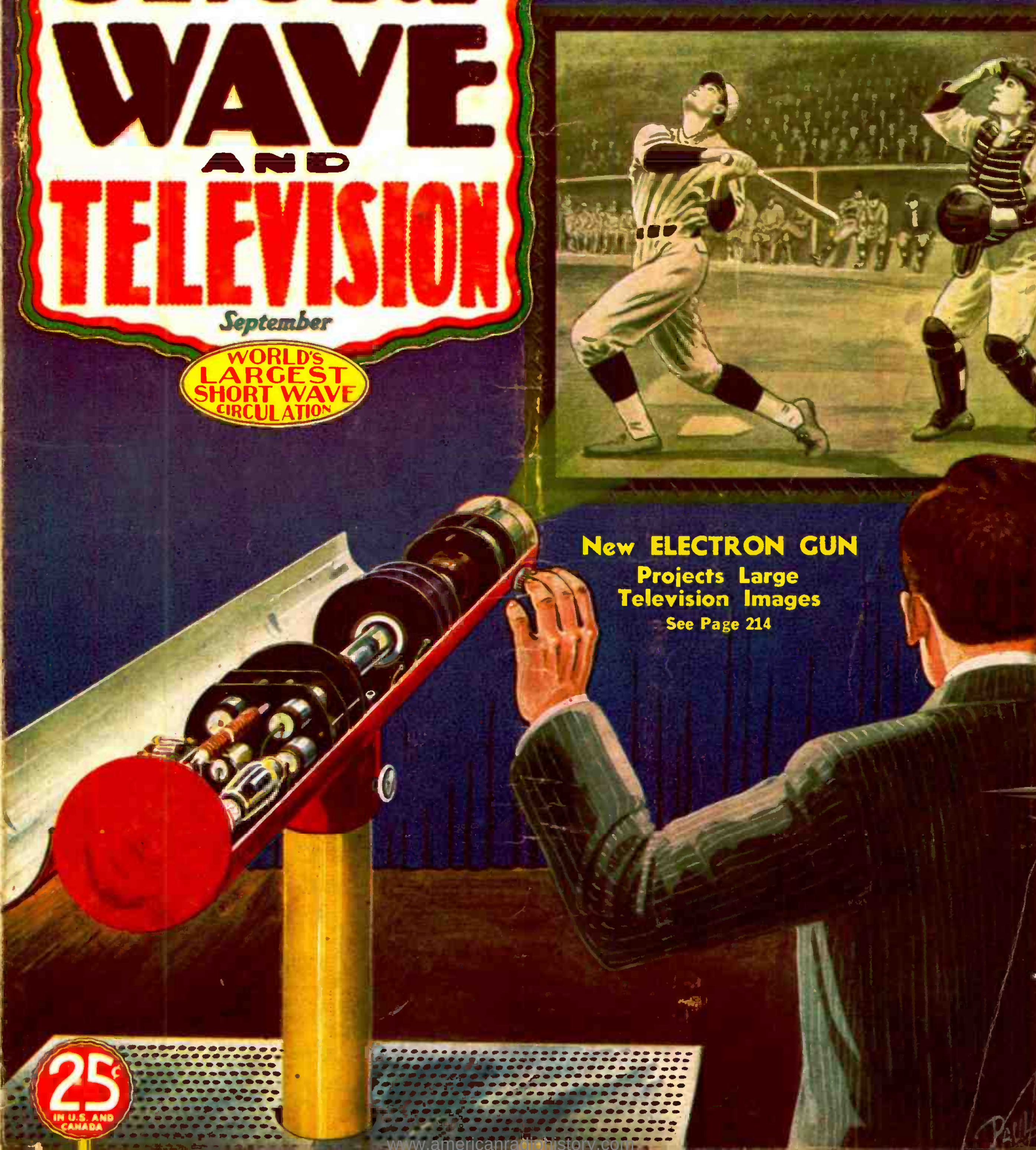
THE RADIO EXPERIMENTER'S MAGAZINE

HUGO GERNSBACK
Editor

SHORT WAVE AND TELEVISION

September

WORLD'S LARGEST SHORT WAVE CIRCULATION



New ELECTRON GUN
Projects Large Television Images
See Page 214

25¢ IN U.S. AND CANADA

RCA ALL THE WAY

RCA Radio News

RCA Manufacturing Company, Inc. • Camden, New Jersey
A Service of the Radio Corporation of America

EVERYTHING IN RADIO-MICROPHONE TO LOUDSPEAKER

To the consumer, RCA means high quality performance at low cost...To the radio man, RCA means easier selling, higher profits

TUNING 50 TIMES EASIER

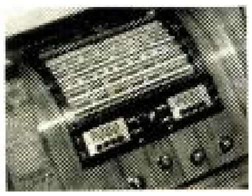
New RCA Victor Overseas Dial Is Short Wave Sensation

Electric Tuning Also Scores. Push a Button—There's Your Station!

Remote Tuning Achieved by Fool-Proof Armchair Control Device

Short wave fans are buzzing about the new 1938 RCA Victor Overseas Dial, a radical departure which makes short wave tuning easier than domestic.

The individual band scales representing the popular international entertainment bands are each 9½ inches long. This compares with the ¼-inch segments on the usual short wave dials. By actual measurement the crowded short wave stations are spread fifty times wider.



Each wave band lights up only when in use. Foreign stations appear by name on the dial scales.

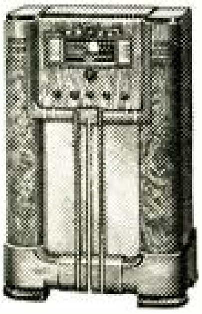
The Overseas Dial is the leader of four improved dials in the 1938 RCA Victors. All are larger, easier to read.

Another major RCA Victor improvement is Electric Tuning—the first that's truly automatic. Push a button—there's your station. It's as simple as that. Gets any eight stations, foreign or domestic.

Electric Tuning may be extended to your easy chair with Armchair Control which may also be placed anywhere, in any room, that is convenient.

A fourth big new RCA Victor feature is the Sonic-Arc Magic Voice, which applies the principle of a band shell to bring finer tone, free from boomy reverberation.

RCA Victor Dealers are now demonstrating the 39 new 1938 models, ranging in price from $20 up. All models incorporate a generous number of RCA Victor's 55 great extra-value features.



RCA Victor Model 811K featuring new Straight-Line Dial and Electric Tuning, 11 tubes, new Sonic-Arc Magic Voice, Magic Brain, Magic Eye, RCA Metal Tubes, covers standard broadcast band and 49, 31, 25, and 19, 16 and 13 meter bands of international entertainment. Armchair Tuning available at slight extra cost. $150. (f.o.b.) Camden, N. J., subject to change without notice.

Fall Radiotron Check-Up Gets Under Way

Gives Old Sets New Life . . . RCA Offers Outstanding Selling Helps

Window Display scheduled for delivery in September. See your distributor about yours.

To alert service men and dealers, September means the RCA Radiotron Check-Up Plan. Experience proves this plan gives radio dealers and service men a fine opportunity to make money.

The RCA Radiotron Check-Up puts new life in radios that are wobbling on their last legs. It's good for them. Makes them perform like they did when new. And it's a service most radio owners are glad to pay for—because the job is so satisfactory and the cost is so small.

To dealers and service men the Check-Up means more service jobs—at a minimum of $1.50 a job. It means not only a chance to sell tubes, but by providing entry into the various homes in the community, an opportunity for the sale of many other electrical products.

The RCA Radiotron Check-Up is easy to sell: first, because it's an excellent service; second, because RCA backs it up with selling helps and advertising that does a job.

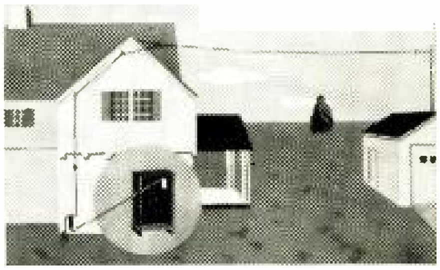
The Saturday Evening Post and Collier's will carry timely ads on Check-Up every other week. Real selling commercials will be plugged on a full hour radio program every Sunday. Besides these, there are scores of store helps available to you, plus tested direct mail pieces, such as letters and postcards, the Listening Ear, auto door hangers, auto radio check-up letters—every one of which packs a real selling punch. See your distributor.

Get behind the RCA Radiotron Fall Check-Up campaign—and your cash register will bang out a merry tune. Full details from your jobber.

Ask your RCA Parts Distributor for new RCA Parts Catalog and data about Magic Wave Antenna System.

New Antenna Cuts Noise

RCA Magic Wave Antenna System Operates up to 16 Outlets on One Antenna



No improvement in radio reception is more universally desired than the elimination or the reduction of noise. RCA now offers a product that does the job! The new Magic Wave Antenna System provides noise reduction on both standard and international short wave bands from 530 to 23,000 kcs. This is due to use of a new magnetite core transformer and the transmission line.

Operates 16 Outlets at One Time

The Magic Wave Antenna will operate up to 16 outlets on one antenna. This is possible through the use of additional special distribution and set coupling transformers.

The length of the antenna proper may be varied between 20 and 120 feet, making for ease of installation—yet retaining excellent efficiency. The transmission line is also variable to any desired length, again with a minimum of losses. No doublets or critical lengths required. Adaptable to existing installations.

Can Be Used for Vertical Installations

By using several lengths of ordinary iron pipe and reduction couplings, a high efficiency vertical antenna may be used in conjunction with the RCA Magic Wave System. By using stock number 12429, Submarine Cable, the transmission line may be buried and all unsightly wiring eliminated. Such an installation can be conveniently located remote from interference.

The new RCA Magic Wave Antenna System consists of one antenna coupling transformer and one receiver coupling transformer. Each coupling unit has two transformers in which magnetite cores are used. One of the transformers responds with greater efficiency on the standard broadcast band. The other on the international short wave band.

The Magic Wave Antenna System, stock 9812, lists at $6.95, assembled in one complete unit ready for installation.

IN THIS ISSUE: PROMINENT SHORT-WAVE AND TELEVISION AUTHORS

Peck • Spitz • McNish • Coronado • Shuart • Adams • Lynch

HUGO GERNSBACK
Editor

SHORT WAVE AND TELEVISION

H. WINFIELD SECOR
Managing Editor

GEORGE W. SHUART, W2AMN
Associate Editor

Combined With

Official SHORT WAVE LISTENER

Contents for September, 1937

Features in the October Issue

A Dandy 4-tube receiver for "Ham" and "Fan" bands, by Ernest Kahlert, W2BHZ.

A 5-meter 100-watt transmitter, with adjustable frequency to avoid QRM, by G. W. Shuart, W2AMN. Don't miss it!

The 5-40-400 transmitter, Part 2, by Arthur H. Lynch, W2DKJ.

Short wave antennas for "Fans" and "Hams", the best types and how to build them, by W2AMN.

A Real Pocket-Size Receiver.

A 7-tube Battery Superhet, by Mander Barnett.

Certified Circuits

● SHORT WAVE & TELEVISION goes to a large expense in verifying new circuits. When you see this seal it is your guarantee that such sets have been tested in our laboratories, as well as privately, in different parts of the country. Only "Constructional-Experimental" circuits are certified by us.

When you see our certified seal on any set described, you need not hesitate to spend money for parts, because you are assured in advance that the set and circuit are bona fide and that this magazine stands behind them.

SHORT WAVE & TELEVISION is the only magazine that certifies circuits and sets.

OUR COVER

● The cover illustration shows how large television images will be projected on a screen by the new "electron gun," devised by television experts of the RCA. The construction of the new television projection gun is described and illustrated with photos and diagrams on page 214.

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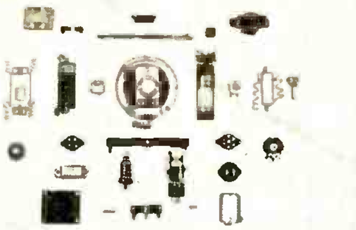

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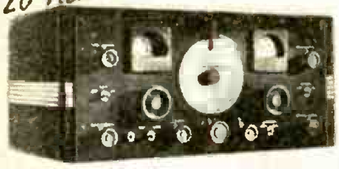

See the largest selection of Amateur Equipment in Radio! Page after page of the leading manufacturers—new RCA 111, new Hallicrafters models, new Utah X-mitters—a tremendous assortment of the latest transmitters, receivers and tran-sceivers—in factory-built and kit form. 20,000 Amateurs buy at ALLIED because ALLIED's service is faster, ALLIED's prices are lower!

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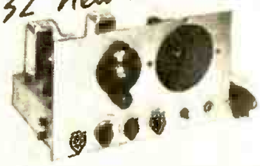
25 Modern P.A. SYSTEMS

32 New KITS



A new, enlarged section for Radio Builders! Kits of every type, from a Beginners' 1 Tube Set to a 14 Tube All-Wave Superhet. We can supply matched kits for building any circuit in any radio publication. Write to us for Free Parts Lists. ALLIED is Radio Parts Headquarters for Radio Builders everywhere!

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HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

SHORT WAVE AND TELEVISION

Mechanical Scanning for Television

By William Hoyt Peck,
President, Peck Television Corporation

● FIVE years ago the public was told that television was "just-around-the-corner." Today, they are told approximately the same story—and it is beginning to wear a little thin. As a matter of fact, television is actually here and has been here for some time. As this is written, I confidently expect that one form of television at least will be before the public within sixty days. This is a Television news service which displays news bulletins and similar material in type or other characters moving across a screen.

However, the idea which most people have of television is moving images similar to talking motion pictures. These, indeed, exist in the laboratory and have existed there for several years. The chief problem in making such forms of entertainment public is to finance stations and programs. There is a vicious circle; the public cannot be expected to buy television receivers in any quantity, unless they are assured of excellent programs of reasonable diversity and certain to continue for a number of years. Nor can broadcasters be expected to invest tens of thousands of dollars in transmission equipment, unless they can be assured of an adequate revenue from program sponsors. Such sponsors, in turn are likely to be reluctant to make any large expenditures such as are necessitated by first-class programs, unless they can be assured of a large listening and looking audience, which brings us back where we started. These problems will doubtless be solved and I feel confident in saying that the solution will come within approximately 18 months.

William Hoyt Peck, President of the Peck Television Corporation, leading exponent of mechanical scanning and inventor of a television news service.

There are two major systems of television between which the public will possibly have to choose. For that reason I should like to express my opinion of the systems which will doubtless compete.

In the cathode ray system, light source, modulating means, scanning means, and screen, are contained in a single tube, whereas, in the mechanical system these must be separate elements. At first glance it would seem the cathode ray system, due to its greater simplicity, was superior for manufacturing operations. Further examination, however, shows this not to be the case, for in order to control the cathode ray tube sweep circuits are necessary, and such sweep circuits require the use of numerous additional resistors, condensers, chokes and tubes. It is a fact that the more successful cathode ray receivers of today employ upwards of 30 tubes. Compare this with the mechanical systems, which need no more than 9 regular radio tubes.

Further, excessively high voltages comparable with those used in the electric chair at Sing Sing, are necessary to operate a cathode ray tube in order to secure a sufficiently large and brilliant image. Not only is such a voltage dangerous to human life, but it is also expensive, in that it requires more heavily insulated apparatus throughout the power pack.

Mechanical systems, like those in which I am interested, for example, derive light from an automobile headlight bulb working on but 7½ volts. No voltages in the receiver need be greater than those commonly employed in standard broadcast receiving sets.

The factor of size of image is another point which must be considered. A cathode ray tube producing a 5" x 7" picture must be approximately 9" in diameter and 17" in length. While 8" x 10" pictures and even larger ones have been broadcast, I consider it doubtful that tubes could produce images of home-movie size, or that images 2 x 3 ft. can ever be broadcast commercially, unless a small projection tube working at tremendous voltage is used. This obstacle is not met with in the mechanical system, for it is unnecessary to use any different equipment or higher voltages to produce an image 2' x 3' or larger.

As to detail, the size of the scanning spot remains constant in the mechanical system, while it doubles its size when in the cathode ray. For this reason, a 220 line mechanical system affords detail which is the equivalent of 441 line cathode ray pictures. The mechanical system is also more flexible; if a cathode ray receiver is factory-adjusted to receive a 441 line, 60 frame image, and if the user desires to receive images composed of any other number of lines per frame, or frames per second, it is a lengthy job for a technician to re-align the sweep circuits in order that this may be done.

In the mechanical scanning system as developed in our laboratories, a self-synchronizing multi-speed motor is used. A component of the signal received is fed into an amplifier which incorporates a grid-glow relay. Thus the speed of the motor is regulated to scan the incoming signal perfectly, irrespective of number of lines or number of frames. There is no reasonable limit to the number of lines or frames which the mechanical system is capable of handling. We will have no difficulty in *(Continued on page 270)*

Ninth of a Series of "Guest" Editorials

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SHORT WAVE & TELEVISION, *Published monthly at* Mount Morris, Ill.
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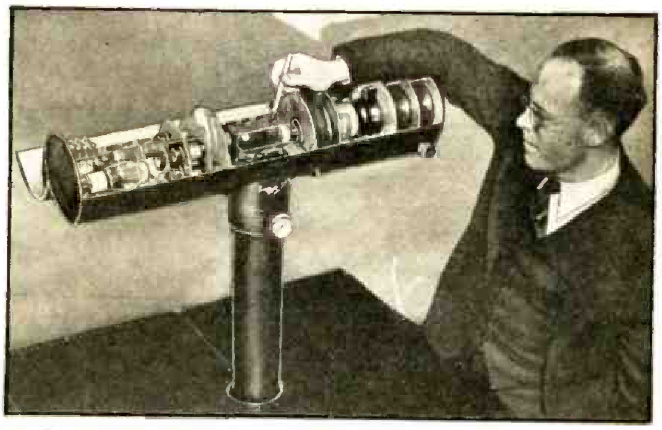
New "Electron Gun" Projects Large Television Images

Dr. Law of the RCA Laboratories views a Television image projected by his new "Kinescope."

● NEW television projection tubes capable of reproducing televised scenes brightly on a relatively large screen were described before the *Institute of Radio Engineers* in New York City recently by V. K. Zworykin, W. H. Painter and R. R. Law of the Radio Corporation of America's laboratories. Dr. Zworykin and Mr. Painter disclosed that present achievements with such tubes result from research directed to this end and which has been carried on for years. A demonstration by Dr. Law came as a highlight in a symposium of technical reports on the status of television by RCA scientists, whose laboratory work along with the experimental field tests now in progress in the New York City area are vital parts of RCA'S television program.

The tube, which is about eighteen inches in length, produces an image about 1½ x 2¼ inches on its fluorescent screen. This is so brilliant that a simple optical system will project it onto a large screen. A projected picture 18 x 24 inches compares favorably in brightness with home motion pictures. In the demonstration, a picture 3 x 4 feet in size was shown, which was bright enough to be seen by the audience of several hundred engineers.

The principal feature of the demonstrated device is a new type of "electron gun," developed by Dr. Law and a group of associates in the RCA laboratories at Harrison, N.J. The gun is the structure in a television receiving tube which focusses flying electrons into an extremely slender beam. In projection, it is necessary to start (*Continued on page* 252)



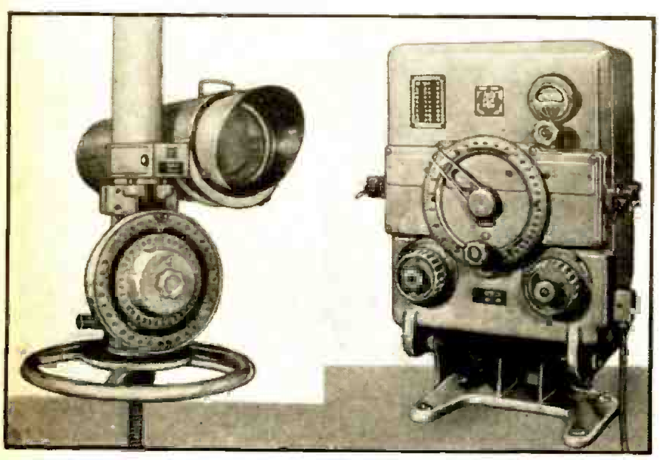
Dr. R. R. Law points to a newly developed "Electron Gun" in the new "Kinescope" for projecting Television images.

"Ghost Echo" Detector • • To Reduce Plane Crashes

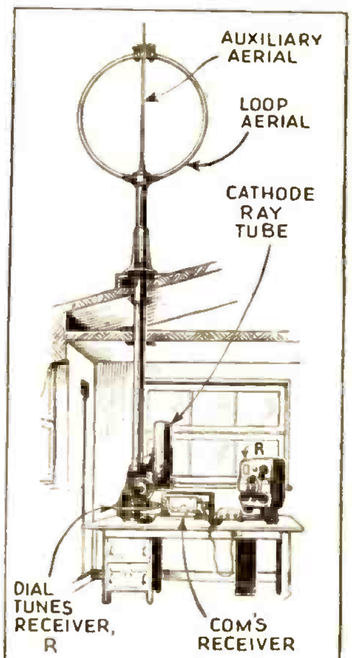
● MUCH has been said and even more has been written about the constant danger to *air-traffic* caused by mysterious radio "*ghost echoes.*" No one has been able to find where they come from and where they go to; and the number of airplanes which have crashed to pieces has by no means decreased. Not only has America been alarmed by the increasing number of air-crashes, especially during the time of sunset and sunrise, but European aviation has also experienced similar accidents in increasing number.

Science, which does not believe in supernatural things, started to search for the real nature of these "ghost echoes" and the results of the research work here and abroad has disclosed some very interesting facts, which not only concern radio-communication between airliners and ground stations, but also short-wave transmission in general.

According to the experiments and the ensuing conclusions, this disastrous radio phenomena (often referred to as *ghost echoes*) is by no means of supernatural origin, although it has not been proven, nevertheless it may be stated with a fair degree of accuracy, that solar flocculi eruptions (whether visible or not) are the initial cause of the widespread impairment of any type of radio transmission. In addition to this generally observed effect radio transmissions especially on the higher frequencies are influenced to a considerable degree by the exposure of the so-called Heaviside Layer to light rays from the sun, and during the daily periods of *sunrise* and *sunset* these two factors cause especially strong disturbances in the *straight* or *reflected* path of transmission. The much commented upon "ghost echoes," although they caused ghostly accidents, are of a clear physical origin, and (*Continued on page* 256)



Left—Cathode ray indicator and below it, the tuning dial for the "ghost echo" receiver shown at the right.



"Ghost Echo" detector set-up. This apparatus distinguishes between the desired signals and the "ghost echo" by means of a cathode ray tube.

SHORT-WAVE PICTORIAL

The latest television and short-wave events in various parts of the world have been caught in the camera's eye by our roving reporter.

Edward Startz, probably the most famous short-wave announcer in the world. He speaks seven languages and frequently makes announcements in all of them. Mr. Startz's voice is heard from the well-known PHOHI short-wave station at Eindhoven, Holland. This station will soon have a new transmitter in operation

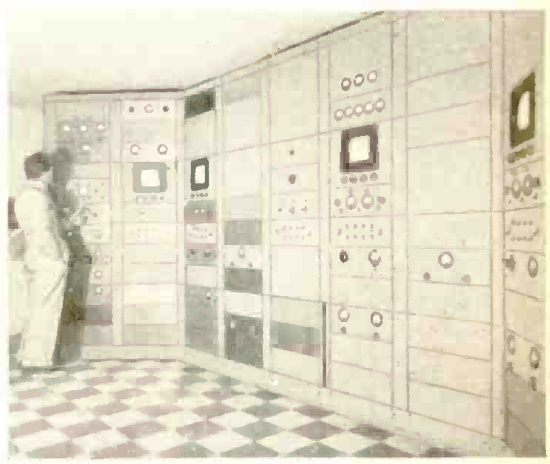
Conchita Ascanio, the beautiful "Radio Caracas" artist often heard by North American short-wave listeners. Miss Ascanio is a born comedienne and she is as well the possessor of a lovely soprano voice. Her interpretation of "Dona Carmen" in the radio feature "Don Lisandro y Dona Carmen" has endeared her to Venezuelan radio listeners.

Elizabeth-Ann Tucker, who is now in charge of the Short-Wave Program Activities of the Columbia Broadcasting System. Although not an engineer, Miss Tucker is none-the-less familiar with engineering technique and has, as she describes it, "a layman's knowledge of short-wave radio broadcasting." She has traveled extensively and has first-hand knowledge of what people in foreign countries would like to hear via short-wave from the CBS short-wave transmitter, W2XE.

Lowell Thomas, internationally known radio commentator, is here shown being televised at the NBC television studios in New York City. Shortly, our radio audiences will have the satisfaction of "seeing" their favorite news commentator and other entertainers, and will not have to be satisfied with simply hearing their voices. "Spot News" flashed by television will be extremely thrilling as the listener frequently will be able to see the actual scene being described at the moment.

Amelia Earhart is here shown with E. Jay Quinby of the Western Electric Company who supplied the radio equipment for her powerful plane. This photo was taken before the start of her "round-the-world" flight. The radio sets are installed in "out-of-the-way" corners and only the tuning controls and switches are mounted in the pilot's cockpit; these controls being centralized in the small unit which Miss Earhart is holding in her hand.

Left—Here we see a Hollywood group inspecting the latest invention of the well-known radio pioneer, Leroy J. Leishman. The device is a special tuning dial which Mr. Leishman is here shown explaining; it enables both the television image and sound dials to be moved to the correct settings by pressing a single lever. In the photo we see Lloyd Corrigan, movie director; Jean Rogers, actress, Mr. Leishman, the inventor, and Boris Karloff, actor.



Right—The Farnsworth Television transmitter installed in their laboratory located at Philadelphia.

The SPITZ Flight Recorder

By Mae Noble Rineman

Flashing lights on ground station map trace flight by short-waves radiated from plane.

Dr. Samuel Spitz has invented a new system for tracing planes in flight by means of an elaborate illuminated map located in the ground station. The small map to which Dr. Spitz is pointing, is used for tracing the plane by flashing lights as it comes into the local airport zone.

● FINAL extensive tests of the Spitz Flight Recorder, invented by Dr. Samuel Spitz, at his laboratories in Burbank, Los Angeles County, established the fulfillment of modern aviation's dream—charting an air transport's continuous progress through the skies.

Dr. Spitz's now-famous marine depth sounder achieved its purpose and became standard equipment on all navy and merchant ships, and so may his Flight Recorder carry out its purpose in eliminating major airplane disasters.

One of the greatest needs in commercial aviation today has been for some instrument or series of instruments by which a plane's flight might be accurately and continuously checked on the ground and the pilot directed to insure maximum degree of safety; also for the pilots as well as transport operators to have a positive means of recording their location at all times, on the ground ports.

Test flights covering the four hundred miles between Los Angeles and Oakland, California, were accurately followed by the Flight Recorder at the Union Air Terminal in Burbank. Its field of activity is 100 miles wide. By measuring and recording radio waves, the Recorder established the precise direction and distance of the test plane from its port. Through spots of light projected through the translucent map created by Dr. Spitz, the plane's movement was charted by the lights jumping steadily along the strip map of the airway lane, altering their speed as the plane altered speed.

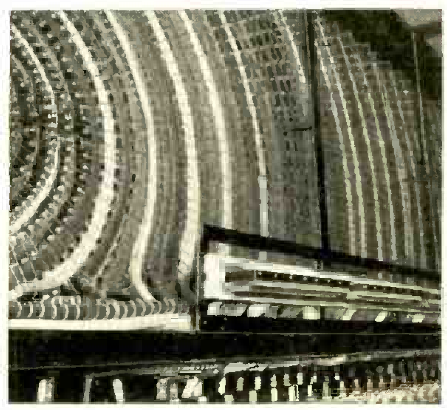
When the ship returned to within eighteen miles of the Union Air Terminal, its charted movement was transferred to the round "landing map" which shows the topography of the terrain in an eighteen-mile radius, and progressed on a scale of one light to the mile until the center of the map was reached and the plane landed safely.

Short-wave radio impulses sent from a small portable transmitter with a high frequency oscillator in the cockpit of the plane influence the movement of the lights on the air terminal control map. As it nears the port, the ship emits stronger radio waves.

With the Flight Recorder in operation, should a plane vary from its proper course, this fact is promptly recorded at the ground station. The operator there, in short wave radio communication with the pilot can at once direct him back to the course. By checking the map the operator is able to keep the pilot advised at all times as to the nature of the country over which he is flying, the altitude necessary to safe progress, and such other information as is important to the pilot in the safe conduct of his flight.

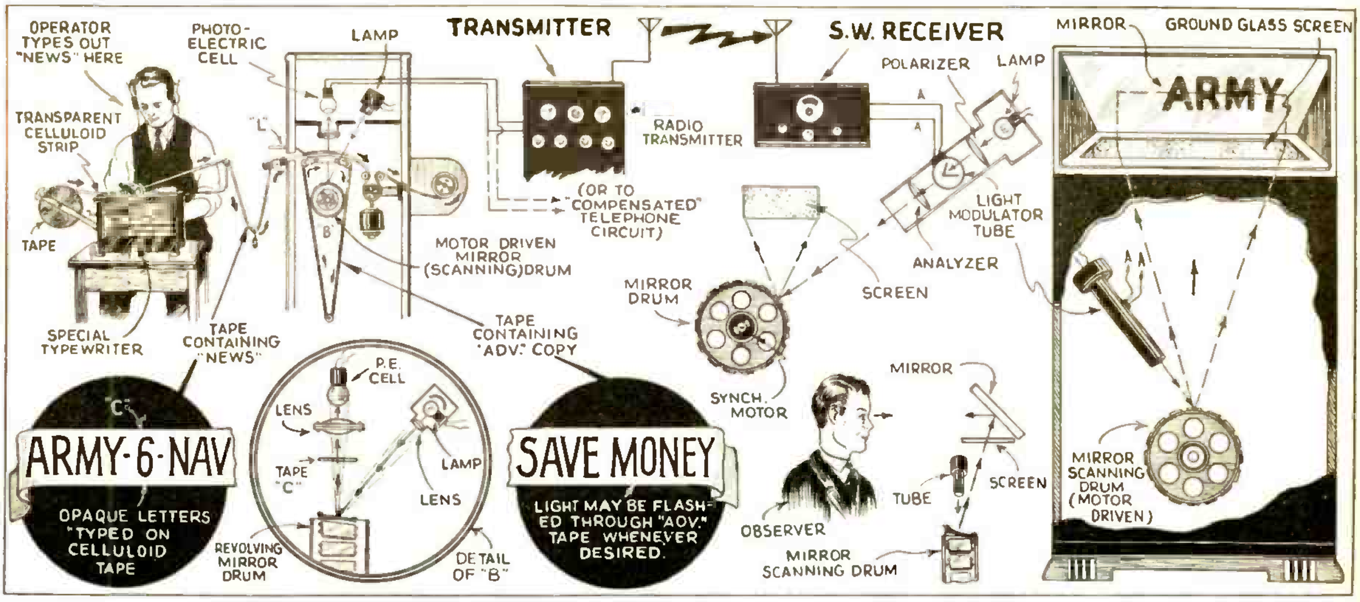
Should a mechanical difficulty occur that makes it necessary for the pilot to make a forced landing before reaching his destination, the light on the map indicating the plane's position will not change. Within two minutes it will be known at the airport that the plane is down within a very limited area, and relief can be dispatched immediately for that spot. Should the landing result in wreck of the plane, even though the transmitter aboard may be completely destroyed, the Flight Recorder has been so perfected that the light on the map will not go out.

The accompanying pictures illustrate to some degree the maze of powerful tubes, miles of wiring and many intricate coils which comprise the ground apparatus of the Flight Recorder. Behind the huge *(Continued on page 258)*



Back view of illuminated board showing intricate system of wiring.

Photo at left shows radio control board for the Spitz Flight Recorder. The directional coils are seen mounted on top of the Binaural Selector, at the right of the picture. Landing map is seen in center of panel above the "divergence" wavemeter. Right hand photo shows panel-board with map removed and the elaborate system of lights that progressively flash the plane's course behind the map.



The general plan for distributing "spot news" by television or wire is shown above. The news is dispatched to the one or more receiving points by means of a special typewriter, which prints the characters on a cellophane tape. The words are scanned as the tape passes before a mirror-drum and photo-electric cell, the scanning process being repeated at the receiver.

"Spot News" Transmitted by TELEVISION

By Robert Oakhill

Here is the very latest method of flashing "spot news" to the public—via television! Advertising items can also be woven into the "news" report.

● ODDLY enough, the first commercial appearance of television will apparently not be the programs of entertainment which fiction writers have imagined, but instead will consist of *news* flashes, headlines and bulletins, sent out either by radio or over standard "land lines" similar to those used in broadcasting networks.

The apparatus to make transmission and reception of such material possible has been perfected in the laboratories of the Peck Television Corporation in New York City, and an independent company has contracted to take over the gathering and dissemination of *news*, and the rental of receiving equipment to key locations.

William Hoyt Peck, inventor of the latest "spot news" distributing system, watching a "televised" news item as it travels across the "screen."

J. Francis Dusek is shown examining one of the Peck "light-modulator" cells; the multi-mirrored scanner appears below in the cabinet, and the S-W receiver at the right.

Images consisting of moving letters in a strip six inches tall by three feet wide are produced on a screen that may be as much as seventy miles away from the typewriter where the messages originate.

This typewriter looks much like a standard machine, save that its characters are ⅝-inch tall, and are written on a continuously moving strip of *cellophane*, instead of the conventional paper. An electric motor, automatically stopped and started, is built as an integral part of the typewriter, causing the transparent tape to move one space each time a letter is struck, without need for carriage return.

From the typewriter, the tape is fed into a transmitter cabinet, which is about the size of a four-drawer file. At the back of the cabinet, there is an automobile headlight bulb, the light of which is concentrated and focussed onto a scanning disc, where reflecting lenses, patented by William Hoyt Peck, president and chief engineer of the corporation, cause the beam to scan the moving tape. The light passes through the transparent portions, but is blocked by the opaque ink of the typed letters as it passes to the photo-electric cell at the upper part of the cabinet. The output of this cell is connected to a pre-amplifier, which may be used directly into wire lines, or to actuate a radio transmitter.

The signal, sent in either of these ways, is picked up by one, or any number of, receivers. There the signal is detected and amplified, then fed into a special light-modulator cell, which modulates the beam coming from a second automobile headlight bulb and passing through the cell on its way to the scanning disc, which also is provided with re- (*Continued on page* 250)

An engineer is shown in the act of checking the 6-volt exciter lamp on the transmitter. The short-wave transmitting panel is shown at the right of the photo.

Short-Wave Transmission and The IONOSPHERE

By A. G. McNish

Department of Terrestrial Magnetism, Carnegie Institution of Washington

The editors asked Mr. McNish to prepare this article especially for our readers, in view of the fact that the author has carried on a great number of experimental researches covering the phenomena of short-wave transmission; particularly the effects of sun spots, magnetic storms, etc.

● THE remarkable advances in radio science accomplished in recent years would probably have been very much retarded, except for one remarkable provision of nature—a region of the atmosphere capable of reflecting radio waves back to the earth. Although existence of such a region was suggested over 50 years ago by the British meteorologist, Balfour Stewart, to explain certain facts of terrestrial magnetism, definite proof of its existence was not supplied until 1925 when Breit and Tuve in this country and Appleton in England performed their experiments on radio wave reflection. Since that time the earth's upper atmosphere, called the *ionosphere*, has been a fertile field for scientific research.

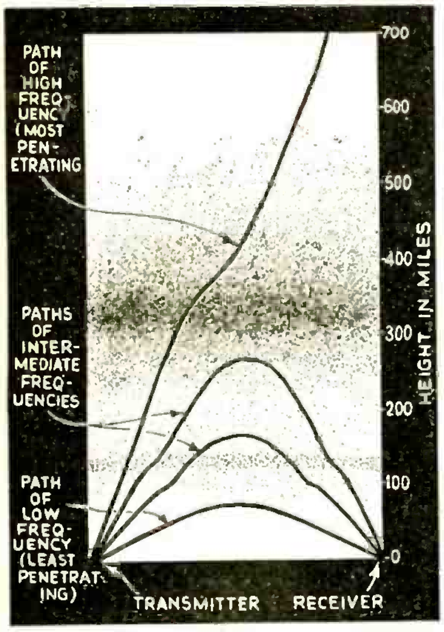


Figure 4—Paths of radio waves of different frequencies in the ionosphere.

Cause of Ionization

All scientific evidence clearly shows that radiations from the sun are the only important causes of the *ionization* which gives this region its peculiar electrical properties. At first thought of as a single region of ionization, it is now known that the ionosphere is highly *stratified*. A lower layer exists capable of reflecting only long waves, while higher are the F_1- and F_2-layers, capable of reflecting shorter and still shorter waves. The reflecting power of these layers is determined by the number of electrified particles present, either free electrons or electrically-charged air molecules called *ions*. If the number of free electrons per cubic centimeter in a layer is high, then very short waves may be reflected by it. For reflecting efficiency a single electron is equivalent to about 10,000 ions because of the much greater weight of ions. If the number of electrons per cubic centimeter in a layer is 1,000,000 then a wave of roughly 33 meters will be reflected back to earth at vertical incidence—that is, going straight up and straight down—while still shorter waves will *pass on through and escape into space*. However, such a layer is able to reflect waves three times as short, if the waves strike the layer at the oblique angles commonly involved in long-distance transmission.

These statements apply only for the highest parts of the atmosphere where electrons can move appreciable distances without colliding with molecules of air. Lower in the atmosphere where air molecules are more numerous, electrons, set into vibration by the radio waves, strike against air molecules so frequently that they *waste all the energy given them by the radio waves, and do not reflect it back to the earth.* If the electrons are sufficiently numerous in such a region they waste all of the radio-wave energy and constitute an absorbing layer.

The "E" and "F_1" Layers

It is now known that the E- and F_1-layers of the ionosphere are due to ultra-violet radiation from the sun. Solar ultra-violet light striking the air-molecules sets electrons free in much the same manner as electrons are set free in a photo-electric cell.

A recent discovery, announced by Dr. J. H. Dellinger of the National Bureau of Standards, has opened the way for a considerable (*Continued on page* 253)

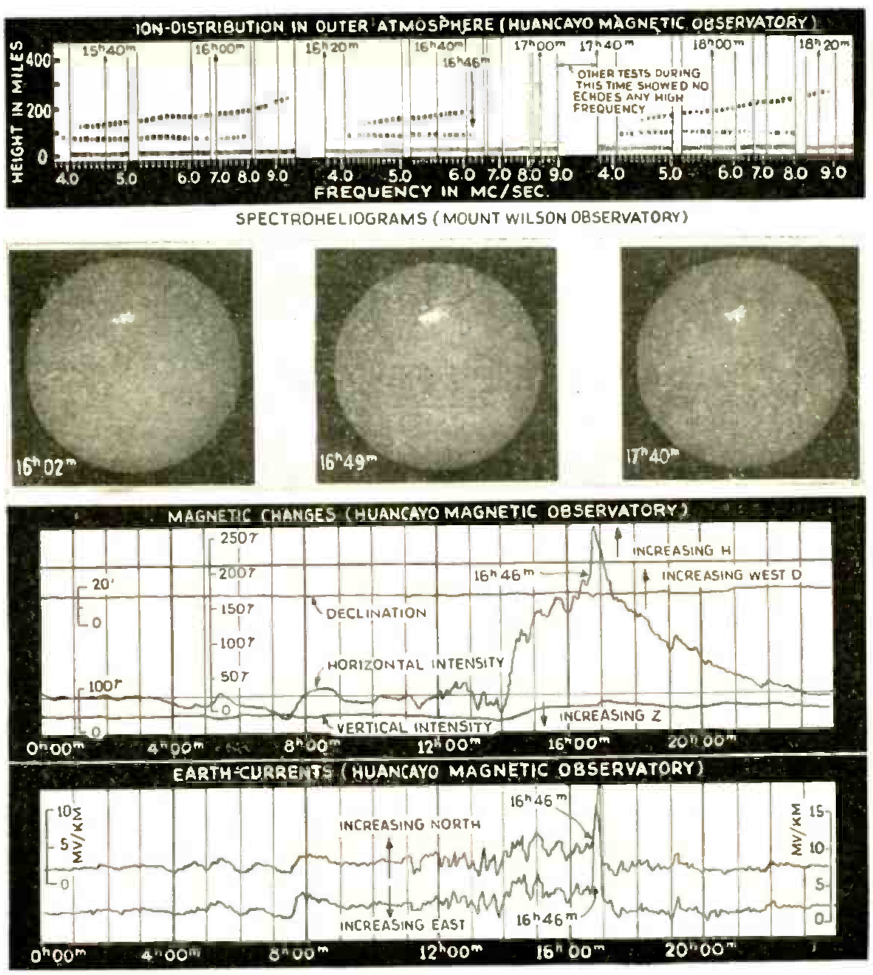


Figure 1—Magnetic, radio, and earth-current disturbances associated with brilliant solar eruption, April 8, 1936.

The B.B.C. Test Transmission visual announcement. This shows receiving tube rather too heavily biased, giving a very heavy black and white effect. Note how the M. & I. on E.M.I. are cut off, owing to the curvature of the receiving tube. Exposure three secs.

Tube biased rather too brightly for photographing two tones black and white. The general curvature and angle of the Marconi-E.M.I. are due to two effects, one, curvature of tube; two, local tuning circuits not quite adjusted to incoming synchronizing signal.

The tube biased to about correct brightness for ordinary viewing. Again note slight cut off in brilliancy of the I. in E.M.I. Note white edge on right of picture; this effect appears to be present in varying degree in all M.-E.M.I. pictures.

How To Photograph TELEVISION IMAGES–

Some of the Problems and Their Solution

● AMONGST all the publicity which the press in general has given to television very few attempts have been made to reproduce the image of the television screen and pictures which have been published show marked signs of retouching or faking. Photographers, professional and amateur alike, have tried to get pictures, but with far from satisfactory results.

One of the greatest stumbling blocks to the average photographer, who wishes to photograph a television image, is a complete lack of knowledge of how the picture is formed.

The photographer looking at a television screen of the cathode-ray type generally forms the opinion that there is a reasonable amount of light available to take a picture, which is true, but he is not generally aware of the fact that only a very small area of the scene is illuminated at any given instant, and that which looks like a well illuminated area is, in reality, only darkness.

Now to explain this more fully let us inspect some actual figures, taking the Baird system first. This is a 240-line picture with a picture-frequency of 25 per second, that is to say a spot of light draws 240 lines across the end of the cathode-ray tube, 25 times per second, the actual size of the spot of light, if everything is correctly set, being .000013 of the area (including synchronizing) of the television image.

This close-up of a cat's face was from a newsreel recently televised. In the original the scanning lines are most clearly marked. The mark between the eyes is a piece of faulty emulsion. Exposure 1/10 sec. F/2.9; hypersensitive plate.

Now let us see how much time is spent in drawing, say, one line. 240 lines are drawn in .04 second, therefore one line in .00016 second, and as there are the equivalent of 320 spots of light in one line the time taken for one spot to travel its own length is .0000005 second. Simply put, all this means is that if one opens a camera shutter for one second the actual time the photographic emulsion is exposed will be 25 short exposures of 1/2,000,000 second, that is to say, a total of 1/80,000 a second, which is not much compared with the usual photographic exposures.

In the Marconi-E.M.I. system, the period of exposure is less. In this system 405 lines are used on 25 pictures per second though the system of scanning is different. 202½ lines scan half the total area of the image in 1/50 of a second (*Continued on page* 257)

Elizabeth Cowell taken as she looked down to read announcement. Spots on nose and mouth photographic blemishes. This picture is another example of what can be done if the right moment is chosen. Exposure 1/10 sec. F/2.9 Kodak S. S. pan. film.

Leslie Mitchel, B.B.C. television announcer. Exposure half sec. F/2.9 Kodak super S. pan. film. The white shading where the black suite cuts the picture edge appears in most pictures on one of the systems of television.

Scene from "Marigold." Rather an imperfect result due to contrasting studio lighting and running the receiving tube with the general "brightness" too low for photographing. Original shows scanning lines. Exposure 1/10 sec. F/2.9 Ilford hypersensitive pan. plate.

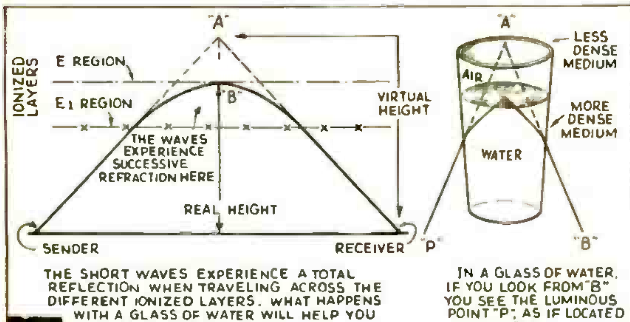


FIG. 1

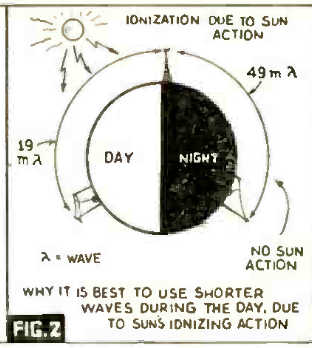


FIG. 2

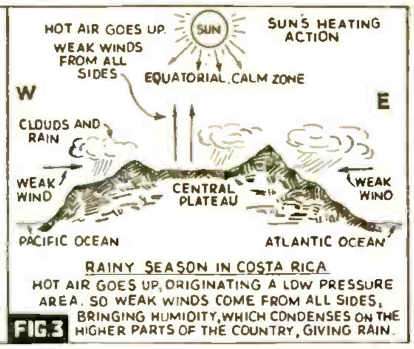


FIG. 3

Diagrams above show region in which short waves are reflected: why short waves are best during day, and weather conditions during rainy season in Costa Rica.

Weather Forecasting by Short Waves

By J. Merino y Coronado, (TI2JM)
Ex-Ass't Professor of Physics,
Liceo, San Jose, Costa Rica.

Describing the interesting experiments carried on in Costa Rica, Central America, by the author. An extension of this radio method of weather forecasting should prove very useful to weather experts in all parts of the world.

● WHAT I have to say here with regard to weather forecasting by short waves is the result of actual experiments, and I am addressing my report in this case to the average "Ham" and also the "Fan," who listens to the short-wave stations, and who is interested in the great problems still to be solved by the meteorologists. I have purposely omitted therefore all involved mathematical analysis, but have presented the more practical aspects of the subject, so that those interested may have a chance to try and apply this latest development in short waves. The experiments and studies which I have made may be considered as a particular application in this part of the world, that is, Costa Rica, where tropical storms form rapidly and where it is important to know of their probable route as quickly as possible. At the same time, it is also to be pointed out that the general rules given have been followed successfully in other countries.

While I do not advocate this system as a substitute for known weather forecasting systems, I do believe that it will prove valuable as an additional aid in weather forecasting. This system should also prove extremely valuable in countries like Costa Rica, where the farmers do not have the benefit of a well-organized meteorological service.

How Weather Affects Short Waves

To begin with, it is interesting to remember that, in general short waves travel upward to the ionized layers of the upper atmosphere and there experience a reflection; really this phenomenon is one of successive refractions as shown in Fig. 1. The reflected waves come back to earth and impinge on the aerial of the receiving apparatus if one is set up for the purpose. It is also well to remember that great atmospheric pressure changes produce correspondently large meteorological changes. As Ladner and Stoner, in their short-wave treatise *Short Wave Wireless Communication* point out—"The importance of atmospheric pressure, in regard to radio transmission, lies in the fact that pressure determines conductivity and dielectric constant, for although air at atmospheric pressure is almost a perfect insulator, at low pressures it becomes ionized by the sun's action. The effect of ionization is to reduce the dielectric constant and to increase the conductivity of the gas *in different ways to different frequencies.*"

Thus we see that the propagation of radio waves suffer considerable changes under the action of all meteorological and cosmic phenomena capable of producing alterations in the atmospheric pressure, dielectric constant, conductivity and ionization. Just as we choose different wavelengths to suit different operating and weather conditions for everyday transmission between two points, we must also be able to listen to a considerable number of different wavelengths if we wish to make efficient weather observations. Some are best for daytime while others are better suited for night observation, due to the sun's action on the ionized layers of the upper atmosphere. See Fig. 2.

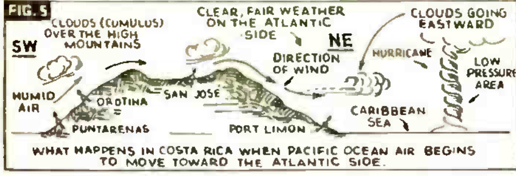
Climate in Costa Rica

Let us consider for a moment the climate in this part of the world, Costa Rica, where the short-wave method of weather forecasting has been tried out with considerable success. The climate in Costa Rica, which is an isthmus, is essentially tropical and oceanic. We have a dry season from November to April, a rainy season from April to November, but this rainy season is divided into two parts by a short dry season when the sun is on its yearly travel; i.e., arriving at the tenth parallel (the latitude of Costa Rica).

