SHORT WAVE & TELEVISION

The Popular Radio Magazine

SHORT WAVES LAND
PLANE IN FOG
SEE PAGE 204

25¢
IN U.S. AND CANADA

HUGO GERNSBACK
EDITOR

BEST SHORT-WAVE STATION LIST
HOW TO GET OVERSEAS STATIONS
NEWEST RADIO EXPERIMENTS
RADIO QUESTIONS AND ANSWERS

AUG.
1938

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THESE publications are large printed sheets which average in size about 11"x17", the majority of them printed on both sides. All have photographic reproductions of the complete project, as well as detail illustrations. In addition, there are complete wiring diagrams and various technical details to assist the experimenter and builder in constructing the set.

Full parts lists are always given, and the printed text runs anywhere from 500 to 3,000 words, depending on the complexity of the radio receiver.

ALL RECEIVERS AND TRANSMITTERS ARE STRICTLY UP-TO-DATE; THERE ARE NO ANTIQUES OR OUT-OF-DATE PUBLICATIONS IN THIS LIST. These projects are particularly valuable to the experimenter and constructor who builds "his own". Indeed, the 50 publications shown on this page represent the cream of recent radio construction by the master radio builders of America. Designs of this kind usually are sold for 25c to $1.00 apiece, and frequently you do not get half the technical information we give you.

Remember, for the ridiculously low price of 10c you can now buy a complete radio design with photographic reproductions, wiring diagrams, and full technical description making it possible to build each radio project in question.

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SPECIAL OFFER: IF YOU ORDER 12 OF THESE PUBLICATIONS AT ONE TIME THE PRICE WILL BE $1.00, A SAVING OF 20c.

COMPLETE LIST OF 10c PUBLICATIONS

HOW TO BUILD THE SWITCH BAND-2 RECEIVER. A low-cost receiver for 6 volt battery or A.C. operation which enables the short-wave fan to hear stations in all parts of the world.....No. 1

HOW TO MAKE A 2-TUBE RECEIVER FOR THE BEGINNER. This receiver consists of detector and two audio stages. A double purpose tube is used to secure the 2 audio stages. Tubes are for 1½ volt battery operation. .....No. 2

HOW TO MAKE THE PORTABLE SUPERHET 4. An ace all-wave superhet for battery operation. This receiver features band-spread and has a built in beat oscillator. .....No. 3

HOW TO BUILD A 4-BAND 3-TUBE SUPERHET. A 3-tube receiver giving 4-tube results. Rack and panel type construction is employed. It has a regenerative second detector.....No. 4

HOW TO MAKE A FIXED-BAND 8-TUBE SUPERHET. This short-wave "fan" receiver tunes over a wide band of frequencies without coil switching or changing. It's a real performer. It operates directly from 110 V. A.C. and has band-spread.....No. 5

HOW TO BUILD A 5-TUBE SUPERHET FOR FAN AND HAM. A sure-fire receiver for all short-wave enthusiasts. It uses plug-in coils and iron core I.F. transformers which assure plenty of gain.....No. 6

HOW TO MAKE A TWIN-PENTODE RECEIVER. This receiver, especially designed for the beginner, employs but one dual purpose tube which gives results equivalent to a 2-tube receiver. It is for 2-volt battery operation with headphones.....No. 7

HOW TO BUILD AN EFFECTIVE SHORT WAVE PRESELECTOR. A signal-booster that will greatly improve reception on any short-wave super. It employs two 6K7 tubes in parallel in a highly efficient circuit in which both input and output are tuned.....No. 8

HOW TO BUILD A REGENERATIVE 2-TUBER. This unusual receiver has the tickler coil in the screen grid circuit of the detector. The receiver tunes from 9-270 meters; band-spread is included; metal or glass tubes may be employed.....No. 9

HOW TO MAKE THE S.W.&T. COMMUNICATIONS RECEIVER. An unusually fine receiver for the critical Ham and Fan, incorporating many exceptional features. Regeneration is employed in the first detector stage which makes use of an acorn tube. The receiver also incorporates a noise-control circuit, variable selectivity control and a tuning meter.....No. 10

HOW TO MAKE A BAND-SWITCHING 2-VOLT RECEIVER. This fine receiver for battery operation employs a band-switching arrangement, enabling the builder to tune from 16-550 meters by flipping a switch. No. 11

HOW TO BUILT THE MULTI-BAND 2 RECEIVER. A receiver for the short-wave beginner. It has a remarkable tuning range of 2½-270 meters with band-spread on all bands. Plug-in coils are used and complete data for an A.C. power supply is given.....No. 12

HOW TO MAKE THE VS-5 METAL TUBE SUPERHET. This complete all-wave receiver boasts, among other things, variable selectivity, metal tubes, AVC and band-spread. The tuning range is from 17-550 meters. .....No. 13

HOW TO BUILD A BEGINNERS 2-TUBE SUPER. A simplified superhet using 2 volt battery tubes which is just the thing for the beginner. It employs plug-in coils which cover a tuning range from 15-200 meters. .....No. 14

HOW TO MAKE A T.R.F.-3 FAN RECEIVER. This is an all-around receiver employing 2 volt tubes. A T.R.F. stage ahead of the regenerative detector insures good selectivity and sensitivity. Band-spread is provided by a two-speed dial.....No. 15

HOW TO BUILD THE FORTY-NINER—A RECEIVER FOR LEAN PURSES. This novel receiver features a space-charge detector and requires only 12 volts of B battery. It uses 2-49 tubes which may be operated from any 2 volt A battery.....No. 16

HOW TO MAKE A REAL 5-METER SUPERHET. This carefully designed receiver for ultra-short wave reception employs a straightforward circuit. Careful placement and high quality parts insure fine results...No. 17

HOW TO BUILD THE 2-VOLT SUPER DX-4. This superhet, though small in size is big in performance. Using battery type tubes, it features continuous band-spread, and automatic volume control, which may be cut in or out as desired.....No. 18

