposed by a radio set, car heater or other motor-car electrical accessories. When the radio or other accessory is turned on, the charge control goes into action and increases the charging rate of the generator by an amount equal to the extra current consumed. When the radio is turned off, the charging rate goes back to normal. The operation is automatic and there are no adjustments of any kind.

A Multiplier for A.C. and D.C. Voltage Measurements

An interesting announcement was recently received from Morrill and Morrill on their new six-range, meter-multiplier device. This compact instrument, when used in conjunction with an 0-1 milliammeter, provides d.c. voltage readings in the following ranges: 5, 10, 50, 100, 500 and 1000 volts at 1000 ohms per volt. For a.c. voltage readings a rectifier type milliammeter is employed. The manufacturer advises that the device can be used in conjunction with 100, 200, and 500-microampere meters. Special calibrated resistors are employed to provide an accuracy of plus or minus one percent. The multiplier is built into a sturdy bakelite case measuring 4½ inches by 3 inches by 1½ inches. Servicemen, experimenters and laboratory engineers should find this a very handy device in measurement work.

16-Tube Super

(*Continued from page* 299)

to the chassis, hence the grid voltage becomes more negative, the plate resistance increases and if the station has a certain minimum strength, the grid voltage goes below cut-off, making the plate resistance practically infinite—thus letting all high notes through. When no signal is coming in, the grid voltage is zero and the tone control automatically cuts out practically all noises found in between stations. This system works smoothly both on long and short waves.

The tone control is of an entirely new type. The older type of tone control permits the reduction of high notes but not increasing of lows. The "Fidel-A-Stat" makes it possible to decrease the high notes and also to increase the lows while enabling the listener to combine these two effects in any desired proportion. The control lever connects to a continuous resistance strip without any stop—so the handle can be turned completely around. Tap B is connected to ground, tap C is connected to a feed-back circuit which selects the lower notes. Tap D is connected to a condenser which forms a filter for the high notes. When the runner is at B, the tone is "normal"—this happens with the control lever in a vertical position. When the runner is between B and C, the lows are boosted. Between B and D the highs are reduced and between C and D the two actions are combined and may be blended. Maximum boosting of lows is at C and maximum reduction of highs at D.

The "Micro-Tenuator" is a device for varying the response of the receiver. The first i.f. transformer has a third winding which is closed through a variable resistor, R4. This third winding acts as a shield between the primary and secondary, becoming a more effective shield when the resistance R7 becomes less. So the coupling can be varied and this makes the set broader and sharper, according to one's need. The control also affects the sensitivity. The result is that when high fidelity is wanted for local stations, the band of acceptance can be expanded.

The audio amplifier output stage now employs four –45 tubes in parallel push-pull in a Class A circuit. A 2A5 pentode, used as triode, serves as driver.

Looking at the front panel, the right-hand knob is a dual-speed tuning control with ratios of 6 to 1 and 30 to 1. The left-hand knob controls a double rheostat acting as volume control and tone compensator.

The center lever is the band-selector switch—for the broadcast band it stands perpendicular. The right lever controls the micro-tenuator and "on-off" switch. The normal position is vertical. The left lever is the "Fidel-A-Stat."

This receiver was tried out in the Westchester Listening Post alongside of other receivers in use there. On the broadcast band, the quality was very good and the volume tremendous. The automatic volume control works to perfection, so much so that it seems to the initiated that the short-wave powerful stations do not come in strong enough—they do, but the a.v.c. cut them all to the same size. On short waves the audio output seems weaker and the stations in Germany and England do not cause blasting; however, all the weak stations are coming in. Quietness of operation is surprising. The general run of world short-wave stations, usually received at the Post were turned in, with exception of Japan. The set was not tested at the right time for Oriental reception.

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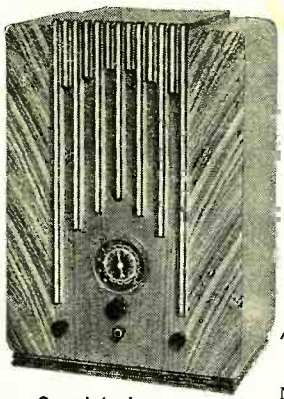

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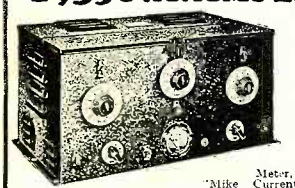

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RADIO PHYSICS COURSE

ALFRED A. GHIRARDI

Lesson 34
Capacitors

PART (A) of Figure 1 shows the conditions existing in a condenser having no charge. The switch K is open, the plates each contain their normal number of free electrons represented by small dots, and the dielectric material has all its atoms in a regular form as shown, with the electrons revolving undisturbed in their circular orbits.

At (B) the switch is closed, making the applied e.m.f. effective in causing a *flow of electrons* around through the wire from the positive to the negative terminal as shown. An ammeter connected as indicated will show that a momentary current is flowing through the circuit. The free electrons are removed from the upper plate, causing a deficiency of electrons and hence a positive charge there, and are transferred around through the circuit and crowded into the lower plate, causing an excess of electrons or negative electric charge there. The introduction of the excess of negative electrons on this plate causes a charged condition in the dielectric between the plates. Depending upon the strength of the charge, the large number of electrons forced around to the negative plate builds up a strong negative charge on it. This increases the repulsive effect on the negative electrons in the dielectric material. On the other side, the positive plate attracts the electrons in the dielectric and therefore the *orbits* of the dielectric electrons are distorted, causing them to assume the shapes shown in exaggerated form at (B). Since most of the electrons in the dielectric are tighty bound to their atoms, they cannot actually leave the dielectric or flow directly through if it is a good insulating material, but are simply strained out of their normal positions and paths as shown. The operation just described is called *charging* the condenser or capacitor. An electrostatic force is said to exist between the positive and negative plates of the condenser. As the electrostatic forces act in straight lines, they are sometimes called *electrostatic lines of force* and are represented by straight lines. It is evident that the greater the applied voltage is, the greater will be these electric forces acting to displace the electron orbits of the dielectric. Also the *quantity* of the electrons, or *electric charge* stored in the plates will be proportional to the value of the applied e.m.f. and the total surface area of the plates.

If the source of e.m.f. is now removed, and the terminals of the condenser are connected together as shown at (C), the electrons on the lower plate will flow back around to the upper plate until the normal condition of (A) is reached. The ammeter will indicate another momentary current flow while this is taking place—opposite in direction to the flow during charging. This is called *discharging* the condenser.

If now the polarity of the e.m.f. is reversed and applied again as shown at (D), the atomic structure will pass through the same conditions as at (B) but in the opposite direction, as shown at (D). Current will again flow through the external circuit momentarily during charge and discharge of the condenser. If an alternating source of e.m.f. were applied to the condenser as at (E) this action would be repeated over and over, a stream of electrons (electric current) flowing through the external circuit and into one plate and out of the other during each charge and discharge of the plates. Thus, we see that in a capacitive circuit it is possible to have a transfer of electrons (or a current) flowing continually in the external circuit between the plates without actually going across or through the dielectric from one plate to another. Current does not flow *through* a condenser for the simple reason that the

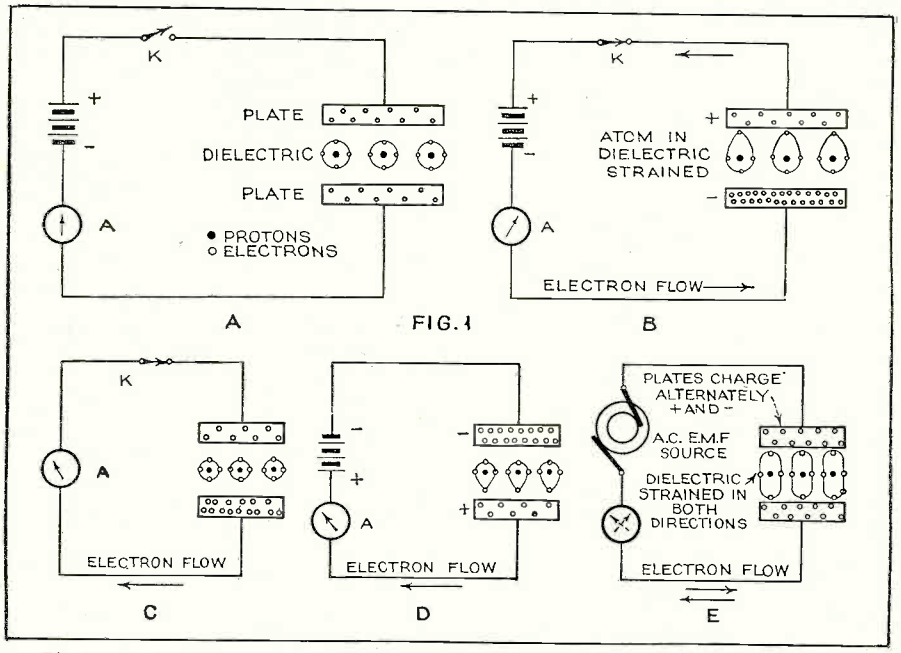

Figure 1. Electron movements during charging and discharging of a condenser (conductor). The electrons in the atoms of the dielectric are strained out of their normal orbits by the electric charges of the electrons transferred around to the negative plate during charge.

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

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plates are insulted from each other by the dielectric. Current does flow in and out of the metal plates, and through the external circuit, however.

If the poularity of the charge is rapidly reversed, as in the case of the application of the alternating e.m.f., there will be a steady straining of the electron orbits in the dielectric, first in one direction (B) and then in the opposite direction (D), resulting in appreciable friction. This generates heat, the quantity of course depending on the extent of the motion (the applied e.m.f.), and the rate or frequency of reversal. That is, the more volts e.m.f., the more motion and heat, also the more speed (cycles per second), the faster the motion, and the more heat developed. If sufficient heat is generated, it will melt the impregnating material used in the condenser, weakening the dielectric structure mechanically and perhaps causing the condenser to break down due to a few electrons breaking through the weakened material.