While these climatic changes seem easy to understand, yet they suffer from powerful outside factors such as the cold northern (*Continued on page* 259)

FIG. 4

FIG. 5



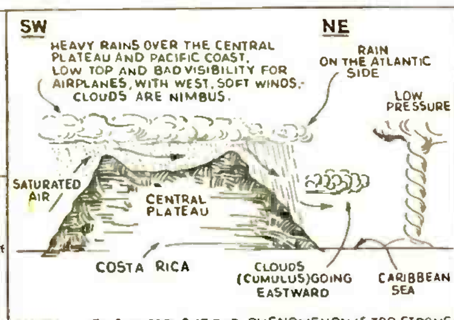


FIG. 6

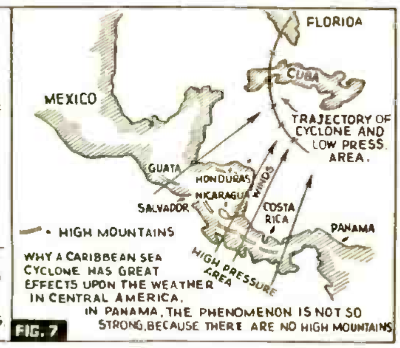


FIG. 7

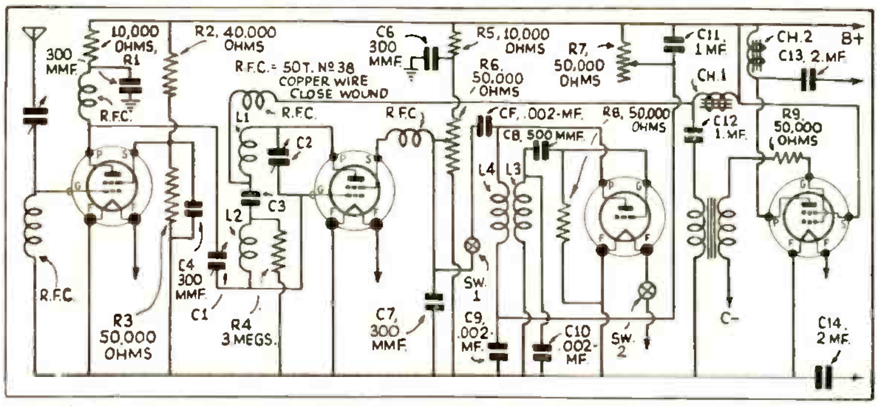
Above—Storm conditions in Costa Rica—What happens if heavily saturated air is blown north-eastward—finally, path of cyclone and low-pressure area with resultant effect on Costa Rica weather.

WORLD-WIDE SHORT-WAVE REVIEW

–Edited By C. W. PALMER

U. H. F. Super-Regenerator

● A SUPER-REGENERATIVE receiver designed for the ultra-short waves, and somewhat more elaborate than the usual type found in foreign magazines is shown in the sketch here, as reproduced from *Practical and Amateur Wireless (London).*



A novel super-regenerative hook-up for use on the ultra short waves is shown above.

As an examination of the hookup shows, the set contains a stage of aperiodic R.F. amplification before the detector and quenching tube. This R.F. stage is used primarily to prevent radiation of the receiver as well as to stabilize the response and to prevent swinging aerials or other external conditions from affecting the response. However, it is also useful to some extent (depending on the frequency) as an amplifier.

The detector is the usual type of tickler regenerative detector which is "quenched" or made to super-regenerate by means of a low-frequency oscillator—in this case a separate tube. This detector and beat oscillator is followed by a stage of A.F. to increase the gain. Additional A. F. stages can be added as needed. In order to provide stable operation in this set it is necessary to shield each of the three "R.F." circuits—the R.F. amplifier, detector and quench oscillator. These should be enclosed in separate shield boxes.

The coil L3 of the quench oscillator should contain about 1,400 turns of number 38 enamelled wire while L4 should contain 900 turns. Both coils are wound on a ⅜-in. slotted form with about 1/16th inch space between the windings. Jumble winding can be used in making these coils.

The values of the remaining parts are indicated, with the exception of the detector tuning coils, which depend on the desired frequency range. About 3 turns of number 14 wire, ½-in. in diameter, slightly spaced, will be suitable for both L1 and L2 for the 5 meter band.

Home-Made Recorder

● Automatic recorders for registering code signals on a paper tape have not received much attention in this country, but in Europe they are quite popular. An interesting recorder was recently described in the *"T & R" Bulletin (London).* The diagram shows how the recorder is connected to the output tube of a receiver, which may be a superhet.

A sensitive relay of the polarized or other type may be connected to a small metal rectifier, such as one employing copper oxide plates. As the diagram shows the relay and rectifier were connected to the secondary of an output transformer; this output transformer should have an impedance which will match the plate circuit of the output tube as nearly as possible. A small electric motor pulls the paper tape along under the recording pen. This pen may be a fountain pen of the type which has a small wire passing through the center of it, and commonly known as an *ink pencil.* With a little care, an ordinary pen can also be adapted for

(Continued on page 262)

R.F. Regeneration for a Short Wave Set

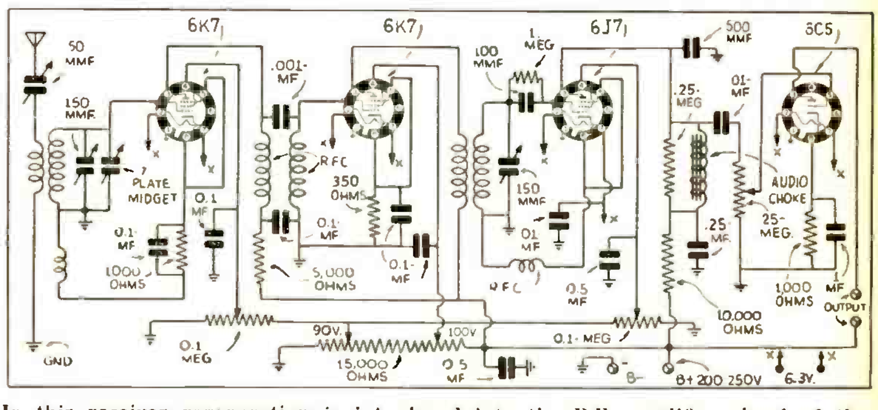
● IN an effort to make a regenerative set for short-wave reception which has more "pep" than the ordinary type, a radio set designer, writing in *The Australasian Radio World* (Sydney) has introduced regeneration into both the R.F. amplifier before the detector and in the detector itself.

This naturally increases the "gain" tremendously, but as might be expected, the set is extremely unstable, flying into oscillation at the slightest provocation. To eliminate this undesirable effect, a buffer amplifier is introduced between the regenerative R.F. stage and the regenerative detector tube.

Electron coupling is used in both regenerative circuits, as a means of making the set as stable and easily controlled as possible.

The circuit, shown here, gives the values of all the condensers and resistors. The coils, both in the aerial and the detector circuits are the usual tapped secondary type used in electron-coupled tuners. The R.F. tube is coupled to the buffer tube through a .001 mf. condenser and short-wave chokes are used to allow the proper voltages to be applied to the tubes, without loss of signal voltage. These R.F. chokes are important in the successful operation of the set, and they should be chosen with care. The value of inductance is not important as long as the chokes do not have any "holes" in the desired tuning bands.

The radio experimenter who wants a set which will really "reach out"—though it may not be the most simple to operate—should try this system of double regeneration. Using a properly arranged chassis to keep the coupling between the coils and grid and plate wires at a minimum, this set will "warm the heart" of any Ol' Timer.



In this receiver regeneration is introduced into the R.F. amplifier ahead of the detector, as well as in the detector itself, with a considerable increase in "gain."

$25.00 FOR GOOD 1-TUBE SET

● THE editors know that our short-wave set-builders and experimenters must have developed some extra fine 1-tube circuits—possibly for receiving sets, short-wave converters, etc.

We are therefore offering $25.00 for a good 1-tube set, either in the form of a short-wave receiver or a converter. Please note that there is little use in sending in an ordinary hook-up for a 3-element tube as most of the circuits possible with these tubes have been published.

What the editors want is a new circuit, designed around one of the latest type tubes having a multiplicity of grids. Refer to the March issue, page 675, where a very ingenious 1-tube S-W converter circuit is given. This will give you some idea of what we are after.

As a preliminary, you may send in a diagram and a description of the set and a good clear photo or two of it. A list of parts should accompany the description and the editors, who will act as the judges, and whose opinion will be final, reserve the privilege of requiring the set to be sent to them for inspection and test if they so desire. With the dual purpose tubes now available many ideas will suggest themselves. For example—Receivers with R. F. and Detector stages; Detector and A.F. stage; Detector and Plate-Supply Rectifier; 1-tube Super-het; Reflex set, etc.

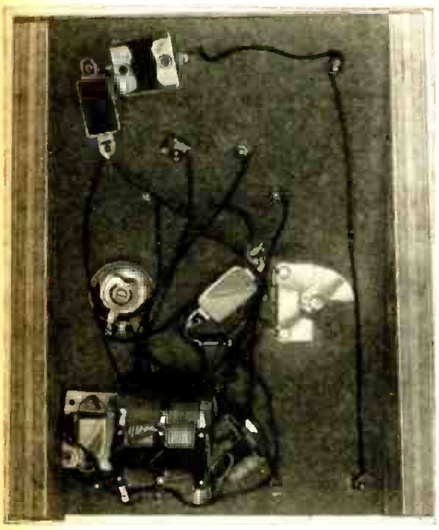
A·B·C·BEGINNER'S Short-Wave Set

By H. G. Cisin, M.E.

As the author points out, the beginner should start with a 1-tube set—the simpler the better. This receiver has regeneration and a simple coil arrangement, provided with taps, so that different bands can be switched in quickly and easily. It works on batteries and its low cost should commend it to every S-W "Fan."

The 1-tube Beginner's receiver here described is very easy to tune and can be switched from one band to another in a "jiffy."

● HERE'S a beginner's set which should help to create thousands of new short-wave "fans." Although it has an extremely attractive appearance, a glance at the top and the bottom views confirms the statement that it has been designed especially for the man without previous experience in set-building.



A bottom view of the Beginner's set—the wiring can be done in an hour, easily.

Only 1 Tube Used

The following features, in the writer's opinion, are essential in every beginner's set. First of all, the set should employ only one tube and that, a very simple one—a tube having only the following elements—plate, grid and filament. For this reason, *battery* operation is preferable for the novice. Secondly, the receiver should have only a minimum number of parts—i.e., only truly essential components, leaving out the tricks, gadgets, automatic "doo-dads," mystic brains and eyes and all other luxuries tending to complicate the wiring or to add to the expense.

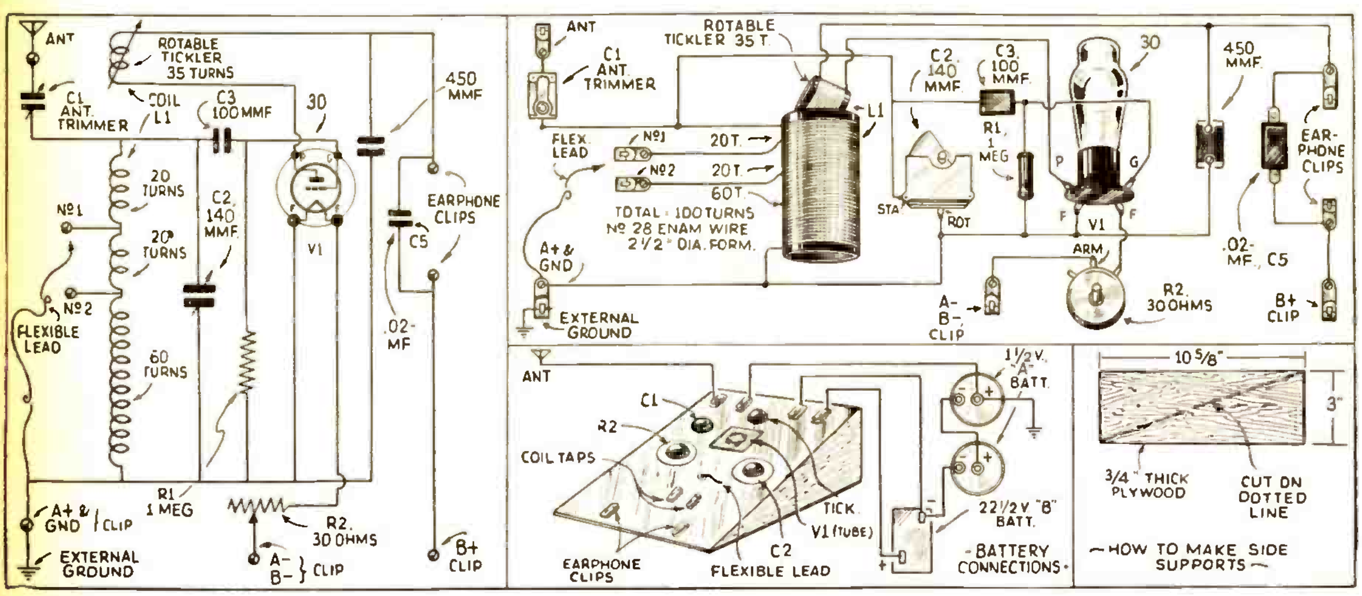
Thirdly, the beginner's set should be built on a wood or bristol-board chassis instead of on a metal one. Wood is easy to drill and provides insurance against short-circuits. On the other hand, metal requires special tools and if a bare wire happens to touch the chassis in the wrong place, this may be the cause of extra expense for burned out tubes or run-down batteries.

With the above three points in mind, the writer set about to provide a short-wave receiver for the *embryo* set-builder which would actually be "as simple as A.B.C." Hence, we offer you the "A.B.C." Beginner's Short-Wave Set.

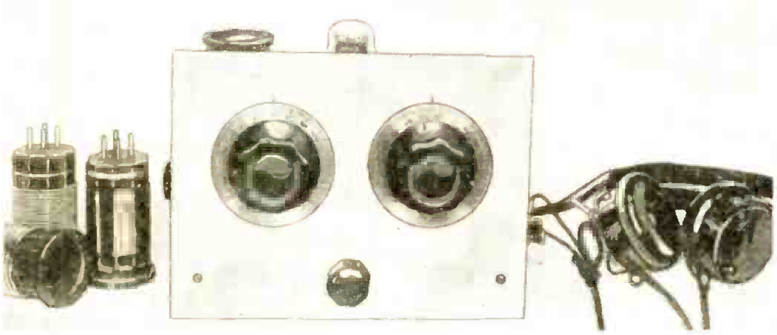
All parts of this novel set are assembled on an 8½" by 11" wood or bristol-board panel, which in turn is mounted on two inclined plane wood side-supports which start from a maximum height of three inches. The popular 30 type tube is employed because of its simple structure and low battery drain. It is of the two volt type, and needs only two 1½ volt dry cell "A" batteries and one 22½ volt "B" battery. This tube uses so little current, that the batteries will last for months under normal conditions. For added volume, more "B" batteries can be added, up to a maximum of 135 volts.

This circuit is of the "regenerative" type, which means that additional amplification is given to the output current, through the simple expedient of connecting an extra coil of wire, called a "tickler," in series with the plate and the earphones and placing this close to the tuned coil in the antenna circuit. This actually magnifies the strength of the incoming signals, and the experimenter can verify this for himself, by placing the set in operation and then shorting out the tickler coil with a piece of wire. The great drop in volume will be noticed at once.

The "A.B.C." Beginner's Set uses a coil of the solenoid type, wound on an air core. The secondary has a diameter of 2½" and a primary (not used) of the same size. The tickler, which is also air-wound, has a diameter of 1½". This latter coil is provided with a rotary shaft and when this shaft is turned by (*Continued on page* 261)



Schematic, as well as picture wiring diagrams for the Beginner's 1-tube receiver are given above, also battery connections.



Here's a 1-tube receiver which will delight the heart of every short-wave beginner. The circuit is easy to follow and one tube performs the functions of two tubes. Band-spread is provided and with high quality parts very fine receiving results are assured. This is a "head-phone" set and it can be operated from batteries or a regular power-supply unit.

Front view of the 1-tube receiver which has numerous features, including a very smooth regeneration control and band-spread. Foreign stations can be heard swell on this set.

For the BEGINNER . . .

By
G. W. Shuart, W2AMN

A Twin-Pentode Receiver

● WE have had twin diodes, twin triodes, and many other types of twin combinations of tubes, around which various receivers have been built by the short-wave experimenter. The tube engineers have now presented us with the 1E7G which is a twin-pentode battery type tube. This tube is similar to the type 33, except that there are two sets of pentode elements in the one couple.

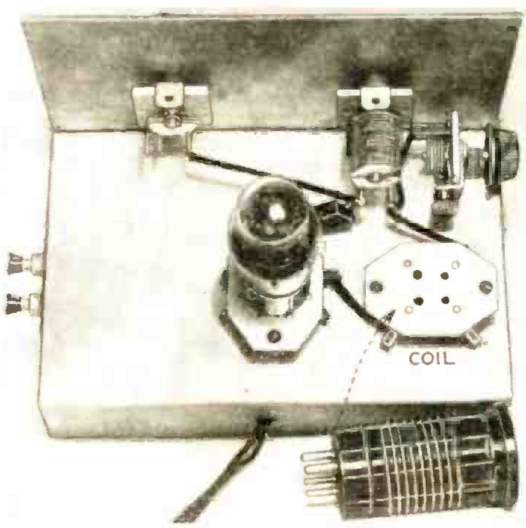
Bearing in mind the excellent results thousands of readers obtained with the Twinplex receiver using the type 19 tube, we believe this set will be destined to attain great popularity, inasmuch as it provides considerably more volume than the one using the type 19.

The circuit diagram of the new twin-pentode receiver is essentially the same as the Twinplex, and should offer no difficulty in construction or operation to even the most inexperienced beginner.

Referring to the diagram we find that the conventional pentode detector circuit is employed, with plate feed-back for regeneration and a screen-grid potentiometer for controlling regeneration. The audio stage is resistance-coupled to the detector. However, should the experimenter desire to employ transformer coupling, one may be incorporated with a slight increase in over-all volume. The screen-grid regeneration control provides the smoothest operation, although it necessitated the use of quite a low voltage on the screen of the audio stage, due to the fact that the screen-grids of the two-tubes are connected in parallel within the tube, and are represented by a *single prong* in the base.

An alternative method for controlling regeneration would be in the plate circuit of the detector. This could be either in the form of a potentiometer or a variable condenser in place of the .0005 mf. fixed plate by-pass condenser, which is employed in the diagram shown. In this case the full 67½ to 90 volts may be applied to the screen-grids, although with higher voltage on the grids, the audio stage functions more efficiently but the detector tube is a little more awkward to handle.

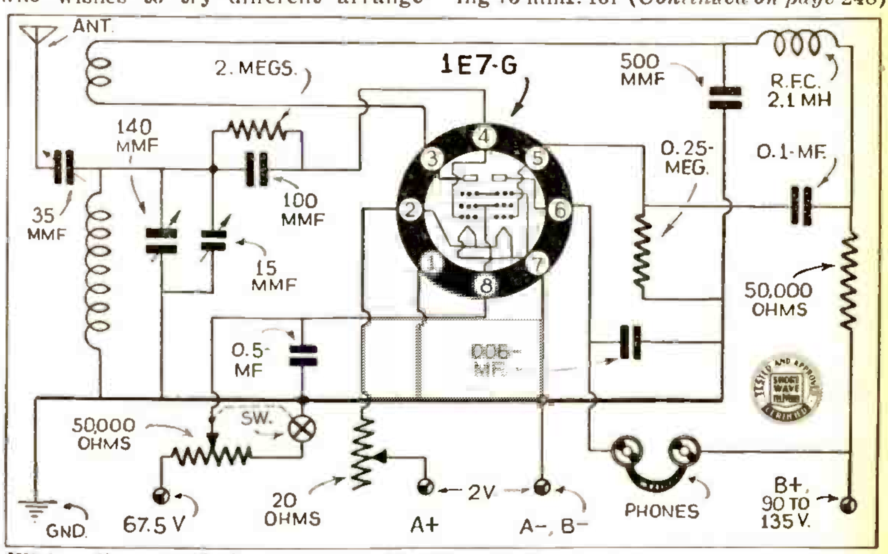
We would advise that you follow the arrangement shown in the diagram, with the choice of transformer or resistance coupling being left to the builder. These other methods of controlling regeneration are given in order to provide material for the experimenter who wishes to try different arrangements. It will be noted that the suppressor of the tubes is connected to the negative side of the filament and not to the center, therefore, all grid leads are made to the negative side of the circuit to which is also connected the B negative. This provides no bias voltage on the grid of the audio amplifier and for operation with 90 volts on the plate, the bias battery does not seem to be necessary. However, with 135 volts on the plate the bias battery should be connected in series with the ¼-meg. grid resistor in the audio stage. This battery should have a value of 4.5 volts.



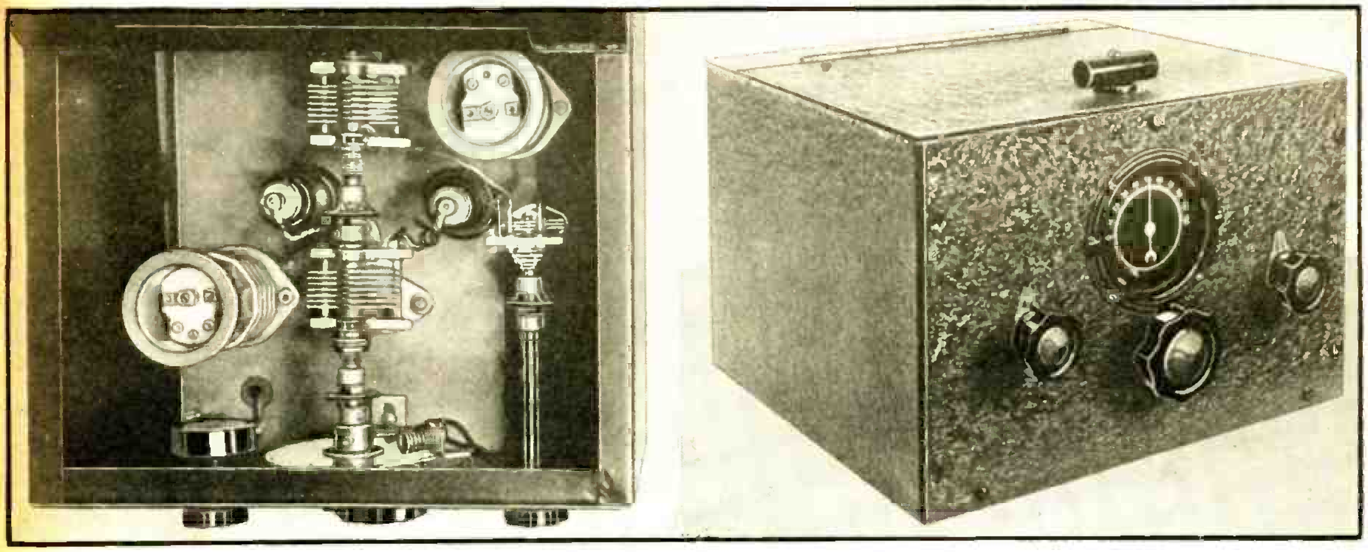
A rear view of the Twin-Pentode receiver showing "band-setting" and "band-spread" tuning condensers, as well as the "antenna tuner" at the right.

Returning to the regeneration control again for a moment, we find that the control has a switch attached; this switch is connected in series with the control and the connections are such that when the control is entirely *off* the switch *opens*. This is done to eliminate any drain from the 50,000 ohm potentiometer on the B batteries when the set is not in use.

Band-spread is provided by two condensers; one large one for bandsetting, and one very small one for *band-spread tuning*. By employing 15 mmf. for (*Continued on page* 248)



Wiring diagram of the Twin-Pentode receiver. It uses but one tube, but has a number of valuable features including an extremely smooth regeneration control.



Front and top views of the short-wave "pre-selector."

AN EFFECTIVE S-W Pre-Selector

By Raymond P. Adams

In this pre-selector two 6K7 tubes are connected in parallel. providing a noticeable increase in efficiency. To further this "gain" and to increase selectivity. both the input and output circuits are tuned. This pre-selector can be used with any short-wave receiver.

The R.F. Stage

● THE radio-frequency stage in most *all-wave* receivers tunes rather broadly, in spite of the use of a high C. Both signal and image selectivity suffer, therefore, and especially if the tuned detector circuit is a similarly inefficient discriminator. The image gets through to beat with the high frequency oscillator signal and ride in on the I.F. no matter how efficient the intermediate circuits may in themselves be. Signal gain—and after all it's the business of the R.F. stage to provide such gain—is made poor in effect, and all the more so if the input circuit and tube do not provide proper amplification. Last and certainly not least, over all *noise-level* is made high.

If there is no R.F. stage then these effects become all the more noticeable.

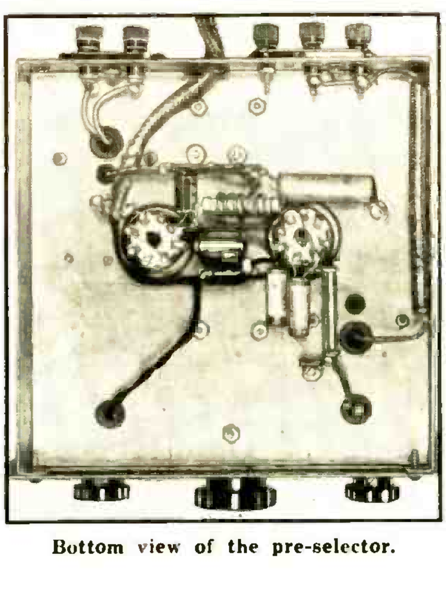
That "First Tube"

The first tube in any superhet line-up is the one which *must*, over and above all others, work at full gain efficiency. Noise voltages—caused by thermal agitation and random electron currents are generated within it and appear in both grid and plate circuits, to be amplified by all succeeding tubes and circuits. To these noise voltages are added those brought in via the antenna. And where will the signal be if it is not amplified to every possible degree in this tube? Why, *right down deep in the background mud!*

The Tuned R.F. Circuits

In order to provide proper "gain" for the first tube, its own tuned circuit must be effective as a means of discriminating against undesired signals and image. *Gain* is not entirely unrelated to selectivity. If one tuned circuit will not afford such selectivity, then two, perhaps three are in order. Whether or not additional input circuits use R.F. tubes sometimes doesn't matter—so long as they work to bring a desired signal not only *above* incoming background noise, but above heterodyne and general interference.

As we have stated, some superhets have no R.F. stage, perhaps no pre-selector circuits whatsoever. Thus their mixer tube is called upon to detect, to mix, and to provide inherent *gain* sufficient to bring the *signal-level* well above *noise-level*. Thus, too, their single-tuned circuit is called upon to afford the desired input selectivity. And it simply can't be done. Image and signal selectivity is not only poor, especially at high frequencies, but first-tube *gain* becomes entirely inadequate.



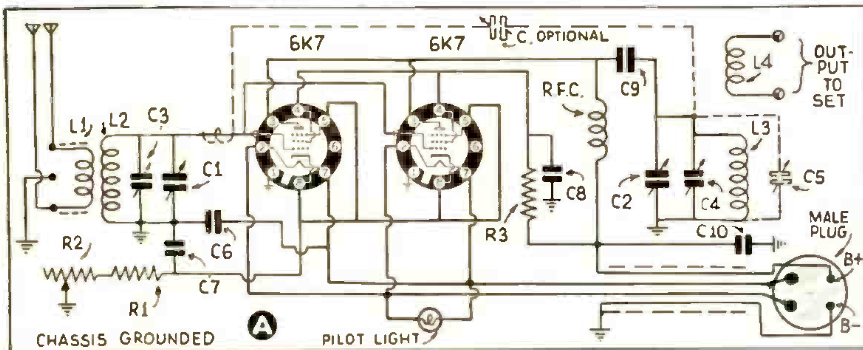
Bottom view of the pre-selector.

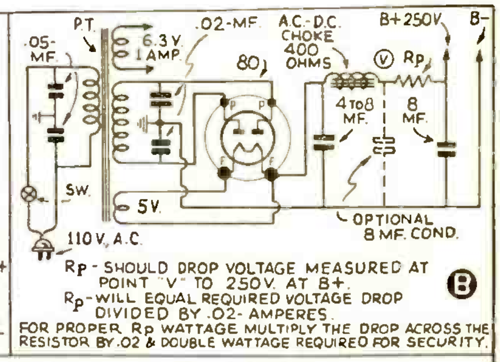
Why a Pre-Selector?

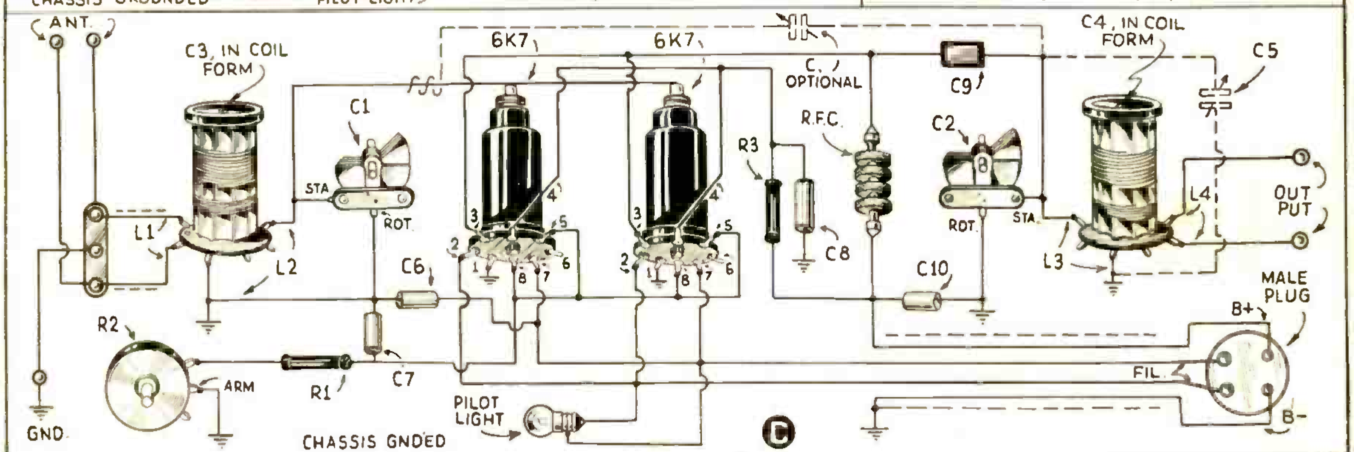
Our last paragraph made it fairly apparent that an R.F. stage is necessary to effective performance in any superhet. No one will argue that a pre-selector isn't really advisable where the receiver is not equipped with such a stage. But is a pre-selector desirable where a receiver is so equipped?

The writer believes that it is, especially where the receiver is of switched coil all-wave construction, or where the instrument is used for serious "DXing" or amateur operation on high frequency bands, or where poor image and signal selectivity and signal-to-noise ratio have been demonstrated. There is no receiver in this man's world, for that matter, which will not perform more effectively when a *well engineered, high gain, selective* external tuned R.F. stage is added as a refinement. It cannot be too frequently explained that peak receiver adjustments, increased I.F. selectivity, and trick antennas may have much to do with the capturing of that elusive signal—but that a *highly selective* and *efficient* R.F. stage is, above all things, most contributive to satisfactory performance. (*Continued on page* 263)

Hook-up and other details of Pre-Selector







COIL DATA AND CONNECTIONS

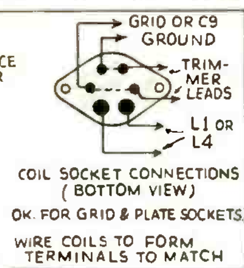
COVERAGE IN METERS	L1	L2	L3	L4	REFERENCE LETTER
10-25	3T	5½T.	5½T.	"X"	A
25-50	5 TO 8 T.	11½T.	11½T	"X"	A
35-100	10T.	20T.	20T.	"X"	B
100-250	10T	50T.	50T	"X"	B

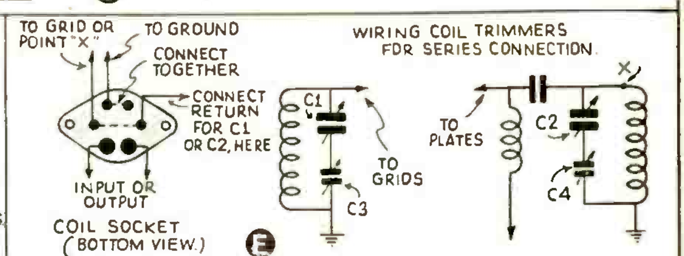
L4 = ("X") NUMBER OF TURNS SHOULD BE DETERMINED EXPERIMENTALLY FOR PROPER MATCHING TO THE RECEIVER INPUT CIRCUIT.

A = LENZ ELECTRIC SPECIAL No. 20 INSULATED R.F. WIRE, CLOSE WOUND OR No. 22 D.S.C. CLOSE WOUND FOR L1-L4, SPACED 1" FOR L2-L3

B = No. 24 D.S.C. CLOSE WOUND

NOTE:— ABOVE COVERAGE DATA REFERS TO COILS BUILT ON HAMMARLUND XP-53 FORMS AND WITH INSTALLED TRIMMERS AT MINIMUM CAPACITY SETTING IN PARALLEL CONNECTION. ANY INCREASE IN TRIMMER CAPACITY WILL LOWER HIGH FREQUENCY LIMITS.



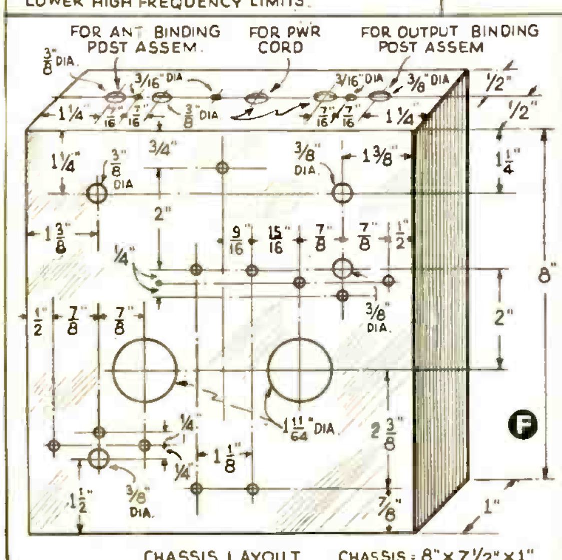


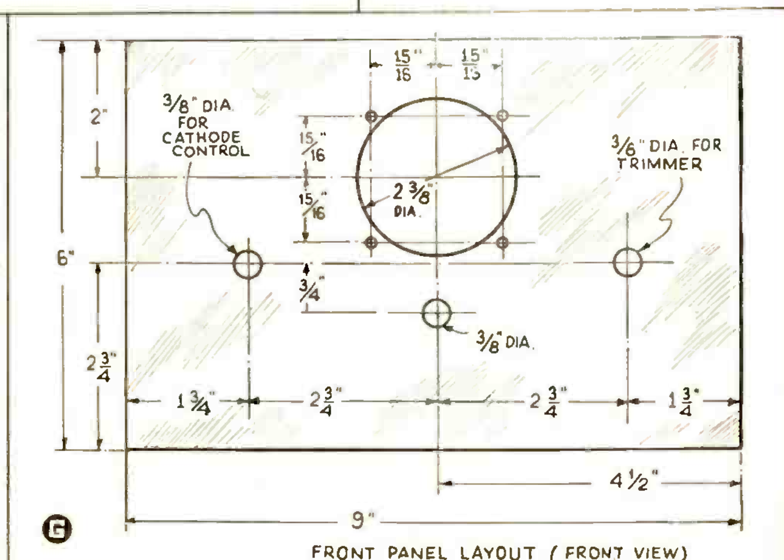
Diagrams for the pre-selector described on the opposite page are given at the top. B in the upper right corner shows hook-up of power-supply. Coil data and connection diagram are given at the left; optional hook-up for coil trimmers in series connection at the right. Chassis and front panel layout diagrams are given below.

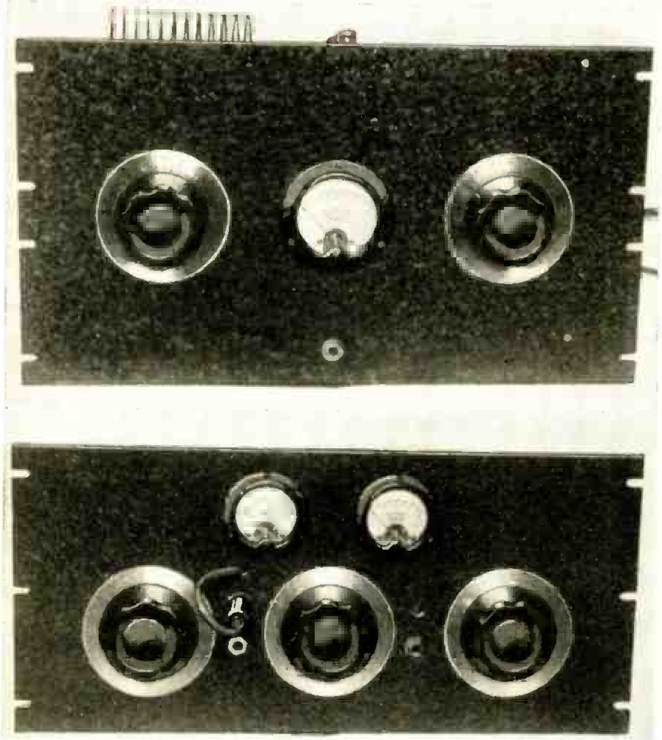
C5 SHOULD BE MADE EXTREMELY SMALL, OR BE DISCARDED.

BOTH L2 AND L3 WINDINGS MUST BE ACCURATELY MATCHED FOR SPOTTING AND ALIGNMENT.

C3 AND C4 SHOULD BE ADJUSTED TO GIVE BOTH DESIRED BANDSPREAD AND PROPER TRACKING.







Front view of the complete transmitter. The "exciter" and "driver" stages are built on the lower panel and sub-base; the 806 "final-amplifier" and control panel being the top one.

806 "ALL-

This very interesting transmitter employs an 806 as a final amplifier. Details of the exciter and driver stages are given; the exciter unit can be used as a 90-watt transmitter if desired. This transmitter has been tested "on the air" and has proven to be one of the "smoothest" operating rigs ever built.

● THE main purpose in the design of this transmitter was flexibility and simplicity. It is an easy matter to make an *all-band* transmitter employing a large number of stages. On the other hand, if proper tubes and circuit arrangements are employed, the problem is not quite so complicated as it may seem.

In transmitters having fairly high-power amplifier stages, that is somewhere around ½ kw., (500 watts) the *driver stage* should receive greatest care in the choice of components. The tube used as the driver determines whether or not the transmitter would be complicated. If the tube used in this position requires only a few watts excitation, then we can reduce the number of stages to three, providing we do not desire all-band operation with a single crystal. With this transmitter we have chosen the 804, which works exceptionally well down to 10 meters. The excitation requirements of this tube are extremely modest, less than 1 watt being sufficient for maximum output.

"Pen-tet" Exciter Employed

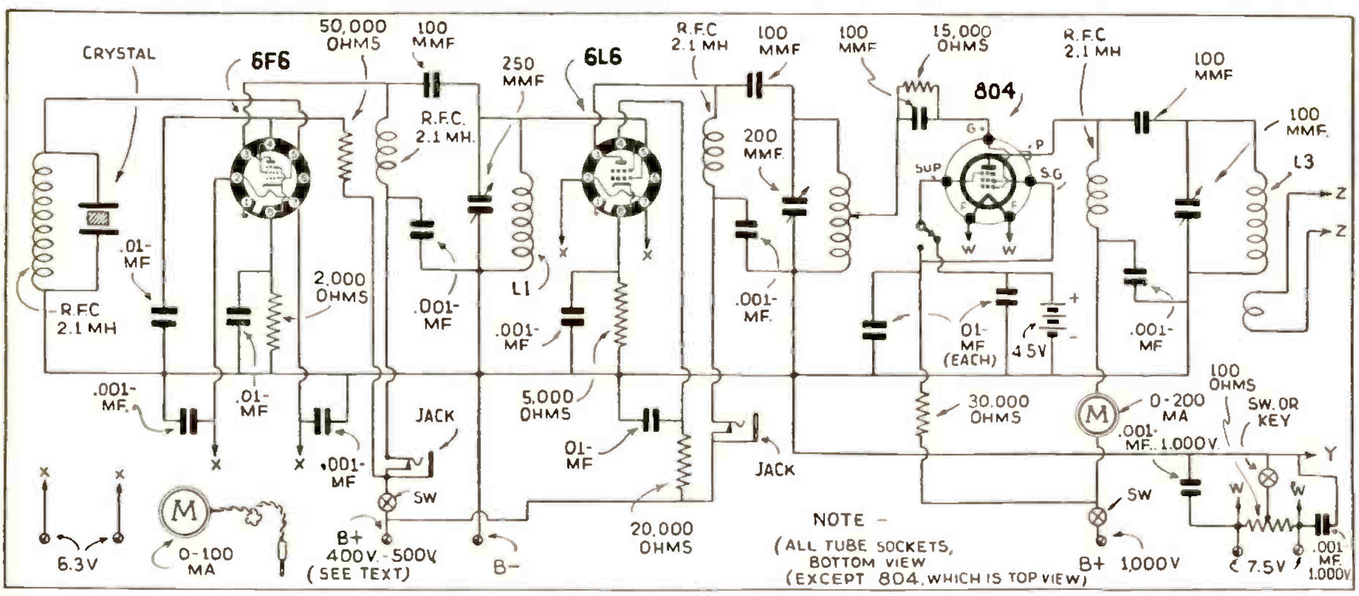
In order to obtain the utmost in flexibility, we resorted to the "Pen-tet" exciter which was described in the March 1937 issue of this magazine. This unit consists of nothing more than 6F6 pentode crystal-oscillator, followed by a 6L6 multiplier. This arrangement makes it possible to quadruple the crystal frequency with excellent efficiency. With 400 volts on the plates of the oscillator and multiplier, the output of the fourth harmonic and 80 meter crystal is more than sufficient to drive the 804 driver and it is necessary to adjust the coupling in order not to over-drive the large pentode. The 804 pentode seems to be the ideal driver for the 806 final amplifier used in this transmitter, as its output ranges from 50 to 80 watts, depending upon the circuit connections and the voltages applied to the tube.

Excitation Requirement Is Small

In our case we used the Tetrode connection and applied 1,000 volts to the plate of the tube. The output with this arrangement was approximately 50 watts with an excitation requirement of only .65 watt. This output, of course, is slightly greater than the 25 to 30 watts required for the 806, when operated as a plate-modulated class C amplifier. However, the driver stage, especially in a phone transmitter should have *good regulation* and a *fair surplus of power;* proper excitation being obtained by *varying the coupling* between the driver and the final stage.

Since link coupling is used, a variation of the excitation is simply a matter of the proper placement of the link coil. The amount of grid current present in the final amplifier stage is the best guide to proper excitation adjustment. For class C telegraphy, the final amplifier grid current should be in the neighborhood of 25 to 40 mills. (M.A.) This can be obtained with a 15,000 ohm grid-leak.

Smaller values of grid-leaks may be used with lower voltages.



Complete Exciter Unit 50-to-90 watts; for operation of the exciter alone, the switch in the suppressor-grid circuit should be in the position which puts 45 volts on the suppressor.

BAND" Xmitter Delivers 400 Watts

By George W. Shuart, W2AMN

Phone or CW Operation

For phone operation, the grid current should be at least 40 mills, slightly higher values—not exceeding 50 milliamperes—may in some instances improve the linearity of the amplifier. For CW or *code* operation, the plate voltage to the final amplifier can run as high as 3,000 volts. However, for phone use, the maximum rating is 2,000 and this seems to provide the best all-around operation. These values will serve for the 80, 40 and 30 meter band. However, in some cases, it may be advisable to reduce the plate voltage slightly, probably to 1500 to 1800 on the final amplifier. Although we have operated the tube with 2,000 volts on 10 meters with no signs of ill effects, the manufacturers claim that for this service the tubes should be cooled, preferably with an electric fan. While this may be an inconvenience in some cases, should it become necessary, we believe that a slightly lower plate voltage would overcome the problem. The slight reduction on 10 meters would not be worth mentioning, insofar as actual service is concerned.

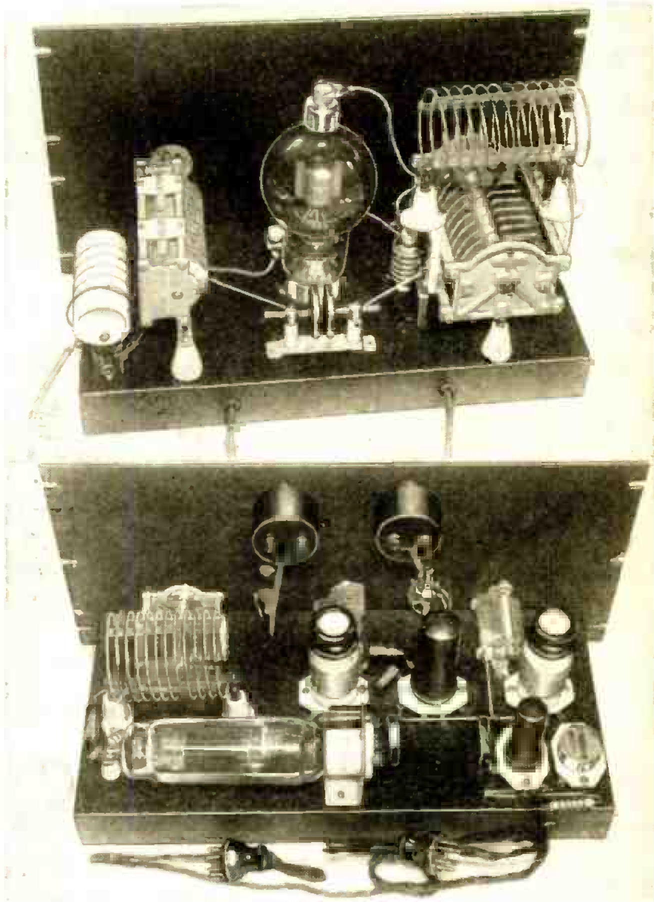
Single Chassis for "Exciter" and "Driver"

The photographs show the general construction of the *exciter* unit, as well as the *final-amplifier* unit. The exciter and driver stage are contained on a single chassis and it can be seen that this is the same unit described in the March issue, except that the 804 is substituted for the 807 previously used. The panel dimensions are 8¾" by 19", while the chassis is 2" by 7" by 17". The chassis for the final stage is the same size and the panel is slightly higher or 10¾". The final amplifier tank condenser is of the *split-stator* variety and has a capacity of 50 mmf. per section. This unit originally was a 6,000 volt 100 mmf. condenser, the stator was later split. However, a standard split-stator condenser is readily available. For operation on the 80 meter band, this capacity is slightly small; we would recommend the use of a condenser having 100 mmf. per section if one is interested in high powered operation on 80 meters.

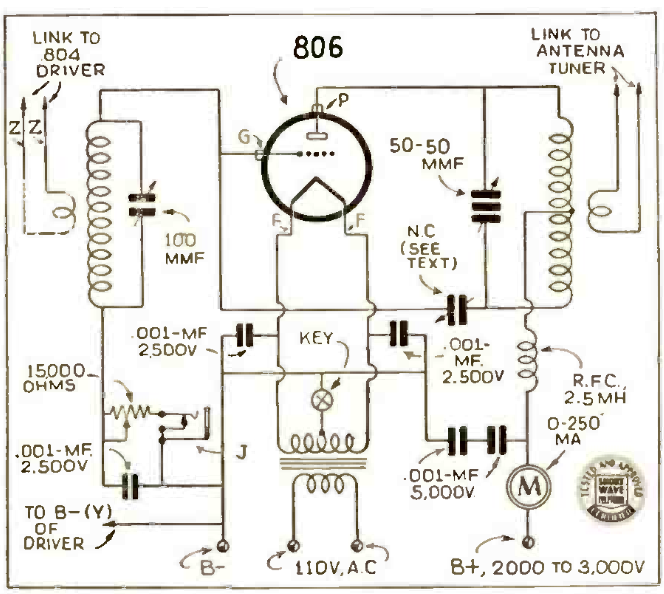
Exciter Unit Can Be Used As 90-Watt Transmitter

Our suggestion is that the final amplifier be eliminated for 80 meter operation, and by applying approximately 45 volts to the suppressor of the 804, we have a 90 watt transmitter which should be thoroughly capable of meeting all requirements on the 80 meter band. In fact, this is the way the original transmitter was operated.

The high power final stage is only used on 40, 20 and 10 meters. The grid tuning condenser for the final amplifier stage appears to be a split-stator condenser of quite large dimensions. This was used in the first arrangement of the transmitter in an endeavor to employ a single-section plate condenser by the simple expedient of *grid neutralization*. However, satisfactory results can be more easily obtained with the split-stator condenser in the plate circuit, and a single condenser in the grid circuit. When using *grid neutralization*, the output of the driver stage, operated as shown in the diagram, would not provide sufficient excitation for efficient phone operation on the higher frequencies. Plate neutralization is shown in the diagram and eliminates this problem.



A peek behind the front panels—top, the 806 "final-amplifier," and below—the "exciter" and "driver" stages, with crystal.



The 400 watt final amplifier, using the 806. The neutralizing condenser is a disc type, high-voltage neutralizing condenser. See photos for details.

The complete transmitter as described, provides one of the smoothest operating "rigs" ever tried. Its excellent output of 400 watts on *all* bands provides an impressive signal.

Coil Data

Coil data for the oscillator and frequency multiplier unit of the exciter may be found in the May 1937 issue.