HOW TO MAKE THE ULTRA-HIGH FREQUENCY WIZARD-6. This is a first-class 5-meter super-regenerative receiver, using acorn tubes in the R.F. and detector stages. The other tubes are of the metal type. The use of the acorn tubes insures exceptionally fine results. No. 19

HOW TO BUILD A HIGH-GAIN METAL-TUBE RECEIVER. This little receiver is a real performer, tuning from 10-200 meters. Continuous band-spread is provided. .....No. 20

HOW TO BUILD THE WORLD-WIDE 10-METER CONVERTER. Many enthusiastic reports have been received from the builders of this unit, which may be attached to your present receiver for picking up 10 meter signals from all parts of the world. Only 2-tubes are used. .....No. 21

HOW TO BUILD A DE LUXE 3-TUBER. This is the receiver for the Ham or Fan who wants a really high class receiver of simple design. It employs an unusual band-spreading dial. The circuit, employing metal tubes, has a stage of T.R.F. followed by a regenerative detector and a stage of audio.....No. 22

HOW TO BUILD THE OCTODE METAL TUBE-3. This receiver is capable of excellent performance on the short waves. It requires only one plug-in coil for each band as a stage of untuned R.F. precedes the detector. It also has an A.F. stage for boosting the volume to comfortable headphone level.....No. 23

HOW TO MAKE THE 3-IN-1 REFLEX SET. A 2-tuber giving 4-tube performance is this receiver which does its work with a minimum of tubes. A 6F7 is used as a combined R.F. amplifier, detector and first audio stage; a 6C5 is used as second audio stage.....No. 24

HOW TO BUILD THE 100 WATT QRM DODGER—A COMPACT 5-METER TRANSMITTER. This M.O.P.A. rig puts out a hefty signal and by use of a calibrated vernier oscillator control will overcome the QRM problem on 5 meters. .....No. 25

HOW TO BUILD A DE LUXE 5-METER MOBILE STATION. A really fine M.O.P.A. mobile transmitter which will work real DX on portable location. It employs five metal tubes.....No. 26

HOW TO BUILD THE H-G-M MEDIUM POWER TRANSMITTER. A crystal control set with an output of 90 watts. Band-switching is employed for operation on the 80, 40, 20 and 10 meter Ham bands. It gave excellent results under test.....No. 27

HOW TO MAKE THE 806 ALL-BAND TRANSMITTER. An unusual transmitter delivering 400 watts output from an 806 final amplifier. A crystal pen-tet oscillator is used, followed by a driver stage. Real DX has been worked on 10, 20, 40 and 80 meters with this smooth working job.....No. 28

HOW TO BUILD A 125-WATT MODULATOR USING 35T's. This is an ideal unit for the amateur and will modulate any transmitter with a power input up to about 400 watts. A total of 10 tubes are used including the power supply unit.....No. 29

HOW TO BUILD THE C-O-M 150 WATT TRANSMITTER. An unusual crystal oscillator, multiplier with but one tuned circuit. It uses a pair of HK37's in parallel with a RK39 driver. The crystal oscillator circuit uses a 6L6.....No. 30

A LONG-LINES TRANSMITTER FOR 1-METER TRANSMISSION, AND A COMPANION RECEIVER. A really special job for the seriously minded experimenter. This outfit permits short distance contacts in this interesting band.....No. 31

HOW TO BUILD A 200 WATT XMITTER WITH PEN-TET EXCITER. This transmitter will really go to town. The use of the Pen Tet crystal oscillator and frequency multiplier circuit eliminates many headaches from cracked crystals.....No. 32

HOW TO BUILD A 10 AND 20 METER TRANSMITTER. A 200 watt transmitter which worked world-wide DX on test. Although compact, it is highly efficient in the 10 and 20 meter bands. Five tubes are used. .....No. 33

HOW TO MAKE THE WIZARD 1-TUBE 50-WATT TRANSMITTER. An amateur, crystal-controlled c.w. transmitter using the RK20 screen grid pentode. In tests, it compares with 250 watters.....No. 34

HOW TO MAKE THE "OSCILLODYNE" 1 TUBE WONDER SET. One of the most sensitive short-wave sets designed, employing a really new circuit for the first time. Battery operated.....No. 35

HOW TO MAKE THE "19" TWINPLEX (ONE TUBE PERFORMS AS TWO) RECEIVER. One of the most sensitive 1 tube sets ever designed and very popular. .....No. 36

HOW TO MAKE THE IMPROVED 3-TUBE DOERLE SET FOR BATTERY OPERATION. One of the finest of the Doerle series, by the famous short-wave inventor. .....No. 37

HOW TO MAKE THE "GO-GET-'EM 2" RECEIVER FOR THE BEGINNER. This unusual 2-tube circuit gives 3-tube results. Battery operated. Excellent for beginners. .....No. 38

HOW TO MAKE THE 1-TUBE ALL-ELECTRIC OSCILLODYNE. This is the famous electrified short wave receiver. Easy to build for little money. Operates on A.C. and D.C.....No. 39

HOW TO MAKE THE 2 TO 5 METER TWO-TUBE LOUDSPEAKER SET. This receiver may be used with batteries or with an A.C. power back. Packs a big wallop. .....No. 40

HOW TO MAKE THE 3-TUBE BATTERY SHORT-WAVE RECEIVER. This receiver was a prize winner in SHORT WAVE CRAFT. An unusual short-wave receiver, easy to build.....No. 41

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HOW TO BUILD THE POCKET SHORT-WAVE RECEIVER. One of the smallest, pocket-size, battery receivers ever designed by Hugo Gernsback and Clifford E. Denton. A marvelous set that brings in European stations. .....No. 43

HOW TO BUILD THE CIGAR-BOX 1-TUBE "CATCH ALL" RECEIVER. An effective short-wave battery set which fits into a small cigar box, insuring high portability yet great efficiency.....No. 44