Since the electron orbits are displaced during the charging and discharging of a condenser, and since the movement of electrons constitutes an electric current flow, it is common to talk of these electron displacements in the dielectric as "displacement currents." Displacement currents do not consist of any actual flow of electrons as in the case of a condenser, but simply a small displacement against the surrounding electrical forces.

In a capacitor used in a direct-current circuit in which the voltage is fluctuating (as in the filter circuit of a radio B power device), there is never a complete reversal of charge, but the change in condition from that in (A) to that of (B) and back, will have just as much destructive effect as though complete reversals with approximately half the voltage were to take place.

From the foregoing description of the action of a condenser or capacitor in a circuit, it is evident that a condenser really stores electrical charges or electricity. It is unlike the storage battery in this respect, for the storage battery really stores up chemical energy when being charged and is ready to convert this back into electricity on discharge. In a charged condenser, we actually have an object in which a large number of electrical charges (electrons) from one set of plates have been pushed around to the other set of plates and left there. They will tend to return to the other plaes if given the slightest opportunity to do so. If they are allowed to return, by providing a conducting path between them, the plates become electrically neutral again, the condenser is said to be *discharged* and a current flows through the conductor while this is taking place.

The "Skyscraper"

(*Continued from page* 297)

megacycles (9.4 meters) and the low-frequency range to 535 kc. The individual ranges of the standard coil set, either 2-circuit or 3-circuit, are as follows:

No. 1—16.4 mc.-7.3 mc. (18.3-41 meters)
No. 2—9.2 mc.-4 mc. (32.6-75 meters)
No. 3—4.5 mc.-2 mc. (66.6-150 meters)
No. 4—2.2 mc.-1 mc. (136-300 meters)

In the December issue additional discussion of this new receiver will appear, together with wiring and construction hints, a picture wiring diagram and complete working draws for the construction and drilling of the chassis.

Parts List

C1, C2—Hammarlund midget condensers, type MC-20S, 20 mmfd.
C3, C4—Hammarlund midget condensers, type MC-140M, 140 mmfd.
C5—Hammarlund midget condenser, type MC-35S, 35 mfd.
C6—Hammarlund adjustable padding condenser, type MICS, 70-140 mmfd.
C7, C8, C9—Aerovox type 1460 mica condensers, .0001 mfd.
C10—Aerovox tubular paper by-pass condenser, .01 mfd., 400 volts
C11—Aerovox can type paper condenser, 1 mfd., 200 volts
C12—Aerovox type PB-25 cardboard electrolytic condenser, 10 mfd., 25 volts
C13, C14, C15—Solar mica condensers, .01 mfd.
CH—Thordarson a.f. choke, type T-2927
L1—Hammarlund 2-circuit, 4-prong plug-in coils (4 required)
L2—Hammarlund 3-circuit, 6-prong plug-in coils (4 required)
R1—Electrad potentiometer, 25,000 ohms
R2—Electrad potentiometer, 50,000 ohms, type 205-D
R3—Electrad potentiometer, 500,000 ohms
R4—Electrad voltage divider, type B, 50,-000 ohms, 25 watts
R5—100,000 ohms, ½ watt
R6—250 ohms, ½ watt
R7—4 megohms, ½ watt
R8—.5 megohm, ½ watt
R9—Electrad Truvolt resistor, 700 ohms, 10 watts (1-watt resistor suitable)
RFC1—Hammarlund r.f. choke, type CH-8, 8 millihenries
RFC2—Hammarlund r.f. choke, type CH-X, 1.2 millihenries
SW—Toggle switch, d.p.s.t.
T—Thordarson output transformer, type T-6806, single-pentode primary, 10-ohm and 2000-ohm secondaries
1 Hammarlund isolantite 4-prong socket, type S-4 (for coil L1)
3 Hammarlund isolantite 6-prong sockets, type S-6 (for 6C6 and 6D6 tubes and coil L2)
1 Eby wafer socket, 6-prong (for -41 tube)
1 Blan the Radio Man "Skyscraper" chassis assembly consisting of chassis, 2 box shields and dial panel (see layout drawing next month)
1 National illuminated drum dial, type H
2 Kurtz-Kasch vernier dials, 2¾-inch size
1 Eby chassis mounting, 4-prong cable connector (male)
1 4-wire cable (3 feet)
1 Eby 4-hole cable plug (female)
1 Eby moulded 3-gang binding post
1 Eby moulded twin jack marked "Speaker"
2 Hammarlund tube shields, type TS-50
1 Hammarlund flexible-shaft coupling
2 Blan solid-shaft couplings
1 3-inch length of ¼-inch-diameter bakelite rod
1 shield can, 2-inch diameter (cut length to approximately 2 inches) for detector plate filter shield

Backstage

(*Continued from page* 307)

Alive" man, who came to the mike on the NBC Pepsodent program to dramatize his thrilling jungle adventures.

DENNIS KING, operetta and talkie star, has returned to the microphone after a long absence as star of a dramatico-musical series heard over NBC Wednesdays under the sponsorship of Enna Jettick shoes. King has dual singing and dramatic assignments on the programs. On each broadcast he is heard in two or more baritone solos and in the leading rôle of an original or adapted drama. The singing actor's stage career was studded with successes. Louis Katzman's orchestra supplies the musical background to the series.

★ ★ ★ ★

Ghirardi says:

"Have been looking over some of the new 1935 receivers, and am thoroughly convinced that radio set circuits and construction have become so intricate that only those servicemen with a really complete knowledge of the latest servicing methods, instruments and circuit features will stand the gaff this season. THE FIT WILL SURVIVE! What are you doing about learning all the new things you will need to know? Think it over boy! You know you *can* learn if you really get *down* to it!"

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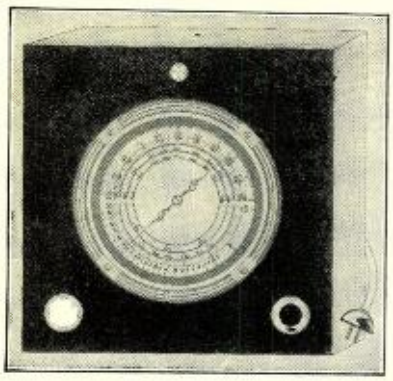

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Model 137 works on 90-120 volts a. c. or d. c. or batteries, hence any place there is a radio set there is power to run the Signal Generator. Special models for any voltages can be supplied.

This instrument is made by the first manufacturer to introduce direct-frequency reading dials in signal generators, the method that dispenses with awkward charts, saves your eyes and your time, and enables greater accuracy.

The main purpose of Model 137 is to line up intermediate, broadcast and short-wave channels in receivers. It may be used also as station-finder (100 kc. to 500 mgc.). One may pre-set the receiver accurately at 125 to 16,000 kc. The pre-setting benefit is one that mere station-finders do not possess.

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QRD? QRD? QRD?

CONDUCTED BY GY

IT is with a great deal of pleasure that this column notes the tremendous response in fan letters given to an editorial on Education by our Editor, Laurence M. Cockaday, in a recent issue of this magazine. It only emphasizes the fact that radio men are continually trying to know more about their work and endeavoring to find the best possible schools to keep them abreast with new developments. Letters came from all over the country, from little towns and big cities, from ships at sea and boats at dock, requesting information as to the best schools for their particular needs and Mr. Cockaday, true to his determination to give the boys the proper guidance, answers these letters personally suggesting the method of instruction which would be most helpful. So if you have not already done some hearties, get yourself on the right track and let us help you solve your problem of keeping in step with the times.

THE new Radio Commission, which comprises the new Federal Communications Commission, was picked by President Roosevelt more for their political sponsorship, their experience in public life and his personal knowledge of their abilities than for any expert background in the field of communications. The Chairman of the new Commission who is appointed for a seven year term is Judge Eugene O. Sykes; he was also Chairman of the FRC. The only communications expert is Dr. Stewart, who won the place wholly on merit for his work on the Dill-Rayburn bill. One of the big ideas of the ARTA and other organizations professing to bring the radio profession into the limelight as one about which to be proud, have in their plans for future development a place for some former radio man to be on the Board. It would simplify matters greatly, not only for these organizations, but also for the radio men, if there were a man on this Commission *who had had previous experience as a radio operator!* There are many cases brought before the Board which require the judgment of one who can see the radio man's viewpoint, not only from the standpoint of communication channels, but also from the standpoint of bettering conditions for radio men through advice to NRA administrators who, in turn, could deal with shipping companies. This may seem a far-fetched dream at the present time, but if organizing continues and if radio men stick together as a single unit, this fantastic idea might become a reality.

It seems that the West Coast has been more thoroughly organized than the East Coast as attested to by latest developments on demands by radio operators from a few shipping companies. Vacations *with pay* have become the order of the day; *three men* on a ship *plus pay increases!* The answer to why the West Coast can gain its ends and the East Coast has been unable to make much headway in its demands can very easily be seen. It is all in the simple catch phrase "All for one and one for all." Until the time comes when radio men will combine for a common cause, they will not be very successful in any of their demands. No employer, regardless of how much money he is making, will easily give in to certain requests unless pressure is brought to bear, and if he is able to get cheaper men to take ships out, he will do so. This only means *organization* and *more organization*. One cannot wait to fight alone. One must have co-operation. Good news occasionally comes into Ye Editor's ken, and we wish to pass it on to you. The Moore and McCormack SS Co. has seen fit to again raise the wages of its radio operators. From the West Coast, the Globe Wireless Co. has agreed to increase the pay of radio ops in the point-to-point services. The Eastern Steamship Company grants two weeks' vacation with pay for each radio op who has had one year or more service in the company. Also the discontinuance of laying radio men off, when vessels are in port for periods of one week. The Dollar Steamship Lines have added a third operator on their vessels. And so it goes, as things keep looking brighter from day to day.