The new data for the 804 amplifier is as follows: 80 meters —22 turns, No. 12, 2½" diameter; for 40 meters 14 turns, No. 12, 2½" diameter; 20 meter, 6 turns No. 12 2½" diameter; 10 meter, 4 turns No. 12 1¾" diameter. These coils are of the self-supporting type with a length of 4". The 806 grid coils are wound on 1¾" dia. isolantite forms. The coils are wound to a length of 3" with No. 18 tinned wire. The turns are as follows: 22 turns for 40 meters; 12 turns, for 20 meter; and 5 turns for 10 meters.

The 806 plate coils are of the same construction as the 804 plate coils, however, they are wound to a length of 5" and have a diameter of 2½". The 40 meter coil has 26 turns; 20 meter coil has 12 turns. The 10 meter coil has 4 turns of the same diameter but is only spaced to a length of 4".

The self-supporting coils are constructed with No. 12 tinned copper wire of the soft-drawn variety. The supporting strips are made of 1/16" celluloid strips ¼" wide.

(*Continued on page* 250)

A Simple, Rotary 5-Meter Beam Antenna

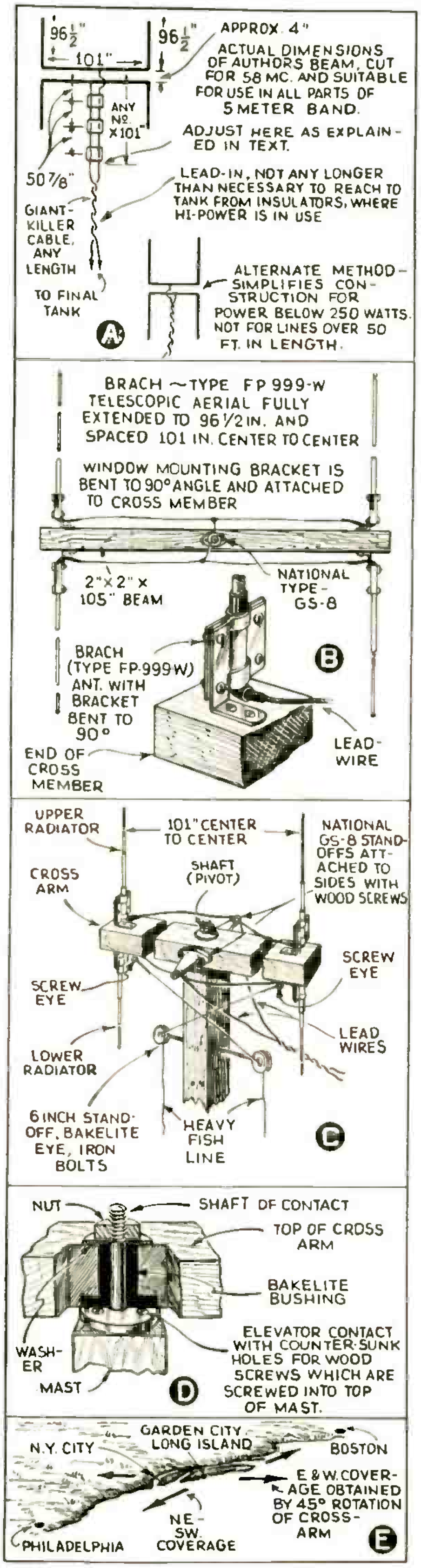
By Arthur H. Lynch, W2DKJ

● IN the article we intended to write for this month's installment on the "5-40-400 Transmitter" we were going to cover the modulation and power equipment. However, we believe that the following information will be very much more timely and we will hold over the description of the power equipment until another time.

Perhaps last night was a particularly good night on five meters or, perhaps, it was just one of the regular nights that happen at this time of the year. In any event, we had our first opportunity to try out our new rotary beam antenna and the results were most gratifying.

From our Garden City, Long Island location, we worked one station in Worcester, Massachusetts; one in Scituate, Rhode Island; one in Wilton, Connecticut; one in Collingswood, New Jersey, and another in Abbington, Pennsylvania, which is about twenty-five miles southeast of Philadelphia. Satisfactory reports were received from all of these stations.

The accompanying drawings show the simple mechanical construction followed in building the rotary, 5-meter beam antenna, which was tried out with excellent results by the author. The cost of building the antenna is nominal and its directive effect will prove useful to every "Ham."



A Beam That "Beams"!

During the time that the contacts to the northeast and to the northwest were made, our beam was in the correct position for stations located in those two directions. As an indication of the effective manner in which the beam was functioning, we worked a station in North Pelham, New York, which was at right angles to the beam and our report there was Q5-R-4. Ordinarily, the report from the same station would be R-9+.

Rotating the beam produced a very noticeable effect on incoming signals and stations which were just about audible or not even audible on an ordinary type of antenna, could be brought in from an R-6 to an R-7 on the beam. Other stations a reasonable distance away, such as forty or fifty miles, were tuned in to their peak and then their intensity was observed as the beam was swung into and away from their direction. The signal level was found to vary from inaudibility, when the beam was at right angles to the station, to an R-7 or 8, when the beam was in the proper direction.

We have attempted to use any number of different types of arrays but our enthusiasm for the present unit comes, not only from the excellent fashion in which it performs but also from its simplicity of design and ease of construction.

Fortunately our location is such that a bi-directional beam will give us coverage in nearly every direction in which we desire to transmit or receive if it can be made to rotate forty-five degrees. The arrangement that we have made for rotating our own beam is extremely simple, as will be observed from some of the accompanying sketches, and where ninety degrees or more of rotation is required, so that the beam will function in every conceivable direction, the construction should not be a particularly difficult mechanical task.

This Beam Antenna, Including The Four Radiators And The Matching Sections—Also The Transmission Line, Was Constructed And Put In Operation In A Single Afternoon.

Details of Our Beam Antenna

Somewhat more than fifteen years ago we secured a piece of well seasoned lumber three inches square and twenty feet long. The edges were trimmed off and the top was tapered so that it would not appear too unsightly and then the stick was given several coats of paint. It has been fastened to one of the studs on the side wall of the house in a corner beside the chimney, by four rather large lag bolts. It is doubtful that there is any kind of antenna which it has not supported during its rather long life but it has had more different types of aerials perched on top of it in the past year than during all the rest of its life combined.

In order to provide ourselves with a beam which would make up, to a degree, for the low altitude of our home town as well as the low altitude of aerials that we are permitted to erect under the restrictions imposed by the village board, we wanted something that would provide reasonable efficiency but would not produce an assembly that would have the appearance of a Christmas tree perched on our roof top.

When the L. S. Brach Manufacturing Corporation introduced Telescopic Fishpole antennas, designed for mounting on automobile bumpers and apartment house windows we got the notion that they could be used very satisfactorily in connection with the building of multi-element ultra hi-frequency antenna systems. It is hard to imagine a more useful arrangement than our present beam and, when it is considered that it was built and set up on top of our mast in a single afternoon the value of this type of radiator, to the ultra high-frequencies, becomes obvious.

Aerial Withstands Wind In Good Shape

These aerials are made of spring steel. They taper, so that they have extremely low wind resistance and the radiators themselves can hardly be seen a block (Continued on page 266)

Short Wave Scouts

FORTY-FIRST TROPHY

Presented to
SHORT WAVE SCOUT
ALFRED K. KULECK
57 E. Parker St.
Scranton, Pa.
103 Stations—91 Foreign
For his contribution toward the advancement of the art of Radio
by
SHORT WAVE TELEVISION
Magazine

● THE forty-first Short Wave Scout Trophy goes to Alfred K. Kuleck of Scranton, Pa., for his excellent total of 103 verification cards, 91 of which were *foreign*. These stations were received on a 1936 Philco model 660X receiver employing 10 tubes with a 50 ft. single wire some 30 ft. high. Mr. Kuleck's list represents a very interesting period of DXing and he is to be congratulated for his untiring efforts.

His list was neatly prepared, and the cards were in the same chronological order as the list, which greatly aids checking by the judges—other contestants please note!

The complete list of the stations and verifications submitted follows:

Stations Heard by Mr. Kuleck

United States

Call—Frequency Location

W1XAL—15.120 mc.—University Club, Boston, Mass.
W1XAL—11.790 mc.—University Club, Boston, Mass.
W1XAL—6.040 mc.—University Club, Boston, Mass.
W2XAD—15.330 mc.—General Electric Co., Schenectady, N.Y.
W2XAF—9.530 mc.—General Electric Co., Schenectady, N.Y.
W3XAL—17.780 mc.—Bound Brook, N.J.
W3XAL—6.100 mc.—Bound Brook, N.J.
W3XAU—9.590 mc.—Philadelphia, Pa.
W3XAU—6.060 mc.—Philadelphia, Pa.
W9XAA—11.830 mc.—Chicago, Ill.
W9XAA—6.080 mc.—Chicago, Ill.
W9XF—6.100 mc.—Chicago, Ill.

Canada

CFCX—6.005 mc.—Canadian Marconi Co., Montreal, Canada.
CJRO—6.150 mc.—Winnipeg, Manitoba, Canada
CJRX—11.720 mc.—Winnipeg, Manitoba, Canada.

Cuba

COCD—6.130 mc.—Havana, Cuba
COCH—9.428 mc.—General Broadcasting Co., 2 B St., Vedado, Havana
COCO—6.010 mc.—P.O. Box 98, Havana, Cuba. Daily
COCQ—9.750 mc.—De la "RCA Victor" Calle 25 No. 445, entre 6y 8 Vedado, Havana
COCX—11.435 mc.—La Voz del Radio "Philco," Apartado 32, Havana, Cuba

Mexico

XEFT—9.510 mc.—Av. Indepdencia 28 Vera Cruz, Mex.
XEXA—6.132 mc.—Departamento Autonomo De Publicidad y Propaganda, Mexico City, Mexico.
XEUZ—6.120 mc.—Nat'l Broadcasting Network-Cadena Radio Nacioal, 5 de Mayo 19 y 21, Mexico, D.F.

West Indies

HIN—6.243 mc.—La Voz del Partido Dominicano, Ciudad Trujillo, Dom. Rep.
HIT—6.630 mc.—"La Voz de La RCA Victor" Apartado 1105 Ciudad Trujillo, Dominican Republic.

● ON this page is illustrated the handsome trophy which was designed by one of New York's leading silversmiths. It is made of metal throughout, except the base, which is made of handsome black Bakelite. The metal itself is quadruple silver-plated, in the usual manner of all trophies today.

It is a most imposing piece of work, and stands from tip to base 22½". The diameter of the base is 7¾". The diameter of the globe is 5¼". The work throughout is first-class, and no money has been spared in its execution. It will enhance any home, and will be admired by everyone who sees it.

The trophy will be awarded every month, and the winner will be announced in the following issue of SHORT WAVE & TELEVISION. The winner's name will be hand engraved on the trophy.

The purpose of this contest is to advance the art of radio by "logging" as many short-wave phone stations, amateurs excluded, in a period not exceeding 30 days, as possible by any one contestant. The trophy will be awarded to that SHORT WAVE SCOUT who has logged the greatest number of short-wave stations during any 30-day period.

HONORABLE MENTION

W. A. Dennis
E. Berlin, Conn.
J. Dolzanski
Winnipeg, Man. Canada
Dr. G. D. DiMarco
Chicago, Ill.
William Elliott
New York City, N.Y.
Theodore Bottema
Bethlehem, Pa.

HIX—6.340 mc.—Secretaria De E de Comunicaciones y Obras Publicas., Ciudad Trujillo, Dom. Rep.
H1LJ—5.865 mc.—Box 204, San Pedro de Macoris, Dom. Rep.
HI3C—6.730 mc.—"La Voz de La Feria"—La Romana, Dom. Rep.
HI3U—6.015 mc.—"La Voz del Comercio"—Santiago, Dom. Rep.
HI8A—6.479 mc.—"La Fa-Doc en el Aire"—Apartado 1912, Ciudad Trujillo, Dom. Rep.
HH2S—5.915 mc.—P.O. Box A103, Port au Prince, Haiti.
"Radio-Fort-De-France"—9.450 mc.—Edouard Boullanger Fils, Fort de France, Martinique, French West Indies.

Central America

TI4NRH—9.670 mc.—"La Voz de Costa Rica," Amando Cespedes Marin, Apartado 40, Heredia, Costa Rica.
TGW—9.450 mc.—Radiodifusora Nacional, Ministre de Fomento, Guatemala City, Guatemala
HRD—6.235 mc.—"La Voz de Atlantida," La Ceiba, Honduras
HP5B—6.030 mc.—Mira Mar, Apartado 910, Panama City, Panama
HP5J—9.590 mc.—La Voz de Panama, Apartado 867, Panama City, Rep. of Panama

South America

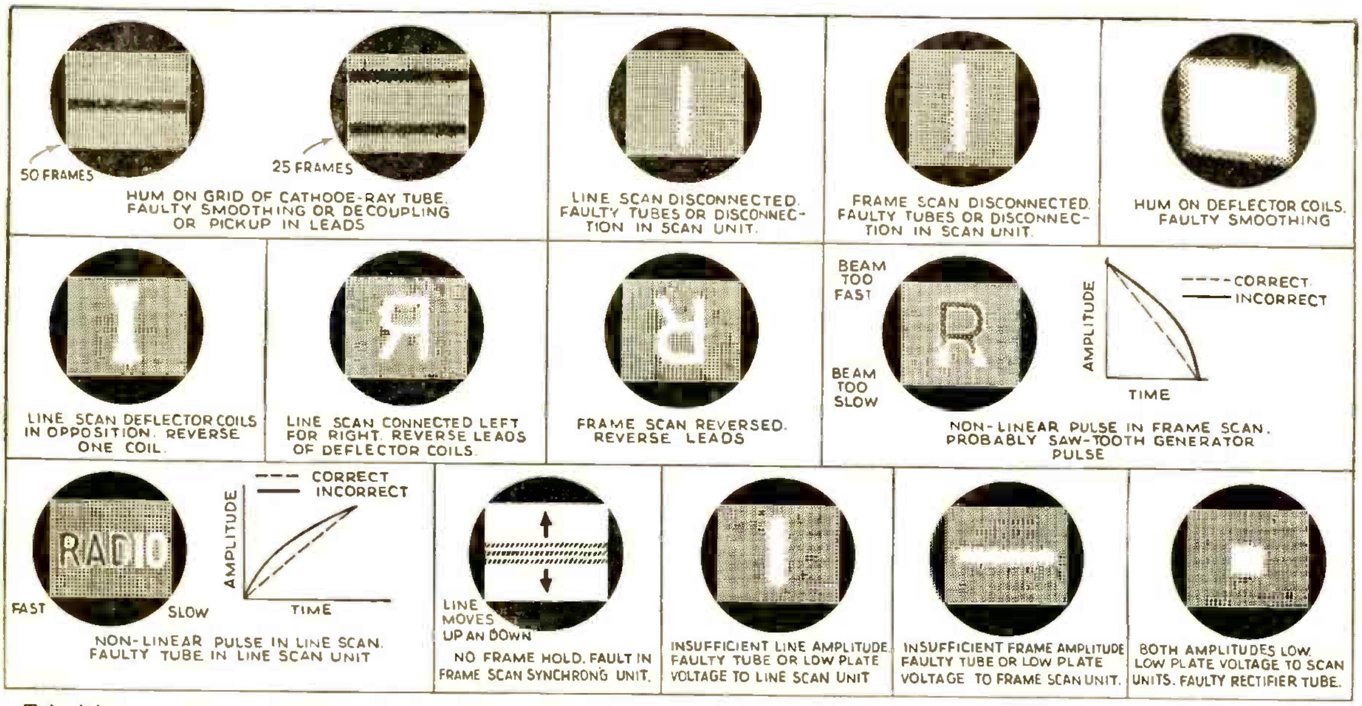
LRX—9.660 mc.—Radio El Mundo, Buenos Aires
LRU—15.280 mc.—Radio El Mundo, Buenos Aires
PRF5—9.501 mc.—Comp. Radio Internacional Do Brazil, P.O. Box 709, Rio de Janeiro, Brazil
VP3MR—6.010 mc.—The Br. Guiana Broadcasting Co. Ltd., The Voice of Guiana, Georgetown, British Guiana
CB615—12.300 mc.—Radio Service, Bandera 176, Casilla 761, Santiago, Chile
HJ1ABE—9.500 mc.—"La Voz de Los Laboratorios Fuentes"
HJ1ABG—6.042 mc.—Emisora Atlantico, Barranquila, Colombia
HJ1ABP—9.600 mc.—Radio Cartagena, Apartado 37, Cartagena, Colombia.
HJ3ABD—6.050 mc.—Emisora Nueva Granada, Colombia Broadcasting S.A., Apartado 509, Bogota, Colombia.
HJ3ABX—6.122 mc.—"La Voz de Colombia, Apartado No. 26-65, Bogota, Colombia.
HJ4ABE—6.097 mc.—"Lo Voz de Antioquia", Medellin, Colombia.
HJ4ABP—6.030 mc.—Emisora Philco, Medellin, Colombia
HSJB—4.107 mc.—La Voz de Los Andes, Quito, Ecuador.
HC2JSB—7.854 mc.—"Ecuador Radio," Guayaquil, Ecuador
HC2RL—6.635 mc.—P.O. Box 759, Guayaquil, Ecuador.
PRADO—6.625 mc.—Fabrica de Tejodos de "El Prado", Apartado 98, Riobamba, Ecuador.
OAX1A—6.125 mc.—Companio de Radios "Delcar", Casilla No. 9, Chiclayo, Peru.
YV1RB—5.800 mc.—Ecos Del Zulia, Apartado Correos No. 37, Maracaibo, Venezuela.
YV3RC—6.158 mc.—Now YV5RD. Radiodifusora Venezuela, Caracas, Venezuela.
YV5RC—5.800 mc.—"Le Habla a la Nacion "Radio Caracas, Caracas, Venezuela.
YV5RP—6.270 mc.—"La Voz de La Philco", Apartado 508, Caracas.
YV6RV—6.520 mc.—Now YV4RB. Radiodifusora "La Voz de Carabobo", Valencia, Venezuela.
YV9RC—6.400 mc.—Now YV5RH. Emisora Ondas Populares, Apartado 1931, Caracas, Venezuela.

Europe

OER2—11.801 mc.—Osterr. Radioverkehrs A.G., Wien, 1., Johannesgasse 4 b, Vienna, Austria.

(Continued on page 271)

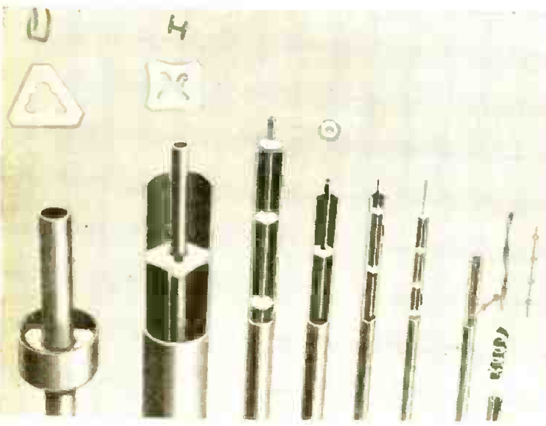
When That Television Image Goes Blooey!



Television receivers, whether of the scanning disc or cathode ray type, have a number of peculiar ailments, prominent among which we find reversed images, peculiar shadow effects, fuzzy images, etc. The accompanying picture, reproduced by the courtesy of Television and Short-Wave World (London), shows what frequently happens to the image on cathode ray television receivers, and the indicated remedies in each case. It won't be long now before television enthusiasts and experimenters in this country will be studying these peculiarities in television image pick-up on cathode ray receivers, so you had better cut this out and paste it in your scrap-book for reference.

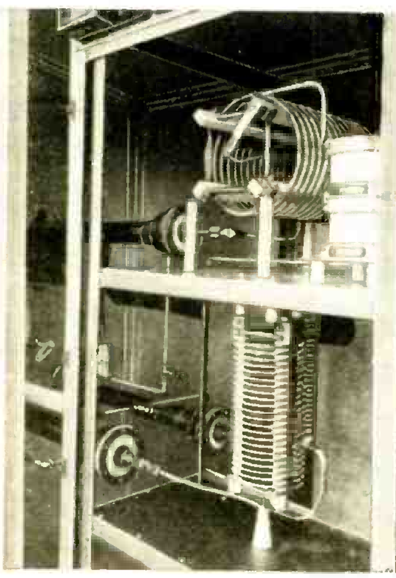
The above analysis chart should not be interpreted too literally as in some instances, the same effects might be produced due to some other defect or improper adjustment in the apparatus.

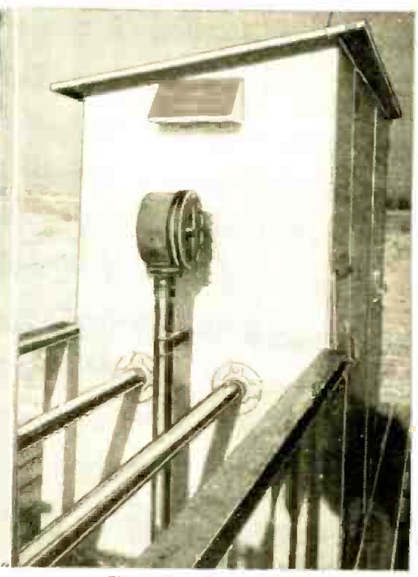
Piping R. F. With Concentric Lines



Above—"Exploded" views of concentric line and its component parts, designed by Bell Telephone Laboratories engineers for "piping" radio frequency energy from broadcast transmitter to antenna. Center—Close-up of interior of coupling house, showing some details of the network through which the concentric transmission line branches.

Right—Center coupling house, midway between the two end towers, which contains the phase shifting and tuning units, the net-work through which the main transmission line divides three ways. The vertical pipe is the main line from the transmitter coming from under-ground to make a right-angle turn into the coupling house. The two horizontal pipes are exiting from the coupling house on their way to the end towers. The third branch goes to the middle cable antenna, a segment of which may be seen above the coupling house.





Photos from Western Electric Company.

By P. H. Smith

Member, Technical Staff, Bell Telephone Laboratories

● RADIO frequency transmission lines in the more general sense include all conductors of radio frequency currents from the shortest interconnection between radio circuit elements to the longest carrier frequency telephone line. In the broadcast field interconnections between circuit elements are invariably very short electrically so that considerations of their electrical behavior from the standpoint of transmission line theory is generally unnecessary. However, at higher frequencies, due to their greater electrical length, short connections often exhibit marked transmission line characteristics which may at times become detrimental to the successful operation of a circuit. A consideration of the behavior of these connections as radio frequency transmission lines will often indicate the trouble and may even suggest ways of taking advantage of some of their desirable characteristics.

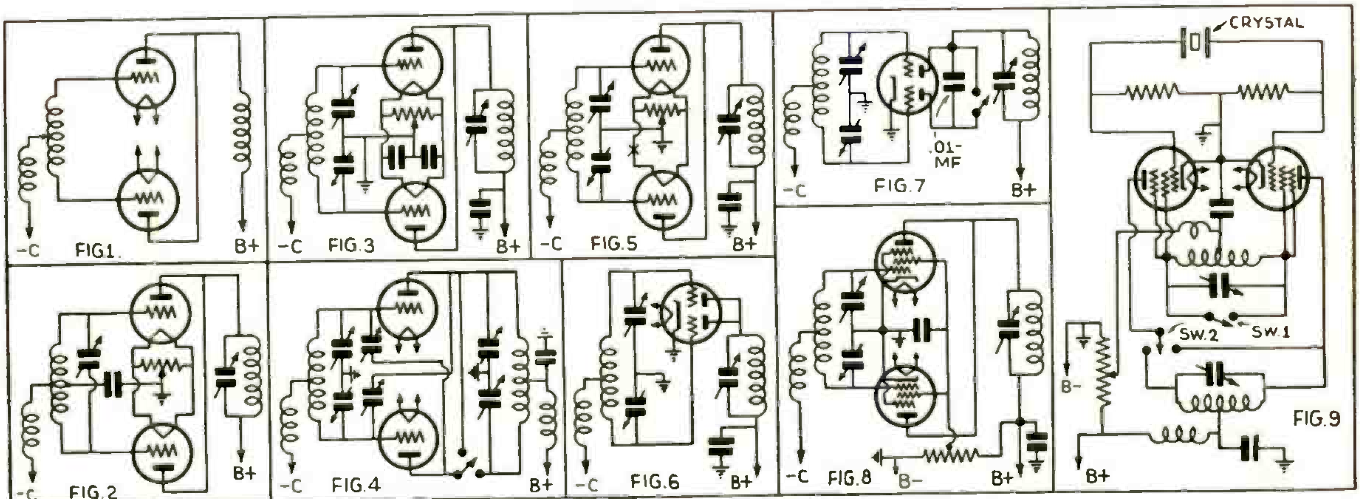
In the usual sense, the radio frequency transmission line comprises the connection between the antenna and radio equipment. At broadcasting stations the many advantages afforded by locating the antenna a few hundred feet away from (*Continued on page* 267)

High Efficiency Doubling

—R. J. Hagerty, W6JMI

● PROBABLY the two greatest handicaps of amateur transmitters are lack of *adequate excitation* and *low-efficiency* frequency multiplication. It is disconcerting, to say the least, to have or design a transmitter for certain bands only to find out that at higher frequencies there just isn't enough excitation to the final stage. This is due to the fact, in most cases, that the doubler stages will not put out sufficient RF (radio frequency) and unfortunately the higher in frequency we go the more our excitation falls off. And, on the other hand, it seems a waste of time and money to have a long string of doublers whose output is just about the same as the output of the crystal oscillator stage itself.

The answer and solution to the above is *high-efficiency* frequency multiplication or *push-push* doubling. Just why can be briefly explained by the following: In its ordinary form a doubler consists of a single tube whose plate circuit is tuned to twice that of the input or grid circuit. The only reason it works is because there is distortion present in every radio tube and we capitalize on this by juggling the grid bias, excitation, introducing regeneration, raising the plate voltage, etc., until we cause the (*Continued on page 269*)



A variety of "push-push" R.F. doubler circuits are displayed above. The average "Ham" will find a study of these circuit well worth while.

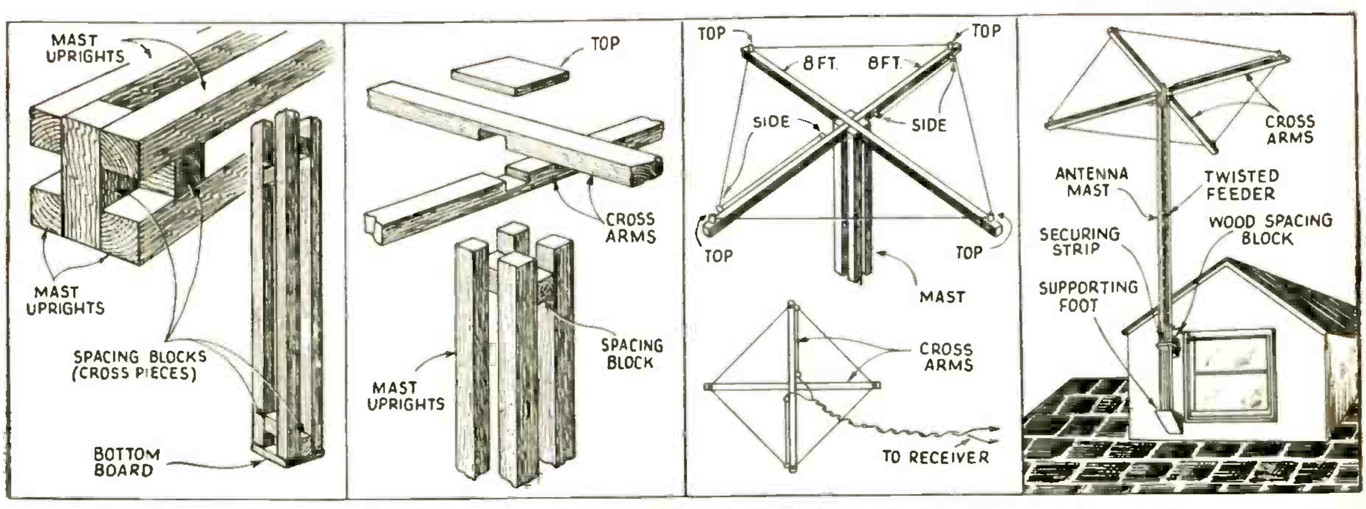
A "Folded Doublet" Saves Space

● IT is a well-known fact that if properly constructed and mounted, the *doublet* antenna will greatly reduce general background noise and "hash" caused by various electrical apparatus in the immediate vicinity of the receiver.

In the drawings we find that two Englishmen G2IS and G6DT have constructed a folded doublet. The reason for the peculiar shape of the antenna was the lack of available mounting space for the usual doublet. We can not vouch for the technical assets of this antenna. However, the claims of the designers of this folded doublet are substantial arguments in its favor.

The four drawings show the various mechanical details and its construction is very simple. Of course, the usual rules applying to doublet antennas apply to this one. The antenna proper, or the folded section, should be located outside the field of the noise, and the signal from the antenna thus conducted through the field with a twisted feed-line. If, for any reason, it is impossible to locate the antenna outside of the range of the noise its benefits will be very few in number.

Coupling between the receiver and the feed-line consists of the usual coil. The coupling between the two coils, that is the coil at the receiving end of the feed-line, and the tuned input coil of the receiver should be variable; if one wants to go to the trouble, a further precaution against noise can be brought about by the use of a Faraday shield placed between the two (*Continued on page 248*)



Dimensions of the wood framework and supporting mast for a "folded doublet" antenna for short-wave receiving purposes are given in the above drawing. Very good results are claimed for it.

WHAT'S NEW In Short-Wave Apparatus

The short-wave apparatus here shown has been carefully selected for description by the editors after a rigid investigation of its merits.

New 1938 Super Skyrider

Front view of the new 1938 Super Skyrider, an excellent "communications" type receiver for "Ham" and "Fan." A high degree of selectivity is afforded, thanks to a carefully designed I.F. amplifier featuring variable selectivity, plus a crystal filter circuit. No. 641.

One of the latest Communications type receivers, suitable for all "Ham" and "Fan" requirements. This receiver provides excellent band-spread and has a variable selectivity feature. Six bands are covered by means of a switch, including the broadcast band; the complete range is 62,000 to 545 kc. The set has a calibrated dial, an "S" meter, crystal filter and beat oscillator.

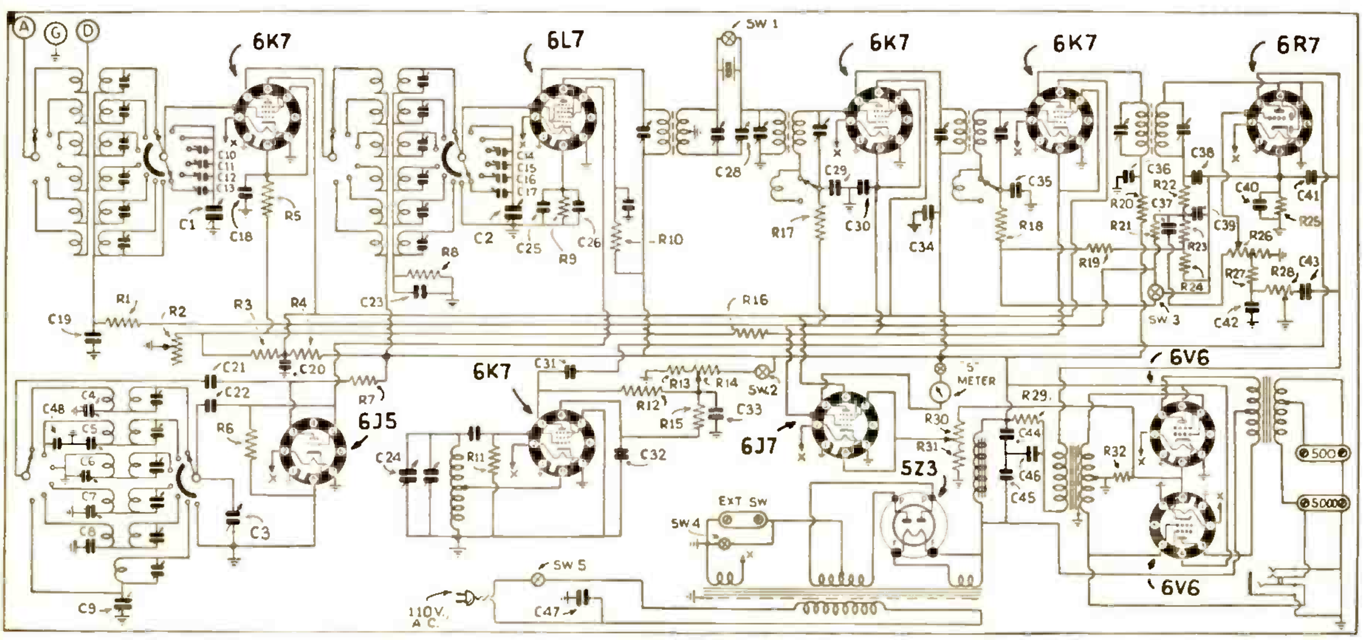
● MANY new and interesting features are combined in the *1938 Super Skyrider*, one of them is the unique construction of the tuning controls. These are equipped with heavy balance wheels which makes tuning far easier. By merely giving a twist to the knobs it will continue to rotate for quite some time. Further—the tuning controls are accurately calibrated. As can be seen from the photograph, the main dial is clearly marked with each band and calibrated in frequency. The *band-spread* control has a special combination of electro and mechanical features providing over 1,000 degrees of band-spread, which is quite ample for comfortable tuning.

This receiver incorporates a frequency range of 62,000 to 545 kc. Six bands covering everything of "air" interest—5 meters, 7 meters (2-way police), all "broadcast" frequencies, foreign short-wave, aircraft, relay broadcasting, etc. Band 1—frequency 545 kc. to 1,550 kc.; Band 2—1,550 kc. to 4.3 mc.; Band 3—4.2 mc. to 10.2 mc.; Band 4—9.8 mc. to 20.5 mc.; Band 5—19 mc. to 36 mc.; Band 6—35 mc. to 62 mc. A Band Pointer is used as a tuning aid, found only on the Super Skyrider. The average over-all sensitivity of the receiver is better than 1 microvolt.

Now for selectivity. There is a wide range of variable selectivity, from "single-signal" razor-edge sharpness to broad high-fidelity. New and improved iron core I.F. transformer circuits permit this "Wide Range Selectivity" control (7.5 kc. to 25.5 kc.). With crystal *in*, selectivity is better than one kc., giving a total ratio of variable selectivity of over 30 to 1.

Band Spread: The Super Skyrider not only satisfies the usual band-spread requirements but betters them. Band-spread is accomplished in a unique electro-mechanical manner, highly efficient electrically; simple and smooth mechanically. A special high frequency condenser with double rotors and single stator units, makes a *tuning-unit* with the band-spread section forming an integral part of the main condenser. This simple and sensible design feature, by eliminating extra wiring and parallel insulator losses in the tuned circuits, achieves worthwhile improvements, particularly at the higher frequencies. The added mechanical rigidity gained by such a system makes for steadier signals and smoother tuning ability. The new dynamic balanced tuning and the large controls represents a new and exclusive concept in band-spread technique. Over 1,000 degrees of band-spread calibration provide better than 5 kc. per division on the 20 meter band, and 25 kc. per complete turn of the knob.

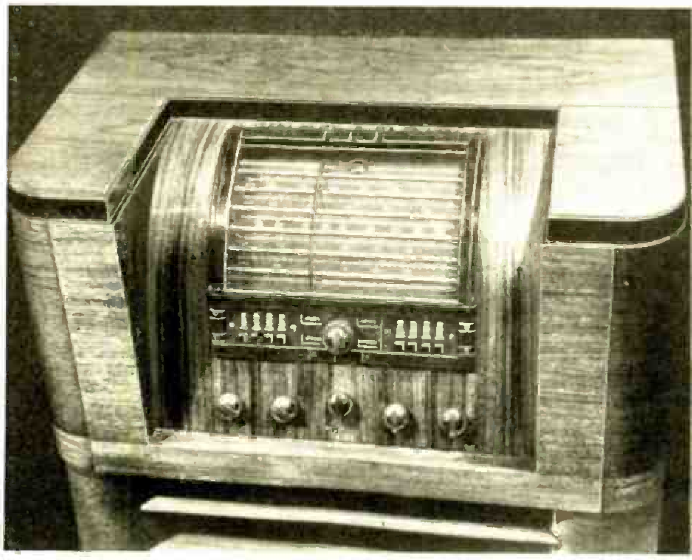
Other outstanding features—11 (*Continued on page* 268)

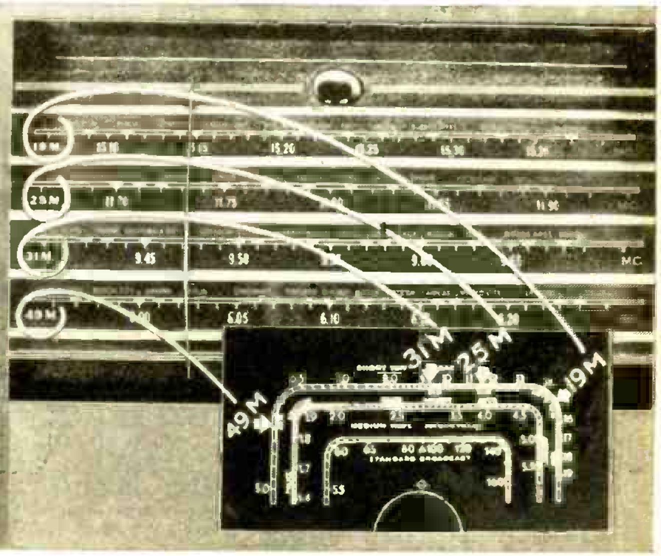


Circuit diagram of the 1938 Super Skyrider, with crystal filter.

Names and addresses of manufacturers of apparatus furnished upon receipt of postcard request; mention No. of article.

New "Overseas" Dial Makes S-W Tuning Easy





A remarkable new circuit development by RCA Victor engineers has made it possible to spread out the closely spaced foreign radio stations so that they occupy fifty times more space on the dial and actually make foreign tuning as easy as tuning domestic stations. Electric tuning is another important advance. Press a button and your station is automatically and precisely tuned in. Photo at right, above, shows comparison of new band-spread tuning on "Overseas" dial with the crowded S-W tuning on ordinary dial.

● PERHAPS the most spectacular feature in the new RCA Victor receivers is push-button electric tuning and armchair control. Simply push a button—and there's your station—it's as easy as that. There are eight of these buttons. Each of them can be pre-set to different radio stations and these stations precisely tuned in by merely pressing the button. It's so foolproof that a child or a careless servant cannot hurt the mechanism by tinkering with the push buttons or dials. A remarkable new engineering development called *automatic frequency control* is responsible for the new electric tuning feature. Reduced to its simplest terms, this means that in automatic operation the radio circuit will actually adjust itself to compensate for any variation in the mechanical system so that the station is precisely tuned to its most resonant point. Once adjusted to the stations you want you can always get them back, precisely tuned, every time thereafter by merely pressing the button.

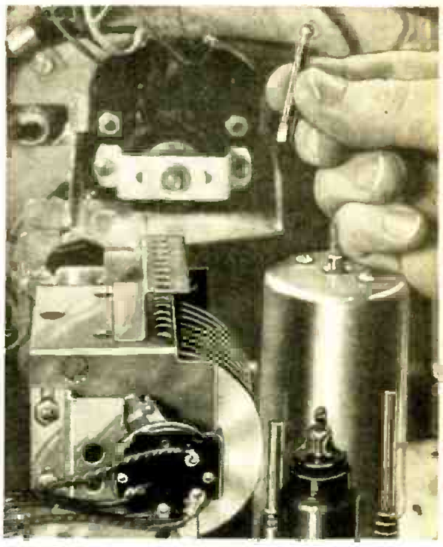
This same remarkable push-button system for electric tuning is available in the form of an inconspicuous control tablet which may be placed on the arm of an easy chair or an end-table and connected to the radio set in any part of the room by a flat cable that may be concealed under the carpet or along the wall baseboard.

The new *overseas* dial makes the tuning of short-wave stations actually as simple as tuning your favorite domestic program. The four most important short-wave bands have been spread out in a straight line across the front of the radio set. For instance, the popular 25-meter band, which formerly occupied a space on ordinary dials never more than ½ inch in length, has been spread out to 9½ inches, and the important foreign stations are marked by name on the dial. This means that you will be able to get the various foreign stations positively and easily every time you want them, without endless searching and delicate adjustment, or crowding from the many nearby foreign stations. The same arrangement holds true for the 49-, 31- and 19-meter bands.

Good clean-cut reception on both short-wave and local stations is assured in the new models by the use of special air trimmers and magnetite core transformers which are impervious to temperature and humidity changes and keep the radio circuits permanently aligned as they were intended, so that stations are always found in exactly the same place on the dial.

Another development, magic voice tone quality, which attracted a great deal of attention last year, has this year been brought to an ever higher state of perfection. The space immediately surround-

(*Continued on page 270*)



Above—rear view of tuning mechanism, showing one of the pins that is inserted in holed plate atop condenser to "set" device for a certain station.
No. 644

Fixed Mica Padding Condensers

● Adjustable mica padding condensers, replacing the usual fixed condensers with trimmer in parallel, are shown in photo. These units are intended for use in intermediate-frequency and radio-frequency circuits.

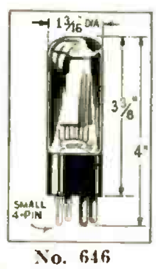
Each unit is held together by a central screw by means of which the capacity may be adjusted. Amateurs can readily vary the capacity over a wide range by adjusting the trimmer screw, thereby resonating circuits without addition of a trimmer condenser.

Dual units with one terminal as common, are available in plus or minus 10% tolerances, up to .01 mf. for the combination. Units are fabricated of finest grade mica and impregnated to repel moisture. Loss factor is reduced to negligible value, making the condenser highly efficient at all frequencies. Stray capacity is almost entirely eliminated, when using this single unit instead of the two condensers previously required, since capacity is now concentrated in a single unit. No. 645

This article has been prepared from data supplied by courtesy of Aerovox Corp.

New 1.5 Volt Tubes Work on Dry Cell

● TWO interesting new battery type tubes have just been announced by Raytheon. One is a *single triode*, while the other is a *twin triode*. Both of these tubes operate directly from a 1.5 volt dry cell. They should greatly facilitate the construction of portable apparatus because of their filament rating. The usual rheostat and two dry cells required for the ordinary tube employing a 2-volt filament can now be replaced with a single dry cell.



No. 646

Complete technical data on both tubes is given in the following table.

RK-42
Triode Amplifier (Filament Type)

Bulb—T-9 Base—Standard 4-Pin

DIMENSIONS
- Maximum Overall Length—4"
- Maximum Diameter—1 3/16"

BASING—R.M.A. Numbering
- Pin 1—Filament +
- Pin 2—Plate
- Pin 3—Grid
- Pin 4—Filament —

RATINGS
- Filament Voltage—1.5 volts
- Filament Current—0.06 amp.
- Maximum Plate Voltage—180 volts

DIRECT INTERELECTRODE CAPACITANCES
- Grid to Plate—6 uuf.
- Input—3 uuf.
- Output—2.1 uuf.

AMPLIFIER—CLASS A
- Plate Voltage—180 volts
- Grid Bias— —13.5 volts
- Amplification Factor—8.2
- Plate Resistance—10300 ohms
- Transconductance—800 umhos.
- Plate Current—3.9 ma.

(*Continued on page 256*)

Let's "Listen In" With

SV1KE—the Greek station sends a handsome QSL; light blue red letters.

Our Short Wave "DX" Editor

Winner of 30th "S-W Scout" Trophy

All Times E. S. T.

● DX for the past month (June) has been quite active and numbers of new catches have been heard by those DXers who haven't packed away the old DX rig in mothballs for the summer.

We have spent much time (and currency) in rigging up a new matched-impedance *doublet antenna* here and the results certainly atoned for the bruises, blisters, mosquito bumps, etc., suffered in erecting the antenna in this neck of the woods.

Stations in Europe and Asia, to which antenna is partial, being directional East and West, came in with "roaring" signals, and we await the quiet DX season this fall and winter with eagerness, confident in the belief this sky-wire will "drag 'em in" as never before, especially from the Orient.

Details on the doublet will be sent to all DXers who will send a stamped self-addressed envelope. And so to DX:

SIAM

HSE2, 19.016 mc., at Bangkok, has been heard late in June, twice in one morning, at 6:30 a.m., and again at 9:10 a.m., both times in communication with DFB, Nauen, Germany, on 17.52 mc. HSE2 had a stronger signal at the earlier time but was well heard at both times.

As our friend Sangiem Powtongsook, Asst. Engineer at HS8PJ has told us, Siamese radiophone stations are now equipped with apparatus for inverted speech modulation, and we noted that in our reception of HSE2, DFB was clearly heard to call "Hello, Bangkok," several times and to address Mr. Powtongsook in person, before both switched to inverted speech.

In an unusually long letter, Mr. Powtongsook, a young man of 27, operator of 3 Siamese amateur stations, and who has amassed all his radio knowledge from the study of books purchased from the U. S. A. and England, gives us some valuable data concerning the operation of the famous Siamese Xmtrs.

Here's the dope: HSE2, 19.016 mc., fones JVE, Tokio, 15.66 mc. anytime between 11 p.m. and 6 a.m., and HSE2 also fones DFB anytime between 3-5 a.m. and 8-9 p.m., when there is a commercial call.

HSP, on 17.74098 mc., or, in fact, 17.741 mc. (this differs from frequency given in HSP veri), will be used only where HSE2 is unavailable. Ordinarily, HSP will be heard on CW only.

During the period from August-November, 1936, HSG2, 15.53 mc., was used for radiophony. However, upon Mr. Powtongsook's suggestion, HSE2 was used and results using same power as HSG2 were much improved, so HSG2 was thereafter silent.

Regarding the recent rumor that Siam would no longer verify reports, it is clearly stated that all reports are welcomed, and will be answered as soon as possible, but owing to the lack of staff and time, some delay must be expected.

Thank you, Mr. Powtongsook, for a most informative and interesting letter, and please write again, often. OM!

FRENCH SOMALILAND

FZE8, 17.28 mc., located at DJIBOUTI, has confirmed our recent reception of their station while heard in contact with France; a *letter-veri* with the gorgeous stamps on cover for which the French Colonies are famous. Quite informally, the Chief Engineer comments on a photo sent with our report, adding that a pipe, shown in photo, must have helped overcome our discomfort in posing for the picture, hi!

The Chief also adds that FZE8 is generally to be heard in radio-phone communication with France on the first days of each month from 7:35-8:15 a.m. The veri took just 5 weeks to arrive, to and from DJIBOUTI! Unusually prompt!

FZE8 was again heard phoning France, this time at 9:05 a.m. Signal was an R7-8 here! QRA (address) in previous issue.

INDIA

VVS, 12.87 mc., Mingaladon, Burma, which is considered a separate country from India proper, was logged on several occasions during the past month, at 5:50 a.m. and again at 6 a.m. using inverted speech. A typical Asiatic "bumpy" signal here, with good strength. VVS generally phones VVN, 13.26 mc., at Fort Madras, India.

In a letter from Mr. Ashley at VWY, Poona, the QRA of VVS is given as: Station Engineer, Wireless Station VVS, Mingaladon, Burma, India, VVS, is located just to the HF side of CNR, so should not be too difficult to "log."

Jim Lanyon of Vancouver, B. C., relates hearing the Rangoon Gov't. station during April and May, and that the station shifted often, being on 6.08, 6.06, and lastly 6.005 mc. Tnx for the "bouquet," Jim, and glad to hear from you.

MADAGASCAR

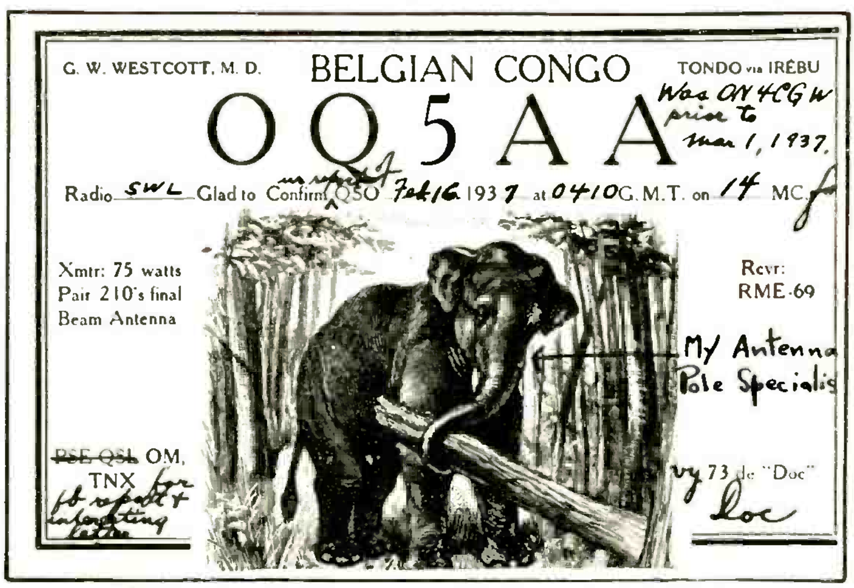
Radio Tananarive, 6.01 mc., at Tananarive, has at last replied to our report of last November, and, to our joy, verifies most specifically our report of November 29, when we heard them with such an unusual signal that we were somewhat doubtful that we were actually hearing Madagascar! Reception that morning was exceptionally good, especially from the direction of South Africa, as ZEB in Southern Rhodesia was also heard, though not well enough to get an acceptable report.