HOW TO BUILD THE "DUAL-WAVE" SHORT-WAVE BATTERY RECEIVER. With this set, you can hear both ends of radiophone talk, on one set of phones. In other words, you can listen to a ship at sea and the land station communicating with it, simultaneously, by means of this double receiver.....No. 45

HOW TO BUILD THE 1-TUBE "53" TWINPLEX RECEIVER. The twinplex, although it has only one tube, works as if it had two. Marvelous in efficiency. Uses either batteries or A.C. power pack for "B" supply. .....No. 46

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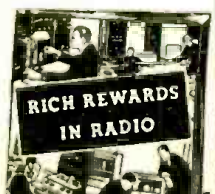

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SHORT WAVE & TELEVISION
The Popular Radio Magazine

AUGUST—1938

Vol. IX No. 4

HUGO GERNSBACK, Editor
H. WINFIELD SECOR, Manag. Editor
M. HARVEY GERNSBACK, Assoc. Editor

In This Issue

FEATURES

S-W STATIONS—HOW TO FIND THEM

TELEVISION

CONSTRUCTOR

MISCELLANEOUS

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In the Sept. Issue

American S-W Programs for "Foreign" Listeners, M. Harvey Gernsback.

Suppressor-Grid Controlled C.W. or Phone Transmitter, M. N. Beitman.

A T.R.F. 4-Tube Receiver for the Short-Wave Fan, Harry D. Hooton, W8KPX.

How the English "Derby" Was Televised.

A 1-Meter Transmitting and Receiving System.

20 Meter Twin-Tube Xmitter for Beginners.

Elizabeth-Ann Tucker, C.B.S. short wave program director; Andrew Farnum, radio operator of "Queen Mary," and Hollis Shaw, C.B.S. soprano, at recent conference aboard ship. W2XE programs are enjoyed regularly aboard the "Queen."

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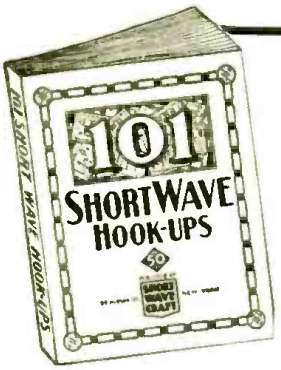

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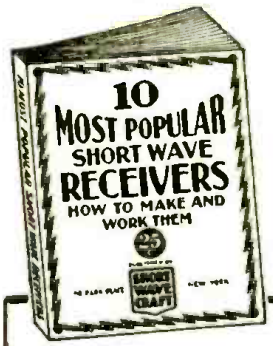

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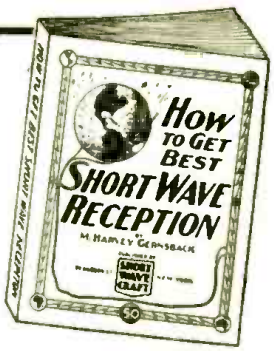

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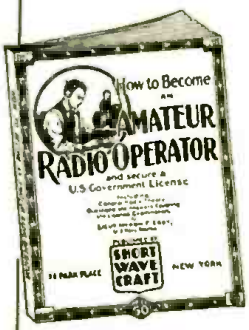

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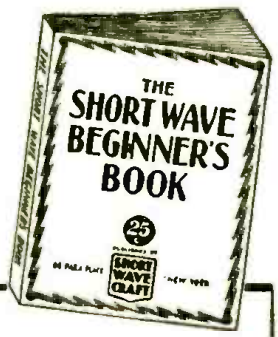

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St. Paul Book & Stat. Co., St. Paul

MISSOURI
Burstein-Applebee Co., Kansas City
Radio Labs., Kansas City
Walter Ashe Radio Co., St. Louis
Van Sickle Radio Co., St. Louis

NEW JERSEY
Radio Apparatus Co., Newark
United Radio Co., Newark
Wholesale Radio Service Co., Inc., Newark

NEW YORK
Fort Orange Radio Dist. Co., Albany
Wholesale Radio Service Co., Inc., Bronx
Wholesale Radio Service Co., Inc., Jamaica, L. I.
American News Co., New York City
Baker & Taylor Co., New York City
Blan, the Radio Man, New York City
David Bogen & Co., New York City
Federated Purchaser, Inc., New York City
Harrison Radio Co., New York City
Radio Circular Co., New York City
G. E. Stechert & Co., New York City
The Steiger Co., New York City
Sun Radio Co., New York City
Thor Radio Corp., New York City
Try-Mo Radio Co., New York City
Van Riemsdyck Book Stores, New York City
Wholesale Radio Service Co., Inc., New York City
H. W. Wilson Co., New York City
Radio Parts & Equipment Co., Rochester
M. Schwartz & Son, Schenectady

OHIO
College Book Exchange, Toledo

OREGON
J. K. Gill Co., Portland

PENNSYLVANIA
Radio Electric Service Co., Philadelphia
Cameradio Co., Pittsburgh

WASHINGTON
Seattle Radio Supply Co., Seattle
Wedel Co., Inc., Seattle
Spokane Radio Co., Spokane

WISCONSIN
Radio Parts Co., Milwaukee

ARGENTINA
Radio Revista, Buenos Aires

AUSTRALIA
McGill's Authorized Agency, Melbourne

BELGIUM
Emil Arens, Brussels

CANADA
T. Eaton & Co., Winnipeg, Man.
Electrical Supplies, Ltd., Winnipeg, Man.
Wholesale Radio Supply, Winnipeg, Man.
Canadian Electrical Supply Co., Ltd., Toronto, Ont.
Radio Trade Supply Co., Ltd., Toronto, Ont.
Canadian Electrical Supply Co., Ltd., Montreal, P. Q.