On the good-will flight which will shortly take off to Soviet Russia, Art Finch will be radio officer aboard. Arthur can tell some pretty hair-raising stories of past experiences and they are not tall ones, either. This flight, with all its hazards, will be duck soup for him, sez he. An aircraft radio compass will be used on the plane added to a 75-watt c.w. and i.c.w. XMTR, also an emergency 5-watt c.w. phone transceiver. He will work on the following frequencies: 315 kc., 333 kc., 3105 kc., 12420 kc. and 16560 kc., through call letters KHYVE. Ye Ed certainly wishes Finch the best of luck and hopes the trip will have plenty of smooth sailing.

On a wild night in the late fall of 1933 a boat, not equipped with radio or direction finder, went on the beach within ten miles of a coastal station with great damage to the vessel, whose cargo was practically lost by the pounding of the waves. Distress signals were "blown" all night before attention was finally attracted. The next morning radio-equipped vessels were directed to her aid. Now the Great Lakes Protective Assn. has adopted a rule that all vessels in the membership must be equipped with a radio compass. Had this vessel been equipped with radio, the coast stations would have known all particulars within ten minutes and the cargo might have been saved. They might also have adopted the rule that all membership boats must carry radio *and a competent radio operator!*

A sea-going tug had delivered its tow at Santiago, Cuba, and was making heavy weather of it back to the States, passing among a few of the many islands that dot the lane—out that way. Suddenly there appeared a Cuban gunboat, which quickly overtook them, firing a shot across the tug's bow to make her stop. The captain of the gunboat came aboard with his aides, demanded of the skipper "who he was and where he was bound," and the skipper, all hot and bothered, even forgot his own name but managed to make the Cuban understand that he was an American bound for the States. In the meanwhile, the quartermaster was diving into the sail locker trying to find the American flag, but as it was buried at the bottom of all the other flags, he couldn't get to it. Suddenly, out popped the radio operator from his shack with a shout that the U. S. Coast Guard was sending boats out to overtake them. This scared the Cubans away. The funniest part of the story is that, when the tug reched New York, the owners of the tug had received information that four men had been shot and thrown overboard by the Cuban gunboat! Just another poor radiogram gone wrong!

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From the West Coast we hear from Joe Dockendorf, check-er-up-er of the doings of operators out in them thar oceans: *That* most of the broadcast technicians in L.A. joined the I.A.T.S.E., paying $3.00 monthly dues. I.A. did nil, except collect the money, although the International Office refused to recognize the Operators' section. The boys were swayed into the I.A. by a "sound" technician who refused to allow marine or airway men into this union, and the boys, under persuasion by V. Mathison, A.R.T.A. delegates, dropped from the I.A. and some of them joined the A.R.T.A. *That* there are 150 experienced broadcast operators in Los Angeles and less than one-third are members of any organization. I.B.E.W. has a special agent out from Washington who is laying the groundwork for a real organization. *That* Mackay Radio is looking for 50 operators, point-to-point work on tape, but it seems that so far there have been no takers for the job.

Well, gang, now that you've heard our side of the story relative to organization, education and opportunities, we would like to get an earful from you. So shoot in the heavy dope so that we all can relay the "info" to all, and with a cheery toodle-oo and 73- ge, GY.

Aid to Inventors

(*Continued from page* 281)

what surgeons call the "operation of choice"; the one of several alternatives that you should choose, if you can.

Still another possible form of commercial protection is by trademark. The law of the United States permits persons or corporations to record in Washington, under reasonably simple rules and restrictions, any made-up name, design or other mark or designation not already having a well-known meaning. No one else then is permitted to use this. The two most famous Smiths in the world, the brothers labelled Trade and Mark whose bewhiskered countenances adorn the box-top of their cough-drops, are a case in point. Such works as "Kodak," "Uneeda," "Mazda" and many others now become household words are, or originally were, trademarks. Like most laws, that of trademarks is not without kinks, tricks and uncertainties, but in general it is true that any invention may be protected in some degree, like any other piece of commercial property, by marketing it under a trademark instead of protecting it by a patent (or in addition to a patent).

The trademark, however, does not protect the invention itself, but merely its name. My organization, for example, makes noise-meters. We could market these as "Freelab" noise meters or under some similar made-up and trademarked name and no one else could use that name, either on our kind of a noise-meter or on any other kind. But anyone else could copy our noise-meters, if unpatented, exactly in every detail and could sell these copies openly without interference, so long as he sold them under some other name. In situations like this trademark protection often is the best kind of commercial protection obtainable. It requires no disclosure of secrets. It also has the advantage that it can be combined with patent protection, there being no objection to selling under trademarked names articles which also are covered, partly or completely, by patents. A trademark undoubtedly is among the protective mechanisms to be studied when commercial protection of any invention is being considered.

A fourth kind of protection, extremely indefinite but often one of the most satisfactory, is protection by the reputation of the user. Such names as "Weston," "Western Electric," "Marconi" and hundreds of others, affixed to a piece of apparatus or to any other article, carry to the well-informed purchased a guarantee, the commercial value of which would be hard to over-estimate. It has been the usual rule of American courts that such established names, whether corporate or personal, cannot be used by unauthorized persons. This, however, is an asset and protection, not often available to the individual inventor, whose reputation usually is still to be made.

Still other forms of possible commercial protection exist as other alternatives to patents: sales contracts, control of raw materials, legal copyright of descriptive or other literature, and many others. All may be proper parts of a final commercial plan but none is likely to be of first importance to people with nothing but an invention or an idea. In spite of all the limitations on a patent and of the many things which patents might be but are not; a plain, ordinary patent is likely to be the form of protection most desirable and most easily obtainable by the average inventor and on the average invention.

But before a patent is obtained or even is applied for, the first step should be to make as certain as one can whether or not the supposed invention (which it is proposed to patent) is likely to be commercially useful. Some possible and practical ways of trying to do this will be the subject of the next article of this series.

The DX Corner (Short Waves)

(*Continued from page* 294)

adelphia, Pa.; A. Hamilton, Somerville, Mass.; A. J. Mannix, Portsmouth, N. H.; A. H. Garth, Adelaide, S. A.; W. S. Robinson, Sarepta, La.; F. Stone, Kintnersville, Pa.

Send in Your Reports

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

O. R. N. S. W. L. P. O. to Wed U. S. Girl

LONDON, ENGLAND—C. L. Wright of Leicester, Official Radio News Short-Wave Listening Post Observer for England is on the way to the United States to marry Miss Eleanor Fox of Mount Clemens, Michigan whom he has never seen but with whom he became acquainted through the medium of short-wave radio. Mr. Wright has maintained one of the leading Official Listening Posts for RADIO NEWS in England for some time and both he and Miss Fox are ardent radio enthusiasts. He just "happened" to get into communication with Miss Fox on an amateur transmitter and after further conversations started a correspondence and eventually proposed by letter.

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DOWN IN THE BOWL NEAR RAPID CITY

Here is the spot from which the stratosphere flight started. Notice the announcers, with the portable short-wave transmitter. At right is the Army hydrogen truck, for filling the great balloon.

The Playground of Radio Waves

(*Continued from page 276*)

All of his instructions, conveyed over land lines and short waves, were heard at all reception and transmission points. Two NBC mobile units and an airplane were en route to the point of the balloon's landing being directed by the short-wave signals. Miller co-ordinated all of the talks from the gondola and the land into an intelligible series of broadcasts throughout the day. The bulk of the short-wave material was not rebroadcast on the network on account of its private nature, consisting chiefly of official talks between the fliers and Army officers, scientists and relatives. Just those portions considered of a sufficient nature to warrant public interest were routed over the entire NBC chain.

Short-wave amateur listeners throughout the nation reported constant reception of the balloon and land stations which provided them with an unusual day of dramatic real lifethrills in a first-hand story of the daring venture above the atmosphere.

Major Kepner, like a ship's radio operator, stuck to his post till the very last possible moment. With the gondola plunging toward the ground with a ripped and tattered bag, Major Kepner did not leap until the balloon was 500 feet above the ground and until his two companions were safely parachuting clear of the gondola.

When the balloon crashed on Reuben Johnson's farm in Loomis, an unual radio scoop was scored when Kepner, who landed nearby, rushed to the farmhouse and used a party-line telephone to call a base station at Grand Island, Nebraska. Once the communication was established and permission was obtained from the American Telephone & Telegraph Company to use its facilities in such a manner, the voice of Major Kepner, picked off the phone line, was routed right to Chicago NBC headquarters for distribution over the network.

An unusual radio courtesy was extended to NBC by a non-chain station, KGSW, Kearney, Nebraska, which rushed its own microphones and remote-control apparatus to the Johnson farm for the use of the network. The apparatus did not arrive until after the voice of Major Kepner was put on the air direct from the telephone equipment, so it was not used. NBC officials, however, were profuse in expressions of thanks for the KGSW gesture.

A total of thirty-five Official RADIO NEWS Short-Wave Listening Post Observers in twenty states reported hearing signals from the balloon and sent in logs of the flight.

Exactly three weeks after the United States Army Air Corps-National Geographic Society flight, another penetration of the stratosphere was made. On August 18, Professor Max Cosyns, who accompanied Professor Auguste Piccard on his previous ascent, went aloft in Belgium with Meere Van der Elst. He utilized the old Piccard balloon. It was planned to utilize coded radio messages from the Cosyns balloon in order to prevent false reports from being picked up as authentic. But false reports persisted throughout the day until the Belgian National radio broadcasting station issued denials of unauthentic rumors regarding the balloon's ascension to fantastic heights. Something went wrong with the radio equipment, Cosyns later explained. It was not the intention of the balloonists to seek an altitude record and they reached a height of 52,480 feet. The balloon, aloft until the evening, landed safely in Yugo-Slavia.

The official stratosphere altitude record was made November 21, 1933, when Lieutenant Commander T. C. W. Settle and Major Chester L. Fordney soared to a registered height of 61,237 feet.

NBC land stations from coast to coast kept in frequent two-way communication with the two men in the sealed gondola as the balloon soared from Akron, Ohio, to the salt marshes near Bridgeton, New Jersey. At one time during the flight the chain rebroadcast a three-point conversation between the balloon, more than ten miles above the earth, and the NBC studios in New York and Chicago. This flight was jointly sponsored by the NBC and *The Chicago Daily News*.