Radio Tananarive is lately reported to be using frequencies in the 25 and 31 meter bands, near 9.50 and 11.81 mc., besides their 6.01 mc. wave. Times reported are 12-12:30 a.m. and 9:45-10:30 a.m. We have not been informed as to which frequencies may be heard at these times, and doubt that all broadcast simultaneously.

QRA is: Le Directeur des P. T. Administration des P. T. T., Tananarive, Madagascar.

MOZAMBIQUE

CR7BH, 11.718 mc., Laurenco Marques has verified reports of Ashley Walcott, John DeMyer, Charles Miller and Irving Cohen. Card is green and black, in same design as CR7AA's QSL. The best time for reception here is between 9:30-11 a.m. Full schedule is: Weekdays 11:45 p.m.-12:30 a.m.; 9:30-11 a.m.; 12:45-3:45 p.m. On Sundays 5:30-7 a.m.; 10 a.m.-12:30 p.m.; 1:30-3:30 p.m. (*Continued on page* 236)



OQ5AA—From the Congo comes this fine card, all in black.

CORRECTED AND REVISED Monthly

World S-W Station List

Complete List of Broadcast and Telephone Stations

All the stations in this list use telephone transmission of some kind. Note: Station calls printed in bold face are broadcast stations; others are telephone stations.

Please write to us about any new stations or other important data that you learn through announcements over the air or correspondence with the stations.

↓ S.W. BROADCAST BAND ↓

Mc.	Call	
31.600	**W3XEY**	**BALTIMORE, MD.,** 9.494 m., Relays WFBR 4 pm-12m.
31.600	**W2XDV**	**NEW YORK CITY,** 9.491 m., Addr. Col. Broad. System, 485 Madison Ave. Daily 5-10 pm.; Sat. and Sun. 12.30-5, 6-9 pm.
31.600	**W4XCA**	**MEMPHIS, TENN.,** 9.494 m., Addr. Memphis Commercial Appeal. Relays WMC.
31.600	**W8XAI**	**ROCHESTER, N. Y.,** 9.494 m., Addr. Stromberg Carlson Co. Relays WHAM 7.30-12.05 am.
31.600	**W8XWJ**	**DETROIT, MICH.,** 9.494 m., Addr. Evening News Ass'n. Relays WWJ 6-12.30 am., Sun. 8 am-12 m.
31.600	**W9XPD**	**ST. LOUIS, MO.,** 9.494 m., Addr. Pulitzer Pub. Co. Relays KSD.
26.400	**W9XAZ**	**MILWAUKEE, WIS.,** 11.36 m., Addr. The Journal Co. Relays WTMJ from 1 pm.
26.100	**GSK**	**DAVENTRY, ENG.,** 11.49 m., Addr. B. B. C., London. Operates irregularly 5.45-8.55 am., 9.55 am.-12 n.
25.950	**W6XKG**	**LOS ANGELES, CAL.,** 11.56 m., Addr. B. S. McGlashan, Wash. Blvd. at Oak St. Relays KGFJ 24 hours daily.
21.550	**GST**	**DAVENTRY, ENG.,** 13.92 m., Addr. (See 26.100 mc.) Irregular at present.
21.540	**W8XK**	**PITTSBURGH, PA.,** 13.93 m., Addr. Grant Bldg. Relays KDKA 7-9 am.
21.530	**GSJ**	**DAVENTRY, ENG.,** 13.93 m., Addr. (See 26.100 mc.) 5.45-8.55 am., 9.15 am.-12n.
21.520	**W2XE**	**NEW YORK CITY,** 13.94 m., Addr. Col. Broad. Syst., 485 Madison Ave. Relays WABC 6.30-9 am.
21.470	**GSH**	**DAVENTRY, ENG.,** 13.97 m. (See 26.100 mc.), 5.45-8.55 am., 9.15 am.-12 n.

↑ S.W. BROADCAST BAND ↑

Mc.	Call	
21.420	WKK	**LAWRENCEVILLE, N. J.,** 14.01 m., Addr. Amer. Tel. & Tel. Co. Calls S. Amer. 7 am.-7 pm.
21.080	PSA	**RIO DE JANEIRO, BRAZ.,** 14.23 m. Calls WKK daytime.
21.060	WKA	**LAWRENCEVILLE, N. J.,** 14.25 m. Addr. (See 21.420 mc.) Calls England morning and afternoon.
21.020	LSN6	**BUENOS AIRES, ARG.,** 14.27 m., Addr Cia. Internacional de Radio. Works N. Y. C. 7 am.-7 pm.
20.860	EHY-EDM	**MADRID, SPAIN,** 14.38 m., Addr. Cia. Tel. Nacional de Espana. Works S. Amer. mornings.
20.700	LSY	**BUENOS AIRES, ARG.,** 14.49 m., Addr. Transradio Internatl. Tests irregularly
20.380	GAA	**RUGBY, ENG.,** 14.72 m. Calls Arg., Brazil mornings.
20.040	OPL	**LEOPOLDVILLE, BELGIAN CONGO,** 14.97 m. Works ORG mornings.
20.020	DHO	**NAUEN, GERMANY,** 14.99 m., Addr. Reichspostzenstralamt. Works S. Am. mornings.
19.900	LSG	**BUENOS AIRES, ARG.,** 15.08 m., Addr. (See 20.700 mc.) Tests irregularly.
19.820	WKN	**LAWRENCEVILLE, N. J.,** 15.14 m., Addr. A. T. & T. Co. Calls England daytime.
19.680	CEC	**SANTIAGO, CHILE,** 15.24 m., Addr. Cia. Internacional de Radio. Calls Col. and Arg. daytime.
19.650	LSN5	**BUENOS AIRES, ARG.,** 15.27 m., Addr. (See 21.020 mc.) Calls Europe daytime
19.620	VQG4	**NAIROBI, KENYA,** 15.28 m., Addr. Cable and Wireless, Ltd. Calls London 7.30-8 am.
19.600	LSF	**BUENOS AIRES, ARG.,** 15.31 m., Addr. (See 20.700 mc.) Tests irregularly.
19.480	GAD	**RUGBY, ENG.,** 15.4 m. Calls VQG4 7.30-8 am.
19.355	FTM	**ST. ASSISE, FRANCE,** 15.5 m. Calls S. America mornings.
19.345	PMA	**BANDOENG, JAVA,** 15.51 m. Works Holland 5.30-11 am.
19.260	PPU	**RIO DE JANEIRO, BRAZ.,** 15.58 m., Addr. Cia. Radiotel. Brasileira. Works France mornings.
19.220	WKF	**LAWRENCEVILLE, N. J.,** 15.6 m., Addr. A. T. & T. Co. Calls England daytime.
19.200	ORG	**RUYSSELEDE, BELGIUM,** 15.62 m. Calls OPL mornings.
19.160	GAP	**RUGBY, ENG.,** 15.66 m. Calls Australia 1-8 am.
19.020	HS8PJ	**BANGKOK, SIAM,** 15.77 m. Mondays 8-10 am.
18.970	GAQ	**RUGBY, ENG.,** 15.81 m. Calls S. Africa mornings.
18.890	ZSS	**KLIPHEUVEL, S. AFRICA,** 15.88 m., Addr. Overseas Comm. of S. Africa, Ltd. Calls GAQ 9-10 am.
18.830	PLE	**BANDOENG, JAVA,** 15.93 m. Calls Holland early am.
18.680	OCI	**LIMA, PERU,** 16.06 m. Tests with Bogota, Col.
18.620	GAU	**RUGBY, ENG.,** 16.11 m. Calls N. Y. daytime.
18.480	HBH	**GENEVA, SWITZERLAND,** 16.23 m., Addr. Radio Nations. Tests irregularly.
18.345	FZS	**SAIGON, INDO-CHINA,** 16.35 m. Works Paris early morning.
18.340	WLA	**LAWRENCEVILLE, N. J.,** 16.36 m., Addr. A. T. & T. Co. Calls England daytime.
18.310	GAS	**RUGBY, ENG.,** 16.38 m. Calls N. Y. daytime.
18.299	YVR	**MARACAY, VENEZ.,** 16.39 m. Works Germany mornings.
18.250	FTO	**ST. ASSISE, FRANCE,** 16.43 m. Works S. America daytime.
18.200	GAW	**RUGBY, ENG.,** 16.48 m. Works N. Y. C. daytime.
18.135	PMC	**BANDOENG, JAVA,** 16.54 m. Works Holland mornings.
18.115	LSY3	**BUENOS AIRES, ARG.,** 16.56 m., Addr. (See 20.700 mc.) Tests irregularly.
18.040	GAB	**RUGBY, ENG.,** 16.83 m. Works Canada morning and afternoon.
17.810	PCV	**KOOTWIJK, HOLLAND,** 16.84 m. Works Java 6-8 am.

↓ S.W. BROADCAST BAND ↓

Mc.	Call	
17.790	**GSG**	**DAVENTRY, ENG.,** 16.86 m., Addr. B. B. C., London. 12 m.-2.15 am., 5.45-8.55 am., 9 am.-12 n., 12.20-3.45, 4-6, 9-11 pm.
17.785	**JZL**	**TOKIO, JAPAN,** 16.87 m. Tests irregularly.
17.780	**W3XAL**	**BOUND BROOK, N. J.,** 16.87 m., Addr. Natl. Broad. Co. 8 am.-8 pm.
17.770	**PHI**	**HUIZEN, HOLLAND,** 16.88 m., Addr. (See PHI, 11.730 mc.) Daily except Wednesday, 8.25-10 am., Sat. till 10.40 am., Sun. 7.25-10.35 am.
17.760	**DJE**	**BERLIN, GERMANY,** 16.89 m., Addr. Broadcasting House. 12.05-5.15 am.; 5.55-11 am. Sun. 11.10 am.-12.25 pm.
17.760	**W2XE**	**NEW YORK, N. Y.,** 16.89 m., Addr. Col. Broad. System. 485 Madison Ave.
17.755	**ZBW5**	**HONGKONG, CHINA,** 16.9 m., Addr. P. O. Box 200. 4-10 am. irregular.

↑ S.W. BROADCAST BAND ↑

Mc.	Call	
17.741	HSP	**BANGKOK, SIAM,** 16.91 m. Works Germany 4-7 am.
17.650	XGM	**SHANGHAI, CHINA,** 17 m. Works London 7-9 am.
17.520	DFB	**NAUEN, GERMANY,** 17.12 m. Works S. America, near 9.15 am.
17.480	VWY2	**KIRKEE, INDIA,** 17.16 m. Works London 7.30-8.15 am.
17.120	WOO	**OCEAN GATE, N. J.,** 17.52 m., Addr. A. T. & T. Co. Works ships irregularly.
17.080	GBC	**RUGBY, ENG.,** 17.56 m. Works ships irregularly.
16.835	ITK	**MOGADISCIO, ITAL. SOMALILAND,** 18.32 m. Calls IAC around 9.30 am.
16.270	WLK	**LAWRENCEVILLE, N. J.,** 18.44 m., Addr. A. T. & T. Co. Works S. Amer. daytime.
16.270	WOG	**OCEAN GATE, N. J.,** 18.44 m., Addr. A. T. & T. Co. Works England Late afternoon.
16.240	KTO	**MANILA, P. I.,** 18.47 m., Addr. RCA Comm. Works Japan and U. S. 5-9 pm. irregularly.
16.233	FZR3	**SAIGON, INDO-CHINA,** 18.48 m. Calls Paris early morning.
16.030	KKP	**KAHUKU, HAWAII,** 18.71 m., Addr. RCA Comm. Works Dixon 3-10 pm.
15.880	FTK	**ST. ASSISE, FRANCE,** 18.9 m. Works Saigon 8-11 am.
15.865	CEC	**SANTIAGO, CHILE,** 18.91 m. Calls Peru daytime irregular.
15.810	LSL	**BUENOS AIRES, ARG.,** 18.98 m., Addr. (See 21.020 mc.) Works London mornings and Paris afternoons.
15.660	JVE	**NAZAKI, JAPAN,** 19.16 m. Works Java 3-5 am.
15.620	JVF	**NAZAKI, JAPAN,** 19.2 m. Works Cal. near 5 am. and 8 pm.
15.450	IUG	**ADDIS ABABA, ETHIOPIA,** 19.41 m. Works Rome 9.15-10.30 am.
15.440	**XEBM**	**MAZATLAN, SIN., MEX.,** 19.43 m., Addr. Flores 103 Alto. "El Pregonero del Pacifico." Irregularly 7 am.-10 pm.
15.415	KWO	**DIXON, CAL.,** 19.46 m., Addr. A. T. & T. Co. Works Hawaii 2-7 pm.
15.370	**HAS3**	**BUDAPEST, HUNGARY,** 19.52 m., Addr. Radiolabor, Gyali Ut 22. Sun 9-10 am.
15.360	**DZG**	**ZEESEN, GERMANY,** 19.53 m., Addr. Reichspostzenstralamt. Tests irregularly.
15.355	KWU	**DIXON, CALIF.,** 19.53 m., Addr. A. T. & T. Co. Phones Pacific Isles and Japan.

↓ S.W. BROADCAST BAND ↓

Mc.	Call	
15.340	**DJR**	**BERLIN, GERMANY,** 19.56 m., Addr. Br'dcast'g House, 8-9 am., 4.50-10.45 pm.
15.330	**W2XAD**	**SCHENECTADY, N. Y.,** 19.56 m., Addr. General Electric Co. Relays WGY 10 am. to 8 pm.
15.310	**GSP**	**DAVENTRY, ENG.,** 19.6 m., Addr. (See 26.100 mc.) 6.20-8.30 pm.
15.290	**LRU**	**BUENOS AIRES, ARG.,** 19.62 m., Addr. El Mundo. 7-9 am.
15.280	**HI3X**	**CIUDAD TRUJILLO, D. R.,** 19.63 m. Relays HIX Sun. 7.40-10.40 am. Week-days 12.10-1.10 pm.
15.280	**DJQ**	**BERLIN, GERMANY,** 19.63 m., Addr. Broadcasting House. 12.05-5.15, 6-8, 8.15-11 am., 4.50-10.45 pm.
15.270	**W2XE**	**NEW YORK CITY,** 19.65 m., Addr. (See 21.520 mc.) 2-5 pm.

(Continued on page 237)

(All Schedules Eastern Standard Time)

HS8PJ—This distinctive Siamese QSL verifiies both frequencies.

CR7AA and CR7BH have same QRA: Box 594, Lourenco Marques, Mozambique.

CEYLON

VPB, Colombo, has confirmed reception report of Ashley Walcott with a fine verification from the Chief Telecommunication Engineer, Broadcasting Office, Torrington Square, Colombo. Along with a letter veri was a copy of the *Ceylon Radio Times*, and also a few Ceylon postage stamps! We intend to write the engineer as soon as we hear VPB, hi!

Data on VPB: 6.16 mc. Schedule: 6:30-11:30 a.m., which must be daily.

CHINA

The Chinese commercials are quite active, as almost every morning we can "log" at least 2 X's near 6 a.m.

The following were heard the past month: XTB, 11.415 mc., Shanghai; XTV, 9.49 mc., Canton; XGW, 10.42 mc., Shanghai; XTS, 11.47 mc., Swatow; XTK, 9.08 mc., Hankow; XTR, 9.36 mc., Swatow, all near 6 a.m., before or after, and also XOJ, often heard evenings with JVE, JVF, or KWU, and near 5 a.m., with JVE.

All reports should be sent, with a reply coupon to: Mr. T. C. Loo, *Chinese Gov't. Radio Administration*, Sassoon House, Jinkee Road, Shanghai.

SWEDEN

SBG, operating on both 11.705 mc. and 6.095 mc. at Motala, and formerly SM5SX, has the following schedule: Weekdays—11.705 mc., 7-9 a.m., 11 a.m.-1:30 p.m. Sundays—3 a.m.-1:30 p.m. On 6.095 mc., weekdays and Sundays, 1:30-5 p.m.

This data received from SM5SV, OM John Lagercrantz, former builder and operator of SM5SX, the man responsible for the inauguration of international broadcasting in Sweden. John informs us that the Government has taken over SM5SX, and we can safely say that it was entirely due to John's efforts that Sweden today is heard throughout the world. The power of SBG is stated as 700 watts and due to be increased.

INDO-CHINA

From Mr. Paul C. Brown, Radio Engineer at Philco Radio, Saigon, comes a letter giving the latest schedule in effect. It is: Daily 11 p.m.-1 a.m.; 5:30-9:30 a.m. Frequency is 11.71 and 6.03 mc., operating simultaneously and each is powered at 250 watts. Power to be increased soon.

Mr. Brown adds that the station is now called "Boy-Landry, Saigon," in announcements. Ashley Walcott adds that of late the lower frequency has been changed from 5.985 mc., to 5.91 mc., and that frequency stability of both frequencies is poor. This station, with a power increase, should be well heard this Fall and Winter.

ASIATIC REVIEW

"Erlanger and Gallinger, Inc., Manila, Philippines," heard testing a Xmtr on 11.84 mc., 9 p.m.-9 a.m., E.S.T., first heard on June 10 by Ashley Walcott, San Francisco. Ashley adds that station becomes audible in California at 1:30 a.m., and that station relays KZEG, Manila, until 5:30 or 6 a.m., and KZRM from then until "shutdown." No call letters as yet issued.

TDE, 10.065 mc., Shinkyo, Manchukuo, heard "QSOing" JVO, 10.37 mc., Nazaki, Japan, at 3:35 a.m. These two may be heard daily anywhere between 3-6 a.m., generally.

JIB, 10.53 mc., Taiwan, Formosa, heard using inverted speech at 5:50 a.m. JIB is verified through the regular Tokio address. JVK, 12.02 mc., Nazaki, heard phoning at 6 a.m.

PK6CI, was heard from 6:30-7:30 a.m., while on 20 meter band, in an unusual contact with PNI, 8.775 mc., at Makassar, Celebes Island, Java. This was arranged as an emergency telephone circuit; this from our friend Ashley Walcott.

DX REVIEW

VK6ME, 9.59 mc., Perth, Western Australia, has verified to Jim Lanyon and Ashley Walcott, giving power as 5 kw., and schedule daily except Sunday from 6-8 a.m.

VK8SC, 6.96 mc., Port Hedland Western Australia, was heard from 8:30-8:40 a.m. calling listeners in Melbourne and asking that they get in touch with the Postmaster. Sounds like an emergency. This is by courtesy of Ashley Walcott.

ZGB, 13.643 mc., Kuala Lumpur, Federated Malay States, heard irreg. from 7:45-8:15 a.m. phoning PLQ, 10.68 mc., Bandoeng, using inverted speech.

PJCI, 5.93 mc., Willemstad, Curacao, Netherland West Indies, has QSL'd reports of our friends Ed Goss and John DeMeyer, stating schedule to be Monday to Saturday inclusive, 7-9 p.m.

QRA or PJCI is: "Curom," KORTE GOLF ZENDER, PJCI, Willemstad, Curacao, N. W. I.

Re VAC standings this month, we have not heard from all members as to revisions of their standings, so will give full list next month. New members standings are: Clarence Hartzell, 5 VAC, 58 countries; Roger Legge, Jr.; an OT, rates 16 VAC, 78 countries; Albert Emerson, 10 VAC, 64 countries; W. S. Wade, 5 VAC; Ashley Walcott, 11 VAC.

HAM STARDUST

"SU1SG, on approximately 14000 kc., Alexandria, Egypt," as announced during our Special Broadcast was heard here with a terrific signal, far above expectations, and we feel sure all IDA and SW&T readers throughout the U.S.A. had an easy time of it in "logging" this FB catch. All DXers who write Mr. Pettitt should thank him for his kindness and trouble. We were certainly lucky in just making the "deadline" with this flash scoop, and were doubly glad that SW&T readers would know in time about this fine Special. We surely hope all of you heard it, as SU1SG sends one of the best ham QSL's ever received here!

OQ5AA, Tondo, Belgian Congo, has confirmed reception here, with an interesting QSL, and it seems that all of our friends have also heard from "Doc," as the missionary, Dr. George W. Westcott, M.D., terms himself. The card is shown in this month's article. OQ5AA is often heard near 14050 in the afternoons, with an unusually strong signal between 3:30 and 5:30 p.m., and, as we suspected, "Doc" uses a beam antennae.

EA9AH, 14004, Tetuan, Spanish Morocco, seems to be on daily, and may be heard anywhere between 3 p.m. and midnight, "pouring in" a powerful signal; usually QSOing Central and South American amateurs.

EA8AE, 14060, Canary Islands, also heard FB, QSOing in Spanish, usually announcing as "*Aqui ocho ah ay, Canarias*" same times as EA9AH.

CN8AM, "America, Morocco," 14100, at Casablanca, French Morocco, with a FB signal at 5:30 p.m.

CN8AJ, "America Japan," 14120, same QRA as above, also FB, weekends, near 4:30-5:30 p.m.

SU1CH, 14320, at Cairo, heard lately at 5:25 p.m. an R9 signal.

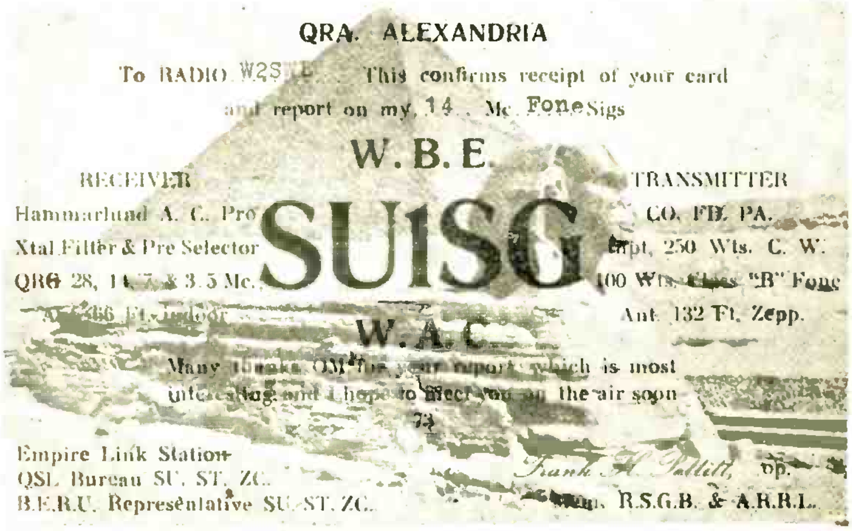
ZS5AB, 14060, South Africa, "logged" by Irving Goodeve, QSOing a W1 at 7:10 a.m. This is an unusual time for such DX. Congrats, Irv.! !

Other Africans reported are FT4AA, 14380, R8 at 1 a.m., by Charles Miller and Clarence Hartzell, FT4AN, same "ham" as above, heard at 12:30 a.m. by Murray Buitekant, our Brighton Beach DX Eagle.

Also reported are FA8GT, 14340; CN8MU, 14130; these in afternoons.

ZE1JF, 14070, Southern Rhodesia, heard at 9:30 a.m.; ZU6N, 14265, lately using

(*Continued on page* 262)



SU1SG—Red letters, green background make a handsome QSL.

Mc.	Call	
15.260	GSI	**DAVENTRY, ENG.,** 19.66 m., Addr. (See 26.100 mc.) 12.20-3.45, 9-11 pm.
15.252	RIM	**TACHKENT, U.S.S.R.,** 19.67 m. Works RKI near 7 am.
15.250	W1XAL	**BOSTON, MASS.,** 19.67 m., Addr. University Club. Sundays 11 am-12.30 pm. Daily 3.30-4 pm.
15.245	TPA2	**PARIS, FRANCE,** 19.68 m., Addr. 98 bis. Blvd. Haussmann. "Radio Colonial." 5-10 am.
15.230	HS8PJ	**BANGKOK, SIAM,** 19.32 m. Irregularly Mon. 8-10 am.
15.230	OLR5A	**PRAGUE, CZECHOSLOVAKIA.** Mon. and Thurs.. 9-10 pm.
15.220	PCJ	**HUIZEN, HOLLAND,** 19.71 m., Addr. N. V. Philips' Radio, Hilversum. Tues. 4.30-6 am., Wed. 8-11 am.
15.210	W8XK	**PITTSBURGH, PA.,** 19.72 m., Addr. (See 21.540 mc.) 9 am.-7 pm.
15.200	DJB	**BERLIN, GERMANY,** 19.74 m., Addr. (See 15.280 mc.) 12.05-5.15 am., 5.55-11 am., 4.50-11 pm. Also Sun. 11.10 am. to 12.25 pm.
15.190	ZBW4	**HONGKONG, CHINA,** 19.75 m., Addr. P. O. Box 200. 11.30 pm. to 1.15 am.. 4-10 am. Sat. 9.15 pm.-1 am. Sun. 3-9.30 am.
15.180	GSO	**DAVENTRY, ENG.,** 19.76 m., Addr. (See 26.100 mc.) 12m.-2.15 am., 4-6, 6.20-8.30 pm.
15.180	RW96	**MOSCOW, U.S.S.R.,** 19.76 m., Sun 2-3 pm.
15.165	XEWW	**MEXICO CITY, MEXICO,** 19.78 m. Irregular 9 am.-6 pm.
15.160	JZK	**TOKIO, JAPAN,** 19.79 m., 3-4 pm., 4.30-5.30 pm., 12.30-1.30 am.
15.150	YDC	**BANDOENG, JAVA,** 19.8 m., Addr. N. I. R. O. M. 6-7.30 pm. 10.30 pm.-2 am., Sat. 7.30 pm.-2 am., 5.30-10.30 am.
15.140	GSF	**DAVENTRY, ENG.,** 19.82 m., Addr. (See 26.100 mc.) 4-6, 6.20-8.30pm.
15.120	HVJ	**VATICAN CITY,** 19.83 m., 10.30-10.45 am., except Sun., Sat. 10-10.45 am.
15.110	DJL	**BERLIN, GERMANY,** 19.85 m., Addr. (See 15.280 mc.) 12 m-2, 8-9 am.. 11.35 am. to 4.30 pm. Sun. also 6-8 am.

↑ S.W. BROADCAST BAND ↑

Mc.	Call	
15.090	RKI	**MOSCOW, U.S.S.R.,** 19.88 m. Works Tashkent near 7 am. Broadcasts 7-9.15 pm. daily. Relays RAN.
15.055	WNC	**HIALEAH, FLORIDA,** 19.92 m., Addr. A. T. & T. Co. Calls Central America daytime.
14.980	KAY	**MANILA, P. I.,** 20.03 m., Addr. RCA Comm. Works Pacific Islands.
14.970	LZA	**SOPHIA, BULGARIA,** 20.04 m., Addr, Radio Garata. Sun. 12.30-8 am., 10 am. to 4.30 pm. Daily 5-6.30 am.. 12 n.-2.45 pm.
14.960	PSF	**RIO DE JANEIRO, BRAZIL,** 20.43 m., Works with Buenos Aires daytime.
14.950	HJB	**BOGOTA, COL.,** 20.07 m. Calls WNC daytime.
14.940	HII	**CIUDAD, TRUJILLO, D. R.,** 20.08 m., Phones WNC daytime.
14.940	HJA3	**BARRANQUILLA, COL.,** 20.08 m. Works WNC daytime.
14.845	OCJ2	**LIMA, PERU,** 20.21 m. Works South American stations daytime.
14.790	ROU	**OMSK, SIBERIA, U.S.S.R.,** 20.28 m. Works Moscow irregularly 7-9 am.
14.730	IQA	**ROME, ITALY,** 20.37 m. Tests irregularly.
14.653	GBL	**RUGBY, ENG.,** 20.47 m. Works JVH 1-7 am.
14.640	TYF	**PARIS, FRANCE,** 20.49 m. Works Saigon and Cairo 3-7 am, 12 m.-2.30 pm.
14.600	JVH	**NAZAKI, JAPAN,** 20.55 m. Broadcasts irregularly 5-11.30 pm. Works Europe 4-8 am.
14.590	WMN	**LAWRENCEVILLE, N. J.,** 20.56 m., Addr. A. T. & T. Co. Works England morning and afternoon.
14.535	HBJ	**GENEVA, SWITZERLAND,** 20.64 m., Addr. Radio Nations. Broadcasts Sat. 5.30-6.15 pm., 7-8.30 pm.
14.530	LSN	**BUENOS AIRES, ARG.,** 20.65 m., Addr. (See 20.020 mc.) Works N. Y. C. afternoons.

Mc.	Call	
14.500	——	**ASMARA, ERITREA, AFRICA,** 20.69 m. Works Rome and Addis Ababa 6.30-7.30 am.
15.500	LSM2	**BUENOS AIRES, ARG.,** 20.69 m., Addr. (See 21.020 mc.) Works RIO and Europe daytime.
14.485	TIR	**CARTAGO, COSTA RICA,** 20.71 m. Works Central America and U. S.A. daytime.
14.485	YSL	**SAN SALVADOR, SALVADOR,** 20.71 m. Irregular.
14.485	HPF	**PANAMA CITY, PANAMA,** 20.71 m. Works WNC daytime.
14.485	TGF	**GUATEMALA CITY, GUATEMALA,** 20.71 m. Works WNC daytime.
14.485	YNA	**NICARAGUA, MANAGUA,** 20.71 m. Works WNC daytime.
14.485	HRL5	**NACAOME, HONDURAS,** 20.71 m. Works WNC daytime.
14.485	HRF	**TEGUCIGALPA, HONDURAS,** 20.71 m. Works WNC daytime.
14.470	WMF	**LAWRENCEVILLE, N. J.,** 20.73 m., Addr. A. T. & T. Co. Works England daytime.
14.460	DZH	**ZEESEN, GERMANY,** 20.75 m., Addr. (See 15.360 mc.) Irregular.
14.440	GBW	**RUGBY, ENG.,** 20.78 m. Works U. S. A. afternoons.
14.200	EA9AH	**TETUAN, SPANISH MOROCCO,** 21.13 m. Daily except Sun. 2.15-5,7 and 9 pm.
13.990	GBA	**RUGBY, ENG.,** 21.44 m., Works Buenos Aires late afternoon.
13.820	SUZ	**ABOU ZABAL, EGYPT,** 21.71 m. Works with Europe 11 am. to 2 pm.
13.690	KKZ	**BOLINAS, CALIF.,** 21.91 m., Addr. RCA Communications. Irregular.
13.635	SPW	**WARSAW, POLAND,** 22 m., Mon., Wed. Fri., 12.30-1.30 pm.
13.585	GBB	**RUGBY, ENG.,** 22.08 m. Works Egypt and Canada afternoon.
13.415	GCJ	**RUGBY, ENG.,** 22.36 m. Works Japan and China early morning.
13.410	YSJ	**SAN SALVADOR, SALVADOR,** 22.37 m. Works WNC daytime.
13.390	WMA	**LAWRENCEVILLE, N. J.,** 22.4 m., Addr. A. T. & T. Co. Works England morning and afternoon.
13.380	IDU	**ASMARA, ERITREA, AFRICA,** 22.42 m. Works Rome daytime.
13.345	YVQ	**MARACAY, VENEZUELA,** 22.48 m. Works WNC daytime.
13.285	CGA3	**DRUMMONDVILLE, QUE., CAN.,** 22.58 m. Works London and ships afternoons.
13.330	IRJ	**ROME, ITALY,** 22.69 m. Works Tokio 5-9 am. irregularly.
13.075	VPD	**SUVA, FIJI ISLANDS,** 22.94 m. Irregularly.
12.840	WOO	**OCEAN GATE, N. J.,** 23.36 m., Addr. A. T. & T. Co. Works with ships irregularly.
12.825	CNR	**RABAT, MOROCCO,** 23.39 m., Addr. Director General Tele. & Teleg. Stations. Works with Paris irregularly.
12.800	IAC	**PISA, ITALY,** 23.45 m. Works Italian ships mornings.
12.780	GBC	**RUGBY, ENG.,** 23.47. Works ships irregularly.
12.485	HIN	**CIUDAD TRUJILLO, D. R.,** 24 m. "Broadcasting National." 12 n.-2 pm. 6-11 pm. approx.
12.325	DAF	**NORDDEICH, GERMANY,** 24.34 m. Works German ships daytime.
12.300	CB615	**SANTIAGO, CHILE,** 24.39 m., Addr. Louis Desmaras, Casilla, 761. 11 am.-1 pm., 4-8 pm., Sun. 4-10 pm.
12.290	GBU	**RUGBY, ENG.,** 24.41 m. Works N. Y. C. evenings.
12.250	TYB	**PARIS, FRANCE,** 24.49 m. Irregular.
12.235	TFJ	**REYKJAVIK, ICELAND,** 24.52 m. Works Europe mornings. Broadcasts Sun. 1.40-2.30 pm.
12.215	TYA	**PARIS, FRANCE,** 24.56 m. Works French ships in morning and afternoon.
12.150	GBS	**RUGBY, ENG.,** 24.69 m. Works N. Y. C. evenings.
12.130	DZE	**ZEESEN, GERMANY,** 24.73 m., Addr. (See 15.360 mc.) Tests irregular.

Mc.	Call	
12.120	TPZ2	**ALGIERS, ALGERIA,** 24.75 m. Calls Paris 12 m.-6.30 am.
12.060	PDV	**KOOTWIJK, HOLLAND,** 24.88 m. Tests irregularly.
12.000	RNE	**MOSCOW, U.S.S.R.,** 25 m. Daily 3-6 pm., Sat., Sun., Tues., Thurs., 10.15-10.45 pm., also Sun. 6-11 am., Mon 6-7 am. and 8.30-9 pm. Wed. 6-7 am., Thurs. 8.30-9 pm.
11.991	FZS2	**SAIGON, INDO-CHINA,** 25.02 m. Phones Paris mornings.
11.960	HI2X	**CIUDAD TRUJILLO, D. R.,** 25. 08 m., Addr. La Voz de Hispaniola. Relays HIX Tue. and Fri. 8.10-10.10 pm.
11.955	IUC	**ADDIS ABABA, ETHIOPIA,** 25.09 m. Works IAC around 12 midnight.
11.950	KKQ	**BOLINAS, CALIF.,** 25.1 m. Tests irregularly evenings.
11.940	FTA	**STE. ASSISE, FRANCE,** 25.13 m. Works Morocco mornings and Argentina late afternoon.

↓ S.W. BROADCAST BAND ↓

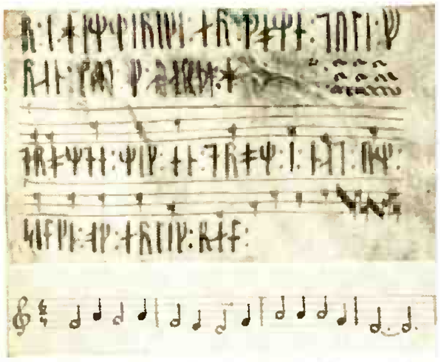
Mc.	Call	
11.900	XEWI	**MEXICO CITY, MEXICO,** 25.21 m. Monday, Wed. and Fri. 3-4 pm., 9 pm.. 12 m. Tues. to Thurs. 7.30 pm.-12 m. Sat. 9 pm. to 12 m. Sunday 12.30-2 pm.
11.895	HP5I	**AGUADULCE, PANAMA,** 25.22 m., Addr. La Voz del Interior. 7.30-9.30 pm.
11.880	TPA3	**PARIS, FRANCE,** 25.23 m., Addr. (See 15.245 mc.) 1-4 am., 11.15 am.-5 pm.
11.870	W8XK	**PITTSBURGH, PA.,** 25.26 m., Addr. (See 21.540 mc.) 7-10.30 pm.
11.860	YDB	**SOERABAJA, JAVA,** 25.29 m., Addr. N. I. R. O. M. Sat. 7.30 pm. to 2.30 am., daily 10.30 pm. to 2 am.
11.860	GSE	**DAVENTRY, ENG.,** 25.29 m., Addr. (See 26.100 mc.) Irregular.
11.855	DJP	**BERLIN, GERMANY,** 25.31 m., Addr. (See 15.280 mc.) Irregular 11.35 am. to 4 pm.
11.840	CSW	**LISBON, PORT.,** 25.35 m. Nat'l Broad. Stat. 11.30 am.-1.30 pm.
11.840	OLR4A	**PRAGUE, CZECHOSLOVAKIA,** 25.35 m. Addr. Czech Shortwave Sta., Praha XII, Fochova 16. Daily 2-4.30 pm., Mon. and Thurs., 7-9 pm.
11.830	W9XAA	**CHICAGO, ILL.,** 25.36m., Addr. Chicago Federation of Labor. Irregular.
11.830	W2XE	**NEW YORK CITY,** 25.36 m., Addr. Col. Broad. System. 485 Madison Av., N.Y.C., relays WABC 6-11 pm.
11.820	XEBR	**HERMOSILLA, SON., MEX.,** 25.38 m., Addr. Box 68. Relays XEBH. 2-4 pm., 9 pm.-12m.
11.820	GSN	**DAVENTRY, ENG.,** 25.38 m., Addr. (See 26.100 mc.). Irregular.
11.810	2RO	**ROME, ITALY,** 25.4 m., Addr. E.I.R.R., Via Montello 5. Daily 6.43-10.30 am, 11.30 am.-5.30 pm., 6-7.45 pm. Sun. 6.43-9 am., 11.30 am.-5.30 pm.
11.800	JZJ	**TOKIO, JAPAN,** 25.42 m., Addr. Broadcasting Co. of Japan, Overseas Division. 9-10 am.3-4, 4.30-5.30 pm.
11.800	OER2	**VIENNA, AUSTRIA,** 25.42 m. Daily 10 am.-5 pm. Sat. until 5.30 pm.
11.795	DJO	**BERLIN, GERMANY,** 25.43 m., Addr. (See 15.280 mc.). Irregular.
11.795	OAX5B	**ICA, PERU,** 25.43 m., Addr. Radio Universal. 11 am.-12 n, 4-11.15 pm.
11.790	COGF	**MATANZAS, CUBA,** 25.45 m., Addr. P. O. Box 51. Relays CMGF.
11.790	W1XAL	**BOSTON, MASS.,** 25.45 m., Addr. (See 15.250 mc.) Daily 3.30-5.45 pm. Irregular at other times.
11.770	DJD	**BERLIN, GERMANY,** 25.49 m., Addr. (See 15.280 mc.) 11.35 am.-4.30 pm., 4.50-11 pm.
11.760	OLR4B	**PRAGUE, CZECHOSLOVAKIA,** 25.51 m., Addr. (See 11.875 mc.) Irregular.
11.750	GSD	**DAVENTRY, ENG.,** 25.53 m., Addr. B. B. C., London. 12 m.-2.15 am., 12.20-3.45 pm., 6.20-8.30, 9-11 pm.
11.730	——	**SAIGON, INDO CHINA,** 25.57 m., Addr. Radio Philco. Irregular 5.30-9.30 am.
11.730	PHI	**HUIZEN, HOLLAND,** 25.57 m., Addr. N. Y. Philips' Radio. Irregular.

(Continued on page 239)

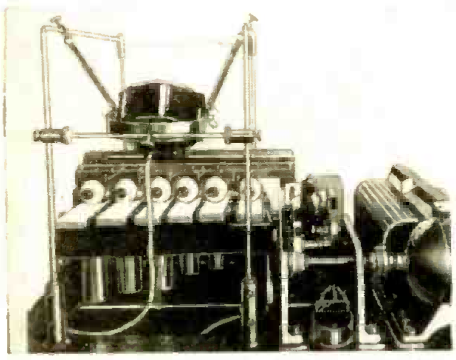
(All Schedules Eastern Standard Time)

How To Identify S-W Stations

Many S-W broadcast stations in various parts of the world have unique identification signals and a number of these are given in the accompanying article. Other identification signals were given in the past two issues of this magazine. Be sure to keep these lists of interval signals, as they will prove very useful to every short-wave listener.



The interesting chart at the top of the cut above shows an ancient musical script dating from the thirteenth century, and it forms the prototype of the musical interval signal used at the Skamleboaek (Denmark) station. The musical notes forming the modern interval signal are also given.



Above—the mechanical device used to produce the musical "identification signal" employed by the Skamleboaek station. It consists of six small hammers which are caused to strike six notes on steel bars in the proper order.

World-Wide Identification List
Part Three

Freq. Station
Mc. Call Type—Location—Service

11.90 XEWI B—Mexico City, Mexico. Announcements in Spanish and English. Slogan: "*My Voice to the World from Mexico.*" Gong struck twice after announcements. Selection opening and closing broadcasts: "*May Angels Guard Thee.*"

11.90 OLR4D B—Prague, Czechoslovakia. See OLR6A, 21.45 mc. Irregular.

11.895 HP5I B—Aguadulce Panama. Slogan: "*La Voz Del Interior.*" Sign-off selection: "*El Tambor de La Alegria.*" Interval signal: 3 notes on gongs; 3 times on half hour and hour.

11.885 TPA3 B—Pontoise. France. Calls "*Allo, Allo, Ici Paree. Station D'etat Radio Coloniale.*" Anthem "*La Marseillaise*" opens and ends broadcasts. Intervals: 3 notes in C.W. News in 6 languages, including English.

11.875 OLR4C B—Prague, Czechoslovakia. See OLR6A, 21.45 mc. Irregular.

11.84 OLR4A B—Prague, Czechoslovakia. See OLR6A, 21.45 mc. Regular.

11.84 No Call. B—Manila, Philippines. Testing new XMTR, relaying station "*KZEG, The Sunshine Station of Manila.*" Later "*KZRM, Radio Manila.*" Both on BCB.

11.826 XEBR B—Hermosillo, Mexico. Slogan: "*El Heraldo de Sonora.*" Uses dual call "*XEBH y XEBR.*"

11.81 2R04 B—Rome, Italy. Call: "*Ente Italiano audizioni Radiofonice EIAR.*" Interval signal: Electrical Bird Call. Opening selection: "*Bells of Rome.*" Woman announcer. Often says "*Radio Roma Napoli.*" Closes with Puccini's "*Hymn to Rome,*" *Royal March,*" and "*Giovinezza,*" the latter being the Fascist anthem.

11.81 FIQA B—Tananarive, Madagascar. Approx. freq. Call: "*Radio Tananarive.*" Opens with "*Ramona.*" Closes with "*Marseillaise.*"

11.80 JZJ B—Nazaki, Japan. See JZI, 9.535 mc.

11.796 OAX5A B—Ica, Peru. Slogan: "*Radio Universal. La Voz de Ica.*"

11.79 COGF B—Matanzas, Cuba. Slogan: "*La Voz de la Provincia.*" Uses dual calls CMGF and COGF. Gives call in English as: "*COG—as in Georgia, F as in Florida.*"

11.778 OER2 B—Vienna, Austria. "*Hier Radio Wien.*" Uses metronone signal, 60 beats per minute.

11.76 OLR4B B—Prague, Czechoslovakia. See OLR6A, 21.45 mc. Irregular.

11.74 HP5L B—David, Panama. Slogan: "*La Ondas del Baru.*"

11.72 TPA4 B—Pontoise. France. See TPA3, 11.885 mc.

11.718 CR7BH B—Lourenco, Marques. Mozambique. All announcements in English and Portuguese. Identification in English at beginning, middle and end of xmission, as follows: "*This is Lourenco Marques, CR7AA, calling on 6137 kc., 48.88 meters, and CR7BH, testing on 25.60 meters, 11718 kc.*" Man announcer weekdays, woman announces in English on Sunday programs. Signs on with various march selections. No set sign-off.

11.71 No Call. B—Saigon. Indo-China. Known as "*Philco Radio,*" but lately announced as "*Boy-Landry.*" Xmits Chinese, Anamite and European music. Announcements in French by woman as "*Ici Station Boy-Landry, Rue Catinat, Saigon.*" P. C. Brown, Philco engineer, gives English announcements often. Preceding announcements, made near the half hour, 2 or 3 dozen chimes rung in varying sequence.

11.49 COCX B—Havana. Cuba. "*La Casa Lavin, La Voz de Radio Philco.*" Uses Dual Call "*CMX y COCX.*" Opens, closes with native song. 5 bells preceding announcement every quarter hour. English announcements every half hour.

11.47 XTS C—Swatow, China. Phones other Chinese cities mornings. Inv. sp. always used.

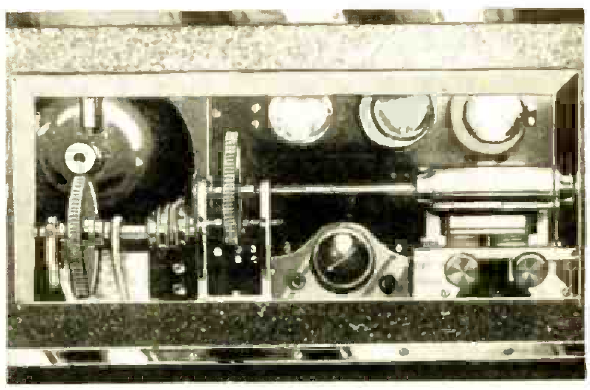
11.415 XTB C—Shanghai, China. See XTS. 11.47 mc.

11.402 HBO B and C—Geneva, Switzerland. Phones early a.m. to Australia and sends special BCs also to Australia. For ordinary BCs see HBP, 7.797 mc.

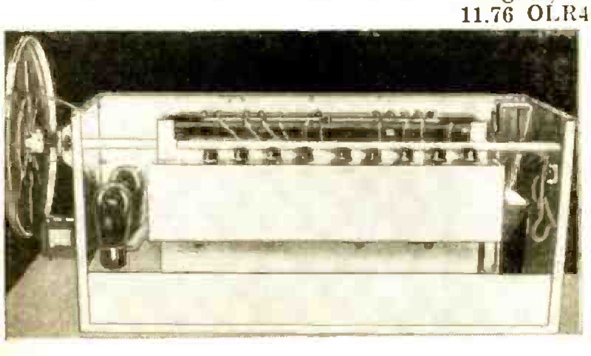
11.05 ZLT4 C—Wellington, New Zealand. Identifies at beginning only. Inv. sp. always used. Phones Australia.

11.04 CSW B—Lisbon, Portugal. Slogan: "*Emisora Nacional.*"

11.00 PLP B—Bandoeng, Java. See YDC, 15.15 mc.



Here is the apparatus used for producing the musical "identification signal" used by the station at Budapest, Hungary. It employs a revolving toothed drum and an amplifier. →



A special electro-magnetic device is employed to produce the musical "interval signal" broadcast periodically by the Belgrade (Yugoslavia) station.

Mc.	Call	
11.720	CJRX	**WINNIPEG, CANADA,** 25.6 m., Addr. James Richardson & Sons, Ltd. 4-10pm.
11.718	CR7RH	**LAURENCO MARQUES, PORTUGESE, E. AFRICA,** 25.6 m. Daily 4.30-6.30. 9.30-11 am., 12.30-3.30 p.m. Sun. 6-8 am., 10 am.-12.30 pm., 1.30-3.20 pm.
11.715	TPA4	**PARIS, FRANCE,** 25.61 m., (See 15.245 mc.) 5.15-7.15 pm., 9 pm.-12 m.
11.710	SBG	**MOTALA, SWEDEN,** 25.63 m., 9 am.-1.30 pm.