BRAZIL
Agencia Soave, Sao Paulo

CHINA
China News Co., Shanghai
International Booksellers, Ltd., Shanghai

CUBA
Diamond News Co., Havana

ENGLAND
Gorringe's Amer. News Agency, London

FRANCE
Toute La Radio, Paris

GERMANY
Rehr G.M.B.H. SW15, Berlin NW No. 7

INDIA
Empire Book Mart, Bombay

MEXICO
American Book Store, Mexico, D. F.
Central De Publicaciones, S. A., Mexico, D. F.
Jaques Salvo, Mexico, D. F.

NEW ZEALAND
Johns, Ltd., Auckland
James Johnston, Ltd., Dunedin
Te Aro Book Depot, Ltd., Wellington

SOUTH AFRICA
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Central News Agency, Johannesburg
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South African Radio Publications, Johannesburg

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Short Wave Broadcasting

—*as a Pioneer Sees It*

Dr. Frank Conrad
Assistant Chief Engineer, Westinghouse Electric & Mfg. Co.

● RADIO broadcasting—and short wave broadcasting in particular—is developing so rapidly that it is hardly safe to make predictions as to its future, lest the prophecies become matter-of-fact realities before your forecasts appear in print.

However, against a background of more than 20 years' relationship with radio, two developments in the use of short wave bands for a wide dissemination of entertainment and culture appear to be imminent: first, a network of short wave broadcasting stations, and second, only a matter of ever-shortening time before the ultra-short wave bands will be carrying television.

If radio broadcasting is to expand, and I have no doubts that it is, then the short wavelengths offer the only road to that expansion.

These forecasts are conservative, even "tame," compared with a few made by the late H. P. Davis, vice-president of the Westinghouse Electric & Manufacturing Company, a few months after the first regular commercial broadcast was made over station KDKA in 1920:

"The importance of reaching such tremendous numbers of people, with practically no effort, offers great possibilities for advertising and the distribution of news and important facts, and in reality introduces a 'universal speaking service'. It is not unreasonable to predict that the time will come when almost every home will include in its furnishings some sort of loudspeaking radio receiving instrument, which can be put into operation at will, permitting the householder to be in more or less constant touch with the outside world through these broadcasting agencies.

". . . And where will it end? What are the limitations? Who dares to predict? Relays will permit one station to pass its message on to another, and we may easily expect to hear in an outlying farm in Maine some great artist singing into a microphone many thousand miles away. . ."

Well, those predictions are facts today. For all practical entertainment purposes channels assigned and commercial broadcasting have proved adequate until today, but these longer wave bands have reached their saturation point; there is virtually no more room to carry additional broadcast loads.

But in the short wave band there is ample room for expansion in broadcasting. These short waves are the long distance carriers of radio.

Early in 1922 we were convinced that there were wonderful possibilities which

Dr. Frank Conrad, Assistant Chief Engineer of the Westinghouse Electric and Manufacturing Company, examining an old type of radio tube in his laboratory in East Pittsburgh.

were being overlooked in the then unused and rather despised short wave bands, considerably lower than those then in use for broadcasting and for communication. An experimental station known as KDPM was installed at the Westinghouse Company's plant at Cleveland, Ohio, and serious work was undertaken between KDKA at East Pittsburgh and this station in an investigation of the subject of short wave transmission and re-broadcasting. In the fall of 1923 Westinghouse located a re-broadcasting station at Hastings, Nebraska, the start of the well-known KFKX. At this point short wave transmissions from KDKA were nightly received and re-broadcast on the station's assigned wavelength.

Strangely enough only a year or so before this re-broadcasting service was launched, radio men were generally convinced that the skip-distance phenomenon of high frequencies destroyed any efficacy the short wave band might have. This "skip-distance" term attached itself to the short wave lengths' characteristic tendency to fade out a short distance from the broadcasting station only to come in strong again at points far removed.

At a conference of associated radio companies held in London, England, in the early 1920's, delegates in discussing a proposed link with South America, raised some questions as to short waves ever being of any value in radio. So one night I invited a number of the delegates to my room, where I unpacked a short wave receiver I had taken with me from Pittsburgh. Tossing a wire out the window to serve as an aerial, I "tuned in" on our station W8XK at Pittsburgh and the Pittsburgh announcer launched a pre-arranged program. He read the entire front page of a Pittsburgh newspaper and threw in some columns of material from the inside pages for good measure; the delegates heard their first trans-Atlantic short wave transmission and simultaneously heard the greatest number of words sent over the ocean by radio up to that time.

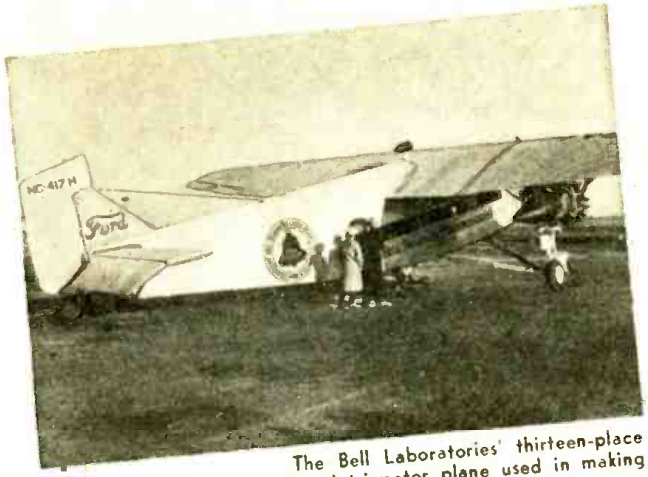
On New Year's Eve in 1923, through previous arrangement, KDKA transmitted a short wave program to Great Britain. This program was re-broadcast to British listeners through a station operated by the Metropolitan Vickers Company at Manchester, England, and was the first internationally broadcast program as well as the first to be re-broadcast.