Shortly after the flight, C. W. Horn, general engineer of NBC, emphasized the importance of such radio experiments.

"If stratosphere planes are developed," he stated, "it will be possible to keep in constant communication with them. We were able to maintain a two-way voice circuit with Commander Settle and Major Fordney from the time they took off until they dropped their batteries to lighten their load."

The engineer claimed that it would be possible to use much more powerful transmitters in planes—provided that such stratosphere craft was developed. He explained that in the balloon it was necessary to carry batteries, whereas a plane set could be operated on a regular generator.

Space and weight limitations in the gondola required the designing of special

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apparatus for the stratosphere flight. All of the radio equipment, including the transmitter, receiver and batteries, weighed less than 100 pounds, according to Robert M. Morris, who directed the designing of the equipment. The transmitter weighed twelve pounds and the receiver, eight pounds. The equipment was built under Morris' supervision by C. P. Sweeney and C. K. Atwater. Morris was stationed at Akron during the flight, where he was assisted by H. C. Luttgens, Chicago division engineer. Morris and Atwater later served in preparations for the Kepner-Stevens-Anderson stratosphere ascent.

The transmitted operated on a wavelength of 15,760 kilocycles. The receiver was alternately tuned to the frequencies of 6425 and 6100 kilocyles, which land stations utilized to contact the balloon.

A push-pull Hartley oscillator was utilized in the balloon transmitter with Class B modulation using the 230 series tubes. This arrangement, Morris told the writer, gave maximum power output with the least battery consumption. The transmitting antenna was of the half-wave vertical type and was supported between the gasbag and gondola.

Two stages of tuned-radio-frequency amplification were used in the receiver. The set included a tuned regenerative detector and a Class A pentode output tube. All receiving tubes were of the -30 type. The receiving antenna was of the trailing-wire type used in many airplanes.

Morris said that the transmitter had power of 3 watts in the antenna. Following the flight, Horn stated that the transmitter had an actual energy radiation of just 1 watt. Despite this low power, the signals were clearly heard by the widely separated stations of RCA Communications, Inc., at Riverhead, Long Island, and Point Reyes, California.

Additional land stations in Akron, Pittsburgh and Washington were in constant touch with the balloon. Horn explained that it was possible to send so far on low power from the stratosphere because of the absence of ground reflections. He said that this absence changed the angle of reflection from the Heaviside layer, greatly increasing the range of coverage.

The NBC listening hook-up was so arranged that the received messages from the gondola could be relayed to the network for rebroadcasting from any point where the signals were clearest.

Although liquid oxygen was used to sustain the two passengers, Morris explained that it was necessary to use a special flask of oxygen to provide an equalized air flow through thet radio apparatus to keep it functioning properly.

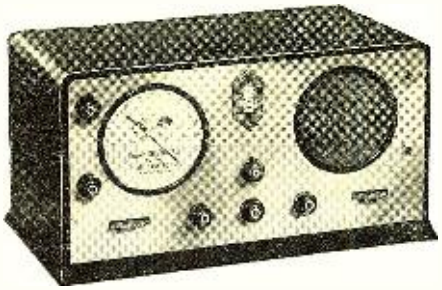
During the flight Commander Settle and Major Fordney reached the official altitude mark of 61,238 feet. This set a new altitude record for the United States and one that was recognized by the Federation Aeronautique Internationale as an official world record.

William McCracken, chairman of the National Aeronautical Association, made these facts known in an NBC broadcast when he officially notified Commander Settle of the barograph readings certified by the Bureau of Standards' calibration of the two sealed instruments. McCracken said the facts would be forwarded to the international federation to claim a new official world record. He pointed out that the Russian stratosphere flight, which claimed an ascension of nearly twelve miles, has not been recognized as that country is not a part of the federation.

Horn said that the NBC was greatly pleased with the results of the stratosphere radio experiment and was looking forward to an opportunity to go further with such tests.

(*Continued on next page*)

Again! A great forward step in short-wave receiver design



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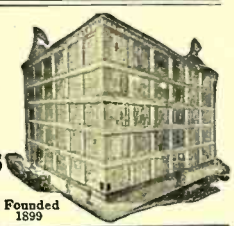

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Commander Settle carried the same radio equipment in the balloon in his attempted solo stratosphere flight of August 5, 1933. During preparations for this first flight he was assisted by the Piccard brothers, Auguste and Jean, the noted stratosphere experts. The August flight was a special attraction of the Century of Progress Exposition, but the balloon had a forced landing in a Chicago railroad yard and was slightly damaged.

Radio apparatus was also carried on the Soviet stratosphere balloon which rose to a record height but ended disastrously in a crash. The radio announcer, at a reported height of over eleven miles, told of the progress of the ascent.

At the time of this writing, plans were under way for several additional stratosphere flights. It is likely that some of them may occur by the time this reaches print. And it is quite certain that radio will play important parts in many of the forthcoming ascents.

Two of the contemplated ventures dealt with the sending up of balloons with "robot pilots" and apparatus.

Professor Arthur H. Compton, of the University of Chicago, made pretentious plans for the sending up of a small pilotless balloon carrying scientific instruments and a small broadcasting set which would automatically transmit the measurements back to the ground. It was claimed that the pilotless balloon could ascend higher than man has yet soared because of the dispensing with of a metal gondola and apparatus essential for sustaining life at such high levels above the earth. The gas-bag was only fifteen feet in diameter when fully inflated. The tiny radio transmitter weighed only seven pounds. Dr. Compton said that radio engineers would record the messages automatically sent to earth. Whether or not the balloon is recovered, he held, will not effect the scientific value of the flight, inasmuch as the important data would already have been radioed to ground. It was estimated that the entire equipment, including the balloon, would cost only $100.

The Meterological Institute of Moscow had planned to send a balloon of twenty-foot diameter (at greatest expansion) to a height of twenty-five miles above the earth. This balloon, too, was to carry no passengers but only automatic equipment for registering data on solar radiation of radio waves, measurements of air currents and ionization of the higher levels. It was reported that this robot flight was to be just a preparation for a subsequent passenger balloon ascent to record-breaking heights.

Shortly after this plan was made known, word reached the U. S. A. that a Soviet crewless balloon soared higher than any aircraft had ever ascended. It was sent aloft from the Russian icebreaker *Yermak* in the Arctic region. The tiny craft reached the record altitude of 13.26 miles. The balloon carried instruments which recorded altitude and temperature. These records were automatically relayed to the scientists aboard the ice breaker by radio equipment.

Professor Jean Piccard and his wife were scheduled to make an Autumn ascent to the stratosphere in the same balloon used by Settle and Fordney in 1933. This flight was not expected to be equipped with radio.

The Italian Air Force last Spring announced the formation of a special section to attempt a penetration of the stratosphere with airplanes. This was designed to be the first "heavier than air" machine flight to the stratosphere. This announcement was followed in the Summer with a report from Rome to the extent that Italian airplane manufacturers were competing in the construction of airplanes and motors for stratospheric navigation. The Ministry of the Air also appointed a special stratospheric commission headed by General G. A. Crocco, a member of the Academy of Italy.

It was also reported in London last Winter that the British Air Ministry had completed secret experiments with an airplane designed for stratosphere flights.

In Chicago, last September, Wiley Post reached a height of 40,000 feet in his famous plane "Winnie Mae." The round-the-world flier said he found it necessary to rearrange some of his instruments before taking off in a new altitude attempt. It was understood that, after some adjustments, he planned to make a new try for a stratosphere record.

Another ascent to the stratosphere may possibly be sponsored by the National Geographic Society at a later date. It was reported that the costly ruined equipment on board the "Explorer," the most expensive apparatus ever designed for a similar flight, was covered by insurance and could be replaced.

DOWN INSTEAD OF UP!

This is a photograph of Dr. William Beebe, marine explorer, just before he was locked in and descended into the ocean to a world's record for depth. The photograph is shown because it is interesting to note that he used a "metallic sphere" to keep the pressure out where the stratosphere fliers used a "metallic sphere" to hold air pressure in for supporting respiration.

It is reported that the nation's leading commercial radio laboratories are experimenting on the perfection of stratosphere radio equipment. Notably, the Naval Research Laboratory is engaged in such experiments.

The Navy has constructed an airtight vault which can be air conditioned for various types of radio tests. When desired, the test chamber can be turned into a vacuum. The purpose of the novel room is to study how radio performs during high-altitude and stratosphere flights. Thus, scientists are enabled to learn, on the ground, some of the facts that would not be advisable except on high-altitude flights.

Radio's part in the stratosphere flights of the past was so successful that it will undoubtedly play an integral part in the flights to come.

A New Television Company

LONDON, ENGLAND—The British are very confident of the future of television, a fact which is shown by the forming of a new television company, "Plow Television, Ltd.", which was announced recently.

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S.W.'s and Aviation

(*Continued from page 271*)

devices both for communication and for automatic piloting. This is true of privately owned planes as well as commercial planes. New airplanes must be equipped with radio instruments and the installer must have the proper knowledge for installing them in all types of aircraft. Then there is the problem of keeping sets in repair, keeping them in proper working order. The great vibration on equipment from powerful motors, stresses on antennas, etc., replacement of worn-out parts, batteries, damaged generators, etc., entail a complete technical and working knowledge of aviation repair work. High-class specially-trained service workers are in great demand. Then again each plane and ground station must have an alert operator, one who is expert at radio, who may be familiar with flying or possibly one who has his own pilot's license.

RADIO NEWS, in response to a growing demand for information on aviation radio matters, will carry, in the future, informative articles on aviation radio, especially as pertaining to short-wave work. In this issue, in the following pages, we have a number of articles in this field of interest both from the aviator's viewpoint and from the radioman's viewpoint. We will continue to publish this information and in a near-future issue will start a complete series dealing with radio installation, maintenance and repair on familiar types of aviation radio equipment. We believe this will be important editorial material for a large number of our servicemen readers and operators, civilian, commercial and in the armed forces of land and sea.