↑ S.W. BROADCAST BAND ↑

Mc.	Call	
11.680	KIO	**KAHUKU, HAWAII,** 25.68 m., Addr. RCA Communications. Irregularly.
11.600	COCX	**HAVANA, CUBA,** 25.86 m. 8 am.-1 am. Relays CMX.
11.595	VRR4	**STONY HILL, JAMAICA, B. W. I.,** 25.87 m. Works WNC daytime.
11.560	VIZ3	**FISKVILLE, AUSTRALIA,** 25.95 m., Addr. Amalgamated Wireless of Australasia Ltd. Tests irregularly.
11.500	XAM	**MERIDA, YUCATAN,** 26.09 m. Irregular 1-7.30 pm.
11.500	PMK	**BANDOENG, JAVA,** 26.09 m. Tests irregularly.
11.413	CJA4	**DRUMMONDVILLE, QUE., CAN.,** 26.28 m. Tests irregularly.
11.405	HBO	**GENEVA, SWITZERLAND,** 26.30 m., Addr. Radio Nations. Sat. 5.30-6.15, 7-8.30 pm.
11.280	HIN	**CIUDAD TRUJILLO, D. R.,** 26 m. Addr. La Voz del Partido Dominicano. Irregular.
11.050	ZLT4	**WELLINGTON, NEW ZEALAND,** 27.15 m. Works Australia and England early morning.
11.040	CSW	**LISBON, PORTUGAL,** 27.17 m., Addr. Nat. Broadcasting Sta. 1.30-5 pm.
11.000	PLP	**BANDOENG, JAVA,** 27.27 m. Relays YDB. 5.30-10.30 or 11 am. Sat. until 11.30 am.
10.970	OCI	**LIMA, PERU,** 27.35 m. Works Bogota, Col. evenings.
10.840	KWV	**DIXON, CALIF.,** 27.68 m., Addr. A. T. & T. Co. Works with Hawaii evenings.
10.770	GBP	**RUGBY, ENGLAND,** 27.85 m. Works Australia early morning.
10.740	JVM	**NAZAKI, JAPAN,** 27.93 m. Works U.S.A. 2-7 am. Broadcasts daily 9-10 am., 2.30-3.30 pm.
10.675	WNB	**LAWRENCEVILLE, N. J.,** 28.1 m., Addr. A. T. & T. Co. Works with Bermuda irregularly.
10.670	CEC	**SANTIAGO, CHILE,** 28.12 m. Daily 7-7.15 pm.
10.660	JVN	**NAZAKI, JAPAN,** 28.14 m. Broadcasts daily 2-8 am. Works Europe irregularly at other times.
10.550	WOK	**LAWRENCEVILLE, N. J.,** 28.44 m., Addr. A. T. & T. Co. Works S. A. nights.
10.535	JIB	**TAIWAN, FORMOSA,** 28.48 m. Works Japan around 6.25 am.
10.520	VLK	**SYDNEY, AUSTRALIA,** 28.51 m., Addr. Amalgamated Wireless of Australasia Ltd. Works England 1-6 am.
10.430	YBG	**MEDAN, SUMATRA,** 28.76 m. 5.30-6.30 am., 7.30-8.30 pm.
10.420	XGW	**SHANGHAI, CHINA,** 28.79 m. Works Japan 12 m.-3 am.
10.410	PDK	**KOOTWIJK, HOLLAND,** 28.8 m. Works Java 7.30-9.40 am.
10.410	KES	**BOLINAS, CALIF.,** 28.8 m., Addr. RCA Communications. Irregular.
10.370	JVO	**NAZAKI, JAPAN,** 28.93 m. Broadcasts around 5 am.
10.370	EHZ	**TENERIFFE, CANARY ISLANDS,** 28.93 m. Relays EAJ43 2.15-3.15, 6.15-9.
10.350	LSX	**BUENOS AIRES, ARG.,** 28.98 m., Addr. Transradio International. Broadcasts 5-6 pm. Mon. and Fri. Tests irregularly at other times.
10.330	ORK	**RUYSSELEDE, BELGIUM,** 29.04 m. 1.30-3 pm.
10.300	LSL2	**BUENOS AIRES, ARG.,** 29.13 m., Addr. Cia. Internacional de Radio. Works Europe evenings.
10.290	DZC	**ZEESEN, GERMANY,** 29.16 m., Addr. (See 15.360 mc.) Irregular.
10.260	PMN	**BANDOENG, JAVA,** 29.24 m., Relays YDB 5.30-10.30 or 11 am., Sat. to 11.30 am.
10.250	LSK3	**BUENOS AIRES, ARG.,** 29.27 m., Addr. (See 10.310 mc.) Works Europe and U.S.A. afternoons and evenings.
10.230	CED	**ANTOFAGASTAN, CHILE,** 29.33 m. Tests 7-9.30 pm.
10.220	PSH	**RIO DE JANIERO, BRAZIL,** 29.35 m. Irregular.
10.170	RIO	**BAKOU, U.S.S.R.,** 29.15 m. Works Moscow 10 pm.-5 am.
10.140	OPM	**LEOPOLDVILLE, BELGIAN CONGO,** 29.59 m. Works Belgium around 3 am. and from 1-4 pm.
10.080	RIO	**TIFLIS, U.S.S.R.,** 29.76 m. Works Moscow early morning.
10.070	EDM-EHY	**MADRID, SPAIN,** 29.79 m. Works S. A. evenings.
10.065	JZB-TDB	**SHINKYO, MANCHUKUO,** 29.81 m. Works Tokio 6.30-7 am.
10.055	ZFB	**HAMILTON, BERMUDA,** 29.84 m. Works N. Y. C. irregular.
10.055	SUV	**ABOU ZABAL, EGYPT,** 29.84 m. Works Europe 1-6 pm.
10.042	DZB	**ZEESEN, GERMANY,** 29.87 m., Addr. Reichspostzentralamt. Irregular.
9.990	KAZ	**MANILA, P. I.,** 30.03 m., Addr. RCA Communications. Works Java early morning.
9.950	GCU	**RUGBY, ENGLAND,** 30.15 m. Works N. Y. C. night time.
9.930	HKB	**BOGOTA, COL.,** 30.21 m. Works Rio evenings.
9.930	CSW	**LISBON, PORTUGAL,** 30.31 m., Addr. Nat. Broad. Station. 5-7 pm.
9.890	LSN	**BUENOS AIRES, ARG.,** 30.33 m., Addr. (See 10.300 mc.) Works N. Y. C. evenings
9.870	WON	**LAWRENCEVILLE, N. J.,** 30.4 m., Addr. A. T. & T. Co. Works England nights.
9.860	EAQ	**MADRID, SPAIN,** 30.43 m., Addr. Post Office Box 951. Daily 5.15-7.30 pm., Sat. also 12 n.-2 pm.
9.830	IRM	**ROME, ITALY,** 30.52 m. Works Egypt afternoons.
9.800	LSI	**BUENOS AIRES, ARG.,** 30.61 m., Addr. (See 10.350 mc.) Tests irregularly.
9.790	GCW	**RUGBY, ENGLAND,** 30.64 m. Works N. Y. C. evenings.
9.760	VLJ-VLZ2	**SYDNEY, AUSTRALIA,** 30.74 m., Addr. Amalgamated Wireless of Australasia Ltd. Works Java and New Zealand early morning.
9.750	WOF	**LAWRENCEVILLE, N. J.,** 30.77 m., Addr. A. T. & T. Co. Works London, night time.
9.740	COCQ	**HAVANA, CUBA,** 30.78 m. 6.50 am. 1 am.
9.710	GCA	**RUGBY, ENGLAND,** 30.89 m. Works S. A. evenings.
9.675	DZA	**ZEESEN, GERMANY,** 31.01 m., Addr. (See 10.042 mc.) Irregular.
9.670	TI4NRH	**HEREDIA, COSTA RICA,** 31.02 m., Addr. Amando C. Marin, Apartado 40. 8.30-10 pm., 11.30 pm.-12 m.
9.660	LRX	**BUENOS AIRES, ARG.,** 31.06 m., Addr. El Mundo. 9.30 am.-11.30 pm.
9.650	CT1AA	**LISBON, PORTUGAL,** 31.09 m., Addr. Radio Colonial. Tues., Thurs. and Sat. 3.30-6 pm.
9.650	YDB	**SOERABAJA, JAVA,** 31.09 m., Addr. N. I. R. O. M. Daily except Sat. 6-7.30 pm., 5.30 to 10.30 or 11 pm. Sat. 5.30-11.30 am.
9.650	DGU	**NAUEN, GERMANY,** 31.09 m., Addr. (See 20.020 mc.) Works Egypt afternoons.
9.645	HH3W	**PORT-AU-PRINCE, HAITI,** 31.1 m., Addr. P. O. Box A117. 1-2, 7-8 pm.
9.645	YNLF	**MANAGUA, NICARAGUA,** 31.1 m. 8-9 am., 12.30-2.30, 6.30-10 pm.
9.635	2RO	**ROME, ITALY,** 31.13 m., Addr. (See 11.810 mc.) Mon., Wed. and Fri. 6-7.30 pm. Tues., Thurs. and Sat. 6-7.45 pm.
9.630	HJ2ABD	**BUCARAMANGA, COL.,** 31.14 m. 11.30 am.-12.30 pm., 5.30-6.30, 7.30-10.30 pm.
9.620	HJ1ABP	**CARTAGANA, COL.,** 31.19 m., Addr. P. O. Box 37. 11 am.-1 pm., 5-11 pm. Sun. 10 am.-1 pm., 3-6 pm.
9.615	HP5J	**PANAMA CITY, PANAMA,** 31.22 m. Addr. Apartado 867. 12 n. to 1.30 pm., 6-10.30 pm.

↓ S.W. BROADCAST BAND ↓

Mc.	Call	
9.600	RAN	**MOSCOW, U.S.S.R.,** 31.25 m. Daily 7-9.15 pm.
9.600	CB960	**SANTIAGO, CHILE,** 31.25 m. Heard after 9.30 pm.
9.595	HBL	**GENEVA, SWITZERLAND,** 31.27 m., Addr. Radio Nations. Irregular.
9.590	PCJ	**HUIZEN, HOLLAND,** 31.28 m., Addr. (See 15.220 mc.) Sun. 2-3, 7-8 pm. Tues. 1.30-3 pm. Wed. 7-10 pm.
9.590	VK6ME	**PERTH, W. AUSTRALIA,** 31.38 m., Addr. Amalgamated Wireless of Australasia, Ltd. 6-8 am. exc. Sun.
9.590	VK2ME	**SYDNEY, AUSTRALIA,** 31.38 m., Addr. Amalgamated Wireless of Australasia, Ltd., 47 York St. Sun. 1-3, 4.30-8.30 am., 10.30 am.-12.30 pm.
9.590	W3XAU	**PHILADELPHIA, PA.,** 31.28 m. Relays WCAU 11 am. to 7 pm.
9.580	GSC	**DAVENTRY, ENGLAND,** 31.32 m., Addr. B. B. C., London.
9.580	VK3LR	**MELBOURNE, AUSTRALIA,** 31.32 m., Addr. 61 Little Collins St. Daily 3.30-8.30 am. Sun. 3.30-7.30 am. Sun., Fri. 9.30 pm.-2.30 am.
9.575	HJ2ABC	**CUCUTA, COL.,** 31.34 m. 8 pm. to 12 m.
9.570	W1XK	**SPRINGFIELD, MASS.,** 31.35 m., Addr. Westinghouse Electric & Mfg. Co. Relays WBZ 6 am. to 12 m. Sun. 7 am. to 12 m.
9.560	DJA	**BERLIN, GERMANY,** 31.38 m., Addr. Broadcasting House. 12.05-5.15 am., 4.50-10.45 pm.
9.555	HJ1ABB	**BARRANQUILLA, COL.,** 31.39 m., Addr. P. O. Box 715. 11.30 am. to 1 pm., 4.30-6 pm.
9.550	OLR3A	**PRAGUE, CZECHOSLOVAKIA,** 31.41 m. See 11.840 mc.
9.540	DJN	**BERLIN, GERMANY,** 31.45 m., Addr. (See 9.560 mc.) 12.05-5.15 am., 4.50-10.45 pm.
9.540	VPD2	**SUVA, FIJI ISLANDS,** 31.45 m., Addr. Amalgamated Wireless of Australasia, Ltd. 5.30-7 am.
9.535	JZI	**TOKIO, JAPAN,** 31.46 m., Addr. (See 11.800. JZJ) 9-10 am.
9.530	W2XAF	**SCHENECTADY, N. Y.,** 31.48 m., Addr. General Electric Co. 4 pm.-12 m.
9.525	ZBW3	**HONGKONG, CHINA,** 31.49 m., Addr. P. O. Box 200. Irregular 11.30 pm. to 1.15 am., 4-10 am.
9.525	LKJ1	**JELOY, NORWAY,** 31.29 m. 5-8 am.
9.520	HJ4ABH	**ARMENIA, COLOMBIA,** 31.51 m. 8-11 am., 6-10 pm.
9.510	VK3ME	**MELBOURNE, AUSTRALIA,** 31.55 m., Addr. Amalgamated Wireless of Australasia. 167 Queen St. Daily except Sun. 4-7 am.
9.510	GSB	**DAVENTRY, ENGLAND,** 31.55 m., Addr. (See 9.580, mc.—GSC) 12 m.-2.15 am., 12.20-6 pm., 9-11 pm.
9.505	HJ1ABE	**CARTAGENA, COLOMBIA,** 31.57 m. Addr. P. O. Box 31. 5-10.30 pm.
9.500	XEWW	**MEXICO CITY, MEX.,** 31.58 m. Addr. Apart. 2516. Relays XEW.
9.500	HJU	**BUENAVENTURA, COLOMBIA,** 31.58 m., Addr. National Railways. Mon., Wed. and Fri. 8-11 pm.
9.500	PRF5	**RIO DE JANIERO, BRAZ.,** 31.58 m. Irregularly 4.45 to 5.45 pm.
9.500	EAR-EAQ2	**MADRID, SPAIN,** 31.58 m., Addr. (See 9.860 mc.) Exc. Mon. 2.30-3, 6.30-7, 7.30-9.30 pm., Mon. 7.30-9.30 pm.

↑ S.W. BROADCAST BAND ↑

(Continued on page 241)

(All Schedules Eastern Standard Time)

SHORT WAVES and • • • LONG RAVES

Our Readers Forum

Layton Bennett of Forest Grove, Oregon, owns and operates this fine looking "Ham" station.

He Enjoyed Our "Ham" Course

Editor, SHORT WAVE & TELEVISION:

Have been picking UR FB magazine from the newsstands ever since I spotted it about two years ago, when I became interested in Radio! I enjoyed the Ham Radio Course by W2AMN and it sure helped me progress towards a better station, ever since I got my "ticket" about a year ago.

I started out with a 6L6 crystal oscillator and worked forty meters for some time with just the *exciter* of the present "rig." The 6L6 is now driving an RK20 "final" to about 100 watts. Am using an 80 meter Zepp antenna and the rig puts out and pulls in very good reports on 20 meters when using a 20 meter crystal; she "socks out" a little more on 40 and better still on 80 meters. 160 meters hasn't been tried as yet, but is going to be taken in as soon as possible.

The receiver whose end just shows is a T-R-F job, using a 58 radio frequency, a 58 detector and a 56 audio.

The whole receiver and transmitter is all home-made. The rack was made from a pair of bed longerons, which were in the form of a right-angle of which the knobs on the end were hacked off. The panels are the standard 19 inch, bought at a sheet-metal works. They will probably be crackle finished later on. There are two panels left blank at the top for "future expansion" or for a modulator.

Layton Bennett
325 Fifth St.,
Forest Grove, Ore.

(Good work, Layton, and a neat-looking line-up. Let's hear more from you. Our readers will be glad to know that the "Ham" or Radio Amateur Course will soon be available in book form.—Editor.)

VK4FE, an "Aussie," Built His Rig From Our Data!

Editor, SHORT WAVE & TELEVISION:

As a constant reader of your very F.B. (fine business) magazine, I watch with keen interest the pictures of "Ham" transmitters, and herewith submit photo of my "rig."

The entire "rig" was built from data given in your magazine. On the bottom shelf are the power supplies for the oscillator, bias and P.A. Second shelf, the speech amplifier, the modulator and the power-supply for the same. The third shelf contains the 46 oscillator and 46 doubler; the top panel contains two 210's in parallel and aerial set-up. The P.A. is modulated by a single 2A5, used as a triode in series modulation and it is surprising the way I can pick up the sticks with it! I work mostly on 7,205 kc. but often QSY to 14,120 kc.

The receiver I use is one that was built from your magazine, and is a 4-tube T.R.F. using a 58 in the R.F., a 57 as an electron coupled detector; a 56 first audio, driving a 2A5 for speaker operation.

As you are aware, the Australian amateurs are only allowed 25-watts, so I am only using about 24.5 watts.

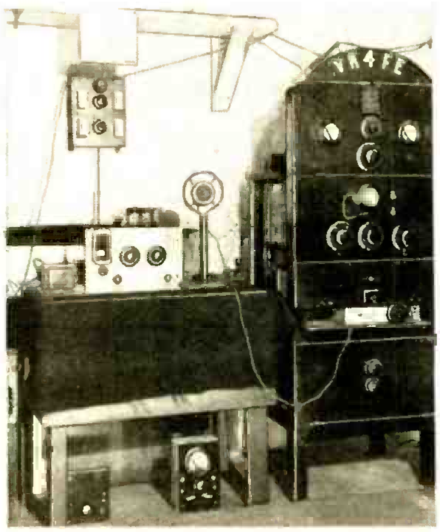
While I do no DXing on fone, which I keep for local "rag-chews," I am always anxious for it on C.W.

On the shelf above the receiver I have a stack of "S.W. & T.'s," which are indexed in a separate book for quick reference.

Wishing you and your magazine every success,

Yours faithfully,
Arthur R. Burton, VK4FE
33 Leichhardt St.,
Brisbane,
Queensland, Australia.

Glad to hear from a "VK"—and especially pleased to hear that you found our construction data of service.—Editor.



A dandy amateur transmitting and receiving station—VK4FE, "down under" in Brisbane, Australia.

He Answers Letters; No Reply! Why?

Editor, SHORT WAVE & TELEVISION:

Since you printed my letter in the magazine, I have had about a score of letters from people in different states in America. From Texas, Massachusetts, Wisconsin, New York, Mississippi, Ohio and many more, all asking me if I could oblige them with different things, including information such as prices of different types of tubes, catalogs, photos of sets, prices of commodities for making sets, blueprints of short wave sets used over here (England), blueprints of long and medium wave sets, views of Sheffield (so they could see what it looked like) and pictures of its products.

Well sir, I have answered *every* letter that was sent and besides sending what they asked for, I sent each one of them three magazines (the one we use here), together with a little present, such as a

(*Continued on page* 250)

A "Live" Philadelphia S-W Listening Post

Editor, SHORT WAVE & TELEVISION:

I herewith submit a photo of my Short Wave Listening Post W3-"SWL." (My own call-letter combination.)

Here is a description of my "shack"; A two tube converter in connection with an eight-tube Majestic broadcast receiver. With this receiver I have logged many foreign stations with veris from: HVJ, Vatican City, DJA, Zessen, Germany, YV2RC, Caracus, Venezuela. Amateur veris from, EA4AO, Madrid, Spain, G5ML and G5VN, England, ON4DX, Belgium, K6CRU and K6JUY, Hawaiian Islands, OZ2M, Denmark, KA1XA, Philippine Islands, HB9AQ, Switzerland, SP1DE, Poland, GI5QX, Ireland, K5AC, Canal Zone, HP1A, Panama, X1AY, Mexico, K4DDH, Puerto Rico, CM2RA, CM6RC, Cuba. Also veris from Naval Stations NPM, NAA, NSS, NPG and NPO. Also police and ship veris, and about 125 broadcast stations.

The four-tube long and short wave receiver, which is between the converter and Majestic broadcast receiver, is used for regular broadcast and police reception and also is used for phonographic pick-up and "home broadcasting."

To the extreme right of the photo is my so called, "transmitter," which is a rack-and-panel job. It houses a code oscillator for code practice; an old battery receiver for amplifying the code oscillator signals for speaker reception, wave-traps for long and short wave reception, etc.

I am a member of the *Short Wave League*, R-9 Listeners League, Radio Explorers Club and the Philadelphia Short Wave Club.

I would like to exchange photos and SWL cards with anyone caring to do so. I will also send to anyone a souvenir of Philadelphia in honor of the "Constitution Celebration," the 150th Anniversary of the signing of the Constitution, providing they will enclose a 3c stamp along with their SWL or QSL cards and photo. All mail received by me will be answered.

Short Wave & Television magazine is the only radio publication that is used here at my shack, and believe me it sure is swell.

Frank J. Schrameyer, Opr.
1510 North 26th St.,
Philadelphia, Penna.

Boy! What a "flock" of veri cards Frank has collected.

Mc.	Call	Station
9.490	XEFT	**VERA CRUZ, MEXICO,** 31.61 m. 11.30 am. to 4 pm., 7 pm. to 12 m.
9.470	XEDQ	**GUADALAJARO, GAL., MEXICO,** 31.68 m. Irregular 7.30 pm. to 12.30 am.
9.460	ICK	**TRIPOLI, N. AFRICA,** 31.71 m. Works Rome, 5.30-7 am.
9.450	TGWA	**GUATEMALA CITY, GUATEMALA,** 31.75 m., Addr. Ministre de Fomento. Daily 12 n. to 2 pm., 8 pm. to 12 m. Sat. 9 pm. to 5 am. (Sun.)
9.440	FZF6	**FORT de FRANCE, MARTINIQUE,** 31.78 m. 11.30 am., 12.30 pm., 6.15-7.15 pm., 8-9 pm.
9.440	HC2RA	**GUAYAQUIL, ECUAOOR,** 31.78 m. Irregularly till 10.40 pm.
9.428	COCH	**HAVANA, CUBA,** 31.8 m., Addr. 2 B St., Vedado. 7 am.-1 am.
9.415	PLV	**BANDOENG, JAVA,** 31.87 m. Works Holland around 9.45 am.
9.363	COBC	**HAVANA, CUBA,** 32.03 m. Addr. Maximo Gomez No. 139. Relays CMBC.
9.350	HS8PJ	**BANGKOK, SIAM,** 32.09 m. Thursday, 8-10 am.
9.330	CGA4	**DRUMMONDVILLE, CANADA,** 32.15 m. Works England irregularly.
9.330	OAX4J	**LIMA, PERU,** 32.15 m., Addr. Box 1166, "Radio Universal." 7 pm.-12 m.
9.300	YNGU	**MANAGUA, NICARAGUA,** 32.26 m. 12 n.-2 pm., 6-7 pm.
9.280	GCB	**RUGBY, ENGLAND,** 32.33 m. Works Canada and Egypt evenings and afternoons.
9.170	WNA	**LAWRENCEVILLE, N. J.,** 32.72 m. Works England evenings.
9.150	YVR	**MARACAY, VENEZUELA,** 32.79 m. Works with Europe afternoons.
9.125	HAT4	**BUOAPEST, HUNGARY,** 32.88 m., Addr. "Radiolabor," Gyali-ut, 22. Sun. and Wed. 7-8 pm., Sat. 6-7 pm.
9.060	TFK	**REYKJAVIK, ICELAND,** 33.11 m. Works London afternoons.
9.020	GCS	**RUGBY, ENGLANO,** 33.26 m. Works N. Y. C. evenings.
9.010	KEJ	**BOLINAS, CAL.,** 33.3 m. Relays NBC and CBS programs in evening irregularly.
8.957	VWY	**KIRKEE, INDIA,** 33.43 m. Works with England in morning.
8.960	TPZ	**ALGIERS, ALGERIA,** 33.48 m. Works Paris afternoons.
8.950	HCJB	**QUITO, ECUADOR,** 33.5 m. 7-10 pm. except Monday.
8.795	HKV	**BOGOTA, COLOMBIA,** 34.09 m. Mon. and Thurs. 7-7.30 pm.
8.775	PNI	**MAKASSER, CELEBES, N. I.,** 34.19 m. Works Java around 4 am.
8.765	DAF	**NORDDEICH, GERMANY,** 34.23 m. Works German ships irregularly.
8.760	GCQ	**RUGBY, ENGLAND,** 34.25 m. Works Africa afternoons.
8.750	FZE8	**DJIBOUTI, FR. SOMALILAND, AFRICA,** 34.29 m. Works Paris around 2.30 am.
8.730	GCI	**RUGBY, ENGLAND,** 34.36 m. Works India 8 am.
8.720	VPD3	**SUVA, FIJI ISLES,** 34 m., Addr. (See 9.540 mc., VPD2). 5.30-7 am.
8.680	GBC	**RUGBY, ENGLAND,** 34.56 m. Works ships irregularly.
8.665	COJK	**CAMAGUEY, CUBA,** 34.62 m., Addr. 4 General Gomez. 5.30-6.30, 8-11 pm., daily except Sat. and Sun.
8.590	YNLG	**MANAGUA, NICARAGUA,** 34.92 m. 7.30-9.30 pm.
8.560	WOO	**OCEAN GATE, N. J.,** 35.05 m. Works ships irregularly.
8.400	HC2CW	**GUAYAQUIL, ECUADOR,** 35.71 m. 11.30 am.-12.30 pm., 8-11 pm.
8.380	IAC	**PISA, ITALY,** 35.8 m. Works Italian ships irregularly.
8.190	XEME	**MERIDA, YUCATAN,** 36.63 m., Addr. Calle 59, No. 517, "La Voz de Yucatan desde Merida." 10 am.-12 n., 6 pm.-12 m.
8.185	PSK	**RIO DE JANEIRO, BRAZIL,** 36.65 m. Irregularly.
8.035	CNR	**RABAT, MOROCCO,** 37.33 m. Sun. 2.30-5 pm.
7.975	HC2TC	**QUITO, ECUADOR,** 37.62 m. Thurs. and Sun. at 8 pm.
7.901	LSL	**HURLINGHAM, ARGENTINA,** 37.97 m. Works Brazil at night.
7.860	SUX	**ABOU ZABAL, EGYPT,** 38.17 m. Works with Europe, 4-6 pm.
7.854	HC2JSB	**GUAYAQUIL, ECUADOR,** 38.2 m. Evenings.
7.799	HBP	**GENEVA, SWITZERLAND,** 38.47 m., Addr. Radio-Nations. Irregular.
7.715	KEE	**BOLINAS, CAL.,** 38.89 m. Relays NBC andCBSprogramsineveningirregularly.
7.626	RIM	**TACHKENT, U.S.S.R.,** 39.34 m. Works with Moscow in early morning.
7.610	KWX	**DIXON, CAL.,** 39.42 m. Works with Hawaii, Philippines, Java and Japan, nights.
7.550	TI8WS	**PUNTA ARENAS, COSTA RICA,** 39.74 m., Addr. "Ecos Del Pacifico", P. O. Box 75. 6 pm.-12 m.
7.520	KKH	**KAHUKU, HAWAII,** 39.89 m. Works with Dixon and broadcasts irregularly nights.
7.510	JVP	**NAZAKI, JAPAN,** 39.95 m. Irregular.
7.500	RKI	**MOSCOW, U.S.S.R.,** 40 m. Works with RIM early am.
7.390	ZLT2	**WELLINGTON, N. Z.,** 40.6 m. Works with Sydney, 3-7 am.
7.380	XECR	**MEXICO CITY, MEX.,** 40.65 m., Addr. Foreign Office. Sunday 6-7 pm.
7.220	HKE	**BOGOTA, COL., S. A.,** 41.55 m. Tues. and Sat. 8-9 pm. Mon. and Thurs. 6.30-7 pm.
7.200	YNAM	**MANAGUA, NICARAGUA,** 41.67 m. Daily at 9 pm.
7.100	FO8AA	**PAPEETE, TAHITI,** 42.25 m., Addr. Radio Club Papeete. Tues. and Fri. 11 pm.-12 m.
6.996	PZH	**PARAMIRABO, DUTCH GUIANA,** 42.88 m., Addr. P. O. Box 18. Daily 6.06-8.36 am., Sun. 9.36-11.36 am., Daily 5.36-8.36 pm.
6.977	XBA	**TACUBAYA, D. F., MEX.,** 43 m. 9.30 am.-1 pm., 7-8.30 pm.
6.976	HCETC	**QUITO, ECUADOR,** 43m., Addr. Teatro Bolivar. Thurs. till 9.30 pm.
6.905	GDS	**RUGBY, ENG.,** 43.45 m. Works N.Y.C. evenings irregularly.
6.860	KEL	**BOLINAS, CALIF.,** 43.70 m. Tests irregularly. 11 am.-12 n., 6-9 pm.
6.850	XGOX	**NANKING, CHINA,** 43.8 m. Daily 6.40-8.40 am., Sun. 4.40-6.05 am.
6.800	HI7P	**CIUDAD TRUJILLO, DOM. REP.,** 44.12 m., Addr. Emisoria Diaria de Commercio. Daily exc. Sat. and Sun. 12.40-1.40, 6.40-8.40 pm. Sat. 12.40-1.40 pm. Sun. 10.40 am.-11.40 am.
6.770	HIH	**SAN PEDRO DE MACORIS, DOM. REP.,** 44.26 m. 12.10-1.40 pm., 7.30-9 pm. Sun. 3-4 am., 4.15-6 pm., 4.40-7.40 pm.
6.775	WOA	**LAWRENCEVILLE, N. J.,** 44.41 m., Addr. A. T. & T. Co. Works England evenings.
6.750	JVT	**NAZAKI, JAPAN,** 44.44 m., Addr. Kokusai-Denwa Kaisha, Ltd., Tokio. Irregular.
6.730	HI3C	**LA ROMANA, DOM. REP.,** 44.58 m., Addr. "La Voz de la Feria." 12.30-2 pm., 5-6 pm.
6.720	PMH	**BANDOENG, JAVA,** 44.64 m. Relays NIROM programs. 5.30-9 am.
6.710	TIEP	**SAN JOSE, COSTA RICA,** 44.71 m., Addr. Apartado 257, La Voz del Tropico. Daily 7-10 pm.
6.672	YVQ	**MARACAY, VENEZUELA,** 44.95 m. Sat. 8-9 pm.
6.670	HC2RL	**GUAYAQUIL, ECUADOR, S. A.,** 44.95 m., Addr. P. O. Box 759. Sun. 5.45-7.45 pm., Tues. 9.15-11.15 pm.
6.650	IAC	**PISA, ITALY,** 45.11 m. Works ships irregularly.
6.630	HIT	**CIUDAD TRUJILLO, D. R.,** 45.25 m., Addr. "La Voz de la RCA Victor," Apartado 1105. Daily exc. Sun. 12.10-1.40 pm., 5.40-8.40 pm.; also Sat. 10.40 pm.-12.40 am.
6.625	PRADO	**RIOBAMBA, ECUADOR,** 45.28 m. Thurs. 9-11.45 pm.
6.558	HI4D	**CIUDAD TRUJILLO, D. R.,** 45.74 m. Except Sun. 11.55 am.-1.40 pm.
6.550	XBC	**VERA CRUZ, MEX.,** 45.8 m. 8.15-9 am.
6.550	TIRCC	**SAN JOSE, COSTA RICA,** 45.8 m., Addr. Radioemisora Catolica Costarricense. Sun. 11 am.-2 pm., 6-7, 8-9 pm. Daily 12 n.-2 pm., 6-7 pm., Thurs. 6-11 pm.
6.545	YV6RB	**BOLIVAR, VENEZUELA,** 45.84 m., Addr. "Ecos de Orinoco." 6-10.30 pm.
6.530	YN1GG	**MANAGUA, NICARAGUA,** 45.94 m., Addr. "La Voz de los Lagos." 8-9 pm.
6.520	YV4RB	**VALENCIA, VENEZUELA,** 46.01 m. 11 am.-2 pm., 5-10 pm.
6.500	HIL	**CIUDAD TRUJILLO, D. R.,** 46.15 m., Addr. Apartado 623. 12.10-1.40 pm., 5.40-7.40 pm.
6.500	TIOW	**PUERTO LIMON, COSTA RICA,** 46.15 m., Addr. Ondas del Caribe. Daily 12 n.-1.30 pm.
6.477	HI4V	**SAN FRANCISCO de MACORIS, D. R.,** 46.32 m. 11.40 am.-1.40 pm., 5.10-9.40 pm.
6.470	YNLAT	**GRANADA, NICARAGUA,** 46.36 m., Addr. Leonidas Tenoria, "La Voz del Mombacho." Irregular.
6.450	HI8A	**CIUDAD TRUJILLO, D. R.,** 46.51 m. 8.40-10.40 am., 2.40-4.10 pm. Sat. 9.40-10.40 pm. Sun. 2.40-4.40 pm.
6.420	HI1S	**SANTIAGO, D. R.,** 46.73 m. 11.40 am.-1.40 pm., 5.40-7.40, 9.40-11.40 pm.
6.410	TIPG	**SAN JOSE, COSTA RICA,** 46.8 m., Addr. Apartado 225, "La Voz de la Victor." 12 n.-2 pm., 6-11.30 pm.
6.400	YV5RH	**CARACAS, VENEZUELA,** 46.88 m. 7-11 pm.
6.380	YV5RF	**CARACAS, VENEZUELA,** 47.02 m., Addr. Box 983. 6-10.30 pm.
6.360	HRP1	**SAN PEDRO SULA, HONDURAS,** 47.19 m. 7.30-9.30 pm.
6.360	YV1RH	**MARACAIBO, VENEZUELA,** 47.19 m., Addr. "Ondas Del Lago," Apartado de Correos 261. 6-7.30 am., 11 am.-2 pm., 5-11 pm.
6.350	HRY	**TEGUCIGALPA, HONDURAS,** 47.24 m. 6.30-8.30 pm.
6.340	HI1X	**CIUDAD TRUJILLO, D. R.,** 49.32 m. Sun. 7.40-10.40 am., daily 12.10-1.10 pm., Tues. and Fri. 8.10-10.10 pm.
6.316	HIZ	**CIUDAD TRUJILLO, D. R.,** 47.5 m. Daily except Sat. and Sun. 11.10 am.-2.25 pm., 5.10-8.40 pm. Sat. 5.10-11.10 pm. Sun. 11.40 am.-1.40 pm.
6.310	TG2	**GUATEMALA CITY, GUAT.,** 47.55 m., Addr. Secretaria de Fomento. Relays TG1 11 pm.-1 am.
6.300	YV4RQ	**MARACAY, VENEZUELA,** 47.62 m. 8-10.30 pm.
6.282	COHB	**SANCTI SPIRITUS, CUBA,** 47.76 m., Addr. P. O. Box 85. 4-6, 9-11 pm.
6.280	HIG	**CIUDAD TRUJILLO, D. R.,** 47.77 m. 7.10-8.40 am., 12.40-2.10, 8.10-9.40 pm.
6.270	YV5RP	**CARACAS, VENEZUELA,** 47.79 m., Addr. "La Voz de la Philco." Irregular.
6.243	HIN	**CIUDAD TRUJILLO, D. R.,** 48 m., Addr. "La Voz del Partido Dominicano." 12 m.-2 pm., 7.30-9.30 pm., irregularly.
6.235	HRD	**LA CEIBA, HONDURAS,** 48.12 m., Addr. "La Voz de Atlantida." 8-11 pm.; Sat. 8 pm.-1 am.; Sun. 4-6 pm.
6.230	YV1RG	**VALERA, VENEZUELA,** 48.15 m. 6-9.30 pm.
6.230	OAX4G	**LIMA, PERU,** 48.15 m., Addr. Apartado 1242. Daily 7-10.30 pm.
6.210	YV5RI	**CORO, VENEZUELA,** 48.31 m., Addr. Roger Leyba, care A. Urbina y Cia. Irregular.
6.190	HI8Q	**CIUDAD TRUJILLO, D. R.,** 48.47 m. 11.45 am.-1 pm., 4.45-6.45 pm.
6.185	HI1A	**SANTIAGO, D. R.,** 48.5 m., Addr. P. O. Box423. 11.40am.-1. 40 pm.; 7.40-9. 40 pm.; Wed. 6-10.30 pm.
6.171	XEXA	**MEXICO CITY, MEX.,** 48.61 m., Addr. Dept. of Education. 7-11 pm.

(Continued on page 243)

(All Schedules Eastern Standard Time)

New S-W Apparatus of Interest to HAMS

NEW CRYSTAL MIKE

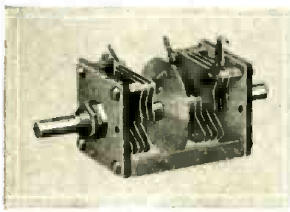
No. 636

● In the photograph we see a reproduction of one of the latest crystal microphones. This is a sound-cell proposition known as B-1. It is very similar to the former Brush BR2S in electrical characteristics However, as can be seen in the photograph, it has a much different appearance. The dimensions are 3½ inches long, 1⅞ inches wide, by ¾ inch thick, and the net weight is 11 ounces. It is furnished complete with a locking type plug and socket-connector for convenience of installation.

This article has been prepared from data supplied by courtesy of the Brush Development Company.

Dual Trim-Air Condensers

● THESE new standard double-section Trim-Air condensers are constructed with sturdy, oversize double bearings and are selling for less than the cost of two individual units. They can be furnished either with a circular shield as illustrated in this ER-25-AD model, or with a square shield that is removable from the nickeled brass tie-rods. A ¼-inch shaft extends at the rear for additional "ganging." This midget is so constructed as to allow for any of four convenient methods of mounting. Isolantite insulation is employed and the condensers are available in ten standard sizes.

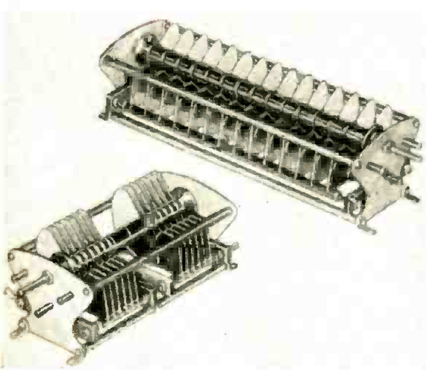


New Double-Section Condenser (No. 637)

This article has been prepared from data supplied by courtesy of Allen D. Cardwell Mfg. Corp.

New Transmitting Condensers

● THE accompanying picture shows two types of transmitting condensers recently made available for amateur and commercial use. The rotor and stator plates are stamped from a special grade of aluminum .051 inch thick and all edges are perfectly rounded to eliminate corona discharge.



Two of the latest amateur type transmitting condensers. No. 638.

The flat surfaces are also highly polished, the general construction of the frame results in an extremely rigid and neat appearing unit. The single type are available in capacities ranging from 40 mmf. to 340 mmf. with working voltages ranging from 4,000 to 11,000.

The split-stator condensers have capacity ranges from 50 to 250 mmf. with various spacings and in voltage ranges from 2,000 to 9,000 per section. In all cases the insulating material used is Micalex, which provides extremely low losses at the high and ultra high frequencies.

This article has been prepared from data supplied by courtesy of Bud Radio, Inc.

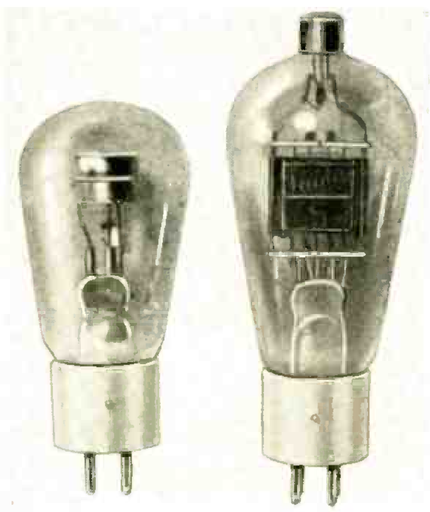
The New T-20

(20 Watts Plate Dissipation)

● A general-purpose *triode*, offering outstanding value to the amateurs, the T-20 will soon establish itself as an extremely fine amplifier on all frequencies up to and including 56 mc. It is efficient as a doubler or buffer and gives real power output in Class B audio work.

GENERAL CHARACTERISTICS

Filament Voltage, volts	7.50
Filament Current, amps	1.75
Plate Resistance, ohms	8000
Mutual Conductance, uMhos	2500
Amplification Factor	20



Left—New half-wave mercury vapor rectifier, type 866 Jr. Right—Recently developed general-purpose triode for frequencies as high as 56 mc. No. 639.

PHYSICAL CHARACTERISTICS

Max. Length, inches	6½
Max. Diameter, inches	2½
UX Ceramic Base	

INTER-ELECTRODE CAPACITIES

Plate to Grid, mmf.	4

CLASS "C" OSC AND POWER AMP.

Max. Plate Volts	750
Modulated D.C. Volts	750
Max. D.C. Plate Current, mills.	75
Max. D.C. Grid Current, mills.	25
Max. Plate Dissipation, watts	20
Max. R.F. Grid Current, amps.	2.5
R.F. Output, watts	42
Percentage of Efficiency	75%

NORMAL OPERATION

Ep=750 EG=−100 Ef=7.5

CLASS "B" A.F. MODULATOR

Push-Pull Operation

TYPICAL OPERATING COND.

Filament, volts	7.5	7.5
D.C. Plate Voltage	800	600
Grid Voltage Approx.	−40	−30
Load Resistance P-P	12.000	8100
Average D. C. Plate Current per tube	68	70
Static Plate Current	10	10
Power Output, Watts (2 tubes)	70	50

(Continued on page 265)

Aerodynamic Microphone

● An Aerodynamic microphone which combines extreme compactness, excellent fidelity and novel streamlined appearance at low cost has been introduced by the RCA Commercial Sound Section.

Of the increasingly popular pressure-operated type, the RCA Aerodynamic microphone was designed to fit a wide variety of public address and "close talking" applications. It has a frequency range of from 100 to 6000 cycles. Impervious to temperature, humidity and barometric pressure changes, of a rugged construction which makes it insensitive to mechanical vibration, the new microphone is particularly suitable for outdoor use too. *Amateur radio operators* will also find it exceptionally adaptable to their needs.

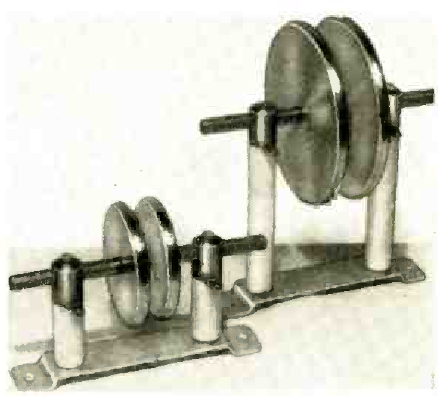
The aerodynamic microphone is actually small enough to fit into the hand and weighs only a pound and a half. It measures 2⅝" wide, 3" high and 3⅜" deep. Its graceful shaped casing of polished chrome metal fits easily to desk or floor type of stands. External excitation or power are unnecessary. It operates at an impedance of 250 ohms and is completely shielded against r-f or a-c fields.

This article has been prepared from data supplied by courtesy of RCA Mfg. Co.

High-Voltage Neutralizing Condensers

● THE neutralizing condensers shown in the photo are designed to be used with the new high efficiency triodes operating at high voltages and frequencies. One is for neutralizing the smaller tubes such as the 35-T, T-55, RK-37, 808 and other similar tubes. This condenser has two adjustable plates mounted 1½ inches high with a diameter of 1-27/32 inches and a thickness of 3/16 inch. The larger condensers have a 3-inch mounting with 3/16 inch thick plates and a diameter of 2 13/32 inches; these are for neutralizing the high-power tubes such as the 150-T, HK-354, HF-300, RK-37, 806 and other tubes having similar capacities and voltage ratings.

This article has been prepared from data supplied by courtesy of Bud Radio, Inc.



New neutralizing condensers for use at hight voltages and frequencies. The plates are very substantial and will hold their adjustment. No. 640.

Names and addresses of manufacturers of apparatus furnished upon receipt of postcard request; mention No. of article.

↓ S.W. BROADCAST BAND ↓

Mc.	Call	
6.160	YV6RO	**CARACAS, VENEZUELA,** 48.7 m. 11 am.-2 pm., 4-10.40 pm.
6.160	VUZ	**COLOMBO, CEYLON,** 48.7 m. Daily exc. Thurs. and Fri., 7 1m.-12.30 pm.; Sun. 7-11.30 am.
6.160	CSL	**LISBON, PORTUGAL,** 48.78 m. Irregular. 7-8.30 am., 2-7 pm.
6.150	CJRO	**WINNIPEG, MAN., CANADA,** 48.78 m., Addr. (See 11.720 mc.) 4-10 pm.
6.147	ZEB	**BULAWAYO, RHODESIA, S. AFRICA,** 48.8 m. Sun. 3.30-5 am.; Tues., Fri., 1.15-3.15 pm.; Mon. and Thurs. 11 am.-12 m.
6.147	COKG	**SANTIAGO, CUBA,** 48.8 m., Addr. Box 137. 9-10 am., 11.30 am.-1.30 pm., 3-4.30 pm., 10-11 pm., 12 m.-2 am.
6.146	HJ4ABU	**PEREIRA, COL.,** 48.8 m. 9.30 am.-12 m., 6.30-10 pm.
6.140	W8XK	**PITTSBURGH, PA.,** 48.86 m., Addr. Westinghouse Electric & Mfg. Co. Relays KDKA 9 pm.-12 m.
6.137	CR7AA	**LAURENCO MARQUES, PORT. E.** 48.87 m. 4-9, 10.30-11 am., 12 m.-3.30 pm., 11.15 pm.-1 am.
6.135	HJ1ABB	**BARRANQUILLA, COL.,** 48.9 m., Addr. P. O. Box 715. 11.30 am.-1 pm., 4.30-10 pm.
6.135	HI5N	**SANTIAGO, D. R.,** 48.9 m. 6.40-9.10 pm
6.130	TGXA	**GUATEMALA CITY, GUAT.,** 48.94 m., Addr. Giornal Liberal Progressista. Irregularly.
6.130	COCD	**HAVANA, CUBA,** 48.94 m., Addr. Calle G y 25, Vedado. Relays CMCD 11 am.-12 m., 7-10 pm.; Sun. 12m.-4 pm.
6.130	VE9HX	**HALIFAX, N. S., CAN.,** 48.94 m., Addr. P. O. Box 998. Mon.-Fri. 9 am.-1 pm., 5-11 pm. Fri.; 1-3 pm., Sat.; Sun. 9 am.-1 pm., 2-11 pm. Relays CHNS.
6.130	ZGE	**KUALA LUMPUR, FED. MALAY ST.,** 48.94 m. Sun., Tue. and Fri. 6.40-8.40 am.
6.130	LKL	**JELOY, NORWAY,** 48.94 m. 11 am.-6 pm.
6.125	CXA4	**MONTEVIDEO, URUGUAY,** 48.98 m., Addr. Radio Electrico de Montevideo., Mercedes 823. 10 am.-12 n., 2-8 pm.
6.125	OAX1A	**CHICLAYO, PERU,** 48.98 m., Addr. La Voz de Chiclayo, Casilla No. 9. 8-11 pm.
6.122	OAX4P	**HUANCAYO, PERU,** 49 m. La Voz del Centro del Peru. 8 pm. on.
6.122	HP5A	**PANAMA CITY, PAN.,** 49 m. Addr. Box 58. 12 n-1 pm., 8-10 pm.
6.122	HJ3ABX	**BOGOTA, COL.,** 49 m., Addr. La Voz de Col., Apartado 2665. 12 n.-2 pm., 5.30-11 pm.; Sun. 6-11 pm.
6.120	W2XE	**NEW YORK CITY,** 49.02 m., Addr. Col. B'cast. System, 485 Madison Ave. Irregular.
6.120	XEUZ	**MEXICO CITY, MEX.,** 49.02 m., Addr. 5 de Mayo 21. Relays XEFO 1-3 am.
6.115	OLR2C	**PRAGUE, CZECHOSLOVAKIA,** 49.05 m. (See 11.875 mc.)
6.110	XEPW	**MEXICO CITY, MEX.,** 49.1 m., Addr. La Voz de Aguila Azteca desde Mex., Apartado 8403. Relays XEJW 11 pm.-1 am.
6.110	VUC	**CALCUTTA, INDIA,** 49.1 m. Daily 3-5.30 am., 9.30 am.-12 m.; Sun 7.30 am.-12 m.
6.105	HJ4ABB	**MANIZALES, COL.,** 49.14 m., Addr. P. O. Box 175. Mon.-Fri 12.15-1 pm.; Tue. and Fri. 7.30-10 pm.; Sun 2.30-5 pm.
6.100	W3XAL	**BOUND BROOK, N. J.,** 49.18 m., Addr. Natl. Broad. Co. 7-10 pm.
6.100	W9XF	**CHICAGO, ILL.,** 49.18 m., Addr. N.B.C. 10.30 pm.-1 am.
6.100	HJ4ABE	**MEDELLIN, COL.,** 49.18 m. 11 am.-12 m., 6-10.30 pm.
6.097	ZTJ	**JOHANNESBURG, S. AFRICA,** 49.2 m., Addr. African Broad. Co. Sun.-Fri. 11.45 pm.-12.30 am.; Mon.-Sat. 3.30-7 am., 9 am.-4 pm.; Sun, 8-10.15 am., 12.30-3 pm.
6.095	JZH	**TOKIO, JAPAN,** 49.22 m., Addr. (See 11.800 mc., JZJ.) Irregular.
6.092	OAX4Z	**LIMA, PERU** 49.25 m. Radio National 7-11 pm.
6.090	HJ4ABC	**IBAGUE, COL.,** 49.26 m. 7 pm.-12 m.
6.090	CRCX	**TORONTO, CAN.,** 49.26 m., Addr. Can. Broadcasting Corp. Daily 5.30-11.30 pm.; Sun. 5-11.30 pm.
6.090	ZBW2	**HONGKONG, CHINA,** 49.26 m., Addr. P. O. Box 200. Irregular.
6.085	HJ5ABD	**CALI, COLOMBIA,** 49.3 m., Addr. La Voz de Valle. 12m.-1.30 pm., 5.10-9.40 pm.
6.083	VQ7LO	**NAIROBI, KENYA, AFRICA,** 49.31 m., Addr. Cable and Wireless. Ltd. Mon.-Fri. 5.45-6.15 am., 11.30 am.-2.30 pm., alsoTues. and Thurs. 8.30-9.30 am.; Sat. 11.30 am.-3.30 pm.; Sun. 11 am.-2 pm.
6.080	ZHJ	**PENANG, FED. MALAY STATES,** 49.34 m. 6.40-8.40 am., except Sun., also Sat. 11 pm.-1 am.
6.080	CP5	**LAPAZ, BOLIVA,** 49.34 m. 7-10.30 pm.
6.080	HP5F	**COLON, PAN.,** 49.34 m., Addr. Carlton Hotel. 11.45am.-1.15 pm., 7.45-10 pm.
6.080	W9XAA	**CHICAGO, ILL.,** 49.34 m., Addr. Chicago Fed. of Labor. Relays WCFL irregular
6.079	DJM	**BERLIN, GERMANY,** 49.34 m., Addr. Broadcasting House. Irregular.
6.070	HJ3ABF	**BOGOTA, COL.,** 49.42 m. 7-11.15 pm.
6.070	CFRX	**TORONTO, CAN.,** 49.42 m. Relays CFRB 6.30 am-11 pm. Sun. 9.30 am.-11 p. m.
6.070	YV1RE	**MARACAIBO, VEN.,** 49.42 m. 6-11pm.
6.070	VE9CS	**VANCOUVER, B. C., CAN.,** 49.42 m. Sun. 1.45-9 pm., 10.30 pm.-1am.; Tues. 6-7.30 pm., 11.30 pm.-1.30 am. Daily 6-7.30 pm.
6.065	HJ4ABL	**MANIZALES, COL.,** 49.46 m. Daily 11 am.-12 m., 5.30-7.30 pm.; Sat. 5.30-10.30 pm.
6.065	SBG	**MOTALA, SWEDEN,** 49.46 m. Relays Stockholm 1.30-6 pm.
6.060	W8XAL	**CINCINNATI, OHIO,** 49.6 m., Addr. Crosley Radio Corp. Relays WLW 5.30 am.-7 pm., 10 pm.-1 am.
6.060	W3XAU	**PHILADELPHIA, PA.,** 49.5 m. Relays WCAU 7-10 pm.
6.060	OXY	**SKAMLEBOAEK, DENMARK,** 49.5 m. 1-6.30 pm.
6.050	HJ3ABD	**BOGOTA, COL.,** 49.59 m., Addr. La Nueva Granada, Box 509. 12m.-2 pm., 7-11 pm.; Sun. 5-9 pm.
6.045	HI9B	**SANTIAGO, D. R.,** 49.63 m. Irregular 6-11 pm.
6.042	HJ1ABG	**BARRANQUILLA, COL.,** 49.65 m., Addr. Emisora Atlantico. 11 am.-11 pm.; Sun. 11 am.-8 pm.
6.040	W4XB	**MIAMI BEACH, FLA.,** 49.65 m. Relays WIOD 12m.-2 pm., 5.30-6 pm., 10 pm.-12 m.
6.040	W1XAL	**BOSTON, MASS.,** 49.65 m., Addr. University Club. Generally from 6-10 pm.
6.040	YDA	**TANDJONGPRIOK, JAVA,** 49.65 m., Addr. N.I.R.O.M., Batavia. 10.30 pm.-2 am.; Sat. 7.30 pm.-2 am.
6.030	HJ4ABP	**MEDELLIN, COL.,** 49.75 m. 8-11 pm.
6.030	HP5B	**PANAMA CITY, PAN.,** 49.75 m., Addr. P.O. Box 910. 12m.-1 pm., 7-10.30 pm.
6.030	VE9CA	**CALGARY, ALTA., CAN.,** 49.75 m. Thur. 9 am.-2 am.; Sun 12 m.-12 m.
6.030	OLR2B	**PRAGUE, CZECHOSLOVAKIA,** 49.75 m. (See 11.875 mc.)
6.025	HJ1ABJ	**SANTA MARTA, COL.,** 49.79 m. 5.30-10.30 pm. except Wed.
6.020	DJC	**BERLIN, GERMANY,** 49.83 m., Addr. (See 6.079 mc.) 11.35 am.-4.30 pm.
6.020	XEUW	**VERA CRUZ, MEX.,** 49.83 m., Addr. Av. Independencia 98. 8 pm.-12.30 am.
6.018	ZHI	**SINGAPORE, MALAYA,** 49.18 m., Addr. Radio Service Co., 20 Orchard Rd. Mon., Wed. and Thur. 5.40-8.0 am.; Sat. 10.40 pm.-1.10 am.
6.015	HI3U	**SANTIAGO DE LOS CABALLEROS, D. R.,** 49.88. m. 7.30-9 am., 12m.-2 pm., 5-7 pm., 8-9.30 pm.; Sun. 12.30-2, 5-6 pm.
6.012	HJ3ABH	**BOGOTA, COL.,** 49.91 m., Addr. Apartado 565. 12 n.-2 pm., 6-11 pm.; Sun. 12m.-2 pm., 4-11 pm.
6.010	VP3MR	**GEORGETOWN, BRI. GUIANA,** 49.9 m. Sun. 7.45-10.15 am.; Daily 4.45-8.45 pm.
6.010	COCO	**HAVANA, CUBA,** 49.92 m., Addr. P. O. Box 98. Daily 9.30 am.-1 pm., 4-7 pm., 8-10 pm.; Sat. also 11.30 pm.-2 am.
6.005	HP5K	**COLON, PAN.,** 49.96 m., Addr. Box 33. 7.30-9 am., 12m.-1 pm., 6-9 pm.
6.005	CFCX	**MONTREAL, CAN.,** 49.96 m., Can. Marconi Co. Relays CFCF 6 am.-11.15 pm.; Sun. 9 am.-11.15 pm.
6.005	VE9DN	**DRUMMONDVILLE, QUE., CAN.,** 49.96 m., Addr. Canadian Marconi Co. Sat. 11.30 pm.-2 am.
6.000	ZEA	**SALISBURY, RHODESIA, S. AFRICA,** 50 m. (See 6.147 mc., ZEB.)
6.000	RV59	**MOSCOW, U.S.S.R.,** 50 m. Irregular.
5.990	XEBT	**MEXICO CITY, MEX.,** 50.08 m., Addr. P. O. Box 79-44. 8 am.-1 am.