On December 12, 1924, KDKA's short wave program was received and re-transmitted in Johannesburg, South Africa, and a few weeks later we transmitted a program

(*Continued on page* 256)

Twentieth of a Series of "Guest" Editorials

FLYING Radio Laboratories



The Bell Laboratories' thirteen-place Ford tri-motor plane used in making tests of radio apparatus.

The highly perfected radio telephone sets now in use on passenger planes flying daily across the country were actually developed in "flying laboratories." The engineers of the Bell Telephone Labs. have made several thousand flights while testing new short and long wave apparatus for use in aircraft.

F. B. Woodworth, one of the Laboratories' engineers adjusts an experimental radio transmitter in the Fairchild plane.

● "TAKE her up 20,000 feet!"—This and similar orders have been heard many times by the pilots flying the radio test planes owned by the Bell Telephone Labs. The test base of these flying laboratories is located at Whippany, N. J. For many years the Bell Telephone Labs. have owned and privately operated a large Ford tri-motor plane and also a Fairchild cabin plane. These two famous airplanes have already made nearly 2500 separate flights, totaling nearly 270,000 miles of air travel, says Captain A. R. Brooks, who has served for ten years as chief pilot and supervisor of Air Operations Group of these Laboratories. Captain Brooks is a former U.S. Army air service pilot.

A typical log of a radio test flight by one of the planes will give some idea of what a daily routine is like:

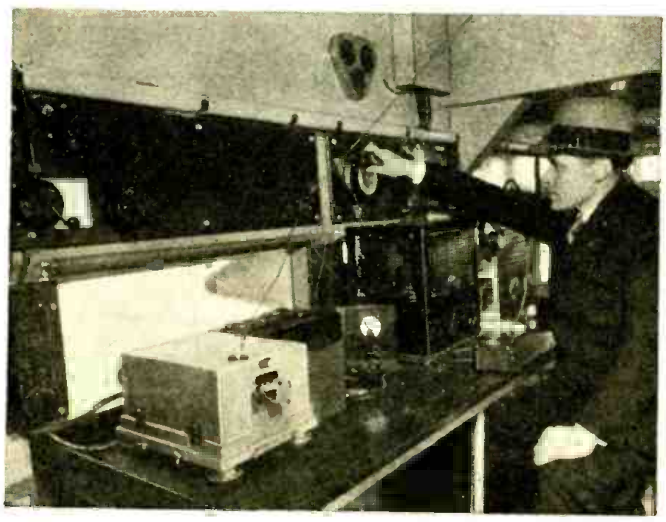
"Coaxial antenna mounted in Ford and transmission line completed to radio receiver on cabin bench. Quarter-wave, shunt-connected rod antenna flown at 2500 feet out from ground station W2XID and at . . . . mile point courses checked to . . . degrees. Two-way, during two flights, 4797.5 kcs. with W2XMZ and . . . . mcs. with W2XID."

Another example: *"With Ford motors running on ground at various speeds, voltage measurements taken with cathode-ray oscillograph on primary ignition circuits for interference-filter design data. UHF transmission from Fairchild to Deal: route . . . . degrees from Deal . . . . Miles. Altitude 3500 feet both directions. Two-way station W2XMZ (Hadley), 4797.5 kcs. and 3415 kcs.; and WREE (Newark) 3105 kcs."*

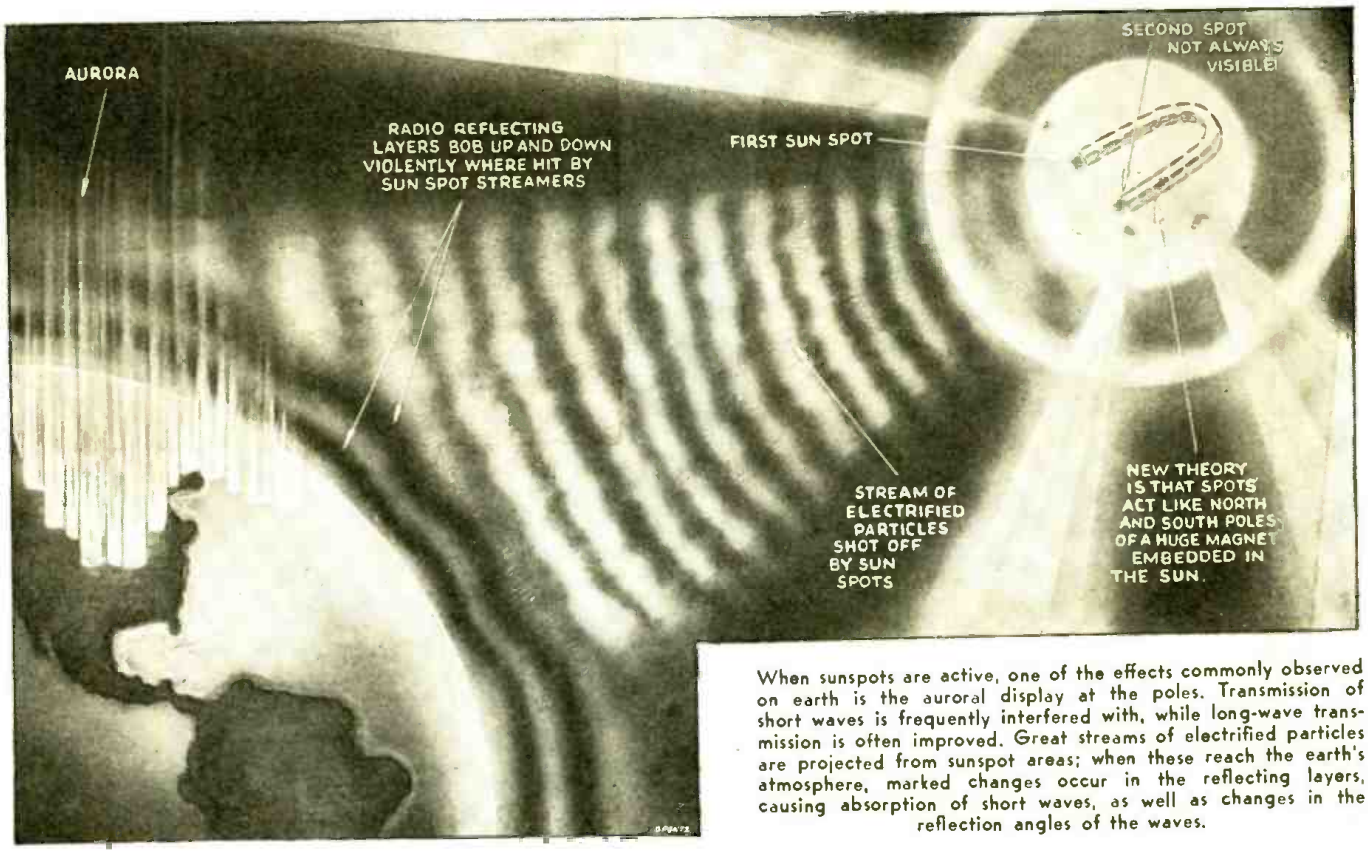
In calling a station on the planes' licensed channels, the pilot is "on the air" when he turns on the filament switch and presses the microphone button to *talk*, releasing the button when he wants to