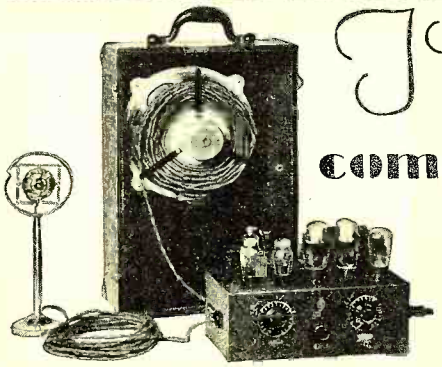
Fliers! Here's How

(*Continued from page 272*)

The unit is preferably mounted alongside the receiver and within reach and view of the pilot to eliminate the difficulty attendant upon remote control. When it is absolutely necessary, however, remote control is possible. The control switch should also be mounted close to the unit. The loop is supported by a 1⅛-inch O.D. round steel tube which should be fastened in a socket clamped or welded to a cross member on the centerline of the plane. The loop is 18 inches in diameter and its base should be about 4 inches above the top of the fuselage. It is connected to the control switch by a flat cable which can be installed beneath the cabin upholstery. In some cases, where a streamline socket and antenna post is already available, the loop-supporting clamp can be welded to the antenna post.

Connections to the new unit itself are made through two plugs, a two-wire shielded cable and a binding post. One four-prong plug carries the input connection from the control switch; the six-prong plug carries all battery connections and the three wires to the equalizer; the two-wire cable connects to the receiver output, and the binding post is connected to the receiver antenna post or the control switch, depending upon the installation requirements.

The use of the loop antenna gives satisfactory operation over any distances over which stations can be received during the daytime, but at night course indication may not be reliable at distances greater than 25 to 30 miles. Research work is being conducted to eliminate this "night effect."



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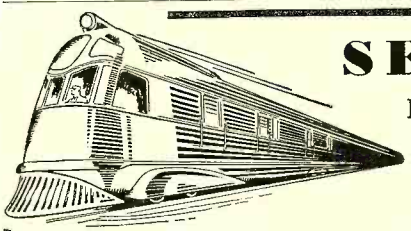

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R.N. Lab. Amplifier

(*Continued from page 283*)

distortion for full output. There is an opportunity for distortion in the first stage, because this stage has no input volume control and may therefore be overloaded by a strong input. With 4 watts output, the *minimum* gain permissible in the amplifier is 62 d.b.; if the gain control must be reduced further to bring the output below 4 watts it is a sign that the input voltage is too great and will overload the first stage. In such a case an external volume control for regulation of input is needed. While this difficulty could be avoided by placing the main gain control ahead of the first tube rather than the second, this is not advisable with this high gain amplifier, because any noise or hum present in the first stage would be amplified to the full extent and might be objectionable.

In regard to the values of the coupling resistors and condensers and the tone control condensers, inasmuch as the gain available is more than will ever be used in practice, it would be possible to decrease the amount of coupling and so still further improve the frequency response and stability and still have plenty of gain. A good value for the coupling resistors in each stage would be 50,000 ohms. The 85 mh. choke in the second stage could be omitted. Both coupling condensers could be .1 mfd., and the .5 megohm resistor in series with the first coupling condenser could be omitted. Tone control condensers should then be equal for each stage, and good values would be .003, .002, .0015, .001, .0005, and .00037 mfd. The gain would then be about 110 d.b., which is still unusually high.

In all investigations of distortion, frequency response, etc., as shown in the curves and oscillograms last month the use of a cathode ray tube as the indicating device was very helpful.

Next month some additional descriptive material will be presented, including close-up views of the individual sections showing the detailed layout of parts.

List of Parts

C1, C4, C11, C16—Aerovox 8 mfd. electrolytic condensers, Type P5
C2—Aerovox 16 (8-8) mfd. electrolytic condenser, type P5, 450 volts
C8, C9, C17, C18—Aerovox 2-section 8-8 mfd. electrolytic condensers, type P5, 450 volts (2 required)
C3, C6, C7, C12—Aerovox 25 mfd. electrolytic condensers, type PR100, 100 volts
C5—Aerovox .05 mfd. cartridge condenser, type No. 1084X, 1000 volts
C10—Aerovox .1 mfd. cartridge condenser, type No. 1084X, 1000 volts
C13—Dubilier 1 mfd. paper bypass condenser, 400 volts
C14, C15—Polymat 8 mfd. electrolytic condensers, 500V
C19—Aerovox 1 mfd. bypass condenser, type 1003, 1000 volts

1—.002 mfd.
2—.001 mfd.
3—.0005 mfd.
4—.00037 mfd.
2—.00025 mfd.
1—.0002 mfd.
1—.0001 mfd.
} Aerovox type 1460 mica condensers used in tone control assemblies

J1, J2, J3, J4, J5, J6, J7, J8, J9, J10—Yaxley Junior jacks, type 702, circuit-closing
J11—2-prong flush-mounting a.c. receptacle
L1—Hammarlund type RFC-85 r.f. choke, 85 millihenries
L2—Kenyon type KC 40-60 choke, 40 henries, 60 ma.
L3—Kenyon type KC 15-150 choke, 15 henries, 150 ma.
M—Triplett type 321 milliammeter, 0-1 ma., bakelite case
R1—Yaxley 400-ohm potentiometer, type C-400-P

R2, R3—Triplett 25-ma. shunts
R10—Triplett 5-ma. shunt
R26—Triplett 10-ma. shunt
R29—Triplett 100-ma. shunt
R18—Triplett 200-ma. shunt
} for Triplett 0-1 milliammeter

R4—500,000 ohms
R5—2500 ohms
R6, R15, R18, R24—50,000 ohms
R7—150,000 ohms
R8, R13, R21, R31—100,000 ohms
R9—60,000 ohms
R11—500,000 ohms
R14—3500 ohms
R16—250,000 ohms
R17—200,000 ohms
R20—1 megohm
R22—4750 ohms
R25—7300 ohms
} Lynch metallized resistors, pigtail type, 2 watts

R23, R28,—Yaxley 20-ohm potentiometer, type C-20-P
R12—Electrad 500,000-ohm volume control, type R1-203
R27—Aerovox 750-ohm, 10-watt resistor, type 931
R30—Lynch 500,000-ohm wire-wound precision resistor
R32—Aerovox 1500-ohm, 50-watt adjustable resistor, type 954
S1—Yaxley type 760, d.p.d.t. junior jack switch
S2, S6—s.p.d.t. toggle switches
S3, S4—Yaxley No. 1517 single-deck, 7-point tap switches, shorting type
S5—d.p.d.t. toggle switch, well insulated
T1—Kenyon type KLGA laboratory standard input transformer, provides input impedance values of 17, 50, 125, 200, 250, 333 and 500 ohms
T2—Kenyon type KA12A laboratory standard push-pull input transformer, 1:2.5 each side
T3—Kenyon type KPP500 laboratory standard output transformer, provides output connections for 1.3, 3, 4.5, 7.5, 15, 50, 125, 200, 250, 333 and 500 ohms
T4—Kenyon type KPT245 laboratory standard power transformer; primary tapped for 100, 110, 115 and 125 volts. Secondary windings 375-0-375 volts (125 ma.), 5 v. (2 amps.), 2½ v. (14 amps.), 2½ v. (3 amps.)
1 General Radio type 660-A universal relay rack
1 General Radio type 661-A unit panel and accesories
2 General Radio type 661-B unit panels and accessories
1 General Radio type 661-K end- and base-plate assembly
2 General Radio type 661-L end- and base-plate assemblies
1 General Radio type 661-R dust cover
2 General Radio type 661-S dust covers
6 General Radio type 661-P1 blank mounting discs
1 General Radio extra base-plate
1 Eby 7-prong wafer socket (used for cable receptacle)
3 Eby 6-prong wafer sockets (1 used for cable receptacle)
1 Eby 5-prong wafer socket
3 Eby No. 12, 4-prong molded bakelite sockets
1 Eby type 9DO-1L chassis-mounting male plug, 7-prong
1 Eby type 9C-1L chassis-mounting male plug, 6-prong
1 Eby type 11-DO female cable plug, 7-prong

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100J Side-Pressure Jack. Mounts in ¼" hole. Uses new Alden *Silver plated BERYLLIUM COPPER* "S" plug points. (See p. 242 Oct. Radio News)

100J (Black) *100JR* (Red) Pressure Jacks. List ea.....15
103JR Circuit Opening Jack. Mounts in ¼" hole. Enable both current and voltage tests to be made with only one jack in each circuit. Dependable *solid silver* contact. Molded red top. List.....35

111D Double Circuit Plug with molded handle to fit 102JR above. Reliable *silver* contacts. List.....40
111DL Current Plug Leads completely wired with leads and two molded plug terminals. For rending current in 102JR jacks. List.....$1.00
112SL Black Jumper Lead wired with S points in black molded handles. Fine for point to point. List.....50
112SLR Same as 112SL, but all in red. List.....50

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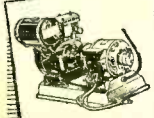

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2 Yaxley type 75TC phone plugs
1½ feet rubber-covered duplex cable (used with phone plugs for meter test circuit)

Brilliant "Tube" Window Display

A brilliant window display of dominating size has just been released by the National Union Radio Corporation of New York for use in retailers' and servicemen's store windows. Mr. Walter Kiefer designed the display which someone has remarked "looked like a chip off the World's Fair."

New Switches

(*Continued from page 285*)

eight. If fewer than five positions are desired, the adjustable stop can be set to the proper position. Such a switch can be permanently mounted on a panel with the required terminals connected to the standard and another set to the position under test, terminating in suitable clips or connectors to which the apparatus under test can be connected quickly and easily. Many pieces of laboratory equipment, which ultimately find application in factory test equipment, are fitted with such switches. An additional test position can be provided which is only reached when the adjustable stop is reset.

Change-over circuits, such as triple- or double-pole, double-throw, are provided by the simple 1-section, 4-circuit switch. In some cases an "off" position seems advisable. This can be obtained by simply resetting the adjustable stop. Applications for such switches are found in loudspeaker and deaf-set devices on radio receivers; as change-over switches for microphones, pick-ups, amplifier and speaker connections in public-address work; as change-over switches in beacon and direction-finding equipment in aeroplanes and many other uses where the circuits and equipment may be of an experimental or semi-permanent type.