↑ S.W. BROADCAST BAND ↑

Mc.	Call	
5.970	HJ4ABD	**MEDELLIN, COL.,** 50.26 m., Addr. La Voz Catia. 8-11.30 pm.
5.968	HVJ	**VATICAN CITY,** 50.27 m. 2-2.15 pm. daily; Sun. 5-5.30 am.
5.950	HJN	**BOGOTA, COL.,** Radiodifusora Nacional, 50.42 m. 6-11 pm.
5.940	TG2X	**GUATEMALA CITY, GUAT.,** 50.5 m. 4-6, 9-11 pm.; Sun. 2-5 am.
5.930	YV1RL	**MARACAIBO, VEN.,** 50.59 m., Addr. Radio Popular, Jose A. Higuera M, P. O. Box 247. Daily 11.43 am.-1.43 pm., 5.13-10.13 pm.; Sun. 9.13 am.-3.13 pm.
5.925	HH2S	**PORT-AU-PRINCE, HAYTI,** 50.63 m., Addr. P. O. Box A103. 7-9.45 pm.
5.917	YV4RP	**VALENCIA, VEN.,** 50.71 m. Irregular.
5.900	TIMS	**PUNTARENAS, COSTA RICA,** 50.85 m. 6-10 pm.
5.898	YV3RA	**BARQUISIMETO, VEN.,** 50.86 m., Addr. La Voz de Lara, 12 m.-1 pm., 6-10 pm.
5.890	JIC	**TAIHOKU, FORMOSA,** 50.93 m. Works Tokio 6-9 am.
5.885	HCK	**QUITO, ECUADOR,** 50.98 m. 8-11 pm.
5.875	HRN	**TEGUCIGALPA, HONDURAS,** 51.06 m. 1.15-2.16, 8.30-10 pm.; Sun 3.30-5.30, 8.30-9.30 pm.
5.855	HI1J	**SAN PEDRO DE MACORIS, D. R.,** 51.25 m., Addr. Box 204. 12 m.-2 pm., 6.30-9 pm.
5.853	WOB	**LAWRENCEVILLE, N. J.,** 51.26 m., Addr. A. T. & T. Co. Works Bermuda nights.
5.850	YV1RB	**MARACAIBO, VEN.,** 51.28 m., Addr. Apartado 214. 8.45-9.45 am., 11.15 am.-12.15 pm., 4.45-9.45 pm.; Sun. 11.45 am.-12.45 pm.
5.830	TDD	**SHINKYO, MANCHUKUO,** 51.46 m. Works Tokio 6-9 am.
5.830	TIGPH	**SAN JOSE, COSTA RICA,** 51.5 m., Addr. Alma Tica, Apartado 800. 11 am.-1 pm., 6-10 pm. Relays TIX 9-10 pm.
5.800	YV5RC	**CARACAS, VEN.,** 51.72 m., Addr. Radio Caracas. Sun. 8.30am.-10.30 pm. Daily 7-8 am., 10.45 am.-1.30 pm., 4-9.30 pm.
5.790	JVU	**NAZAKI, JAPAN,** 51.81 m. Irregular.
5.780	OAX4D	**LIMA, PERU,** 51.9 m., Addr. P. O. Box 853. Mon., Wed. and Sat. 9-11.30 pm.
5.758	YNOP	**MANAGUA, NICARAGUA,** 52.11 m. 8-9.30 pm.
5.740	TGS	**GUATEMALA CITY, GUAT.,** 52.26 m. Wed., Thur. and Sun. 6-9 pm.
5.730	HC1PM	**QUITO, ECUADOR,** 52.36 m. Irregular 10 pm.-12 m.
5.720	YV2RB	**SAN CRISTOBAL, VEN.,** 52.45 m., Addr. La Voz de Tachira. 6-11.30 pm.
5.500	TI5HH	**SAN RAMON, COSTA RICA,** 54.55 m. Irregular 3.30-4, 8-11.30 pm.
5.145	PMY	**BANDOENG, JAVA,** 58.31 m. 5.30-11 am.
5.077	WCN	**LAWRENCEVILLE, N. J.,** 59.08 m. Addr. A. T. & T. Co. Works England late at night irregularly.
5.025	ZFA	**HAMILTON, BERMUDA,** 59.7 m. Works N. Y. C. irregularly at night.

(*Continued on page 252*)

(All Schedules Eastern Standard Time)

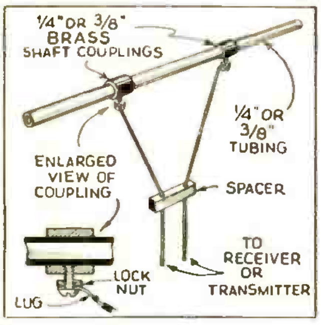
$5.00 FOR BEST SHORT-WAVE KINK

The Editor will award a five dollar prize each month for the best short-wave kink submitted by our readers. All other kinks accepted and published will be awarded eight months' subscription to SHORT WAVE & TELEVISION. Look over these "kinks"; they will give you some idea of what the editors are looking for. Send a typewritten or ink description, with sketch, of your favorite short-wave kink to the "Kink" Editor, SHORT WAVE & TELEVISION.

$5.00 PRIZE

5-METER ANTENNA CONNECTOR

Obtain two brass couplings of the type used for connecting variable condenser rotors together, cut both in two with a back-saw, take the bolt out of each coupling part, put a solder lug on two of them and then lock them with a bolt. Get a stand-off insulator and screw it into the other half coupling. The copper tubing can be mounted by slipping the standoff with the half coupling onto the tubing right in the exact center; tighten it by turning the stand-off insulator. The lead-in wires can be soldered to the other two coupling bolt solder lugs after the coupling is slipped on the copper tubing where they should be. The lead-in coupling can be easily adjusted by merely un-



loosening the bolts. ⅜ inch tubing and couplings work better as they are more sturdy. Consult the drawing for details.—Gordon Mastalio.

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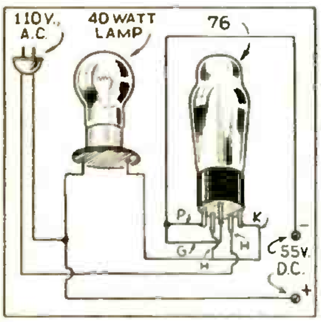
SIMPLE HALF-WAVE RECTIFIER

I am submitting a simple half-wave rectifier which I find quite useful for experimental work. The following description will explain it. Connect a 40-watt light in series with the cathode and filament of a 76 tube, connect the grid and plate together as shown in sketch. Shunt a 6 mf. condenser across the D.C. output and the rectifier will deliver about 70 volts and not exceed 20 milliamperes; try shunting condensers of different values for different



voltage and current flow.—M. F. Fleischman.

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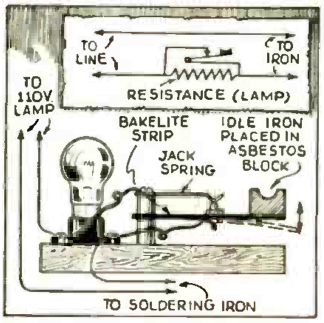
IRON HEAT CONTROLLED BY HOLDER

Here is a simple soldering iron rest that not only holds the iron safely, but automatically cuts in the resistance of a lamp when the iron is laid on it. Thus the iron is kept hot enough for instant use, yet overheating is avoided and power is saved. The size of the lamp to use is determined by the wattage of your particular iron. The wiring of the holder is shown and can easily be followed. The upper contact is a spring leaf taken from an old radio jack and the lower contact is a screw through a strip of bakelite 1/16-inch in thickness and ½-inch wide; the length is determined by the weight of the iron. The stiffness of the bakelite holds the contacts of the



switch closed until the iron is placed on the rest.—W. T. D. Murray.

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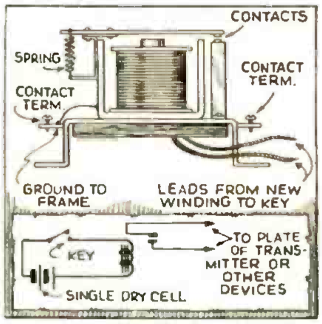
RELAY FROM GENERATOR CUT-OUT

To make a relay from a generator "cut-out," remove the original windings and rewind with about No. 22 magnet wire. The original terminals can be used but it is necessary to ground the one opposite the contacts to the coil frame. These relays may be used for turning circuits "on" and "off," and for keying the transmitter, etc.—Fay Field.



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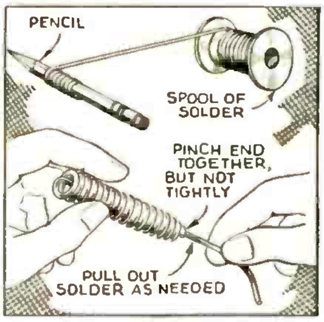
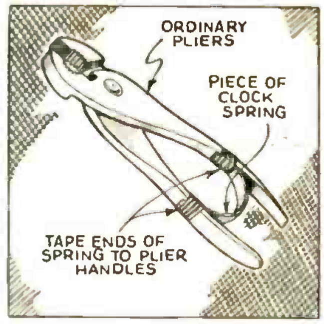
A GREAT IDEA FOR SOLDER

I am sure that the following idea will be found useful by amateurs, experimenters and servicemen. You proceed by obtaining a ¼-inch rod or lead pencil and winding the wire solder to whatever length you want the handle; then pull the solder off the rod. Push one end of the solder inside the coil. With a pair of pliers clamp the other end around the straight piece of solder and it is finished. Draw the solder out as you use it.—Elbert Cline.





AUTOMATIC PLIER OPENER

Here is my pet time and temper saver. The automatic plier opener is simply an old piece of clock-spring taped in place as shown. When pliers are being used steadily, this will be found to be very convenient.—Gordon Sadler.

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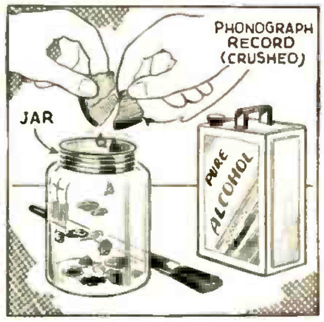
INSULATING PAINT

I have not seen this Kink in print before so I pass it on to the "Ham" fraternity. Obtain a black (or brown, if brown paint is desired) phonograph record and remove all the paper. Then crush it until it is in the smallest pieces possible and cover with alcohol. Let it stand over night then stir and thin with more alcohol and it is ready to use. It makes a nice, commercial-like finish.—Ropp Triplett.



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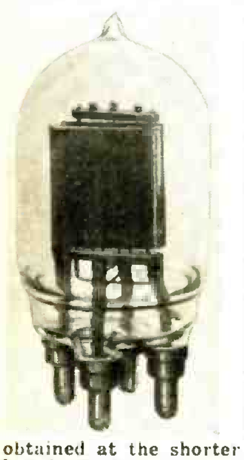
HELP!

● Come on boys, step on it, we need good Kinks and let us have original ones! No duplicates or "lifts" from other magazines! This department is made up of material furnished by our readers and unless good material is received the department won't last. Rush your Kinks and win the $5.00 prize or 8 months subscription.—Kink Editor.

New U.H.F. Tube



● ESPECIALLY designed for use in ultra high frequency or short wave service, a new oscillator and amplifier tube has been announced by a leading radio tube manufacturer. Some of the main fields of application in which this tube will be used, due to its unique characteristics, are for therapy, radio, and other high frequency purposes. In therapy work, in particular, it will permit higher power output to be obtained at the shorter wave lengths than has heretofore been conveniently possible. *It can be used equally well in ultra high frequency radio transmitters, wherever a three element radio frequency amplifying tube of its characteristics is required.*

The usual types of tube construction have been modified in this distinctly modern power tube by supporting the grid, filament and plate electrodes directly from short heavy rods. These support rods in turn terminate in short sturdy thimbles which may be used to connect directly with the external circuits. This tube is one of the first on which such basing has been used, although it has been used for many years on high wattage airport flood lamps where the high current carrying ability has been conclusively demonstrated.

Other decided advantages are the *low inter-electrode capacity* of the tube which results from the new mounting and the high conductivity of the large and short support rods. Tantalum is utilized for the anode material in this tube which from previous experience has proven superior for tubes designed for high frequency operation. This tube has a plate dissipation of 160 watts and is capable of delivering *400 watts of useful power up to 50 megacycles (6 meters).*

The simplification of the internal supporting structure has also made it possible to reduce the size of the tube to the point where only a minimum amount of space need be reserved for it. Designated as the WL-461, this tube has the following ratings:—maximum d.c. plate voltage—2000 volts; maximum a.c. plate voltage—2500 volts; and maximum plate current—250 ma. The filament voltage is 5 volts and the filament current is 11½ amperes. The maximum overall length is 7½ inches. No. 642.

Our information bureau will gladly supply manufacturer's names and addresses of any items mentioned in Short Wave & Television. Please enclose a stamped return envelope.

Water-Cooled Tube

● TWO new RCA Water-Cooled Transmitting Triodes have been designed to give high power output at ultra-high frequencies, the RCA-887 and RCA-888.

Alike in fundamental design, the 887 and 888 feature no internal insulating material, low inter-electrode capacitances, low lead inductance, attached water-jacket, and high out-put capability. The 887 has a low mu, whereas the 888 has a high mu.

When used as oscillators, these new tubes can be operated with the maximum power input of 1200 watts at frequencies as high as 240 megacycles (wavelengths down to 1.25 meters). In r-f amplifier service with its inherently higher efficiency at the

(Continued on page 270)

Names and addresses of manufacturers of apparatus furnished upon receipt of postcard request; mention No. of article.

SHORT WAVE LEAGUE

HONORARY MEMBERS

Dr. Lee de Forest
John L. Reinartz
D. E. Replogle
Hollis Baird
E. T. Somerset
Baron Manfred von Ardenne
Hugo Gernsback
Executive Secretary

Here's Your Button

The illustration herewith shows the beautiful design of the "Official" Short Wave League button, which is available to everyone who becomes a member of the Short Wave League.

The requirements for joining the League are explained in a booklet, copies of which will be mailed upon request. The button measures ¾ inch in diameter and is inlaid in enamel—3 colors—red, white, and blue.

Please note that you can order your button AT ONCE—SHORT WAVE LEAGUE supplies it at cost, the price, including the mailing, being 35 cents. A solid gold button is furnished for $2.00 prepaid. Address all communications to SHORT WAVE LEAGUE, 99-101 Hudson St., New York.

WHEN TO LISTEN IN

by M. Harvey Gernsback

(All Schedules in Eastern Standard Time)

WEST INDIES

● WE are informed that PJC1 at Curacao, N.W.I., will broadcast a special Dxer's program on August 27th from 7:36 to 8:36 p.m. A special verification card will be issued to all sending reports *together with an International Reply Postal Coupon.* Address reports to: Johan P. Curiel, Mundo Nobo No. 143, Curacao, N.W.I. PJC1 operates on 5.93 mc.

HOLLAND

PHI is on a new schedule as follows: Sun., 7:25-10:35 a.m.; Sat., 8:25-10:40 a.m.; Daily except Wed., 8:25-10:00 a.m. PCJ continues on its old schedule.

LONG ISLAND

W2XGB at Hicksville, N.Y., operated by Press Wireless tests irregularly on 18.56, 17.31, 12.86 and 6.425 mc., according to Thomas Twist of Norfolk, Va.

BOUND BROOK

W3XAL at Bound Brook, N.J., operates daily from 8 a.m. to 8 p.m. on 17.78 mc. A South American beam antenna is employed from 2-8 p.m. Special programs in Spanish and Portuguese are broadcast daily except Sun. from 7-7:30 p.m. On Wed., Thurs., and Fri. from 7-8 p.m.

VERIS

The Quixote Radio Club, Box 772, Santa Barbara, Cal., advises that all requests for verifications from stations HRN, Tegucigalpa; HI9B, Santiago de los Caballeros, D.R.; XEDQ, Guadalajara, Mex.; XEBM, Mazatlan, Mex.; and HJ3ABX, Bogota, Col., may be addressed to them together with a dime and three cents postage. Periodically they will forward them by air mail to the stations together with the dimes. The stations will in turn mail veris directly to the listeners. The club guarantees that the stations will issue the veris as they have made special arrangements with them.

CZECHOSLOVAKIA

OLR at Prague now broadcasts for America on Mon. and Thur. from 7-9 p.m. on either OLR4A, 11.84 mc. or OLR5A, 15.23 mc. A further test program is usually given on these nights from 9-10 p.m. on OLR5A. The station is also on daily from 2:30 to 4:30 p.m. with a program for Europe on either OLR4A, OLR5A or OLR5C, 15.16 mc.

ROME

All of the programs of 2RO are now broadcast on 11.81 mc. for the summer months.

NEW YORK

Due to an error we stated last month that W2XE now uses 40 kw. Actually the station operates with 10 kw. power on the following schedule 6:30-9 a.m. on 21.52 mc., 2-5 p.m. on 15.27 mc., 6-11 p.m. on 11.83 mc. The station employs a European beam antenna until 7 p.m. when a shift is made to a South American beam. Special programs for European and South American audiences are presented as well as relays of the WABC programs.

MEXICO

A new unidentified Mexican on 15.165 mc. is heard with good strength and excellent quality daily from early morning till 6 p.m. It apparently relays a long wave station. A 3-note chime is used as signal. No English announcements have been heard. At times it is badly heterodyned by another "unknown" on about 15.162 mc.

News Broadcasts for South America

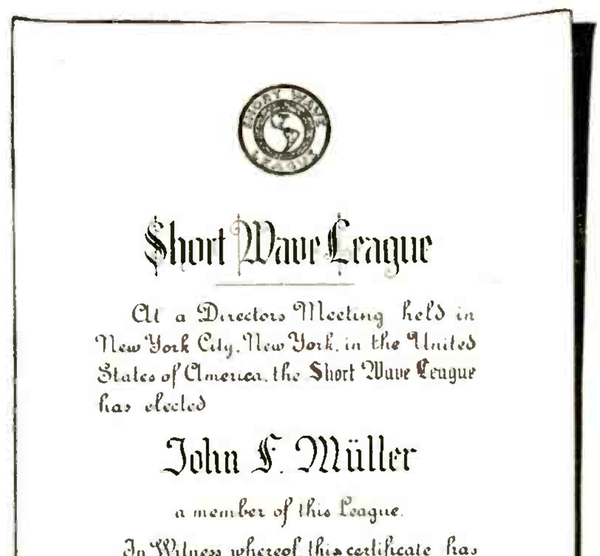
Inauguration of two new series of *Press Radio News* broadcasts to South America over short-wave station W3XAL, Bound Brook, N.J., was announced recently by the National Broadcasting Company at its headquarters in Radio City, New York. Both series are heard daily, except on Sundays.

One of the series, directed especially to Brazil, is broadcast from 7:15 to 7:30 p.m., EDST. Press Radio News reports are given in Portuguese by Pinto Tameirao, Brazilian, who was recently added to the announcing staff of the NBC South American Program Department. The six broadcasts will add an hour and a half to NBC's weekly schedule of South American programs, making a new total of nine hours and fifteen minutes.

The other new series, which replaces a routine news broadcast, will be heard from 7:00 to 7:15 p.m., EDST, and will be directed to Argentina. Martin Viale, from the Argentine, also an addition to the announcing staff, will present the Press Radio News in Spanish.

New Zealander Heard "Coronation" Over W2XAF.

Ian K. Henderson of Wellington, New Zealand, expresses his thanks to General Electric, saying that "if it was not for the fact that W2XAF relayed the proceedings on short waves, listeners out here would have had to do without the last part of the broadcast. The local station which was rebroadcasting from Daventry, England, was only audible about 15 min. and then faded out."


Short Wave League

At a Directors Meeting held in New York City, New York, in the United States of America, the Short Wave League has elected

John F. Müller

a member of this League.

In Witness whereof, this certificate has been officially signed and presented to the above.

H. Winfield Secor
Ass't Secretary

This is the handsome certificate that is presented FREE to all members of the SHORT WAVE LEAGUE. The full size is 7¼"x9½".

See page 592 how to obtain certificate.

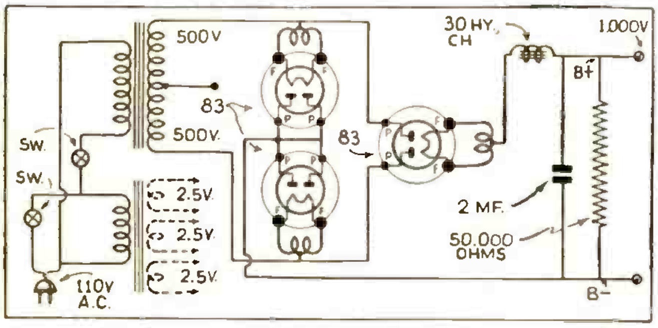
SHORT WAVE QUESTION BOX

EDITED BY
G. W. SHUART, W2AMN

● Because the amount of work involved in the drawing of diagrams and the compilation of data, we are forced to charge 25c each for letters that are answered directly through the mail. This fee includes only hand-drawn schematic drawings. We cannot furnish "picture-layouts" or "full-sized" working drawings. Letters not accompanied by 25c will be answered in turn on this page. The 25c remittance may be made in the form of stamps, coin or money order.

Special problems involving considerable research will be quoted upon request. We cannot offer opinions as to the relative merits of commercial instruments.

Correspondents are requested to write or print their names and addresses clearly. Hundreds of letters remain unanswered because of incomplete or illegible addresses.



High Voltage Bridge Rectifier—1082

BRIDGE RECTIFIER

Alvin Nichols, Pawtucket, R. I.

(Q.) I have a power-supply which, at the present time delivers 500 volts. The transformer used is a center-tap affair and has 500 volts each side of the center-tap. I would like to use a bridge rectifier arrangement whereby I could obtain 1,000 volts from the same transformer. Will you please print the necessary diagram in the Question Box?

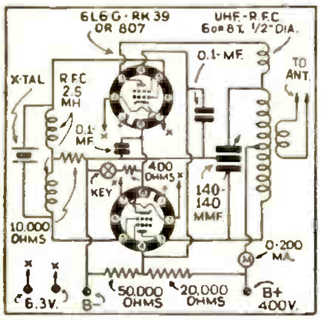
(A.) We have shown the diagram of a power-supply employing three type 83 rectifiers. The filament transformer must have three separate 2.5 volt windings. If your transformer is rated at 500 volts at 250 ma. with a full-wave rectifier system, the output of the new system will then be rated at 1,000 volts at approximately 125 ma.

"PUSH-PULL" BEAM-TUBE TRANSMITTER

Roger Parsons, Massillon, Ohio.

(Q.) I would like to build a simple crystal control transmitter using two beam tubes. Would you be kind enough to show the diagram of such a transmitter.

(A.) If only one-band operation is desired with a single crystal, the most efficient arrangement would be one employing two tubes in push-pull. It should be comparatively easy to obtain 40 or 50 watts from such a transmitter. In some cases there may be a tendency toward high-frequency parasitic oscillation and therefore we recommend a 6 or 8 turn coil be placed in series with one of the plate leads. While this coil will not affect the circuit appreciably, it will in a majority of cases eliminate all tendencies toward ultra high frequency oscillation.



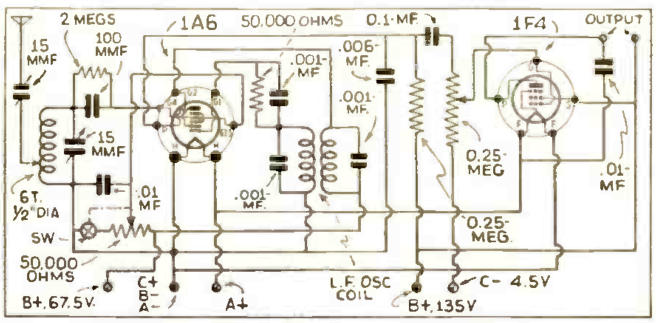
Simple Transmitter—1083

PORTABLE 5-METER RECEIVER

Kenneth Richfield, Olympia, Wash.

(Q.) I would like to build a portable 5-meter receiver using 2 tubes, something that will give fairly good results and still not be too complicated. I would like to use a 1A6 and a 1F4. Kindly print the diagram showing the values of parts.

(A.) We have shown the diagram of the simple super-regenerator, employing an 1A6 combination high frequency oscillator. The output of this arrangement should be sufficient to operate a small speaker, if one is desired. For earphone operation a volume control must be employed. This has been shown in the diagram. Some juggling of the grid coil may be necessary in order to place the tuning range of the receiver in the 5-meter band; this can be accomplished by merely compressing or spreading the turns.



Ultra Short-Wave Receiver—1084

SMALL SPACE ANTENNA

Paul Edson, Los Angeles, Calif.

Q. I would like to build an efficient transmitting antenna, however, on the 80-40-20 meter bands I find that I do not have space for a good antenna. I have tried many varieties but do not seem to get out well on 80 with them. Will you kindly help us with this problem.

(A.) The solution of your problem is a simple one, providing you have at least 65 to 70 ft. of space available for an antenna. If you will refer to the August 1936 issue, page 211, you will find described an antenna system which works out very well. It is a 40 meter half-wave doublet with "spaced" tuned feeders. Experience had proven that it works exceptionally well on 80 meters and, of course, on 40 it is a conventional half-wave doublet and on 20 meters it operates as two half waves in phase.

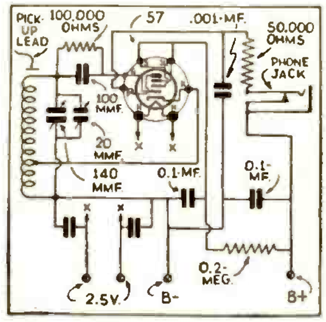
TUNING TRANSMITTER

R. Johnson, New York City, N. Y.

(Q) Would you kindly explain the procedure for tuning a crystal-controlled MOPA transmitter, including neutralization; some simple method which can be easily followed and is sure to work out properly.

(A.) Assuming a transmitter to have a 47 pentode crystal-controlled oscillator and a 210 amplifier, the proper procedure would be (with the filaments already heated) to apply plate voltage to the oscillator only. Rotate the oscillator tuning dial until a dip occurs in the plate current. The condenser should be set slightly toward the low capacity side of this dip, we assume here also that grid-leak bias is employed in the 47 circuit. The next procedure is to measure the grid current in the final amplifier, without the plate voltage applied, but with the keying circuits closed. If capacity coupling is employed between the output of the oscillator and the grid of the amplifier, the grid current would be already indicated by the meter, however, if link coupling is employed then the amplifier grid condenser should be adjusted for maximum grid current. If at this point the oscillator plate current rises too high or the oscillator stops functioning, coupling should be reduced by spacing the link coil farther away from either the grid or plate coil. In the case of capacity coupling the connection from the oscillator to the amplifier should be at a point ⅓ the total number of turns from the B+ or cold end of the oscillator plate coil. For neutralizing merely rotate the amplifier tank condenser until a change in grid current is noted. Then adjust the neutralizing condenser, starting at minimum capacity, until the amplifier condenser can be tuned to resonance without

(Continued on page 260)



Monitor—1085

MONITOR FREQUENCY METER

Richard Atkins, Capetown, So. Africa.

(Q.) I am completing new equipment for the transmitting station and would like to have a diagram of the most efficient yet simple combination frequency meter and monitor.

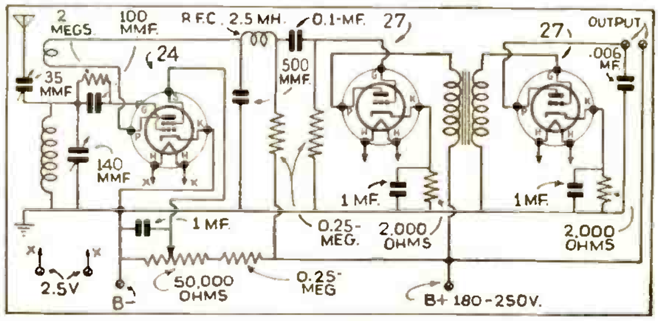
(A.) We find the diagram a 57 electron-coupled oscillator. The size of the coils will depend upon the particular band on which it is to operate. This instrument should be built in an entirely shielded cabinet or box and the power-supply leads should also be shielded in order to prevent too much pick-up. If external pick-up is needed a short piece of wire is used and one end should be placed reasonably close to the grid lead on the coil and the other end extending outside the shielded box for a distance of several inches.

3-TUBE RECEIVER

Ramon Fernandez, Havana, Cuba

(Q.) I have several older type tubes around which I would like to build a short-wave receiver. These consist of types 24 and 27. Would you kindly show a diagram of a suitable receiver employing 3 of these tubes.

(A.) The diagram you requested is shown. The circuit is entirely conventional and has been published a great many times. It consists merely of a regenerative detector with two stages of audio amplification. Resistance coupling is used between the detector and the first audio amplifier, while transformer coupling is used between the 2 audio stages. Resistance coupling may be employed here also. The grid circuit would be the same as the first stage, while the plate circuit of the first stage should have a 25,000 to 50,000 ohm resistor.



3-Tube Receiver Using Old-Style Tubes—1086

A "Folded Doublet" Saves Space

(*Continued from page* 231)

coils. The material used for the construction of the mast which supports the antenna are reasonably low-priced and easily obtainable. The mast is made up of 15 ft. lengths of 1-inch square straight grain pine. A length of this material is used to form each of the 4 corners of the mast. cross-pieces of this same material are placed every 2 ft. as bracing in order to strengthen the mast and even the spacing, as shown in *Television and Short Wave World* (London).

The physical dimensions of the antenna allow most efficient operation on 20 meters, however, its dimensions may be changed so that efficient operation may be obtained on any particular frequency.

Twin-Pentode Receiver

(*Continued from page* 223)

band-spread, it is possible to use a straight dial which has no vernier attachment. When wiring up this condenser the rotors should be grounded independent of the chassis; do not depend upon the chassis for connections in the R.F. circuit. All connections in the diagram which go to the B negative or A negative side of the circuit should be connected to one point, preferably to a lug on one of the screws holding the tube socket. This will eliminate all signs of body-capacity and will improve the stability of the receiver.

Standard Hammarlund plug-in coils are employed, and for the benefit of those who wish to construct their own coils, we refer them to the February 1937 issue of the *Question Box.*

The antenna employed with this receiver should be one preferably 75 ft. long, that is the over-all length from the receiver to the far end. However, if a long lead-in is used, it should be as much in the clear as possible, for remember this also counts as part of the antenna. For those interested in extreme DXing in a certain direction, we might offer the suggestion that they employ a long antenna, one 150 to 200 ft. long or even longer providing space is available; point this antenna right at the section of the globe from which reception is desired. This is the simplest form of directional antenna that one can erect and it has proved to be surprisingly effective.

Parts List

HAMMARLUND

1—35 mmf. condenser, HF style
1—140 mmf. condenser, HF style
1—15 mmf. condenser, HF style
1—2.1 mh. R.F. choke
1—octal socket, isolantite
1—4-prong socket, isolantite
1—set of plug-in coils

CORNELL-DUBILIER

1—.0001 mf. mica condenser
1—.0005 mf. mica condenser
1—.5 mf. by-pass condenser 100 or 200 V. rating
1—.1 mmf. by-pass condenser 100 or 200 V. rating
1—.006 mf. mica condenser

I.R.C.

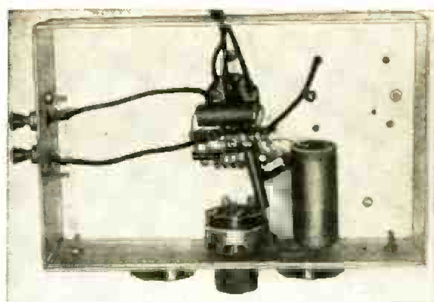
1—2 meg. ½-watt resistor
1—50,000 ohm potentiometer with switch
1—¼ meg. ½-watt resistor
1—50,000 ohm ½-watt resistor.

RAYTHEON

1—1E7G Twin-Pentode tube

MISCELLANEOUS

The set was constructed on a 5"x8"x2" chassis, with a 6"x8" panel. There are two dials, plain non-vernier type and one twin-binding post assembly for earphones.
1—20 ohm rheostat.



Under-side of the Twin-Pentode 1-tube receiver. The parts are few, but should be of high quality if maximum DX results are to be obtained.

In the Next Issue!

New 5 Meter Xmitter, by George W. Shuart, W2AMN.

Don't Miss It!!

NEW SHORT WAVE APPARATUS

PROMPT SHIPMENT ON ALL ITEMS

Eilen

EILEN RX19 7-Tube Bandspread Receiver

8½ to 3000 Meters

Our largest, finest, and most sensitive new 1937 receiver, unequaled in appearance, performance and value. Uses a special, highly efficient and selective circuit producing results which WILL satisfy even the most discriminating short wave fan.

ER-19 is equipped with the famous EILEN NOISE SUPPRESSOR, the latest development of our laboratories and which is skyrocketing itself into immense popularity. This remarkable development, exclusive with EILEN, enables you to enjoy reception from those far-off stations with excellent clarity and volume.

Constructed of the finest materials and to conform with the highest engineering standards, this instrument uses two 6K7G, two 6J5G, one 6C5G, one 42, and one 5Y3 high gain tubes as TUNED RF AMPLIFIER, TUNED ELECTRON COUPLED SCREEN-GRID REGENERATIVE DETECTOR, powerful 3 stage audio frequency amplifier with Type 42 amplifier tube output stage delivering 3 watts peak of audio power to the built-in high fidelity dynamic loud-speaker. VARIABLE NOISE SUPPRESSOR, rectifier and complete built-in HUM-FREE power supply. BANDSPREAD TUNING—a special electron tube circuit enabling the operator to reduce or eliminate certain types of noises occuring in all short wave receivers—automatic headphone jack—smooth and noiseless controls—highly efficient interchangeable inductors—doublet or aerial-ground connections—POWERFUL hi-fidelity audio system—large, illuminated airplane type vernier dial—sensitivity, volume, and selectivity that will amaze you—are features to be found in ER-19.

ER-19 in BEAUTY, as well as performance, is in a class by itself—heavy steel cabinet with hinged lid finished in durable black shrivel—colored dial lights behind black and white scale—chrome plated escutcheon—calibrated dial plates—plated chassis and shielding—Operates entirely from your 105 to 130 volts AC house current.

ER-19 under fair conditions will bring in dozens of foreign as well as domestic short wave stations with enormous volume. Order one and see for yourself.

ER-19, complete, READY TO USE, with 7 RCA or Sylvania tubes, 12 low-loss silver plated coils for 8½ to 3000 meters, wired, in cabinet, and instructions **$21.95**

(If metal tubes are preferred over the glass type, add $1 to above price.)

For those who wish to build their own we offer:

KIT of all parts, coils for 8½-3000 meters, unwired (less tubes & cabinet) **$14.95**

Cabinet, extra $2.50
7 matched Sylvania tubes, extra 3.35
Wired and tested, extra 2.00

AMATEURS: Model ER-19-B has same specifications as ER-19, except that it is equipped with plate voltage cut-off switch and special bandspread coils for 20-40-80-160 M bands spreading these bands 80% of dial scale. Add $1 to price of ER-19. (10 meter band coils if desired extra $1.45.)

Eilen

BS-5

6-Tube Band switch Receiver

10 to 600 Meters

A powerful, sensitive, and selective SW receiver covering the entire wave-length span of 10 to 600 meters in 5 steps. NO PLUG-IN COILS are used. Simply turn the waveband selector switch and enjoy reception on any wavelength within this range.

Uses two 6D6, one 76, one 43, one K42A, and one 25Z5 tubes as RF amplifier, electron coupled screen grid regenerative detector, powerful 2 stage audio amplifier with pentode output stage, rectifier, and complete built-in power supply.

HUM-FREE—Hi-fidelity dynamic loudspeaker—illuminated, airplane type vernier dial—band spread tuning control—automatic headphone jack—extremely smooth acting controls—operates from your AC or DC house current—beautiful heavy, black shrivel finish chassis and cabinet.

See editorial article Page 482, Dec. issue S.W.C.

DELIVERS GREAT LOUDSPEAKER VOLUME ON THE GREAT MAJORITY OF SHORT WAVE FOREIGN STATIONS UNDER FAIR CONDITIONS.

PRICE, complete with 6 tubes, cabinet, wired, and instructions, ready to use **$16.95**

BEAM POWER TUBES TO BE HAD

BS-5 KIT, of necessary parts, including detailed instructions; less tubes, cabinet, unwired **$10.95**

SPECIAL: Complete kit, cabinet, tubes and instructions, unwired **$14.95**

(If metal tubes are preferred to glass type, add $1)

AMATEURS: Model BS-5-AB has same specifications as BS-5 except that it has special band-spread circuit for 20-40-80-160 M bands and is equipped with plate voltage cut-off switch. Add $1.00 to above price.

3-Tube Short Wave Radio Only $3.25

(less tubes, phones, unwired)

A REAL, powerful 3 tube short wave set that readily brings in amateurs, police calls, broadcast stations, experimental and foreign stations with good volume under fair conditions. THE WORLD AT YOUR DOOR!

A dependable receiver which is guaranteed to give results. Operates entirely from the AC or DC house current. Simple to build and easy to operate. Beautiful, black shrivel finish cabinet and instructions furnished. Wavelength range 12-600 meters. An ideal set for the beginner who wishes to learn the thrill of short wave reception.

THREE TUBE BATTERY SET, less tubes, phones, unwired $2.95
TWO TUBE BATTERY SET, less tubes, phones, unwired $2.00

KITS wired, extra 75c. Tubes, each 50c. Broadcast band coils (2), extra 95c. Cannonball double headphones $1.35.

NEW! The HF-25 Beginner's Transmitter

An inexpensive transmitter capable of delivering a good 20 watts crystal power to the antenna on the 160, 80, 40 meter bands and 15 watts on 20 meter band. Using the new 6L6G in a Tri-Tet circuit allowing operation on two bands with one crystal. Highest grade parts mounted on metal chassis housed in a beautiful crackle finished cabinet, antenna tuning unit built in. Eilen silvered transmitting dials. Triplett meter, including set cathode and plate tank coils for any one band. Specially priced at **$11.95**. In kit form, including all parts necessary to put in operation except accessories listed below.

Extra: 6L6G $1.25. Quartz crystal $1.95 for 80, 160 meter band. 40 meter $2.50. Crystal holder $1.00. Coils for additional bands $1.00 per set.

NEW! . . The Last Word in SHORT WAVE RECEIVERS

Model RX 20

An 8 Tube 6L6 Beam Power Audio Electrical Band-spread Receiver. 2½ to 3000 Meters

Our latest development. An 8-tube receiver for the AMATEUR and Short Wave fan, using a tuned R.F. Stage and tuned Electron coupled regenerative detector. Covers all wavelengths now in use including the ultra high frequencies and experimental bands. A gain control for the entire receiver is included. 5 WATTS OF AUDIO POWER AVAILABLE FOR THE BUILT HI-FIDELITY DYNAMIC SPEAKER.

For the HAM we offer type AB. Special Band Spread coils covering all the ham bands with individual padding condensers in each coil are included in this model. Also a stand by switch for use during transmission periods. The phone jack is included which automatically cuts out speaker. Built in hum free power supply.

READY TO USE FACTORY WIRED AND TESTED INCLUDING TUBES AND BAND SPREAD COILS FOR THE HAM BANDS AND 200 TO 3000 METERS GENERAL COVERAGE COILS.

Uses the following tubes: 6K7G tuned R.F. amplifier, 6K7G tuned electron coupled detector, one 6J5G ultra high frequency oscillator tube. Two 6C5G audio amplifiers one 6C5G is the noise suppressor and 6L6G BEAM POWER AUDIO OUTPUT TUBE and a 5Y3G rectifier.

For the Short Wave Fan: RX-20R complete as above with coils from 2½ to 3000 meters $28.95.

For the Amateur: RX-20AB complete as above with special amateur bandspread coils and 200 to 3000 meter coils $29.95.

RX-20AB Amateur Kit: Includes all parts factory assembled ready to wire no holes to drill or parts to mount and schematic and picture diagram and a beautiful cabinet. KIT OF PARTS, $19.95. Tubes, $4.50 EXTRA. Special band spread coils $1.00 per band for any one ham band.

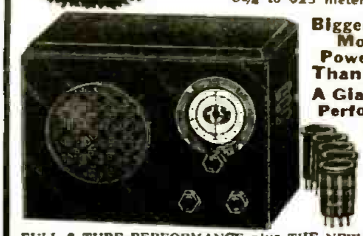
RX-20R S.W.L. KIT: Same as amateur kit but with regular coverage coils from 2½ to 3000 meters. KIT OF PARTS, $19.75. Tubes, $4.50, EXTRA.

Eilen

7C 5-Tube

Short Wave Receiver
8¼ to 625 meters

Bigger and More Powerful Than Ever A Giant in Performance



FULL 6 TUBE PERFORMANCE plus THE NEW K92A SERIES TUBE makes this an outstanding value. Equipped with a powerful 3 stage audio frequency amplifier.

Uses 6D6-6F7 (twin 2 in 1 tube)—76—K92A-12A7 (twin tube) tubes as R.F. amplifier, electron coupled screen grid regenerative detector, powerful 3 stage audio amplifier with pentode output stage, rectifier and complete built-in power supply. Operates entirely from 105 to 130 volt AC or DC light socket.

BAND SPREAD TUNING—smooth regeneration control—built-in high quality loudspeaker—automatic headphone jack—large, illuminated airplane type vernier dial—large low-loss inductances. Heavy, black shrivel finish metal chassis and cabinet. Must be seen to be appreciated. Satisfied owners report as high as 35 foreign countries on the loudspeaker with this model. You may do the same under fair conditions. ORDER YOURS TODAY! YOU WILL NOT REGRET IT!

EILEN 7C RECEIVER, wired, in cabinet, complete, READY TO USE, with speaker 5 RCA tubes, 4 coils for 8½ to 200 meters, and simple instructions **$12.95**
2 Broadcast Band Coils, extra $1.25

7C KIT, unwired, of necessary parts, 4 coils for 8½ to 200 meters, and instructions less cabinet, speaker, tubes **$7.25**
Beautiful metal cabinet, extra $1.25
5 matched RCA tubes 3.15
Special loudspeaker 1.45
(2) Broadcast band coils, 200-625 meters 1.25
Labor for wiring & testing, extra 1.50

SPECIAL: COMPLETE KIT, unwired, cabinet, 5 tubes, speaker, 4 coils for 8½ to 200 meters, and simple instructions **$11.45**
2 broadcast Coils, extra $1.25

AMATEURS: Model 7C-AB, same specifications as 7C except that has special tuning circuit and coils for spreading out the 20-40-80-160 M bands over 80% of dial. Also equipped with plate voltage cut-off switch. Same price as 7C. Model 6B or 6B-AB battery model of 7C. Operates from inexpensive dry batteries. Same price.

Free New Latest CATALOG

of short wave receivers, transmitters, & 5 meter apparatus. Send stamp to cover mailing costs on YOUR copy.

JUST OFF THE PRESS

EILEN RADIO LABORATORIES

Prompt service, 20% deposit on C. O. D. orders

Dept. SC 9, 136 Liberty Street, NEW YORK, N. Y.

806 All-Band Xmitter Delivers 400 Watts

(*Continued from page 227*)

Parts List for 806 Transmitter

For a complete list of parts used in the 6F6-6L6 portion, refer to the article on the exciter unit on page 704, March 1934 issue. The parts list for the New Driver portion are as follows:

HAMMARLUND
1—100 mf. variable condenser, MTC-100B
1—5-prong isolantite socket
1—2.1 mh. R.F. socket
CORNELL-DUBILIER
2—.01 mf. mica condensers 600 V.
1—.001 mf. mica condenser 2500 V.
1—100 mmf. mica condenser 5000 V.
2—.001 mf. mica condensers 1000 V.
I.R.C.
1—30.000 ohm. 20 watt resistor
1—100 ohm center-tap resistor
1—15,000 ohm 20-watt resistor

Parts List for Final Amplifier

HAMMARLUND
1—50 mmf. per section split-stator condenser TCD-50A.
1—100 mmf. condenser MTC-100B.
1—CH-500 R.F. choke 2.5 mh.
BUD
1—small disc-type neutralizing condenser
1—4-prong push-type jumbo socket

S-Ws and Long Raves

(*Continued from page 240*)

set of beads, a pocket-knife, picture views of my home town and little souvenirs of the coronation, etc. Would you believe it, sir, *not one has been good enough to answer my letter!*

I do not think that this is at all fair, as I think that I should have received a little note saying that the souvenir was received in good order. I don't think that this is the right way to establish friendship and brotherhood between fellowmen, but I suppose they mean well.

I received a letter from a writer in Scotland and also a copy of *Short Wave & Television* with my original letter printed in it. Since I mentioned the event, all book-sellers seem to be getting a good supply of *back numbers* now and find a ready sale, three for one shilling.

Wishing your magazine every success, which it fully deserves.

Thomas Mooney
49 Aylward Road
Abourthorne Estate
Sheffield, Yorkshire, England.