(*Continued on page 245*)

A "field-strength" measuring set installed in the Laboratories' Fairchild plane.



Radio transmitters and receivers installed on this work bench in the Ford ship provide extensive tests in flight.



When sunspots are active, one of the effects commonly observed on earth is the auroral display at the poles. Transmission of short waves is frequently interfered with, while long-wave transmission is often improved. Great streams of electrified particles are projected from sunspot areas; when these reach the earth's atmosphere, marked changes occur in the reflecting layers, causing absorption of short waves, as well as changes in the reflection angles of the waves.

Aurora, Sun-spots and Radio

Why and How Short Waves Are Affected by Sun-spots

R. W. Hallows, M. A.

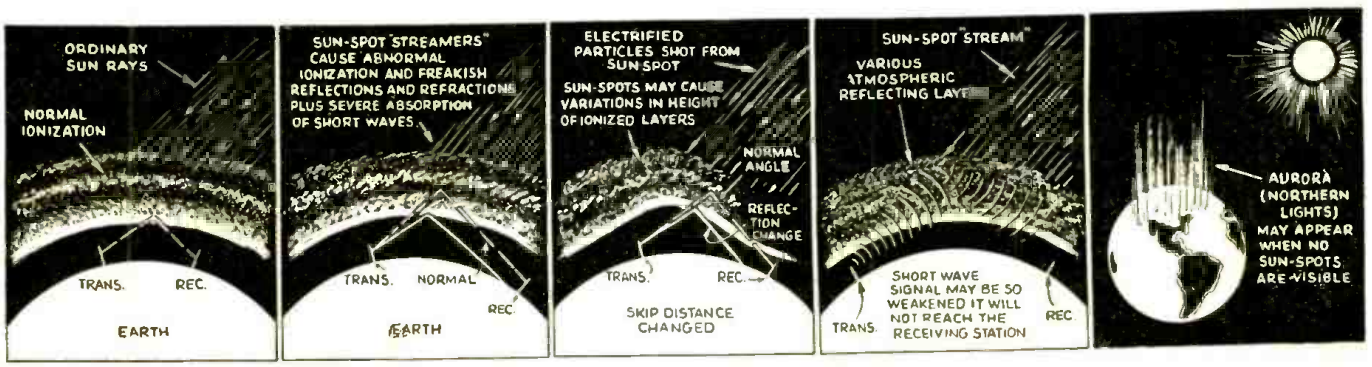
● THERE are one or two ideas about sunspots and the Aurora which have become widely accepted, though it appears they are entirely wrong. One of these is that all sunspots cause magnetic disturbances and upsets and adventures in radio reception, especially on the short waves; another, that the Aurora Borealis, which we saw on January 25 is invariably due to some action produced by big sunspots; a third, that during magnetic storms or displays of the Aurora *all* short-wave transmitters might as well close down, so far as reception at any distance is concerned.

Let us think first of all of sunspots. There are probably few periods of any great duration in which the Sun's surface does not display a few of these, though it is only the larger ones, visible to the naked eye, that are brought to the knowledge of most of us by the newspapers. What may be called the average or common sunspot comes to the attention of none save astronomers, since it is a telescopic and not a naked-eye object.

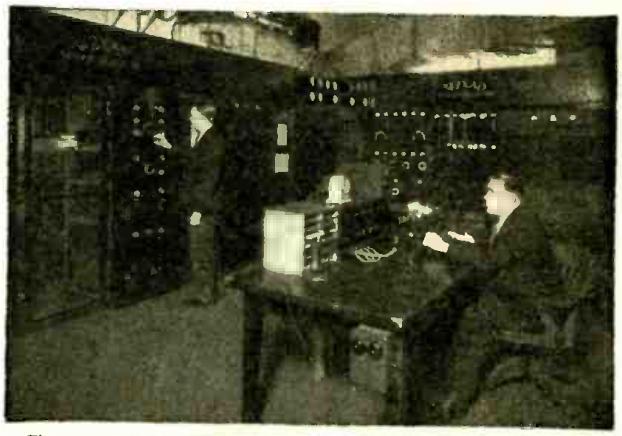
Not every sunspot, then, gives rise to magnetic storms, to violent atmospherics on various wavelengths, or to poor reception or "fade-outs" on the short waves. We may, in fact, go a good deal farther than this. When the phenomena just mentioned occur they are not *caused* by the sunspots themselves, but by whatever it is that is responsible for the appearance on the visible surface of the Sun of these gigantic maelstroms of activity.

Magnetic storms and their concomitant interruption of short-wave radio signals—and, often, of signals sent over land-lines or cables—can and do occur without there being any visible sunspot of more than ordinary size. Equally, quite large spots or groups of spots may pass across the Sun's disk without such phenomena being present to any marked extent.