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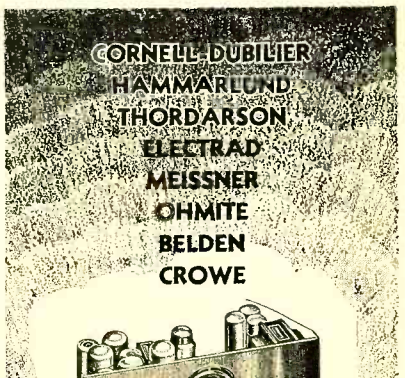

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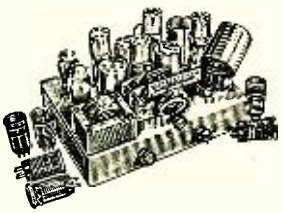

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denser boxes are required as secondary standards. Special values may be desirable, such as a box which has values of 10,000, 20,000, 30,000 ohms, etc. Figure 5 shows the conventional methods of 5 or 6 resistors to give variation in steps from 0 to 9 or 10, as desired. In the case outlined, a 2-section, single-circuit, 11-point position switch is used. If an adjustable condenser is desired, it can be made from four capacitors having values of one, two, three and four units and a 4-section, 1-circuit, 11-position switch. This provides a decade capacitor of from one to ten units as shown in Figure 6.

Often laboratory or experimental oscillators are desired which produce certain frequencies for test purposes. A simple audio oscillator, which is very convenient for many test purposes, can be constructed as shown in Figure 7. A single-section, single-circuit switch is used to provide the various capacitors and the adjustable stop can be set to include the desired switch positions.

Vacuum-tube voltmeters are always of interest, particularly when unusual measurements can be made. In one laboratory it was found necessary to read from .5 volt to 4.5 volts d.c. to an accuracy of .001 volt. Many circuits have been devised which permit such readings to be taken over a limited range. The problem was solved by using the conventional slide-back type of vacuum-tube voltmeter and incorporating a potentiometer network. A 900-ohm bifilar resistance arranged in 9 units of 100 ohms each is connected across a 10-volt battery. The current is so adjusted so that the drop across each unit is exactly .5 volt. The switch S2 allows the desired voltage to be placed in series with the unknown, and when balance is obtained, the sum of the readings on the voltmeter plus that shown on the switch S2 gives the value of the unknown voltage. The switch S2 is a single-section, single-circuit, 10-position circuit selector switch. S1 and S3 are single-section, 4-circuit, 2-position switches. Figure 8 shows the application of these switches in the circuit.

It is obviously impossible to enumerate even a fraction of the uses to which selector switches can be put in the laboratory or for experimentation wherever electrical circuits must be switched under control of the technician. New uses are constantly evolved and for such cases a group of standard selector switches which afford a high degree of flexibility in application form an important and indispensable part of the laboratory and experimental equipment. **Paul G. Andres**, Chief Engineer, Yaxley Mfg. Co., Inc.

All-Wave Super

(*Continued from page* 300)

frequency transformers are pre-aligned at the factory by the manufacturer.

Operating the receiver is simplicity itself. Inspecting the illustration at the top of this page, the control knob shown at the lower left of the chassis is the combined on-off switch and volume control. The middle knob is the main tuning control operating the two gang 140 mmfd. condensers which are connected across the first detector and oscillator circuits, respectively. The knob on the extreme right controls the trimmer condenser which is shunted across the first detector tuning unit and is employed to maintain alignment with the oscillator circuit. For those who prefer not to build their own, the receiver is made available, completely wired, tested and ready for operation, by Try-mo Radio.

The Ham Shack

(*Continued from page* 284)

is encountered, the solution is to use two single-pole switches.

More and more 'phone station operators recently have gone in for R.F. Class B or linear amplifiers, as a means of increasing their output without having to invest in expensive modulating equipment that is required to swing the larger tubes (such as the 203-A and 852) a full 100 percent. With such amplifiers, it is possible to adjust the power to any desired amount by changing the input to the linear amplifier.

In transmitters where either two buffers or doublers are employed between the oscillator and final amplifier, it is possible to reduce power by cutting out the final amplifier. Usually where high power is used in the final amplifier the buffer or doubler exciting it is operated between 30 and 50 watts input and provides an excellent low power "rig" for local contacts. With such transmitters all that it is necessary to do is to couple the antenna tank to the final buffer stage. If link coupling is used between the buffer and final, the problem is greatly simplified. The link coupling coil may be removed at will if it is made as a plug-in coil. A coil large enough to excite the antenna may be substituted. If the set is modulated, the final amplifier modulator may be switched to the buffer-stage plate supply and the gain in the audio amplifier, feeding the modulator, reduced until the modulating power is cut down in proportion to the input of the buffer stage, which for low power purposes, has become the final amplifier.

The editors of RADIO NEWS are interested in having a group of amateurs throughout the country serve as contact stations, affiliated with this department. Such stations would pass on amateur reports of activities and amateur news of developments in their respective territories. Such stations would be designated as official amateur message stations, and would be regarded as amateur contributors to this department. Operators of stations who wish to serve in this amateur capacity are requested to write the editor of this department giving a description of his apparatus. Also, this department is to be conducted on an international basis, and foreign amateurs also are invited to participate in its activities. Remember, this is an amateur department, *by* and *for* the amateur!

A large number of RADIO NEWS Official Short Wave Listening Post Observers include in their reception reports, lists of amateur stations they have heard in their sections of the world. Rather than include this information in the Short Wave DX Corner, the editor has asked that such reports be used in the amateur department. A few of them follow: heard by Norman C. Smith, "Forge House," High Street, Foots Cray, Sidcup, Kent, England:

On 20 meter phone: VE2CA, W2AOE, W2DCX, W2AAO, W2DC, W2AKA, W2KI, W9BHT, W3MD and W2AFB.

On 80 meter phone: W3DFB, W3AEX.

On 40 meter code: W6BBY, W7CKU, ZL2LB, W7CXJ, NY1AA.

On 20 meter code: VE1EK, W4BYD, VE3TO, W4TZ, E17P, VE1BV, W4APP, W4AH, CM2DO, CM2FA, VE8DR, W7CNX PY2CD, and "many 1s, 2s, 3s, 8s, and 9s.

Heard by Edward H. Muhlig, 1009 Fifth Avenue, North, Great Falls, Montana, U. S. A.: W3MB, W6ABF, W6FNN, W8GLY, W9XBY, W9YL, K4FA, X1B and CM2SE.

Heard by Roger Legge, Jr., 20 Beethoven

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Station List

(*Continued from page 301*)

POINT-TO-POINT SERVICE

Location	*Call*	*Freq.*
Albany, N. Y.	WSDM	A, G, L.
Albuquerque, N. M.	KSX	D, I, M.
Atlanta, Ga.	WEEA	E, H.
Atlanta, Ga.	WQDP	B, F, K.
Baltimore, Md.	WEEB	E, H.
Big Spring, Texas	KGUG	F, K.
Blythe, Calif.	KGUS	F, K.
Boston, Mass.	WSDD	A, G, L.
Brownsville, Texas	KGUE	F, K.
Buffalo, N. Y.	WSDO	A, G, L.
Burbank, Calif.	KSI	D, I, M.
Charleston, S. C.	WEEC	E, H.
Chicago, Ill.	WSDG	A, G, L.
Cincinnati, Ohio	WSDI	A, G, L.
Cleveland, Ohio	WSDQ	A, G, L.
Denver, Colo.	KGSP	C, J, M.
Detroit, Mich.	WAEI	A, G, L.
Douglas, Ariz.	KGUN	F, K.
El Paso, Texas	KGUA	B, F, K.
Glendale, Calif.	KGUR	B, F, K.
Greensboro, N. C.	WEEG	E, H.
Ft. Worth, Texas	KGTF	B, F, K.
Houston, Texas	KGUB	F, K.
Indio, Calif.	KGUQ	F, K.
Jackson, Miss.	WSDB	F, K.
Jacksonville, Fla.	WEEJ	E, H.
Kansas City, Mo.	KST	D, I, M.
Las Vegas, Nevada	KGTJ	C, J, M.
Linden, N. J. (Newark)	WEEN	E, H.
McRae, Ga.	WEEH	E, H.
Memphis, Tenn.	WSDK	B, F, K.
Miami, Fla.	WEEM	E, H.
Murfreesboro, Tenn.	WSDH	A, G, L.
Newark, N. J.	WSDC	A, G, L.
New Orleans, La.	WQDQ	B, F, K.
Orlando, Fla.	WEEO	E, H.
Phoenix, Ariz.	KGUP	F, K.
Pueblo, Colo.	KGSR	C, J, M.
Richmond, Va.	WEER	E, H.
Salt Lake City, Utah	KGTH	C, J, M.
San Antonio, Texas	KGUD	F, K.
Spartanburg, S. C.	WEEP	E, H.

Symbol	*Frequency*	*Wavelength*
A	2612	114.8
B	2636	113.8
C	2720	110.2
D	2732	109.7
E	2748	109.1
F	3467.5	86.46
G	4740	63.25
H	4745	63.19
I	6510	46.06
J	6530	45.91
K	6550	45.77
L	6560	45.70
M	8015	37.40

Note: C, D, I, J, M.—blue chain
A, B, F, G, K, L.—brown chain
E, H.—green chain

Signal Generator

(*Continued from page 278*)

coil 8 and condenser 2 are employed to generate this signal. The modulation percentage is fixed within such limits that it will never over-modulate.

This entire system receives its power from small A and B batteries which are neatly fitted into conveniently located positions in the oscillator. Because of this self-contained arrangement, the shielding of the entire oscillator is made thoroughly effective; so effective that it is possible to wrap the antenna lead of an all-wave receiver around the oscillator twice and not receive any signal from the oscillator when it is operating at the same frequency as that to which the set is tuned.