"Spot News" Transmitted by Television

(*Continued from page 217*)

flecting lenses covered by patents.

The beam is reflected from this disc to a transparent screen, suspended about four feet above it. The screen forms the bottom of a shadow box, which has a mirror set in its upper rear portion, and the audience sees the images projected onto the screen as they appear on the mirror.

The television news bulletins are seen about six feet from the floor; they are bright enough to be clearly visible in a room with ordinary artificial light, or in diffused daylight, and large enough to be easily read at distances up to 150 feet. They have been successfully demonstrated in leading Canadian hotels, and will be shown in America, probably upon a commercial basis, within a few weeks after this magazine goes to press.

Next Issue!

Special ANTENNA article will appear. Complete data of interest to FANS and HAMS who want to get DX!

New "Electron Gun" Projects Large Television Images

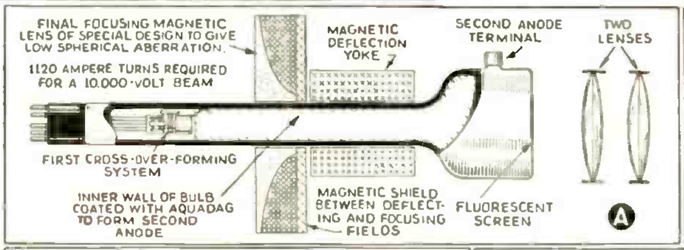
(*Continued from page* 214)

with a much smaller and brighter picture than in the case of a "Kinescope," which is viewed directly. Since the brightness is dependent on the current in the beam, the smaller picture requires a much larger beam current in a smaller "spot."

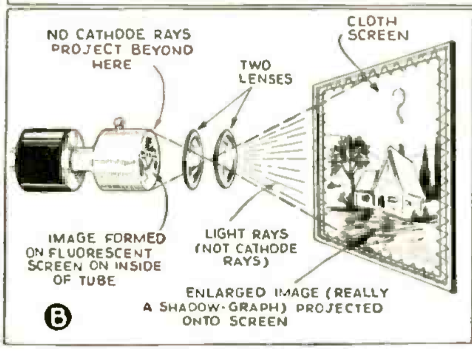
The television images shown were on the 441 line standard, which RCA adopted some months ago for its practical field tests. Despite the enlargement, it was difficult if not impossible for the eye to detect *line scanning* or other details by which the illusion of direct vision was accomplished.

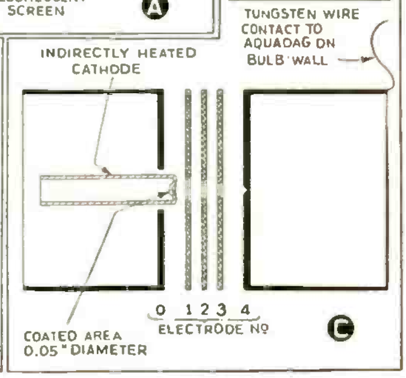
The detailed construction of the newly devised electron gun which makes this advance possible calls for specifications so rigid that the idea was nearly discarded as impracticable, when first proposed. A flood of electrons must be regimented into the solid column of a narrow beam, to "paint" the received picture more vividly on the fluorescent screen of the "Kinescope." The electrons are "conditioned" for the job by being passed through three metal discs, each having an aperture in its center about the diameter of a pencil lead. Then, they pass through a fourth and last disc, similar to the others, but with an opening too small to pass a human hair. Electrons are made to pour through this tiny opening to the fluorescent screen at the tube's end. The bombardment is so intense that the light produced on the screen of the projection "Kinescope" may be spread over an area 100 to 400 times greater in a projected picture.

Although it is regarded in scientific circles as a distinct technical advance in RCA's television developments, engineering opinion is that Dr. Law's contribution could not at this stage be incorporated in home television receivers.



ELECTRODE NO.	APERTURE SIZE	ELECTRODE VOLTAGE
0	0.152	0
1	0.086	100
2	0.067	200
3	0.052	2,000
4	0.004	10,000





World S-W Station List

(*Continued from page* 243)

5.000	TFL	**REYKJAVIK, ICELAND,** 60 m. Works Europe nightime irregularly.
4.975	GBC	**RUGBY, ENG.,** 60.3 m. Works ships irregularly.
4.820	GDW	**RUGBY, ENG.,** 62.24 m. Works N.Y.C. nightime irregularly.
4.790	VE9BK	**VANCOUVER, B. C., CAN.,** 62.63 m., Addr. Radio Sales Service, Ltd., 780 Beatty St. Except Sun. 11.30-11.45 am., 3-3.15, 8-8.15 pm.
4.752	WOO	**OCEAN GATE, N. J.,** 63.1 m., Addr. A. T.& T. Co. Works ships irregularly.
4.600	HC2ET	**GUAYAQUIL, ECUADOR,** 65.22 m., Addr. Apartado 249. Wed. and Sat. 9.15-11 pm.
4.272	WOO	**OCEAN GATE, N. J.,** 70.22 m., Addr. A. T. & T. Co. Works ships irregularly.
4.250	RV15	**KHABAROVSK SIBERIA, U. S. S. R.,** 70.42 m. 1-10 am.
4.107	HCJB	**QUITO, ECUADOR,** 73 m. Daily 7.30-8.45 am. Daily except Mon. 11.30 am.-2.30 pm., 5-7 pm., 7-10 pm.
4.098	WND	**HIALEAH, FLORIDA,** 73.21 m., Addr. A. T. & T. Co. Works Bahamas irregular.

Short-Wave Transmission and The Ionosphere

(*Continued from page 218*)

improvement in our understanding of these processes as they take place in the ionosphere. On frequent occasions—about 100 times in 1936—*fade-outs* of short-wave radio signals have been reported. About half of these cases *occurred simultaneously with the appearance of flares of hydrogen light upon the sun*, and it is likely that a large number of the remaining cases were also accompanied by hydrogen flares, but no astronomer happened to be looking at the sun at the time to report them.

The most outstanding occurrences of these *fade-outs* during 1936 were on April 8, August 25, and November 6. All *short-wave transmission* on the daylight side of the earth was completely knocked out for about an hour in each case, and many receivers were probably torn down to discover the cause of the fade-outs. Even commercial stations, operating on 8 and 13 mc. with plenty of reserve power, could not maintain communication. If the transmission-path between stations lay on the dark side of the earth or near the twilight zone, communication between them was unaffected. Other terrestrial phenomena accompanied these pyrotechnic displays on the sun which are best illustrated by Figure 1.

At the top of the figure is shown a photographic record of radio signals *reflected* from the ionosphere directly overhead the *transmitter* and *receiver* being located in a building at the Huancayo (Peru) Magnetic Observatory of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington.

How Reflected "Sigs" Are Recorded

This equipment for study of the ionosphere works in the following manner: A short pulse of radio waves is emitted from the transmitter ten times a second. This pulse when received actuates an oscillograph mirror, which by means of an auxiliary rotating mirror reflects a beam of light upon a slowly moving sheet of photographic paper. When the *ground wave* is received the light-beam makes a mark on the photographic paper. A few thousandths of a second later when the pulse *reflected from the upper atmosphere* is received, the rotating mirror has turned sufficiently so that the mark for the reflected wave is made some distance above the mark for the ground wave. The distance between the ground wave mark and the reflected wave mark is thus a measure of the time required for the pulse to travel to the reflecting layer and return to earth, and hence a *measure of the height at which reflection occurred*, since radio waves travel with a velocity of 300,000 km. per sec. As the photographic paper slowly moves along the series of dots so produced forms a line. the wave-length of the transmitted wave is varied at intervals and in this manner the ion-density at various heights is determined.

After 11^h 46^m E.S.T. on April 8 the radio operator at Huancayo ceased to receive reflections from the ionosphere. Suspecting that something was wrong with his equipment he examined the set and found it perfect. No reflections could be obtained on any frequency between 2 and 9 mc. until 12^h 40^m E.S.T. At this time reflections were returned and they revealed conditions of all layers had remained unchanged. Two other records of fade-outs, occurring on May 28, 1936 are shown in Figure 2. In this case observations were being made on a fixed frequency of 4.8 mc. The lower solid line is the ground wave received, the next a weak border reflection from the lower or E-layer, and the upper line is a regular reflection from the F_1-layer. The record shown indicates that in each case the weak border reflection fades out more easily than the strong F_1-reflection.

While measurements of the sort conducted at Huancayo and at a few other places reveal exactly what happened, short-wave

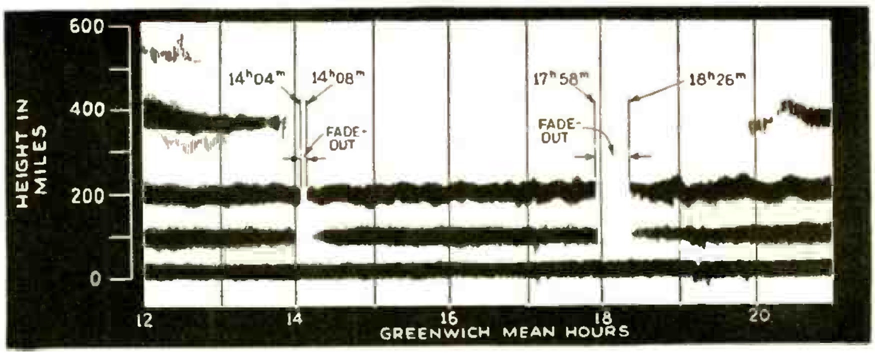


Figure 2—Examples of radio fade-outs, Huancayo Magnetic Observatory, May 28, 1936

operators elsewhere were aware of these unusual conditions as revealed by reports from numerous *amateur* and *commercial* stations throughout the *sunlighted* hemisphere. Many inquiries have been made as to the nature and cause of these fade-outs.

Cause of Short-Wave "Fade-out"

Figure 1 demonstrates that the fade-out of April 8 (and this is true of many others) occurred simultaneously with the appearance of *sudden brightening of hydrogen light in the region of a sunspot.* It was accompanied by an unusual change in the earth's magnetism and in the natural electric currents flowing in the earth. Assembling all the facts scientists have been able to arrive at a reasonable explanation of these phenomena. With the emission of visible light from the sunspot region, intense ultraviolet light is also given off which is capable of ionizing the gases of the high atmosphere. The wave-length of these ionizing radiations is less than 1/100,000 of a centimeter, which makes them capable of setting electrons free from some of the air molecules. So sudden is this blast of light that within a minute, the number of free electrons or ions in the lower part of the ionosphere has increased enormously. Owing to the large number of air molecules present, this intense ionization instead of forming a *reflecting* layer—forms an *absorbing* layer for *short waves.* Short waves passing into it set the electrons and ions into motion. Before the electrons and ions can re-radiate their energy back to the earth, they lose it by colliding with the molecules present, thus dissipating the energy of the radio waves.

Like the traveler in Aesop's fable who could blow both hot and cold from the same mouth, these solar flares have a *reverse* effect—long waves, which are reflected from the lower regions of the ionosphere through which short waves ordinarily pass, are reflected more strongly at these times. R. Bureau reports that atmospherics of wave-length about 10,000 meters come in *much more strongly* during these *short-wave* "fade-outs." This is due to the fact that, owing to their great wave lengths, many more electrons and ions can participate in the reflection of these waves.

Fortunately, short-wave fade-outs of this type can occur only during the daylight hours. They are most pronounced around noon. While short-wave fade-outs may cause considerable inconvenience for both amateur and professional operators at times, they have more than paid for this inconvenience by improving our understanding of the ionosphere and the mechanism of long-distance short-wave transmission.

S-W "Fade-outs" Connected With Sun-spots

During the past few years short-wave fade-outs have been comparatively rare, but recently they have become numerous. This is due to the increase in the number of spots upon the sun, for practically every hydrogen flare which causes a short-wave fade-out originates in the region of a sunspot. This increase in sunspots will continue for a year or two until the sunspot maximum will have been reached. Then the number of sunspots will decrease again, all of which leads to another important consideration.

In addition to the sudden *ionizing effects* causing fade-outs the normal ionizing power of the sun varies enormously from sunspot minimum to sunspot maximum, which has a striking effect on *short-wave* transmission. Terrestrial *magnetic* observations extending back over a century show that there is a close connection between the condition of the ionosphere and the number of spots upon the sun. Scientific radio observations in recent years have shown a close agreement with terrestrial magnetic phenomena, from which it follows that the sunspot relationship must also hold for radio. However, the effects on short-wave transmission far exceeds what was anticipated from the terrestrial magnetic effects. The most pronounced changes occur in the uppermost or F_2-region of the ionosphere, which plays the principal part in short-wave transmission. During the past few years average electron-densities in the F_2-region have increased greatly. In terms of critical frequency this means that

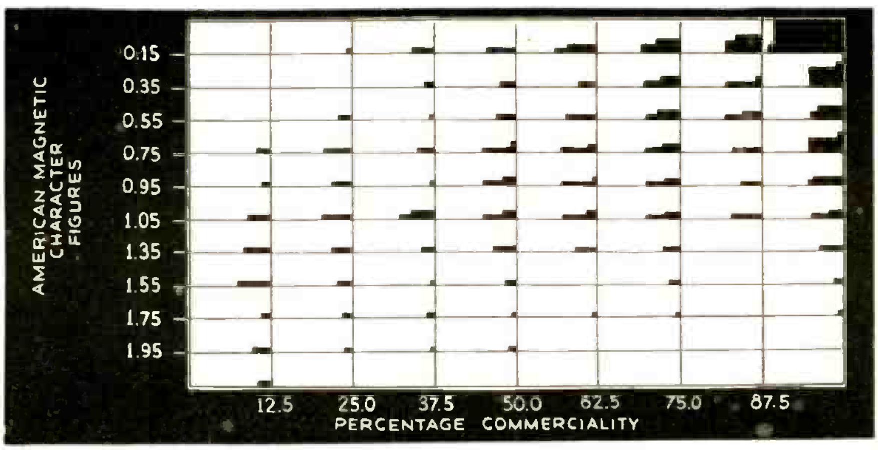


Figure 3—Relation of magnetic storminess and quality of trans-Atlantic radio reception on individual days, May 28, 1928, to December 31, 1930.

wave-lengths are reflected by this layer now which previously penetrated it and passed off into space.

An illustration of this change has been supplied by an amusing consequence of incomplete understanding of the ionosphere and factors affecting radio transmission. A few years ago certain stations were assigned frequencies for short-distance transmission so high that the signals would penetrate the ionosphere and pass off into space, instead of being propagated for great distances. To the amazement of listeners the increased ion-density during recent years caused these frequencies to be heard across the Atlantic—a thoroughly unanticipated result.

Ultra Short-Wave Range to Increase

During the period of sunspot minimum which occurred around 1922, trans-Atlantic communication on 15 mc. was not reliable. On the other hand 45 mc. has been heard across the Atlantic during recent months following the increase in sunspot-numbers. Perhaps during the next few months the sunspot maximum which seems to be approaching may exceed the preceding one and permit long-distance communication on short waves of *exceedingly short wave-length*. It is unbecoming that a scientist should indulge in speculations of this nature, but there is evidence suggesting that the sunspot maximum which is approaching will be the greatest that has occurred since the vogue of amateur radio. Those interested in the advancement of scientific knowledge will perform a real service if they experiment in long-distance communication with extremely short wave-lengths. It may be possible during the next few months or years to achieve long distance communication on 50 or 60 mc.* (5 meter region). It should be pointed out that the experiments suggested should be carefully conducted. Long-distance communication on these frequencies cannot be accomplished regularly. Perhaps on one or two days success may be attained. The writer of this article would be glad to receive information concerning any authenticated cases of long-distance communication on ultra-short waves.

* 5 meter (56mc.) signals have already been heard across the Atlantic.—Editor.

"Sunspots" Serve As Index of Solar Activity

While these variations in the ionosphere are frequently attributed to *sunspots*, it is necessary to recognize that the sunspots are probably *not* the cause of the effects but rather an index of a more fundamental phenomenon—*variations in the activity of the sun*. Our sun is a variable star the radiations from which vary in intensity over an approximately 11-year period. The changes which take place in the radiations capable of ionizing our atmosphere are most pronounced although their results can be perceived only indirectly. These are the radiations which play a leading role in short-wave phenomena.

It is believed that at times of sunspot maxima the sun intermittently sends out clouds of *corpuscles* traveling through space at a speed of about 1,000 km. per sec. (600 miles per sec.) These *corpusclar clouds* are assumed in order to account for the aurorae and sudden changes in the earth's magnetism called "magnetic storms." Mathematical analysis has revealed that these *magnetic storms* result from processes taking place in the upper atmosphere, caused, it is presumed by some solar action. During magnetic storms aurorae flash in the arctic and antarctic skies, particularly brilliant aurorae accompanying the more intense storms. The consequent changes in radio conditions are striking and significant.

These effects are best illustrated by recitation of the events occurring during a recent *magnetic storm*. This storm began around noon E.S.T. on April 24, 1937, and continued through April 28, on which day it attained its maximum intensity. (This stormy interval probably involved three distinct storms, one directly after another.) During this period, short-wave operators were greatly perturbed. Persons listening to ordinary *broadcast* programs heard the familiar announcement many times: "Due to atmospheric conditions beyond our control we are unable to bring you the program scheduled for this hour." Auroral displays of unusual brilliance were seen in many places. Short-wave communication was particularly poor during much of this time.

Effect of "Magnetic Storms" on S-W North Atlantic Circuits

Figure 3 shows a plot in which short-wave transmission conditions, measured in percentage of time North Atlantic (short-wave) circuits were available for commercial service, is coordinated with the American magnetic character—figure, a measure of the amount of magnetic storminess. A small black area is put in one block for each day indicating the degree of storminess and the percentage of time during which commercial traffic could be carried. On days when the magnetic storminess was a minimum, character-figure 0.15 or less, the circuits could be used commercially nearly all day or all day, while the magnetic storminess was a maximum, the circuits were available less than 12.5 per cent of the time. These results apply when the radio transmission is over a path passing within about 20° from the geomagnetic pole, located in longitude 69° east, latitude 78.5° north. Transmission over paths traversing equatorial regions is not severely affected. Use was made of this important fact by commercial companies during the recent magnetic storm in April. Communication with European stations was maintained by routing the traffic through Buenos Aires.

An attempt to explain these idiosyncrasies of *short-wave* transmission at the present time would be hazardous, as sufficient data are not yet available as a basis for definite conclusions. Observations show that during times of magnetic disturbance the ion-densities in the F-region, upon which reflection of short waves depends, are greatly diminished. On the other hand some observations show that in the neighborhood of the auroral zone—the region 20° from the geomagnetic pole—an *absorbing* layer is formed at low heights, preventing the transmission of short waves. Which of these effects is predominant in interruption of radio communication will be solved by further investigation. The fact is that *short-wave* communication is seriously impaired or lost completely during great *magnetic storms*, regardless of whether this is due to decreased ionization, creation of absorbing layers, or breaking down of the sharp ion-boundaries necessary for good reflection.

The effects occurring during magnetic storms are not to be confused with the sudden *fade-outs* caused by hydrogen flares on the sun. The latter are clearly caused by creation of an absorbing layer at the base of the ionosphere and are experienced on the daylight side of the earth only. Magnetic storms influence short-wav transmission over the entire earth, principally where transmission paths traverse high latitudes.

This brief account serves only to outline the profound and perplexing problems involved in trying to account for all the phenomena of radio wave transmission. Many important considerations have not even been mentioned. This is a new field of research in which, month by month, our knowledge and understanding is increased. It is important not only because of the scientific significance of the conclusions which are being drawn, but because its many ramifications also have an intimate connection with the daily life of the whole civilized world.

"Ghost Echo" Detector to Reduce Plane Crashes

(*Continued from page* 214)

therefore permit us to eliminate or at least neutralize their influence with known physical means.

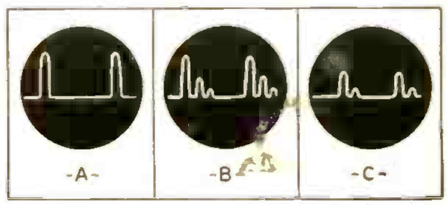
An apparatus for this purpose appears in Fig. 1, which shows a new German *direction finder* device, which does not operate with the usual pair of head-phones or a loudspeaker as an indicator, but utilizes an optical indicator to do the trick. The outfit does not look very different from those applied in this country. We see at the left a loop antenna of usual design, which may be turned by a shaft-drive fitted with a suitable hand-wheel, and at the right side of the table there is placed the receiver (a).

The new features of this direction-finder are the cathode ray tube installed in a cylindrical box with a dial attached directly to the shaft of the loop. The dial operates via remote control the receiver at the right. The receiver in the center is one of the all-wave communications type, and has no direct relation to the new device to be described.

Now let us assume that an airplane requests this ground station to determine its position and it is just shortly after sundown. After all the explanations we have given we will not be surprised to learn that in this specific case one of those famous "ghost echoes" makes the maximum or minimum indications so "broad" that the direction-finder device, (when operated with a pair of headphones) will surely produce a wrong indication of position. A position report of this kind, and especially if some other unfortunate factors coincide, may have fatal consequences.

And now let's see how the new device eliminates mistakes of this kind. Instead of using a pair of headphones to adjust the direction-finder, the operator observes the screen of the cathode-ray-tube. If no "ghost echoes" are present, an image appears as shown in "a" of Fig. 4. However, if an image of the type shown in "b" or "c" flashes over the screen the operator will be much more careful in adjusting the direction-finder. He will disregard the "ghost images" and try to obtain a clear-cut image of the direct signal only. His findings, which he reads in degrees from the azimuth-circle of his loop-drive, will (when compared and combined with the findings of another, or *third* ground station) indicate the exact position of the plane. This verified result will be sent at once via radio to the plane which requested the information.

Considering the high speed of modern airliners one doesn't need much explanation to understand that operators of *ground* stations have to work quite fast in order to obtain exact results, and speedy operation is the most important quality of the new Telefunken direction finder. Regardless of the fact that *ghost echoes* are present or absent, the optical method of indication and adjustment permits much faster and more exact work than is possible with the old-fashioned headphone checking method.



WHAT A GHOST ECHO LOOKS LIKE

The diagram above shows three examples what the operator at a ground station sees when a plane requests his assistance, but the plane's signal is received with ghost echo and without ghost echo.

(A) Plane's radio request received in the late afternoon hours. Only one signal is visible, no "ghost echoes" are there to confuse the operator and to send the plane into a crash.

(B) Image of a plane's signalled request for assistance received at the end of the sunset. The little peaks are "ghost" echoes.

(C) The operator turns the loop antenna 90°; one ghost echo disappears. Then he tunes to the "real" signal, until maximal indication is obtained, and the finding of his operation is sent via radio to the plane in distress in the form of an exact report of its bearing and position.

New 1.5 Volt Tubes Work on Dry Cell

(*Continued from page* 233)

RK-43
Twin Triode Amplifier (Filament Type)

Bulb—T-9 Base—Standard 6-Pin

DIMENSIONS
Maximum Overall Length—4"
Maximum Diameter—1 3/16"

BASING—R.M.A. Numbering
Pin 1—Filament +
Pin 2—Plate (Triode 2)
Pin 3—Grid (Triode 2)
Pin 4—Grid (Triode 1)
Pin 5—Plate—(Triode 1)
Pin 6—Filament —

RATINGS—Each Triode
Filament Voltage—1.5 volts
Filament Current—0.12 amp.
Plate Voltage—135 max. volts
Grid Bias— —3 volts
Amplification Factor—11
Plate Resistance—13800 ohms
Transconductance—800 umhos.
Plate Current—4.5 ma.
Plate Current (Zero Bias)—7.5 ma.

This article has been prepared from data supplied by courtesy of Raytheon Production Corp.

How to Photograph Television Images

(Continued from page 219)

while the second half is scanned in another 1/50 second, the two halves being interlaced.

In this system the time taken for one spot of light to travel its own length is .00000017, so a one-second shutter exposure gives the emulsion an exposure

One of the lady announcers. This is an example of watching one's chance. It was noticed that the announcer kept looking down at her script and an effort was made to photograph directly she looked down. Unfortunately the exposure was just too long and traces of movement have spoilt what might have been a very good result, the eyes being recorded mostly cast down, although the shutter was not quite closed when the eyes were looking at the camera. Exposure 2 secs. F/2.9 S.S. pan. Kodak film.

This picture must be one of the best known scenes to television experimenters, having been used for testing purposes by the (British) Baird Company for nearly two years. The picture is from a loop of film and the artist slowly turns her head, faces the looker-in and then with great rapidity turns her face left. The subject gives photographers a chance to know what is coming, and though the subject is never quite still, a one second exposure with a F/2.9 lens S.S. pan. Kodak film recorded the picture. In the original the scanning lines can be seen. The four faint horizontal lines are produced by the scanning disc at the transmitter, which rotates four times per picture.

equal to 1/250,000 second. On the surface these figures seem to make the photography of a television image impossible. Luckily the light of a cathode-ray tube is very intense and it is quite possible to get a printable negative with a shutter speed of one second using a suitable camera and emulsion. Shutter speeds of 1/10 second have produced very thin negatives, while exposures of 1.5 to 2 seconds give ample exposure.

The lens must be fast, the writer uses a Dallmeyer F/2.9 Pentac lens and Kodak super sensitive panchromatic film, developed in a normal metol-hydroquinous developer.

Unfortunately, though ample exposure is easily obtained, most of the television screens contain fairly rapid movement, which produces a blurred result when adequately exposed. Few scenes televised could in the ordinary way be photographed much more slowly than 1/10 of a second without blurr, so one is rather limited to subject from an ordinary transmission and much patience is required to get a satisfactory picture. Often announcers are comparatively still at the beginning or end of a transmission. The same applies, though to a lesser extent, with artists. Sometimes test transmissions are made when somebody sits in a chair reading for some minutes on end. There is definitely much luck in choosing the right time to expose.

Another big factor in successful television photography is the brightness at which the cathode-ray tube is operated. Obviously the brighter the tube the shorter the exposure. If the brightness of a tube is increased, the picture appears, to the eye, to become flat. The shadows are lightened but the high lights do not get proportionately brighter so the gamma is reduced. This is desirable from a photographer's point of view, as the average television picture is generally tonally distorted (if in no other way).

The three prints of a B.B.C. caption card transmitted prior to the opening of the station clearly illustrate the effect of adjusting the picture brightness. The third would produce the best setting for photographing average scenes, although for a caption a strong contrast is best.

There is also another problem in photographing a television image which must be mentioned, namely, synchronization. Modern high-definition television is synchronized to a high degree of perfection, when the eye is the judge, but over periods of, say, two seconds quite a lot of unsteadiness is sometimes noticeable in a receiver as seen by a camera. So that when the artist is still, with ample exposure and sharp focusing, and the result is blurred, unsteady synchronism was probably the cause. A good photograph of a television image should show the scanning lines on close inspection.

Earlier it was mentioned that in the Marconi-E.M.I. system the scanning is interlaced. Sometimes receivers do not interlace properly, with the result that the scanning lines are very clearly marked, definition is reduced, but generally speaking photographically the intensity is doubled. In such a case the picture appears apparently more exposed than others for a given exposure.

Those who use electronic exposure meters will find that the more sensitive type will give a reading of the average cathode-ray tube of such an order as to indicate an exposure of about one second at F/3 with an H. & D. speed of 1,000. The colour of the light, of course, plays an important part, the greenish tubes are more actinic than the black and white or sepia tubes. This apparent increase in actinic value may, of course, be due to "afterglow" of the fluorescent screen, which will naturally increase the exposure in some cases quite a considerable amount, and in every case increases the apparent exposure to some extent.

We hope photographers will attack the problem with renewed vigor, as good photos of television images are scarce.—R. C. Hanner in *Television and Short-Wave World* (London).

The Spitz Flight Recorder

(Continued from page 216)

scale map of the airways are thousands of wires, arranged in circles, allowing the skipping lights to travel in any direction, two degrees at a time. Over three thousand tiny lights blink the signals of the several routes.

An automatic tuning apparatus at the ground station has several variable condensers set to correspond with oscillating frequencies of several individual planes in flight, which will enable officers in a ground or control station to direct an entire squadron in maneuvers. The sound is amplified and passed through two recording instruments perfected by Dr. Spitz, which control the lights.

One is the "binaural selector" which discloses the direction of a ship's flight by means of a series of revolving coils. The other, the "divergence wave meter," a sensitive short-wave cathode tube which determines within a single degree the distance of the plane from its control station. It is the combined operation of these two remarkable devices which establish the exact *direction* and *distance* of a plane, that the series of lights is controlled.

The possibilities of the flight recorder are almost unbelievable. Besides preserving flying schedules for commercial aircraft, there is control of naval planes from their aircraft carriers; naval officers—on a similar map—could spot the approach of submerged enemy submarines, and could thus visualize the coming of swift destroyers in heavy fog or of other surface craft in the darkness. If in time of national invasion our defense departments could watch, on another such map, the progress of hostile air squadrons across the Atlantic or the Pacific, they could know precisely the number of planes flying toward our shores and exactly where to contact them with defense craft. This equipment would afford no less than a magic mirror of the heavens and the seas at the disposal of our country for the safety of air transportation and to our national security. These things are a near possibility, by the simple process of installation of the flight recorder in all strategic areas, to cover the entire nation and our borders.

Dr. Spitz has long been a foremost authority on sound vibration. The list of inventions after his name in *Who's Who* is a long one. He designed the "Spitzascope" for reproducing images on shipboard, the wireless electric iron, the heating log, special portable radio set designs, new type Selenium cells, and many X-ray and surgical appliances. His flight recorder has taken three years of concentrated study and experiment to bring about the intricate creation that will be welcomed by the aircraft industry, the men who fly the planes, and the public who want safety as well as speed in their air transportation.

Directional Antennae System of Dr. Spitz's Flight Recorder

(1)—The four antennae have a directional pattern of a heart-shaped type, which results in a signal strength variation from maximum to minimum that is in direct proportion to the angle of reception over 180 degrees rotation for each antenna.

The four antennae are installed at the four points of the compass, North, South, East and West, with a reflector at the apex of the four antennae.

(2)—The output of the four antennae is fed to four phasing coils, by means of impedance matching transformers and concentric transmission lines.

The phasing coils are so arranged that the coefficient of coupling varies from minimum to maximum through 180 degrees of rotation.

(3)—The rotating section of the four phasing coils are mounted to rotate as a unit on a common shaft.

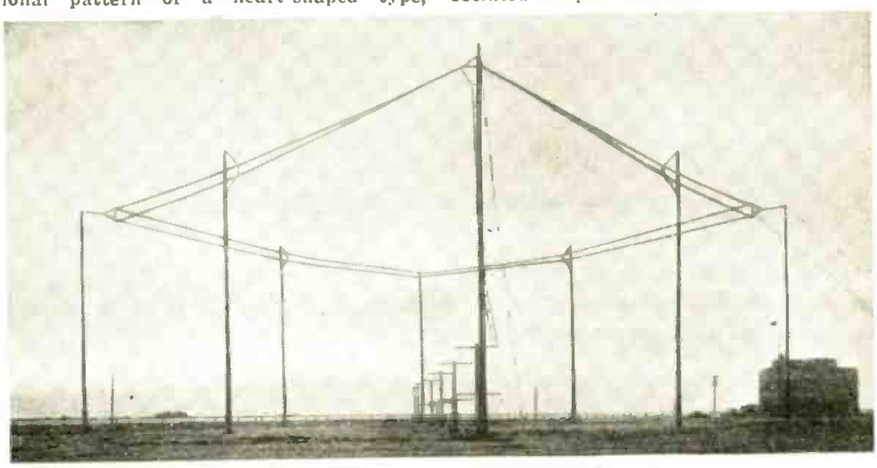
The coefficient of the coupling of the phasing coil that is connected to the antenna that is in the North position, has a maximum of coupling at the time the phasing coil that is connected to the antenna in the South position has a minimum of coupling.

The phasing coils connected to the East and West antennae have their coefficient of coupling in the same manner as the North and South antennae, with respect to one another.

The relationship between the phasing coils that are connected to the North and South antennae, to those that are connected to the East and West antennae, is such that at the time when the North and South phasing coils have their coefficient of coupling at a maximum and a minimum respectively, the phasing coils that are connected to the East and West antennae have a coefficient of coupling of fifty per cent of their maximum value.

When the four phasing coils rotate, a position of maximum signal strength results over a total of 360 degree rotation, in direct relation to the compass position of the unit that is emitting a radio frequency signal at a point distant to the above mentioned phasing coils, and associated units.

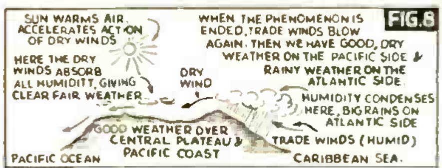
(4)—The output from the four phasing coils is fed to four isolation amplifiers, and the common output of the four isolation amplifiers is fed to an impedance-matching transformer that is coupled to a concentric (co-axial) transmission line, which in turn transfers the energy received to a radio frequency amplifier, where the radio frequency energy is rectified and filtered. The resulting D.C. voltage is fed to the control grid of a D.C. amplifier in a positive polarity, which neutralizes the negative bias potential on the control grid of the D.C. amplifier, which in turn results in an increase of plate current, that in turn causes an ammeter to have a deflection that is in proportion to the radio frequency energy received by the combination of the directional antennae system, isolation amplifiers, radio frequency amplifiers and associated component units.

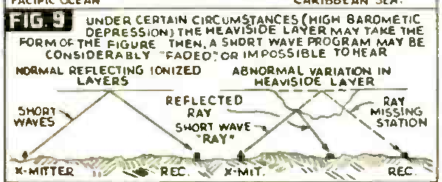


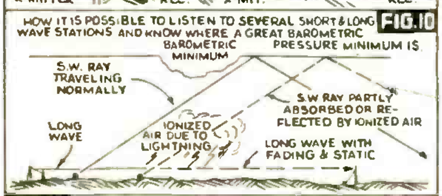
Aerial System used for Spitz Flight Recorder.

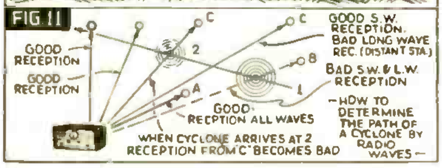
Weather Forecasting by Short Waves

(*Continued from page* 220)









waves coming from the U.S.A. (North American Continent); the Caribbean's terrific hurricanes which come over from the sea, and which frequently prove so disastrous to Columbia and Florida. Let us first study the actions of the hurricanes which originate in the Caribbean Sea, and follow them via radio.

When the equator's calm zone moves northward and reaches Costa Rica, we have the pressure distributed over the country as shown in fig. 3; and we find rain areas on both sides of the isthmus, with almost no wind—the drawing is self-explanatory. Then we have the rainy season, but if—for reasons known to students of meteorology—a cyclone takes place in the Caribbean Sea and a hurricane begins, then the pressure distribution will be more or less like that shown in Fig. 4.

If the barometric disturbance is of sufficient strength, the air currents from the Pacific side will go to the Atlantic side, carrying humidity with them that will condense and produce rain on the *central plateau* (Fig. 5). However, unless the disturbance is exceptionally strong, the air currents will arrive in a dry condition on the Atlantic coast. Thus, while the Pacific side of the isthmus will have heavy rains, for example, the Atlantic side will have clear dry weather. If the phenomenon is sufficiently strong, the Pacific air currents will arrive at the Atlantic coast with sufficient humidity to produce slight rains and a cloudy sky, and we'll have rain over all of the country, as shown in Fig. 6.

S-W Weather Forecasts With Small Error

Consider a typical cyclone's trajectory to be as in Fig. 7, and the influence over the weather in Central America will be seen to be extensive. When the hurricane is ended the trade winds will blow again and the bad weather also come to an end on the Pacific side, but begins on the Atlantic side, (see Fig. 8). Knowing all this, it is only necessary to know when, where and how a cyclone is occurring in order to be able to forecast the weather within an error of 10%, more or less, and this forecasting becomes possible simply by listening on a short-wave radio set and making a brief study of a map, as we shall see.

We know that great changes in barometric pressure affect the height and density, (electron density) of the ionized layers. Therefore, pressure changes influence short-wave communication more or less, (see Fig. 9); thus we are able to tell when there is a cyclone occurring between a certain radio transmitter and the listener, (see Fig. 10). Let us assume that long radio waves travel over the surface of the earth, and suffer a series of successive diffractions; at least this effect is sufficiently correct for our purposes. We will assume also that the short-waves are *reflected* as shown in the figures, but in truth they are refracted many times and experience several changes in their velocity.

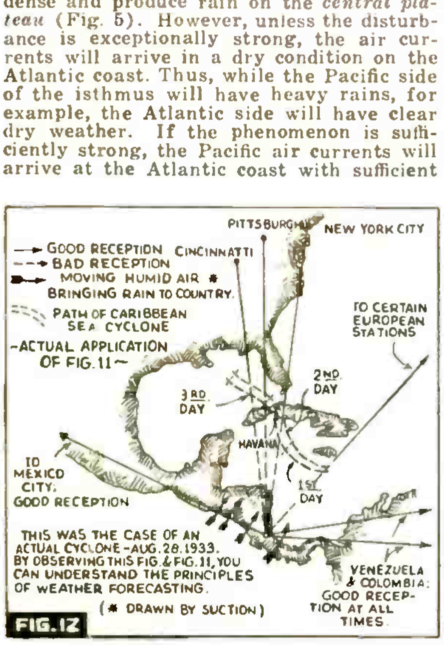
We can point out or *map* the cyclone's trajectory simply by listening to different short- and long-wave stations, (see Fig. 11). When the cyclone is between transmitter "C" and the listener, it would be difficult to pick up the program transmitted from "C," due to high ionization in the lower parts of the atmosphere, but stations located between the cyclone and the listener will be heard all during this time with good volume, and without any unusual disturbances. Very distant stations will not suffer at all, because their waves will be *reflected* at a point far removed from the barometric disturbance. Thus, by suitably interpreting radio reception it becomes possible to prevent damage to cities, towns, and farming communities by giving due advance warning.

Eight Year's Observations

This theory would seem to hold true for the reason that careful radio observations made over a period of nearly eight years prove the points mentioned. It should also be possible for short-wave listeners to observe the occurrence and trajectory of Caribbean Sea cyclones from the United States in a similar way. Here in Costa Rica, when we have no Caribbean hurricanes, we have no big rains, which are called "temporales." (In 1930, no Caribbean cyclones, no big rains. In 1934, the same conditions. On the other hand, 1933 was noted for tremendous rains; and a long series of hurricanes took place over the Caribbean Sea.)

As an illustration of the way in which these radio observations are made, let us take the big barometric disturbance of August 1933 which caused many deaths and great destruction over a vast area with losses amounting to several million dollars. (Refer to Fig. 12.)

On August 28th, the fading was noticeably severe for English stations operating on short waves. It was impossible to pick up the long-wave (800 to 2,000 meters) stations located in England and France. The ionization of the lower layers of the atmosphere was sufficiently great to "cut out" all of these communications. The big barometric minimum was located between Port Limon and Jamaica. On the morning of August 29th, TILCR, a broadcast station operated by the author in the college where he was a professor, announced that a big cyclone had originated in the Caribbean



Sea. The author explained to the public *via radio* the danger of great rains over all of the country, and many of the farmers that listened to the broadcast warning took precautions and managed to save their products from being damaged by the great "Temporale."

The cyclone moved toward Cuba, as indicated by the static heard on the long waves, which gave the effect as if it were receding in strength or going away to a distant point. Also it now became possible to receive the English stations fairly well, while the fading of these stations became less and less noticeable. On August 30th, it became impossible to pick up Cuba, which was very near the cyclone; stations located in San Antonio, Texas, and Mexico were clearly audible.

Poor reception on *long* waves of stations in New York and Pittsburgh became noticeable, due to electrical disturbances in the lower atmospheric layers, and on short waves, (caused by *reflection* of the short-waves at a point near the disturbance) this effect indicated that the cyclone was now over Cuba. Actually, the great hurricane passed over Havana on August 31st. At this time reception of Pittsburgh and Cincinnati stations on long waves was almost impossible. On short waves it was impossible to pick up these stations due to the great fading. Some were able to listen to Cuba again, but now we found that new stations suffered from fading as the cyclone moved along north-westward. But all during this time we heard perfectly stations located in Mexico, California, Colombia, Venezuela, and even Argentina—all of them located well out of the hurricane's path, or not forming a straight line with the cyclone and the listener's location.

The effects of that disturbance were disastrous to Costa Rica and Central America, because of the great rains. But the "weather forecasting" *via short-waves* was a success and distinctly aided in saving life and property. Here are suggestions for listeners in the United States; Observe the conditions under which you obtain stations in Cuba, Colombia, Venezuela, Costa Rica, and in general, South America. As people in the states have a good meteorological service, study the path of barometric pressure minimums in the same way as the author observed the Caribbean cyclones. After a little practice you will be surprised how you can follow all major barometric disturbances and by knowing the effect they produce on your local weather conditions you will be able to make some surprising weather forecasts.

Some of the experiments conducted by the author have shown that a barometric high pressure area can be followed in a similar manner to that already explained, and in a further article I hope to have the pleasure of explaining this phenomenon. This method of forecasting the weather by variations in *short-* and *long*-wave reception presents a new field of experimentation and one which is certain to be of great future importance. Anyone interested in further details may write to the author enclosing a stamped self-addressed envelope and he will be glad to advise them. Address, Lic. J. Merino y Coronado, 150 S. de La Tranquilidad, San José, Costa Rica.

Editor's Note:

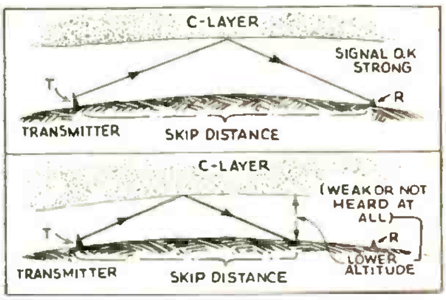
While the foregoing article may present a rather new and unfamiliar aspect to the average student of short waves, a very interesting new discovery described in "The New York Times" of April 30th gives valuable support to Professor Coronado's theory and observations on radio weather forecasting.

In the issue of the *Times* referred to, the discovery of a new radio reflecting layer in the troposphere known as the *C-Layer* was reported by Doctors R. C. Colwell and A. W. Friend of West Virginia University. Some radio students may wonder just how atmospheric changes, variations in the barometric pressure for example, may affect short-wave transmission and reception so as to enable listeners to detect variations caused by "storm centers," such as pointed out in the foregoing article.

The whole theory is now complete for the Doctors Colwell and Friend have found that the new (reflecting) C-Layer varies its height with changes in the barometric pressure and other weather conditions. When the barometer is high for example, the altitude of the C-Layer above the earth is low, and vice versa. The variations in the height of the C-Layer is also very marked, passing through a variation of from 1 to 15 kilometers. (From 0.6 to 9 miles).

As these scientists point out in their report, this discovery promises to provide a valuable new means of forecasting the weather at least 24 hours ahead.

Students of the subject will see from this report, that if the C-Layer, for instance, changes its elevation from time to time as the barometer and other weather conditions change, the strength of signal from a certain short-wave station will change in strength also, the skip distance changing between the transmitter and the listener. In the extreme case—with the C-Layer high above the earth—the reflected short wave may be reflected back so as to entirely miss a listener who had been receiving the signals or program on that wave possibly an hour or so before, when the C-Layer was at



How variation in altitude of reflecting layer causes signal reception to vary also.

a lower altitude. Likewise, if the C-Layer should lower its altitude markedly, the reflected signal will now exhibit a shorter skip distance, and the signal may again miss a given listening post which had been receiving the signal clearly a few hours before, because of the higher altitude of the C-Layer.

Of course, in making a complete study of the various atmospheric reflecting layers, now cataloged and labelled by our radio experts, it becomes necessary to remember that we will have reflected signals coming down to earth from other layers than the C-Layer. But, regardless of this fact and the various reflections from different layers, the main basic principle of the new theory of *weather forecasting via short waves* has been set forth, and it is also undoubtedly true that more or less variation in altitude occurs for the other reflecting layers as well as the C-Layer.

Therefore, variations in the reflected signals or waves will occur with the other layers as well, and the whole action will be seen to "tie in" with the new analysis propounded by Drs. Colwell and Friend.

Tuning Transmitter

(*Continued from page 246*)

a change in grid current. The final amplifier dial should now rest at the point where this change occurred. We are now ready to apply the plate voltage of the final amplifier and adjust the plate condenser to minimum plate current. The antenna is then coupled to the final amplifier to the extent that will cause the plate current to rise to normal operating specifications and the final touch will be to set the amplifier plate condenser for lowest plate current. This, of course, is the procedure with conventional tuned antenna; not with the Collins impedance matching device.

A.B.C. Beginner's Short-Wave Set

(*Continued from page 222*)

means of a knob, the tickler coil can be turned through an angle of over 180 degrees, so that the direction of its windings can be completely reversed with respect to that of the secondary windings. The secondary, consists of 100 turns of No. 28 d.c.c. (double cotton covered) wire. The same size wire is used on all the windings. The secondary is tapped at two points, as indicated on the schematic diagram. It is tuned by a .00014 mf. variable condenser. Connections are made from the taps to four clips, shown at the lower part of the panel in a semi-circle. A flexible wire connection from the grid terminal of the variable condenser, permits the use of the condenser to tune any selected portion of the coil, instead of the entire secondary. For example, if the entire coil is tuned without connecting the flexible wire to any of the two clips, the receiver will bring in stations on the broadcast band. By connecting the flexible lead to clip No. 1 and cutting out 20 turns, stations on the upper police (180 meters) band will be received. By connecting the flexible lead to Clip No. 2 and cutting out a total of 40 turns, the set will bring in *amateur* and lower wave-length (120 meter) *police* calls.

This set is intended mainly for experimental purposes, since the efficiency of a tapped secondary such as the one used, drops considerably on wavelengths below 100 meters.

An *antenna-trimmer* is provided in the antenna circuit as shown at "C1." This may be adjusted by means of a screwdriver, or a shaft may be soldered to the adjusting screw, permitting the use of a knob. The antenna trimmer is of considerable help in tuning in short-wave stations. The filament rheostat is provided to keep the filament voltage constant as the "A" batteries become weaker. The .0001 mf. condenser C3 is known as the grid condenser. R1 is the grid-leak.

Regeneration is controlled by rotating the tickler. As this is turned very slowly, station whistles will be heard. After proper adjustment, the stations will come in clearly, as the tuning condenser is turned.

In assembling the "A.B.C." receiver, fasten the panel to the side supports by means of wire brads. Then, mount the coil, antenna trimmer and variable condenser beneath the panel. The socket may be mounted above or below the panel as desired. The ten clips are fastened above the panel. Next proceed with the wiring, in the following order,—first complete all "A" plus and ground connections; next "A" minus, then grid and plate circuits and finally, wire in the condensers C4 and C5. Check over the wiring carefully, then connect the "A" battery and see whether tube lights up. Remove tube, connect "A" and "B" batteries, earphones, antenna and ground, insert tube and the set is ready for test.

This receiver gives surprisingly good earphone volume. By increasing the "B" voltage, it will even operate a small magnetic speaker, on the stronger stations. The entire receiver can be built in an hour, even by an inexperienced person and its low cost matches its simplicity.

List of Parts for the "A.B.C." Beginners' Short Wave Set

HAMMARLUND

C1—Equalizer Antenna Trimmer, type MICS (10 to 70 mf.)
C2—Midget Condenser, 140 mmf., type MC-140-M

CORNELL-DUBILIER

C3—.001 mf. mica condenser, type 3L
C4—.00045 mf. mica condenser, type 1W
C5—.02 mf. either mica or "CUB" type tubular condenser

ELECTRAD

R2—Electrad Filament control rheostat, 30 ohms, type 270-W

I.R.C. Resistor
R1—1 meg. ½ watt metallized resistor

RAYTHEON

Tube—Raytheon, 1-30 type

MISCELLANEOUS

Socket, 1—four prong socket
1—Find-All Air-Core Antenna Coupler with rotatable tickler
10 Fahnestock connection clips
Two dials
1—8½x11" panel, wood or bristol board
2—Sloping wood side-supports, 3" high x 10⅝" long
Hook-up wire, knobs, etc.

BATTERIES

2—1½ volt "A" dry cell batteries, either flash-light type or No. 6 type
1—22½ volt "B" battery

CANNON-BALL

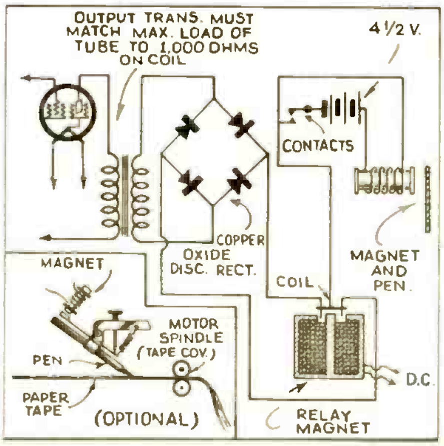
Earphones—sensitive type

Home-Made Recorder

(*Continued from page* 221)

the purpose. The magnet operating the pen may be of quite low resistance, such as that obtained from a bell or other device and is operated from a 4½ volt battery. The local circuit through the pen magnet is opened and closed by silver or other contacts actuated by a high resistance relay. In the article referred to, this relay was made from the field-magnet of an old dynamic speaker. The moving coil, for relay purposes, was especially made by winding 1,500 turns of No. 42 enameled wire on a form made of thin fibre or paper, shellacked to hold it in shape. The magnet winding on the speaker field frame is excited from any convenient source of D.C. The original author used it as the filter choke in his receiver power-pack.