(Continued on page 237)



C. D. Wagoner who spoke around the world over W2XAD in 1930. His voice returned in 1/8 of a second.



The present-day 25 kw. transmitters of W2XAF-W2XAD at South Schenectady.

18 Years of s. w.

Short Wave Broadcasting is not so new as many think. This article should bring fond recollections to oldtimers.

● MOST readers probably think short-wave broadcasting is a modern offshoot of broadcasting. Yet eighteen years ago, in 1920, when Dr. Frank Conrad of Westinghouse began broadcasts from Pittsburgh over KDKA, he also began experiments with an s.w. broadcaster at his home on 150 meters, using the call 8XS. Later in the same year a more or less regular schedule was maintained on waves as low as 60 meters!

The success of these experiments led to the erection of short-wave stations for relay purposes at the various plants of Westinghouse. In 1923 KFKX at Hastings, Nebraska (shades of catwhiskers!) was licensed to function as a relay station for rebroadcasting these s.w. signals from Pittsburgh.

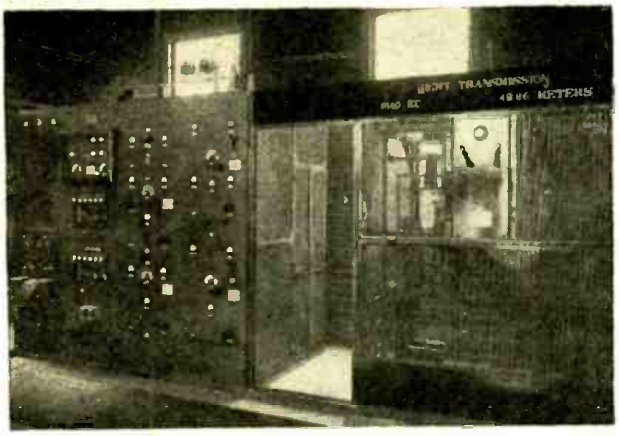
Foreign listeners reported good reception of 8XS and on New Year's eve, 1923, the British Broadcasting Company *rebroadcast* a program from Pittsburgh for London listeners. This program apparently was the *first* special international broadcast. A short time later 8XS was rebroadcast in Melbourne and in Johannesburg!

In 1923, 8XS, which had meanwhile moved to East Pittsburgh, began its series of Far North Broadcasts of messages and entertainment for residents in the Arctic areas. This invaluable service has been continued to this day.

Interior of 2XI, G.E. station on Van Slyck Island early in 1924. Signals went out on 100 meters.

Another view of 2XI in 1924. Power rectifiers in left background, G.E. engineer L. A. Taylor, designer of 2XI, is seated before monitor.

W2XAF, S. Schenectady, August, 1928. Panels contain crystal control and power amplifier.



Another shot of W8XK today. Left—21.54 and 6.14 mc. crystal oscillators and power amplifiers. Right—6.14 mc. final stage.

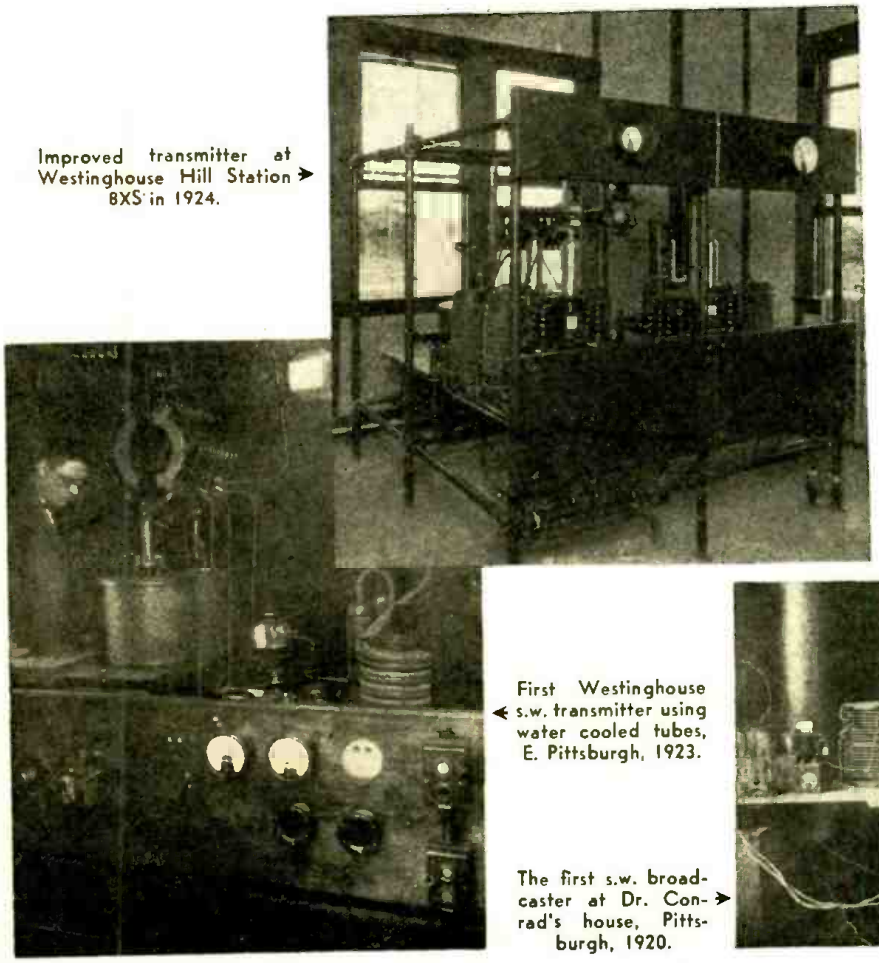
Broadcasting!