The accompanying photograph illustrates the outward appearance of the all-wave oscillator. The band switch at the left is used to select the particular frequencies desired. The new micro-vernier dial enables the user to read to one-tenth of one division throughout the entire scale. This

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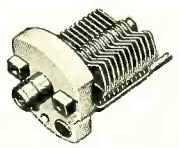

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accuracy in reading, in conjunction with the curves accompanying the instrument, is extremely valuable for obtaining an accurate frequency setting. The attenuator at the lower right is approximately calibrated in microvolts.

In conclusion, note the radio-frequency and audio-frequency output posts. By means of these two sets of posts, three types of signals may be obtained: a 1000-cycle modulated r.f. signal, a continuous wave or pure unmodulated r.f. signal (this is accomplished by shorting the audio posts), and a 1000-cycle audio note separately.

Connections to the receiver under test are made by means of a shielded cable, supplied with pin tips at one end and alligator clips at the other.

Capt. Hall's Page

(*Continued from page 298*)

until midnight during July and August, gradually faded out. Rome, undergoing complete overhauling, was not heard at all! ORK (29.04 meters) Ruysselede, Belgium, has come on a regular schedule and was heard almost every day. Sometimes the reception of this station was R-3 and then at good loudspeaker volume. According to a veri received for a report sent them during the latter part of May, ORK will be operating from 1:45 to 3:15 p.m., E.S.T. The program consists of news in French, musical selections, news in Flemish followed by the playing of "Barbancome," the National Hymn.

K6KPJ, a 20-meter "ham," was heard at 1:20 a.m. playing a record. His signal was R-6. This Honolulu amateur expects very shortly to increase his power.

For those that are interested in logging a new one, here it is. VK3ZX transmits a regular Sunday program on 7000 kc. from 1:30 to 3 a.m., E.S.T., and wants reports. Records are played and he announces each item together with station call and the slogan, "Voice of the South." He sends out a fine card with a picture of a kangaroo on it. The power is 25 watts. Address O. G. Oppenheim, 33 Saturn Street, Caulfield, Victoria, Australia.

Lilliput Tubes

(*Continued from page 279*)

can rely upon good, clear reception of telephonic transmissions from headquarters anywhere within the boundaries of a large town. Actual tests have shown that headquarters experience no difficulty in keeping in touch with police officers within a radius of ten miles or more.

These tubes have a further application of a quite different nature. They can be used most effectively in amplifiers for the deaf, and already considerable progress has been made in this direction. Whereas a deaf-aid amplifier incorporating tubes had formerly to be rather bulky and of considerable weight to be of real service, it is now possible to design lightweight deaf-aid amplifiers of pocket size of quite remarkable efficiency.

So far only the two triode tubes described have been evolved, but it is possible that further interesting developments make take place. It is, for instance, quite feasible to design four-electrode tubes with space-charge grids which would work at an even lower plate voltage and would therefore require still smaller B batteries. Some time ago the writer obtained remarkable results with an experimental four-electrode tube on these lines which

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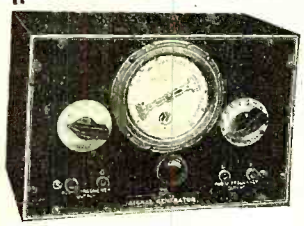

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If only a really efficient telephone receiver or loudspeaker could be invented—and invented it will be some day—tubes with still greater economy in both A and B current could be developed, for the percentage efficiency of even the best of devices for converting electrical impulses into sound waves is tiny, most of the current doing useless work such as raising the temperature of the windings of the speech coils.

S.W. Converter

(*Continued from page 295*)

operating tests of foreign reception, tuning in the same station first on one installation, then on the other, it was shown conclusively that the broadcast receiver-selector combination equaled the all-wave receiver installation in every respect and was superior in its ability to avoid repeat points. Foreign stations from every corner of the globe were tuned in as well as a multitude of police, aviation, commercial and "ham" stations.

This test demonstrated that this selector, combined with a really good broadcast-band receiver, constitututes an excellent all-wave combination.

The next test set-up was made by discarding the broadcast receiver and connecting the selector ahead of the all-wave receiver. Here again excellent short-wave results were obtained when the all-wave receiver was left tuned to 545 kc. and the selector used in tuning the short-wave ranges. As before, the image-frequency selectivity with the selector was superior to that obtained when the short-wave ranges were tuned on the all-wave receiver alone. This test should be of interest to owners of some earlier all-wave receiver models which may be excellent on the broadcast band but not so good on the short waves—a condition which could be corrected by using these receivers as broadcast-band sets and adding the selector for efficient operation on the short waves.

Aerial Traffic

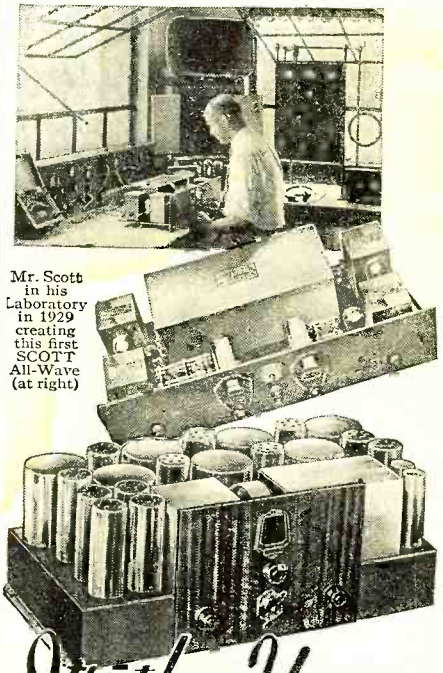
(*Continued from page 273*)

steady flow of dots and dashes, he knows that he is flying on a straight line to the St. Louis airport. As he continues on to St. Louis, he eventually arrives at a "dead spot," at which signals from the radio beam have faded and he knows then that he is directly over the airport. On clear days he will need no directions other than upon which of the many runways he is to land. But, should there be a fog over the field, then it is a different matter. Mr. League then takes a headset and a "mike" on a long extension and goes out on the roof of the building and locates the ship in the air, by means of its motor noise, and then, using the two-way radio transmitter, directs the ship to a safe landing.

When the ships are on the ground, the radio is still needed to direct them, as the traffic is heavy at this field. When a ship is about to land, other ships on the ground are given a word of warning so that they will keep the way clear. Other ships waiting to take off, wait for an "OK" from the radio room before starting.

From Hollanders to Holland

NEW YORK, N. Y.—Twenty-two school children from the Netherlands broadcast greetings to their homeland in a special program relayed by short-waves from the Radio City Music Hall recently.



Mr. Scott in his Laboratory in 1929 creating this first SCOTT All-Wave (at right)

It's the Years Behind THAT PUT THIS RADIO So Far Ahead

Since 1929, every SCOTT receiver has been an all-wave receiver. Because of painstaking, laboratory-precise methods of custom-building, the number of SCOTT receivers available has always been limited. Today . . . with many all-wave receivers using developments pioneered and perfected by SCOTT engineers . . . it is still a mark of distinction—and a scource of satisfaction—to own a SCOTT. For only the SCOTT ALL-WAVE FIFTEEN can bring you the entire scope of regular broadcasts, as well as short wave programs from London, Paris, Rome, Berlin, Madrid, Sydney and the uttermost ends of earth, with so much more regularity, usable volume, and beauty of tone. Superiority of SCOTT performance over that of any other receiver is guaranteed. Send today for complete details and PROOF!

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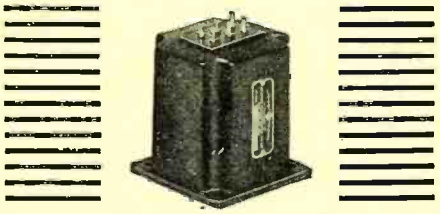
KENYON PRODUCTS

High-Fidelity

Since 1931 KENYON has anticipated improved audio amplification. The constantly refined KENYON Laboratory Standards Audio Components are the answer. No better units are available today.



Flat frequency response curve—1 db from 30 to 15,000 cycles.

Wave form distortion and phase shift reduced to negligible value.

Electrostatic shield between primary and secondary maintains balance to ground and eliminates stray, longitudinal current effects.

Housed in high permeability iron casting—excellent electromagnetic shielding.

Absolutely necessary in constructing AC voltage amplifier of low hum level. Novel coil structure cancels out hum.

Life-time equipment . . . superlative performance . . . yet at reasonable cost.

A complete line from which to choose your units . . . line-to-line, multiple line to grid, intermediate coupling, output, reactors . . . also power and filament transformers.

Write for data on these units. And ask your nearest KENYON representative to show you the line . . . it must be seen to be fully appreciated.

NRA WE DO OUR PART

KENYON TRANSFORMER CO., Inc.
840 Barry St. : New York City

New **BIRNBACH** MOST COMPLETE LINE *Standoffs*

BIRNBACH announces the most com-

With the Experimenters

(*Continued from page* 304)

line. The heater of the rectifier should be next to the ballast resistor which is connected to the high side of the line.

In sets employing a voltage-doubler arrangement, the heaters of the most critical tubes should be connected to the side of the line terminating between the condensers of the doubler. Also, if the speaker is used as a filter choke it should be placed in the negative side at the "B" supply to reduce the potential difference between the cathodes and heaters.

The DX Corner (Broadcast Band)

(*Continued from page* 287)

Buffalo, N. Y., comes a newsy letter containing some notes of interest to listeners in the vicinity of Buffalo.

He reports that station WGR, 550 kc., broadcasts talks on radio troubles and remedies every Friday afternoon from 4:30 to 4:45. These talks are put on the air in co-operation with the Association of Radio Service Engineers and are strictly non-commercial. Anyone having trouble with reception can write to this association, in care of WGR, and during a following broadcast the trouble will be analyzed and remedies suggested.

WOCL, a 50-watter in Jamestown, N. Y., 1210 kc., is a difficult station to log from Buffalo because of other powerful stations operating on the same channel. However, this report states that it can be logged readily from 9 to 9:45 Sunday mornings, at which time it has the 1210 kc. channel all to itself.