A very soft lead pencil may be used for recording; if an ordinary fountain pen is to be used this should be arranged to strike the paper at a very slight angle.



Let's "Listen In" With Joe Miller

(*Continued from page* 236)

14090; ZS5AB, 14060; ZU6P, 14110; ZS6AJ, 14330; ZS2X, 14030; all in South Africa, lately reported by Ashley Walcott, between 8:15-10 a.m.

ASIA

XU8JR, "Japan Radio," 14130, China; J7CR, "Canada, Russia," 14265; J7CJ, in Hokkaido, 14350, also in Japan reported by Ashley Walcott between 8-9:30 a.m. on West Coast.

Also reported heard are VS7AK, 14005, Ceylon; VU2DP, 14005, India; MX2B, 14310, Manchukuo; J2KJ, 14280, and J2MI, 14145, with J4MI, 14310, all in Japan. Also VS6AG, 14084, in Hongkong.

Ashley Walcott reports VS6AB, 14040, and VS6AG. Also VS1AD, "America Denmark," 14350, Singapore; VS2AK, 14265, Malay States. Very FB, Ashley! Best times for Asiatics in East is near 6 a.m.

YI2BA, 14100 approximately, Iraq, was heard by Ralph Gozen at 9-9:30 p.m. with an R6 signal. QRA is given below, received by Ed Murphy, W1IFK, our Stamford Nite Owl, when Ed was in CW QSO with YI2BA. QRA: YI2BA, % Port Directorate, Basra ya Mirgil ya, Irak.

HAM DX REVIEW

GW5KJ, 14125, giving no location, heard lately at 6:45 p.m. As the British Isles are being divided into different *call-prefix* areas, as Scotland, GM; Ireland, GI; Irish Free State, EI, it is quite likely that this is the new prefix for Welsh amateur stations. Those hearing other GW hams may write to the QRA of English amateurs whose call corresponds to the one heard, when the letter W is omitted from call, and we feel certain a veri will be forthcoming.

Till next month, our best wishes for DX and a mailbox chockfull o' Veries! Vy 73 from Ye ED.

Joe Miller.

An Effective S-W Pre-Selector

(*Continued from page 224*)

Pre-Selector Requirements

An effective pre-selector should, as it will be largely used at the high frequencies, tune with a comparatively low C, use plug-in coils of high efficiency or a switch-band system having no-loss characteristics, employ steatite or isolantite insulating parts, and be in general designed in keeping with the demonstrated dictates of ultra high frequency constructional practice. It may or may not be *self-powered*, but in any circumstance it should be small, quite inexpensive, and so engineered that no loss in power will be effected in transfering the signal which it selects and amplifies to the input of the receiver.

This design of ours is really quite elementary and simplified—but it non-theless meets requirements to a "T." It is extremely efficient, provides enormous R.F. signal gain, tunes sharply and cleanly, corrects image and signal selectivity maladjustments in the worst of receivers, and —which is highly important—features a thoroughly sound method of matching its output to the receiver. Powering voltages are obtained from the receiver or a separate "A" and "B" supply, and the coils are of the *plug-in* type.

The Circuit

The circuit is adapted from the familiar *tuned grid-tuned plate* hook-up and requires two sets of coils for each band to be covered. Both coils—that is, both *grid* and *plate* windings—are simultaneously tuned by a "two-gang" .0001 mf. (per section) variable condenser, and peak alignment is facilitated by the adjustment of Hammarlund APC air trimmers installed within the coil forms, and wired so that they be used in parallel or in series with the tuning capacities. (The series arrangement is desirable for full dial scale spreading of limited amateur and short-wave broadcast bands).

The plate winding does not, it might be noted, carry DC, B plus to the tube plates being fed through a pie-wound short-wave choke.

This sort of scheme works out exceptionally well for pre-selector purposes and is well worth the additional cost of plate coils and the inconvenience of having to remove and replace two forms with each band-change. The tuned plate circuit places a positive load on the tubes, permits really effective amplification, and further facilitates the business of properly matching the instrument into the receiver and without signal loss. With regard to this last, it should be noted that output windings on the plate coil forms may be so adjusted, in number of turns, etc., that an exact match to receiver input coils may be effected. The windings may be made different on different coils and to match different inputs as determined by matters of individual receiver construction.

Some *regeneration* is, of course, desirable, and we have so arranged the placement of parts that the right amount of feedback coupling between plate coil and grid circuit is had without any necessity for a coupling device. Note that the grid cap of one R.F. tube is quite close to the plate winding.

The manually adjustable rheostat in the cathode to ground lead determines both regeneration and general gain. Two tubes, note, are employed in parallel connection, and it is suggested that the pair be used by the builder of a duplicate pre-selector. No difficulties in the way of "peak-loading" are experienced, no especial broadness of tuning is effected, and no noticeable tendency toward instability results when the two tubes are thus employed. As a matter of fact the *gain* is almost doubled over that for a single tube—as can be at least fairly well shown with the pre-selector in operation, by lifting one grid cap connector from tube contact and noticing the drop in signal level.

As maximum gain and selectivity are more or less dependent upon the exact alignment of grid and plate tuned circuits at a selected frequency, some means for manually peaking these circuits is made desirable. The air-trimmers in the coil-forms do, of course, effect alignment at the high frequency limits, but precise "tracking" calls for an additional trimmer mounted on the panel and bridged across either the grid or plate tuning condensers, exact placement depending upon matters of load as they affect the tuning curves for the two circuits. Some antennas may be such that they load up the grid coil; and here the trimmer might be required across the output circuit in order to compensate for the effect of such a load. Some connections may disturb the output tuning curve, requiring use of the trimmer in the grid circuit. Proper placement will be really a matter of trial and error experiment in individual instances.

Construction

Any small lift-cover cabinet will work out satisfactorily for this design, that used for the laboratory model being a made-up job 9" long by 6" high by 8" deep and provided with a rather shallow (1 inch high) chassis, spot-welded to the removable front panel. As constructional layout data must be referred to some particular chassis and cabinet, however, that used for the lab. model is suggested for exact reproduction by the reader.

The specified dial is small, very efficient, and certainly neat and professional looking, and is mounted on the chassis (for proper line-up with the front panel cutout) by means of its support, one-half inch of which is bent back and bolted down. The two tuning condensers are ganged together with a flexible coupler, and then mounted on stand-off insulators—with five- and ten-cent store fibre washers placed between frames and insulators until with the stand-offs fastened to the chassis the common condenser shaft lines up properly with the dial hub. Another flexible coupling is used to connect shaft and hub together, to facilitate alignment and to isolate the tuned circuit as much as possible from the grounded dial mechanism, whose bearings and wiping parts might cause tuning noises.

The two socket holes are stamped out so that the 6K7 tube grid caps will be really close to the stator terminals on the grid tuning condenser. Sockets as used in the laboratory model are suggested, not only because of their high dielectric efficiency (low power and loss factors) at ultra high frequencies, but because they take up little space and further may be positioned for shortest possible leads to associated components. (These sockets are retainer-ring mounted and will require no riveting or bolting to the chassis.)

Similar sockets mounted in the adapter plates with which they are regularly supplied are used for coil plug-in, and are elevated above the chassis by means of spacers and long machine screws until prong terminals are in the clear. (The resilient concentric retainer rings take on the full strain of repeated coil form insertion and removal and the plates the full strain of chassis mounting. This assures us against any possibility of socket breakage.)

The *gain* or *regeneration* control and the manually adjustable *tracking-trimmer* are mounted on the front panel, to the right and left of the dial, and a 3-terminal moulded antenna assembly and two terminal output assembly are mounted on the rear wall of the chassis.

Wiring

Little information need be given regarding proper wiring procedure. Simply keep leads as *short* as conveniently possible—

Where C_1 has a maximum capacity of .0001 mf. and C_2 (the trimmer) is adjusted to say .000025 mf. maximum effective C or CS will equal

$$\frac{.0001 \times .000025}{.0001 \text{ plus } .000025} \text{ or 20 mmf.}$$

Where C_1 has a minimum capacity of .000006 mf. and C_2 retains its adjustment at .000025 mf. an effective minimum capacity of 4.8 mmf. will be obtained.

The change in capacity from minimum to maximum will be approximately 5 mmf.—sufficient for wide scale bandspreading of 28 mc amateur phone stations and more than full scale spreading for the complete 14 mc. band. The actual variable C in the circuit will not be sufficient for complete coverage on lower frequency bands, however, and series trimmers for coils used on such bands must be adjusted for a much wider range.

Adjustments and Operation

With the pre-selector and at least one set of coils built, the constructor should go over his wiring carefully and check on opens and shorts in the few components. He should then work out some means of obtaining a proper B supply from his receiver.

The two tubes will draw from 15 to 20 milliamperes of B and .6 amperes of 6.3 volt "A" current, and if the receiver has insufficient reserve power to permit this additional drain on its transformer a separate supply may be necessary. Such a supply may be inexpensively built and will require simply a midget transformer, a miniature AC-DC choke and a power resistor which will (in series connection) drop rectified "B" output down to 250 or so volts, an 80 tube and socket, and a dual or 8-8 mf. electrolytic. Sometimes a receiver will supply the necessary "B" voltage but will not stand an additional .6 ampere of "A" current drain, and here we may simply get the high voltage from the receiver, relying on an auxiliary 6.3 volt filament transformer installed in the pre-selector cabinet to provide the 6K7 heater current.

B plus measurement at the R.F. tube plates should be approximately 250 volts, screen measurement 100 volts through 50,000 ohms dropping resistor, cathode voltage with the gain control wide open for full tube conductance—3 volts.

Now connect the antenna to one input post—shorting the other post to *ground*. (For *doublet* connection use both antenna posts and do *not* ground either one.) Then connect the output posts to the receiver input posts using as short as possible lengths of wire and running them through low-capacity shield tubing grounded at both pre-selector and receiver. Plug in the two coils, connect the power supply, open the ganged tuning condensers, set the manual trimmer for approximately middle capacity and the gain control for moderate amplification, and then adjust the trimmers within the coil forms for maximum noise level. Tune in various signals throughout the operating range, noting required readjustment for the manual trimmer, and change the connections on this trimmer from grid to plate circuits or vice versa if such seems necessary.

With a signal tuned in, advance the *gain* control for maximum level. The signal *should* come in strongly and sharply, with *background noise falling off greatly.*

Oscillation should definitely not be experienced with the gain control advanced. If it is present, then the capacity between plate coil and the grid cap and lead of the nearby 6K7 is too large and the feed-back too great. A shield partition should be placed between this coil and the tubes and, as effective shielding will entirely eliminate any feed-back and regeneration, some external means for coupling coil to grid circuit should be employed (such as an insulated wire, one end connected to the plate terminal at the coil socket, one end wrapped around but insulated from one grid lead) to secure a desirable maximum gain.

R.F. leads in particular—and use tie-points where necessary to keep small parts from moving about and making chassis or other contact when they shouldn't. Use physically small by-pass condensers and make every effort to bring all returns to one *common* ground point.

Coil sockets should be wired as the accompanying diagram indicates. Leads from the antenna input posts to the grid coil socket should be brought across the chassis depth through *low-capacity shield-tubing* and leads from the plate coil socket to the output posts should be *short* and *direct*.

If the cabinet and chassis which we have recommended are used there will be no space on the rear chassis wall for either a power-supply connection plug, or for an alternative four post A and B tie assembly. For that reason it is suggested that four leads (two for filament, one for ground, and one for B plus connection) be brought out the rear and through a low-capacity shield tubing (as shown) for soldering to a male plug. Such a plug should be connected in after the chassis has been installed in the cabinet, by the way, unless an opening is provided in the back of this cabinet large enough to permit the passing through of the plug.

Coils

Coil winding data is given in an accompanying diagram. Both grid and plate coils for a given band may be exactly alike in adjustment and number of primary and secondary turns, in which case they will be interchangeable. However, though the grid and plate windings in themselves must be alike to insure proper *tracking* and *spotting*, primary windings may have unlike characteristics if dissimilarity is found advisable because of antenna and output load matters.

The trimmers are installed in the coil forms, their two leads brought to separate prongs for parallel or series connection with the tuning condensers and as individual service suggests. If they are used in series, they will, of course, cut down the total tuning capacity appreciably and thus spread ordinarily narrow bands over a wider than normal amount of dial scale. The coils must be the more accurately wound to permit precise spotting and tracking, of course, and it will be imperative to bring the return lead for the variable condenser to one socket terminal for the series trimmer, to break the regular tuning condenser return to ground, and to connect the free trimmer socket terminal to chassis to complete the LC circuit.

The formula for capacities in series will be of value here in determining the maximum C and thus the minimum to maximum capacity variation.

$$CS = \frac{C_1 \times C_2}{C_1 \text{ plus } C_2}$$

List of Parts and Materials

COIL DATA
L1—Antenna winding on grid form.
L2—Grid winding.
L3—Plate winding—similar to L2.
L4—Output winding on plate form.
(See text for data on above windings.)

HAMMARLUND
C1 and C2—Type MC100-M variable condensers.
C3 and C4—APC air trimmers, two for each set of coil forms, maximum capacity as required.
C5—HF-15 midget variable.
C—Optional—HF-15 midget variable.
RFC—CH-X midget choke.
2—FC couplings or two ICA 2101 couplings.

AEROVOX
C6, C7, C8—Type 284 .05 mfd. tubular condensers.
C9—Type 1467—.001 mfd.
C10—Type 484—.1 mfd.
R1—1 watt resistor—200 ohms.

ELECTRAD
R2—Volume control type.
R3—½ watt 50,000 ohms.
P—6.3 volt dial and socket (socket to be soldered to panel).
Male plug—Connector.

OTHER ITEMS REQUIRED:
2—Round 8-pin steatite sockets.
2—Round 6-pin steatite sockets, with adapter plates.
1—Three-post antenna assembly (Two posts insulated).
1—Two-post output assembly (Both posts insulated).
2—Nameplate knobs.
1—Nameplate dial.
1—Cabinet and chassis, to layout specifications.

RAYTHEON
2—6K7 tubes, with isolantite insulation between shells and grid-cap terminals.
50 feet—No. 20 hook-up wire.
2 feet—Low-capacity shield tubing.
2 Stand-off insulators—1⅛" between mounting hole centers.
1—dial, airplane type.

New S-W Apparatus for HAMS

(Continued from page 242)

The New 866 Jr.

(Half-Wave Mercury Vapor Rectifier)

● The 866 Jrs. fill a real need for intermediate power requirements. They are intended to be used as rectifiers in power supplies of from 600 to 1000 volts D.C. where the receiving type full-wave rectifiers will not stand up and where the power capabilities of the Heavy Duty 866's are not necessary. The smaller size of the 866 Jrs. is another feature that will prove to be of great advantage in the layout of compact power supplies.

The 866 Jr. uses the multi-strand filament. The multi-strand filament construction used in these rectifiers has twice the emitting surface of the nickel-alloy ribbon-type filaments used in ordinary 866's. The longer life secured with heavy duty 866's has proven that the use of the multi-strand filament results in better rectifiers.

GENERAL CHARACTERISTICS

Fil. Volts	2.5 V
Fil. Current	2.5 A
Max. RMS A.C. Volts	1250
Max. D.C. Current per pair (Choke input)	250 M.A.

PHYSICAL CHARACTERISTICS

Max. Length, Inches	5¼
Max. Diameter, Inches	2¼
UX Ceramic Base	

Connect plate terminal to usual position standard on all UX bases.

The Editors Want

articles describing in detail television receivers on which short-wave experimenters may pick up the television images being broadcast by the RCA Station, in New York City, on about 5 meters, and also those being broadcast in Los Angeles and Philadelphia. All articles accepted and published will be paid for at regular space rates. Send outline of article and what diagrams available to: The Editor, Short Wave and Television, 99 Hudson St., New York, N.Y.

A Simple, Rotary 5-Meter Beam Antenna

(Continued from page 228)

away. While our own beam was actually *in the air* for nearly a month before we had an opportunity to use it, we had plenty of time to observe the manner in which it would withstand the wind and two weeks ago, we had one of the most severe wind storms that Long Island has seen in several years. No difficulty was experienced.

The Brach type FP-999-W broadcast antenna poles are provided with a mounting bracket which is bent to an angle of forty-five degrees. We bent this bracket to an angle of ninety degrees and it formed an ideal support for the antenna itself.

It happens that our crystal has been cut to oscillate on a frequency of 7,245 kilocycles and by suitable doubling, as explained in our article last month, we came to an ultimate frequency in the final stage of 57,960 kilocycles. Extending the telescopic fishpoles to their limit produces rods which are 96½" long and that is just about correct for the frequency on which we are transmitting. Such poles can be used satisfactorily from the middle to the high frequency end of the five meter band but they are not satisfactory for frequencies below 58 megacycles.

The crossarm that we use is made of a piece of well seasoned pine two inches square and one-hundred and five inches long. Two radiators are mounted on the upper side of this cross-member and two are mounted on the lower side. A piece of heavy, insulated wire is provided with this type of fishpole and by joining these lead wires from the two upper radiators at the center and following the same procedure with the two lower radiators we have an "H" beam which might very well be fed by a low impedance transmission line.

In our case, however, we preferred to use an open line for a part of the run to the shack and a junction to the open line is made, without introducing any serious difficulties by sliding the ends of the low impedance twisted pair up and down the last foot or so of the open line until the best point is found, in the usual way. A satisfactory point for starting to locate the optimum junction between the open line and the low impedance twisted pair is to make the open line any number of half wavelengths long.

A Simple Spaced Pair

A few years ago we designed a special type of transposition block, for use in connection with the making of noise-reducing antenna. These blocks provide one of the simplest methods of making an open transmission line because they keep the wires separated the correct distance, they can be inserted in the line without any tie-wires and any time that it is found desirable to insert additional spreaders these transposition blocks can be used very satisfactorily. When a transmission line of this type is made it should be borne in mind that the wires are NOT transposed. The wire we used is approximately the equivalent of No. 14 solid and, as it becomes automatically spaced with the use of these transposition blocks, we provide ourselves with a line having an impedance of approximately 450 ohms. The losses in a line of this kind are negligible, even at five meters. This is not true of any twisted pair nor is it true of any type of coaxial conductor. So, wherever an open spaced pair can be used, particularly on the ultra hi-frequencies, it should be used and the use of nothing but the best twisted pair should be used in conjunction with it.

Making the Beam Rotate

The simplest method for mounting the 2 x 2 inch cross-member on the top of our 3 x 3 mast would be to drill a reasonably small hole through the 2 x 2 and run a fairly long lag screw into the top of the mast, placing a metal washer between the head of the lag screw and the top of the cross member and another one between the bottom of the cross-member and the top of the mast. Such an arrangement is all right for a temporary affair but it is certainly not workmanlike and we believe that the arrangement that we have used will be welcomed by those amateurs who contemplate making their rotary beams more substantial. The arrangement that we have used is a very simple but very effective one.

We secured a copper contact, of the type which is used on large elevator controls from the Chas. E. Chapin Company* which happens to have its headquarters in our own building in New York City. The contact that we use is known as No. 109 and it has an outside diameter of 2¼". The base is ⅜" thick, the pin is 2⅞" long and the diameter of the pin is ½". We drilled three holes through the base and then counter-sunk the holes so that the contact itself could be fastened to the top of the mast with three wood screws. Insulating bushings for these copper contacts are stock items and they are made of molded bakelite. They have a bottom surface which is equivalent to the surface of the base of the copper contact. We drilled a hole through the cross-member and sunk the bakelite bushing into the hole and that gave us a very satisfactory bearing and prevented any side swaying of the cross-member. Plenty of vaseline was applied to the upper surface of the copper contact and the lower surface of the bakelite bushing. The complete antenna can be rotated so easily that it turns as though it was mounted on ball-bearings.

The manner in which the rotation is effected may be seen from the accompanying sketch.

In designing the ultra high frequency antenna it should be borne in mind that we are very likely to run into a situation where more than ordinarily good insulation will be required. This is especially so if the ultra hi-frequency transmitter is being operated on reasonably high power, as is the case in connection with our own transmitter. It will be seen from one of the sketches that National Steatite stand-off insulators have been attached to the center of the cross-member so as to provide suitable insulation at the central portion of the matching section of the antenna itself.

*Address furnished upon request.

Piping R.F. With Concentric Lines

(*Continued from page* 230)

the transmitter have encouraged this practice generally. These advantages include among others greater freedom from spurious coupling effects in the transmitter which are produced by the strong electric fields immediately beneath the antenna structure, and a greater degree of flexibility in the overall design. Under these conditions, however, the radio frequency connection to an antenna required is generally of sufficient electrical length to warrant careful consideration of its electrical properties from the standpoint of transmission line theory if an efficient, trouble-free connection is to be provided.

Within the past few years the concentric type of transmission line has been gaining in favor over the open-wire type. In addition to providing far more constant electrical characteristics, this type of line offers many other attractive advantages. Concentric transmission lines may be buried in the ground since all of the radio energy is totally enclosed by the outer conductor. Thus the hazard of unsightly exposed wires carrying high voltages is eliminated and the possibility of spurious couplings between the antenna and line are prevented. Furthermore, the concentric line will not be a source of harmonic radiation and is not affected by weather conditions.

The outward appearance of these lines is simply that of a metal tube or pipe. A cross sectional view, however, reveals an inner coaxial conductor which for the sake of economy is frequently made hollow. This inner conductor is generally supported by toroidal shaped, ceramic insulators spaced so that by far the greater part of the medium between the inner and outer conductors is air or gas. Calculations and experimental verifications have shown that a most desirable ratio of diameters* of these conductors exists and that this ratio is ordinarily between 2.7 and 3.6 to 1. While the ratio is not very critical, there is considerable justification for employing lines having a ratio of diameters within this range. The ratio 2.7 to 1 represents the optimum ratio from the standpoint of corona formation and voltage flashover, while the 3.6 to 1 ratio corresponds to the minimum radio frequency loss conditions, both for a given size outer conductor. Also, these ratios present no particular mechanical problems.

Typical concentric radio frequency transmission lines cut away to show the insulators and inner conductors are shown in one of the photos. These lines are manufactured in sizes ranging from a fraction of an inch to several inches in diameter. The fourth line from the right is used to transmit radio frequency powers up to 15 kilowatts and the second line from the right will handle up to 100 kilowatts.

In contrast to the complex nature of the electro-magnetic field about open-wire transmission lines, concentric lines present well defined field patterns. The diagram depicts such a pattern. The electromagnetic field, as in any conductor of electric currents, radiates outward from the conductor in a series of concentric rings; whereas the electrostatic field extends radially outward from the inner conductor cutting the magnetic field at right angles similar to the spokes of a wheel. The fields, as may be seen from the diagram, are entirely confined to the medium between the internal surface of the outer conductor and the external surface of the inner conductor. It is for this reason that no radiation takes place from the line, permitting it to be buried in the ground if desired.

The flow of electric current becomes more confined to the surface of the conductors as the frequency is increased, thereby increasing the current density for a given current and in turn increasing the conductor losses. At broadcasting frequencies, the current may be considered as confined to very thin conducting surfaces. It is interesting to note in this connection that at ultra high frequencies a tarnished wire exhibits a measurably higher resistance than a polished one. Neglecting dielectric losses, which can be made small in well constructed concentric transmission lines, the losses are proportional to the square root of the frequency.

The conductor losses are also inversely proportional to the diameters (with fixed diameter ratio) and proportional to the square root of the resistivity of the conductors. At broadcasting frequencies, the losses in copper transmission lines with air or gas dielectric are for most practical purposes negligible and, in general, less than the losses in the associated circuits.

One of the most fundamental parameters of a transmission line is its characteristic impedance. This is a function of its several distributed electrical constants but may be easily computed, however, from its physical dimensions. It is desirable, for several reasons, to terminate a transmission line in a pure resistance load equivalent in value to the characteristic impedance. By so doing, standing waves are avoided which if present may cause corona discharges or flashover within the line at nodal points. Also, the input impedance is then equal to the load impedance irrespective of the length of the transmission line, so that the transmitter output circuit can be designed to work into a predetermined transmission line impedance.

The design of lines suitable for transmitting a specified amount of radio frequency power safely must also involve a consideration of the voltages which are to be imposed on the line. This voltage in the case of a line terminated in its characteristic impedance (Z_0) remains constant throughout its length and is simply:

$$E = \sqrt{P Z_0}$$

where P is the radio frequency power at the carrier in watts.

E is the radio frequency r.m.s. voltage at the carrier.

This must be multiplied by 1.414 to obtain the radio frequency peak voltage at the carrier and again by 2 to obtain the radio frequency peak voltage at 100% modulation.

In a concentric transmission line the maximum voltage gradient occurs at the surface of the inner conductor. A smooth line free from insulators and perfectly concentric flashes over at radio frequencies when this gradient exceeds about 20 kv/cm. The presence of insulators, slight irregularities in the surface of the conductors, etc., often produces this gradient at localized points on the inner conductor long before the same gradient on a smooth part of the surface is reached; consequently the breakdown voltage is not readily calculated from standard formulas with any great degree of accuracy.

Theoretically for two lines of similar construction but of different cross-sectional dimensions, the ratio of their breakdown voltages is proportional to the ratio of their characteristic impedances times the ratio of their inner conductor diameters. However, experiments have shown that due to the large number of other variable factors involved, it is advisable to measure the actual breakdown voltage in each case to obtain definite information.

A notable example of the use of concentric transmission lines is at the new 50 kilowatt station WOR in Carteret, N. J., in connection with a three-element, directive antenna system designed by Bell

* The ratio of inner diameter of the outer conductor to the outer diameter of the inner conductor.

Telephone Laboratories. In this installation a 2⅝" O.D. copper line is employed. The line is filled with nitrogen gas under pressure which serves to exclude the possible entrance of moisture and to provide an additional factor of safety by more than doubling the normal breakdown voltage. Two of the photos show close-up views of details of this line. Gas valves and connections are partially visible in one of the photos.

Concentric lines have been found to exhibit certain electrical properties which render them useful in performing special duties as circuit elements. Sections of line which are either short-circuited or open-circuited at the far end are equivalent at the near end to substantially pure inductances and capacitances varying cyclically between zero and infinity as the length of the section is varied.

In the significant case of a quarter-wave line which is short-circuited at the far end, the input impedance approaches infinity at the operating frequency, while at even harmonics of this frequency the input impedance is but a fraction of an ohm. This property makes the quarter-wave line valuable as a shunt for suppression of the even harmonic frequencies flowing in the main transmission line connecting the transmitter to the antenna. A similar shunt for the third harmonic and its multiplier is obtained in a line which is short-circuited at a distance equal to one-sixth of the operating wavelength.

The one-sixth wave line exhibits a positive input reactance at the operating frequency. While this property makes it impossible to bridge it across the main line as in the case of the quarter-wave line without proper coupling means, the positive reactance can be anti-resonated with a line, in parallel at the coupling point, which is equal to one-twelfth of the operating wavelength and open-circuited at the far end. The latter line will offer further attenuation to the odd harmonics.

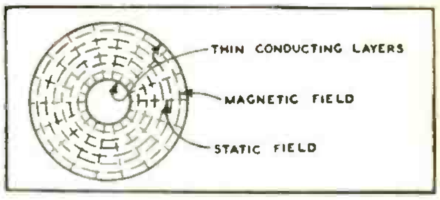
The attenuation offered to the harmonics by these shunts depends upon the ratio of the harmonic impedance of the main line to that of the shunt, since the output of the transmitter may be considered as a source of constant harmonic current. Expressed in decibels, this attenuation is:

$$\text{db} = 20 \log_{10} \frac{Z_1}{Z_s}$$

where Z_1 is the harmonic impedance of main line.
Z_s is the harmonic impedance of shunt line.

When the shunt is connected across the sending end of the main transmission line of a given length, it is necessary to consider the impedance of the load at the harmonic frequency. The most desirable load impedance at the harmonic frequency will depend entirely upon the particular length of transmission line which is used. Thus, for example, a line which is approximately a quarter wavelength long at the harmonic frequency should be terminated in a low harmonic impedance in order to produce a desirable high impedance at the sending end.

On the other hand, a line which is approximately a half wavelength long should be terminated in a relatively high harmonic impedance. Under favorable conditions, harmonics delivered to the antenna may be suppressed 50 db or more by the application of such a shunt. The new 50 kilowatt station WJR at Detroit makes use of a quarter wavelength concentric transmission line harmonic shunt to suppress the second harmonic radiation which, in this case, is the exact operating frequency of another Detroit station.



Static and Magnetic Fields

With the advent of tall radiating structures, the problem of suitable tower lighting circuits has become of some importance. In many cases large electric signs displaying the station's call letters, etc., have imposed unusually heavy requirements upon these circuits, which must be designed to prevent the flow of radio frequency energy from the antenna structure to ground and at the same time allow the free passage of low frequency power to the lights.

At station WWJ in Detroit a quarter-wave concentric transmission line serves in the above capacity. The inner conductor of the line is the conduit which carries the lighting wires from the source to the lights. The outer conductor extends from the antenna base back towards the transmitter for a quarter wavelength and is then short-circuited to the inner conductor. This quarter wavelength section of concentric line, as well as the remaining length of conduit, is buried except for a short vertical section at the antenna where the connections emerge from the ground. Large amounts of low frequency power can in this way be economically and efficiently fed to the lights. In addition, this tower lighting connection serves to suppress even order harmonic radiations and provides a static drain for the antenna.—*Courtesy of "Pick Ups"—Western Electric Co.*

1938 Super Skyrider

(Continued from page 232)

tubes—4 metal, 7 glass, and they function as follows: 6K7 R.F., 6L7 first detector, 6J5G oscillator, 6K7's in the two I.F. stages, 6R7G second detector, AVC and first audio, 2V6G beam tube power-amplifiers, 6J7G signal indicator amplifier and a 6Z3 full-wave rectifier. The band-spread dial and the signal meter dial are illuminated; air trimmers are used. The undistorted power output is 13 watts with a maximum of 18 watts. The set measures 11" deep, by 9¼" high, by 21" long. The various controls on the panel are: tone control, AVC, "on-and-off" switch, BFO injector, "send-receive" switch, A.F. gain, Band-Switch, R.F. Gain, Selectivity (broad and sharp), Pitch Control for beat oscillator, and crystal (in-and-out) and phasing control.

This article has been prepared from data supplied by courtesy of The Hallicrafters, Inc.

High Efficiency Doubling

(*Continued from page* 231)

generation of new frequencies which are multiples of the exciting frequency. But with all of this an efficiency of 30% can be considered good, with considerable less efficiency on the ultra-high frequencies. And we haven't mentioned the "trickiness" usually associated with such doublers.

Push-Push Doubling—Its Features

But in *push-push* doubling the picture is entirely reversed because in reality the tube or tubes are acting as a straight amplifier with its attendant high efficiency. Figure 1 shows the fundamental circuit. Here we see that the grids are connected in push-pull and the plates in parallel. This circuit doubles the frequency, *not because of distortion*, but because each RF impulse applied to the grid circuit results in two impulses in the plate circuit. Thus there are twice as many impulses in the plate circuit as there are in the grid circuit, or in other words, the frequency of the plate tank is twice that of the grid tank. The ultimate result is that the output is all second-harmonic output and efficiencies of 60 to 70% are the rule and not the exception. This means, "believe it or not," that in the push-push doubler stage the output on the second harmonic will be greater than the output of a single tube used in the same stage as a straight amplifier. And this is a very welcome condition as every amateur will readily testify.

The single tuning condenser in the grid circuit and the by-pass condenser from the center of the coil to ground, allows half of the grid coil to act as an *untuned* grid coil of a TNT oscillator with consequent spurious oscillations. *Fig. 3 will cure all this and has never failed to work.* Here the split-stator tuning condenser across the grid coil, with the rotors connected to the center of the filament circuit and grounded, delivers an equal amount of RF to each grid and provides a capacitance reactance to the second harmonic, which in turn prevents spurious oscillations in the doubler circuit.

Figure 4 illustrates how the push-push doubler can be converted to a *push-pull* amplifier with a minimum amount of trouble. This circuit is first set up as a push-pull amplifier and the stage neutralized in the usual manner. Then to use as a push-push doubler, no changes are necessary—other than to use a plate coil of *twice the frequency* and connect the plates in parallel. This can be effected by a switch as shown.

An Interesting Circuit Using a "Dead" Tube

Figure 5 is very interesting, especially when applied to neutralization. To use as a *push-push* doubler, the circuit is exactly the same as Fig. 3. But to use this circuit as a straight amplifier a plate tank of the *same* frequency as the grid tank is used and one side of one filament is opened. This "dead" tube, due to its internal capacities, effectively and completely neutralizes the other tube. For the amateur who has one good tube and another burned-out tube of the same kind, this is a Godsend as he can change frequencies at will and forget about neutralization. No difficulties with this circuit should be encountered but if the stage is not completely neutralized reverse the filament leads to the dead tube and this will usually effect a cure.

In the foregoing we have spoken solely of doubler "stages," but there is no reason why the same can not be said for using this circuit as a final amplifier. In fact I personally prefer this circuit as a *final*, due to its *efficiency* and *simplicity*.

Fig. 4 illustrates how to get about the same output on two consecutive bands with the changing of only one coil and the throwing of a switch. For the amateur who has a number of crystals and likes to work in different parts of the bands, or for the phone amateur, where complete neutralization is a necessity and sometimes a problem, the circuit of Fig. 5 is ideal.

As to the proper tubes to use—any of the ordinary tubes used as class C amplifiers will work OK. The common 45's, 10's, and 211's are fine, down to and including 20 meters. The same can be said for 46's with their grids *tied together*. On the higher frequencies, 10 meters and up, 42's, 53's, 50T's work better than the higher C tubes. Some of the newer tubes with their very low inter-electrode capacities should make ideal *push-push doublers* at *all* frequencies. Remember that the output capacity of the tubes are in parallel and consequently some experimenting may be necessary to get a low C plate tank. In order to get the highest efficiency both grid and plates should be as low C or high inductance as possible, and the grid circuit should be kept symmetrical.

The 53, 6A6, RK34 are known as *twin triodes* and therefore make ideal low-power *push-push* doublers. See Figure 6. A 53 with 350 volts on the plates will put out 10 watts of RF down to and including 10 meters. They will work on 5 meters but at a somewhat lower efficiency. More output can be secured by raising the plate voltage and then it would be advisable to insert a 400 ohm, 10 watt resistor in series with the cathode to provide some automatic bias.

Figure 7 shows a novel development of the circuit as applied to a twin triode and shown in the new transmitter kit of the Phelps-Dodge Corp. Here a .01 mf. mica condenser and a switch are connected across the plates. With the switch closed the circuit acts as a normal push-push doubler. With the switch open the DC is cut off from one plate, yet leaves the circuit capacities practically unchanged. Thus the "dead" section neutralizes the other section and the circuit acts as a *straight amplifier*.

The problem of doubling from 10 meters to 5 meters is probably the toughest one of all. Yet Fig. 8 shows how it can be done and is the only one I have seen where any appreciable power gain was realized. The tubes used are 42's or 2A5's. While the screen voltage can be obtained from a dropping resistor, it is advisable to use a tapped bleeder arrangement as shown. With too *high* voltage the screens run hot, and with too low voltage the output drops off so the variable screen voltage arrangement is preferable. With 400 volts on the plates 10 to 15 watts of RF on 5 meters can be obtained without any difficulty.

A high-output ***crystal oscillator*** with low crystal current is something we usually strive for. Figure 9 illustrates such an oscillator with equal output on two consecutive bands. The circuits shows type 59 tubes used with their screens and suppressors tied together, although 802's or RK25's would give more than twice the output of 59's. Two coils are used—one tuning to the crystal frequency and another tuning to twice that of the crystal. For fundamental operation SW1 is closed, the fundamental coil inserted in the plate circuit and SW2 thrown so as to connect this coil to the other plate. The circuit now becomes a push-pull oscillator for fundamental operation. For push-push operation at twice the crystal frequency the fundamental coil is put in the screen-suppressor circuit and SW1 opened. The coil tuning to twice the crystal frequency is inserted in the plate circuit and SW2 thrown so as to connect the two plates together. We now have all ***second harmonic*** output. In an experimental set-up using a single 59 as a *straight* pentode crystal oscillator and a 400 volt power supply, the output was *8 watts on 80 meters*. Changing over to the well known "tritet" circuit the output was 5 watts on 40 meters. Using the same crystal and power supply in the circuit of Fig. 9 gave an output of *16 watts on 80 meters and 15 watts on 40 meters.*

Water-Cooled Tube

(Continued from page 244)

higher frequencies, either type can be used with maximum input at frequencies as high as 300 megacycles. No. 643.

RCA-887

As R-F Power Amplifier—Class C Telephony.
Carrier conditions per tube for use with a max. modulation factor of 1.0.

D-C PLATE VOLTAGE	2000 max.	Volts
D-C GRID VOLTAGE	-500 max.	Volts
D-C PLATE CURRENT	200 max.	Milliamperes
D-C GRID CURRENT	75 max.	Milliamperes
PLATE INPUT	400 max.	Watts
PLATE DISSIPATION	400 max.	Watts

TYPICAL OPERATION:

D-C Plate Voltage	1500	2000	Volts
D-C Grid Voltage	-450	-500	Volts
Peak R-F Grid Voltage	800	850	Volts
D-C Plate Current	200	200	Milliamperes
D-C Grid Current (Approx.)	50	50	Milliamperes
Driving Power (Approx.)	35	40	Watts
Power Output (Approx.)	200	300	Watts

This article has been prepared from data supplied by courtesy of RCA Radiotron Division.

New "Overseas" Dial Makes S-W Tuning Easy

(Continued from page 233)

ing the loudspeaker unit has been scientifically sealed in a chamber shaped like an arc. The back waves from the speaker are thus controlled, directed and released through a number of measured openings to blend with the sound coming out of the front of the set and create a truly natural tone quality. This new Sonic-Arc Magic Voice eliminates the boominess and over-emphasis of the low tones found in many other receivers.

Added to all of these new developments are innumerable other features, such as the Magic Brain and Magic Eye, which with almost human intelligence direct and control the functions of the radio set.

(This article has been prepared from data supplied by courtesy of RCA Manufacturing Co.)

Mechanical Scanning for Television

(Continued from page 213)

scanning as much as 1,000 line pictures, either at the transmitter or the receiver. It will, doubtless, be some time until such television is ready for the market.

The first television which the public is likely to see will, I am confident, be a television news service developed in our laboratories. In this, letters 6 inches high will be seen moving across a screen 3 feet wide, spelling out the latest news of the day as to world affairs, politics, sports, stock exchange prices, weather, etc. Interspersed among such bulletins there may be advertising notices of business houses. While news has been transmitted by mechanical typewriters over wire lines, hitherto, such apparatus was neither noiseless nor inexpensive and particularly in these days, expense is a matter which concerns most everyone. By using television news equipment, these disadvantages are eliminated for only a simple receiver and scanning disc, modulator tube and light source are needed.

Transmission is equally simple, being accomplished by typing messages on transparent tape, which is then scanned mechanically. The electrical impulses thus broadcast being transmitted either over land lines or by radio. Such apparatus has been operating successful at our laboratories for more than a year and we feel it will bring the public its first glimpse of practical commercial television.

Short Wave Scouts

(Continued from page 229)

OLR3A—9.550 mc.—Czechoslovak Shortwave Station. Praha, Praha XII., Fochava 16, Czechoslovakia.
ORK—10.330 mc.—Radio Ruysselede, West Flanders, Belgium.
Radio-Coloniale—15.245 mc.—"Radio-Coloniale", Paris, France.
Radio-Coloniale—11.880 mc.—"Radio-Coloniale", Paris, France.
Radio-Coloniale—11.715 mc.—"Radio-Coloniale", Paris, France.
DJA—9.560 mc.—Deutschen Kurzwellensenders, Berlin, Germany.
DJB—15.200 mc.—(Same as above)
DJD—11.770 mc.—(Same as above)
DJE—17.760 mc.—(same as above)
DJL—15.110 mc.—(Same as above)
DJN—9.540 mc.—(Same as above)
DJO—11.795 mc.—(Same as above)
DJP—11.855 mc.—(Same as above)
DJQ—15.280 mc.—(Same as above)
DJR—15.340 mc.—(Same as above)
DZB—10.042 mc.—(Same as above)
DZC—10.290 mc.—(Same as above)
DZH—14.460 mc.—(Same as above)
PHI—17.775 mc.—Philips Radio, Huizen, Holland.
HAT4—9.125 mc.—"Radiolabor" Gyali-ut 22, Budapest, Hungary.
HAS3—15.370 mc.—"Radiolabor", Gyali-ut 22, Budapest, Hungary.
2RO-3—9.635 mc.—E.I.A.R., Rome, Italy.
2RO-4—11.810 mc.—E.I.A.R., Rome, Italy.
HVJ—15.120 mc.—Vatican City.
Shortwave Radio Station—6.100 mc.—Belgrade-Poste Emetteur A Ondes Courtes, Belgrade, Jugoslavia.
CT1AA—9.650 mc.—Radio Colonial, Av. Antonio Augusto d'Aguiar, 144, Lisbon, Portugal.
RAN—9.600 mc.—Radio Centre Moscow, U.S.S.R.
RNE—12.000 mc.—Radio centre Moscow, U.S.S.R.
EAQ—9.860 mc.—P.O. Box 951, Madrid.
HBJ—14.535 mc.—Radio Nations, Geneva, Switzerland.
HBL—9.595 mc.—Radio Nations, Geneva, Switzerland.
HBP—7.799 mc.—Radio Nations, Geneva, Switzerland.

Asia

JVN—10.660 mc.—Kokusai-Denwa Kaisha Ltd., Osaka Bldg., Kojimachiku, Tokyo, Japan.
JZJ—11.800 mc.—Kokusai-Denwa Kaisha Ltd., Osaka Bldg., Kojimachiku, Tokyo, Japan.
XGOX—6.850 mc.—The Central Broadcasting Administration, Nanking, China.

Australia

VK2ME—9.590 mc.—"The Voice of Australia", Amalgamated Wireless, Ltd., 47 York St., Sydney, Australia.
VK3ME—9.510 mc.—Amalgamated Wireless Ltd., Melbourne, Australia.
VK3LR—9.580 mc.—National Short-wave Transmitter, Lyndhurst, Victoria, Australia.

Sweden

SM5SX—11.705 Mc.—Royal Technical University, Stockholm, Sweden.

Iceland

TFJ—12.235 Mc.—Icelandic State Broadcasting Service, Reykjavik, Iceland.

Canary Islands

EAJ43—10.370 Mc.—Apartado de Correos, 225, Santa Crus de Tenerife, Canary Islands.

Africa

EA9AH—14.200 Mc.—Tetuan, Spanish Morocco.

Trophy Contest Rules

● THE first of the new contests will be for the greatest number of verified stations heard in *Asia*. You may "listen in" from now until Aug. 25th.

A notarized affidavit must be sent with the veri cards and, of course, all of the veris will have to be for the contest assigned for each particular contest. The *Asia* "listening in" contest will close Aug. 25th, and the trophy award will be announced in the November number.

A—By midnight August 25th all entries for the *Asia* contest must therefore be in the hands of the Editors, together with the veris and the notarized oath that the contestant personally listened to all of the stations listed.

B—For the next issue, the October number, trophies will be awarded on the basis of the old rules, which require that 50% of the stations heard and verified must be foreign, and also that the listening time may be any 30-day period. In either contest, and in the event of a tie between two or more contestants, each listing the same number of stations, the judges will award a similar trophy to each contestant so tying.

C—Bear in mind that the veri cards should be absolute verifications, and not simply an acknowledgement that you notified a station that you heard them. Several stations do not verify, but simply send an acknowledgement card. Note that in either contest that only experimental phone or broadcast stations should be entered in your list. No *amateur* transmitters or *commercial code* stations can be entered. For the October contest, which follows our regular rules, the entries must be in the Editor's hands by midnight of the 25th day of the month for the next succeeding issue. The contest for the October issue will close in New York City, July 24th, etc.

The judges in each contest will be the Editors of *Short Wave & Television* and the opinion of the judges will be final.

Send veri cards with your letter and oath certificate all in one package. Use a single line for each station and list them in a regular order, such as: frequency, schedule. (All time should be reduced to E.S.T., which is five hours behind Greenwich Meridian Time.) Name of station, city, country; musical identification signal if any.

Notice To Trophy Contestants

● The closing date for the Asia contest announced in the May issue, has been advanced from June 25th to August 25th, in order to provide sufficient time for the veris to reach the contestants from Asiatic stations. Note: We are also including in he Asia group, short-wave stations in the Philippines and the East Indies.

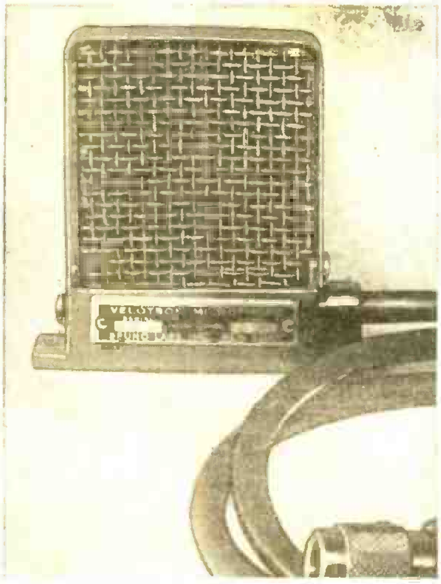
The group for which entries must be in the Editor's hands by September 25th are Australia, Africa and Oceania.

The group in which entries must be in our hands by October 25th, includes the veris from European short-wave stations, including Iceland.

For entries to be in the Editor's hands by November 25th, North America (including Central America, West Indies, Canada and Mexico) veris are to be in by that time.

For entries to be in our hands by December 24th, South American stations are the objective.

Special Purpose Mike



A new model of the well-known Velotron microphone has recently been introduced. It is a rather small unit, ⅜" thick, by 2⅞" high, by 2¾" wide. It is designed with a flat mounting surface, permitting it to be fastened directly to the pre-amplifier unit, or it can be operated as a *lapel* microphone.

The output is -55 DB and it is designed to work directly into the grid of the first amplifier. The frequency response is adjustable from 30 to 14,000 cycles per second. This response is adjusted by varying the polarizing voltage from between 150 volts to 350 volts. It is furnished in two finishes, one model in gun metal and the other in chromium.

This article has been prepared from data supplied by courtesy of Bruno Lab. Inc.

CQ

A local "B. C. L." failed to catch the joke when he asked W4VK to see what was wrong with the set. 4VK found the B. C. L. had thrown away all tube shields as the instructions had said remove all tube *cartons* before using!—Barnett Mitchell.

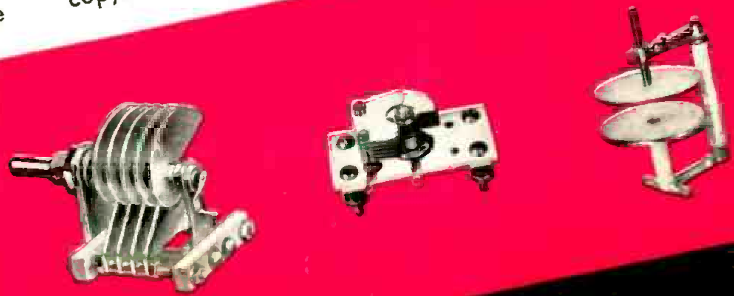
B. C. L. to S. W. L.—"What do you have to do to become a "Ham," get smoked?—J. C. Balloch.

● Index to Advertisers ●

(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

NATIONAL DIALS

The fine finish of a National Dial adds distinction to the appearance of your equipment, and its accuracy insures precision. For years National Dials have been preferred on the best of quality apparatus. The four-inch Type N Dial, with its solid nickel-silver scale and flush vernier, is a favorite wherever smooth accuracy is needed. The plain Type O Dial permits thrift without sacrifice of appearance when vernier tuning is not required. For years a favorite, the Type B combines adjustable ratio with a concealed built-in illuminator. The small HRO Dial is an ideal position indicator for controls such as volume or regeneration. There is a National Dial for every purpose. They are listed in the National Catalogue. The coupon below will bring a copy.



NATIONAL CONDENSERS

National Condensers are the result of years of specialized design. Every detail from material to mounting has been studied to achieve high performance. The PW Condenser with preloaded worm drive and micrometer dial has no competitor for precision and electrical efficiency. The TMC is a husky little transmitting condenser that is typical of a whole series of rigid, low-loss units. The SE Midget Receiving Condenser is outstanding for such refinements as non-inductive pigtail and insulating main bearing. Type UM is an extremely versatile little unit that fits easily in awkward places. NC 500 is the largest of a series of low-loss, high-voltage neutralizing condensers. There is a National Condenser for every purpose. Most are listed in the National Catalogue. The coupon below will bring a copy.

NATIONAL COIL FORMS

The design of National Coil Forms is based on actual experience in constructing receivers and other equipment They are *right*. The XR-10A, XR-12A and XR-13 transmitter coil forms are of low-loss ceramic and are far superior to ordinary porcelain forms. A data sheet, supplied with each form, makes it easy to determine the proper number of turns to use for any amateur band. The low-loss R-39 coil forms are of excellent form factor and convenient size for receiver circuits. They can be readily drilled or threaded. National Coils are convenient, too. Handy and versatile plug-in mounts are supplied for popular sizes. They are described in the National Catalogue. The coupon below will bring a copy.

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