Observer Kalmbach states that he has just overhauled his antenna and is "all set" for the 1934-1935 DX season.

The Service Bench

(*Continued from page* 309)

your shoes fit snugly and therefore will provides a non-skid tread that is particularly effective, on tin and shingled roofs.

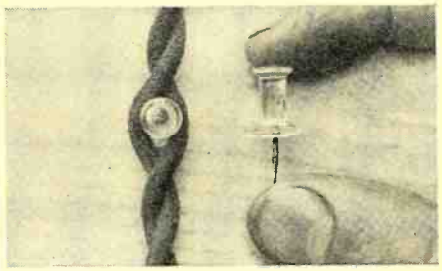


FIGURE 1

FIGURE 2

ALL-WAVE ANTENNA SYSTEMS

SPECIAL *For This Month Only!*

Complete Ready to Hang Up
This type available also in inverted "L" form

No. 894—Doublet
Single Wire (78 ft. flat top) with 35 ft. Giant Killer cable lead-in.

Complete with new Universal Coupler and Double Lightning Arrester. Net **$6.50**
Kit Lynch Materials to build No. 894 . . . . . $4.69
Other types available in Inverted L form with 4-wire cage flat tops and transposed lead-ins. Write for special prices.

LYNCH MATERIALS USED EXCLUSIVELY

The Ideal Station Locator
(Beat Note Oscillator)

Will indicate every station that could be brought in when you are tuning your receiver. Indicates station by whistle, turn switch off, whistle disappears, station remains at peak. Powered from receiver. For superhets only $8.95

The "MISSING LINK"
Phone Receptor for Receiver Without Phone Jack
Inserting phone plug automatically silences speaker. No disturbing of receiver wiring . . $3.95

AMPHENOL LABORATORIES
227 Fulton St., Dept. RN-10, New York City
Chief Engineer—Sol Perlman, E. E., Consulting Engineer on Antenna Problems to A. H. Lynch, Inc.

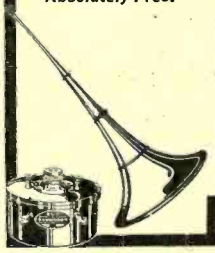
Dependable Sensational Performance!

BUD
Laboratory-Built
P. A. Equipment

5 DAYS FREE *Trial*

Try BUD Sound Equipment For Five Days Absolutely Free!

PORTABLE SOUND SYSTEMS
ELECTRO-DYNAMIC UNITS
CARBON AND CONDENSER MICROPHONES · 4 & 6 FT.
ALL ALUMINUM TRUMPETS
FIELD EXCITERS · AIR COLUMN HORNS · LOW AND HIGH FREQUENCY UNITS FOR WIDE RANGE THEATRE USE



We invite careful, critical inspection of our entire line of BUD laboratory-built sound equipment. We suggest that you conduct your own comparative test. We CHALLENGE you to duplicate BUD performance and BUD DEPENDABILITY AT ANY PRICE! Write today for descriptive literature and prices and details of our FREE FIVE DAY TRIAL offer.

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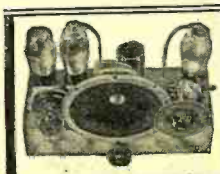
WANTED . . . BRANCH . . . MANUFACTURERS

On small or large scale for our NEW LINE of Cast Metal Toys, 5 and 10c Novelties, Automobiles, Ashtrays and other all year sellers. No special place or experience necessary as we furnish full instructions with moulds and cooperate in selling, also buy finished goods. Chance of a lifetime for man with small capital to get into this new and profitable industry. If you mean strictly business write AT ONCE for details, as CHRISTMAS RUSH is now starting.

METAL CAST PRODUCTS CO.
1696 Boston Road Dept. 7 New York, N. Y.



GET THE WORLD with this famous international SW3A world-wide short-wave receiver. Excels in performance, selectivity, sensitivity and volume. Complete all electric kit including 4 coils to cover 14-220 meters, speaker and full size diagram **$6.75**
Aretuning matched tubes 2.25
Extra for wiring 1.75
Broadcast coil 200-500 M. 75

EXPERIMENTAL RADIO LABS
168P Washington St., *Write for circular* New York, N. Y.

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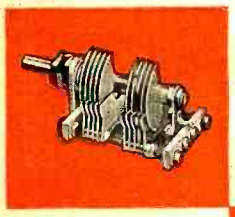
NATIONAL RADIO PRODUCTS

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



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

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

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

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

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

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

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

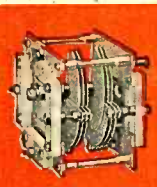
Type B Dial Velvet-Vernier
The smooth, National Velvet-Vernier Drive is positive and free from back-lash. Variable ratio 6-1 to 20-1. Horizontal diameter 4". List price (without illuminator) **$2.75.**

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

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

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

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



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

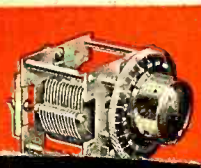
Standard R-39 Coil Forms
Made of R-39 ultra low loss form material, for National SW-5, SW-45, SW-34, SW-3, and SW-58 Receivers. In 4, 5 or 6-prong bases, list price each **$.75.**

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

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

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

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



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

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

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

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

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

INC., MALDEN, MASSACHUSETTS

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MOVIE STARS *Enthuse* OVER THE *New 1935* MIDWEST·16

World-Wide Entertainment

Hollywood, Calif.—Until I received my new Midwest radio, I had never thought it possible to bring in entertainment from half way around the world so clearly.

Jean Harlow

(Metro-Goldwyn-Mayer Star)

Amazing All-Wave Performance

Hollywood, Calif.—My Midwest is the best set I have ever tried. It gives me super foreign reception and new radio adventure. Its performance on all five wave bands amazes me.

RICHARD ARLEN,
(Paramount Featured Player)

Thrilling Foreign Reception

Hollywood, Calif.—Not until I tried out my Midwest 16 did I really appreciate what radio reception was. It thrills me to bring in distant foreign stations as clearly as local programs.

(Paramount Star) Claudette Colbert

Better Foreign Reception

Hollywood, Calif.—I am quite enthused with my Midwest. Many friends who have heard it are delighted with its performance. It brings in, without a doubt, the finest all-wave reception I have ever heard.

Neil Hamilton

Thrill to Unequalled World-Wide Performance with this—

Amazing NEW 1935 SUPER *Deluxe* 16-Tube ALL-WAVE Radio

9 TO 2,400 METERS (12,000 MILE TUNING RANGE)

30 DAYS FREE TRIAL

Guaranteed WORLD-WIDE RECEPTION!

BEFORE you buy any radio, write for FREE copy of the new 1935 Midwest "Fifteenth Anniversary" catalog. See for yourself the many reasons why over 110,000 satisfied customers have bought their radios direct from Midwest Laboratories . . . and saved from ⅓ to ½. Learn why Midwest radios out-perform sets costing up to $200 and more. You, too, can make a positive saving of from 30% to 50% by buying this more economical way. Why be content with ordinary so-called "All-Wave", "Dual Wave", "Skip Wave" or "Tri-Wave" receivers when Midwest gives you more wave lengths in today's most perfectly developed 16-tube Super de luxe ALL-WAVE radio that are proven by four years of success . . . that carry an iron-clad guarantee of foreign reception! These bigger, better, more powerful, clearer-toned, super selective radios have FIVE distinct wave bands; ultra short, short, medium, broadcast, and long. Their greater all-wave tuning of 9 to 2400 meters (33 megacycles to 125 KC) enables you to tune in stations 12,000 miles away with clear loud speaker reception. Write TODAY for new FREE catalog!

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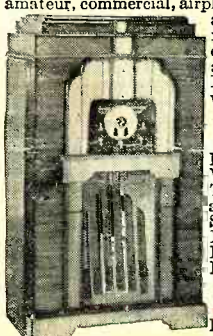
WORLD'S GREATEST RADIO VALUE

$57.50 with New *Deluxe Auditorium-Type* SPEAKER

. . . LESS TUBES . . .

Now, you can enjoy super American, Canadian, police, amateur, commercial, airplane and ship broadcasts . . . and derive new delight and new excitement from unequalled world-wide performance. Now, you can enjoy the DX-ing hobby and secure verifications from more of the world's most distant stations. Thrill to the chimes of Big Ben from GSB, London, England . . . tune in on the "Marseillaise" from FYA, Pointoise, France . . . hear sparkling music from EAQ, Madrid, Spain . . . delight in lively tangos from YVIBC, Caracas, Venezuela . . . listen to the call of the Kookaburra bird, from VK2ME, Sydney, Australia, etc. Send today for money-saving facts.



50 ADVANCED 1935 FEATURES

Here are a few of Midwest's superior features: Controllable Expansion of Volume-Selectivity-Sensitivity (Micro-Tenuator) . . . Fidel-A-Trol . . . Triple Calibration Plus . . . Pure Silver Wire . . . Ceramic Coil Forms . . . Separate Audio Generator . . . Simplified Tuning Guide Lights . . . Compact Synchronized Band Switch . . . Amplified Automatic Volume Control . . . 7 KC Selectivity . . . Power Driver Stage . . . 16 Latest Type Tubes . . . etc. Read about these and 38 other features in the new FREE Midwest catalog. Never before so much radio for so little money. Write for FREE catalog.

Jean Harlow, Richard Arlen, Claudette Colbert, Neil Hamilton, Maureen O'Sullivan, Gloria Stuart and Ginger Rogers are some of the movie stars who prefer the Midwest radio because it gives them the super all-wave reception that they desire.

Try the Midwest for thirty days before you decide. Midwest gives you triple protection with: A one-year guarantee, foreign reception guarantee, money-back guarantee

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NEW STYLE CONSOLES The new, big, Midwest 36-page 1935 catalog pictures a complete line of beautiful, artistic de luxe consoles and chassis . . . in four colors . . . a model for every purse. Hand made by master craftsmen, they harmonize beautifully with any furniture arrangement. Write for new FREE catalog today!

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