M. Harvey Gernsback

Westinghouse Station W 8 X K, Saxonburg, Pa., today. Engineer is announcing call.

With the passage of time expansion made larger quarters necessary and 8XS was moved to the Hill Station near Pittsburgh in 1924. Eventually even these quarters were outgrown and the station again moved, this time to Saxonburg, where it is now located. Until 1929 most broadcasting activity of 8XS was on about 4.8 mc.

In 1929 8XS's call was changed to W8XK and it was licensed to transmit on six frequencies. Four of these are used today (6.14, 11.87, 15.21 and 21.54 mc.). A fifth channel, 9.57 mc., is now used by W1XK, Westinghouse station at Millis, Massachusetts.



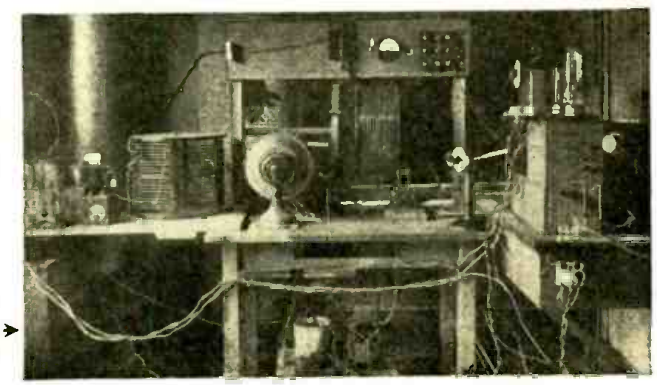
Improved transmitter at Westinghouse Hill Station 8XS in 1924.

Schenectady on the Map

In the meantime the General Electric Company at Schenectady, N. Y., had started experimenting with short waves. In 1923 a transmitter operating around 100 meters went on the air. It was used in connection with development of the then new 20 kw. water-cooled transmitting tube. The engineers had not reckoned with the effects that this transmitter might have on other work being carried out in nearby laboratories. The high frequency currents from the transmitter caused havoc with important work and the short-wave station was shooed into a "potato shack" on Van Slyck Island in the Mohawk River near the

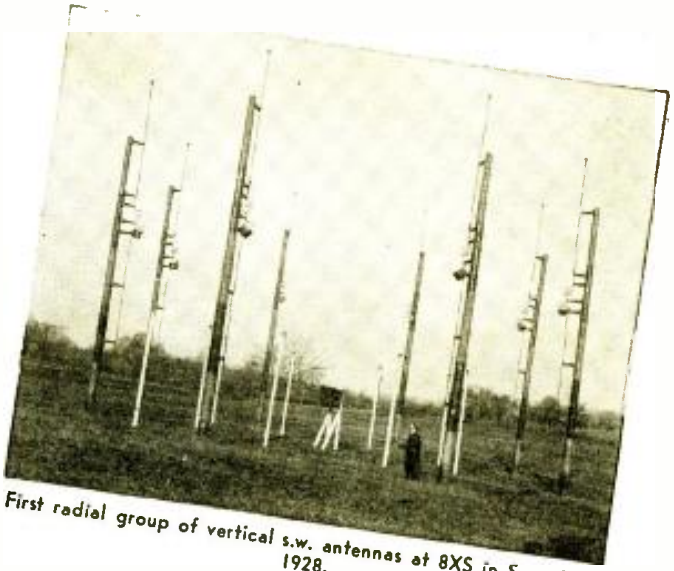
(Continued on next page)

First Westinghouse s.w. transmitter using water cooled tubes, E. Pittsburgh, 1923.



The first s.w. broadcaster at Dr. Conrad's house, Pittsburgh, 1920.

The building and aerial at 2XI, Van Slyck Island, early in 1924.



First radial group of vertical s.w. antennas at 8XS in Saxonburg, 1928.

G.E. Schenectady plant. Here was born 2XI—granddaddy of the present stations W2XAF and W2XAD.

2XI was heard far and wide. Amateurs wrote in to warn of the terrific harmonic of WGY (G.E. broadcast station) on 100 meters. We can remember cutting down an old 3-circuit broadcast tuner so that it would get down to 100 meters. It got there all right—but the threshold howl was terrific. Still, we heard 2XI; great day!

The engineers at Van Slyck Island, isolated though they were, did not lack excitement. Came spring, came floods—but broadcasting went on despite these difficulties. On more than one occasion the staff was marooned and had to be rescued by rowboat and canoe. From such stuff was short-wave broadcasting developed.

Progress made expansion necessary and Van Slyck Island was bade farewell for more spacious quarters at South Schenectady, the present location of the G.E. stations. Here the trek to shorter waves continued until channels at 4.61, 7.14, 9.15, 11.55 and 13.66 mc. were used.

As a result of long investigation with the cooperation of amateurs and observers here and abroad two frequencies were finally selected for regular use. These were 15.33 and 9.53 mc. (W2XAD and W2XAF). W2XAF went on the air on 9.53 in June, 1925, and W2XAD in July, 1926. A station W2XO was used for broadcasting special programs to Australia on 12.85 mc. until 1931 or 1932, and a W2XK on 17.3 mc. was used irregularly till the same time. W2XAD now operates on 21.5 and 9.55 mc. as well as on 15.33 mc.

The first, and until recently, only short-wave station on the Pacific Coast was W6XN at Oakland, California, also operated by G.E. W6XN started broadcasting in 1928 or 1929. It relayed KGO on 12.85 mc. with a power of 10 kw. This station was well heard in the U.S. and Australia. After a year or two of operation it made its final "sign-off" in 1930. A verification card received from W6XN in 1929 is reproduced to the right of this column. The new s.w. station at Belmont, California, now under construction, is a direct descendant of old W6XN.

In the early days little use was made of directional transmitting aerials as the main idea was to see how far away signals could be heard. Contrast this with modern stations using elaborate directional arrays for spraying signals at any point on the globe.

Foreign Stations

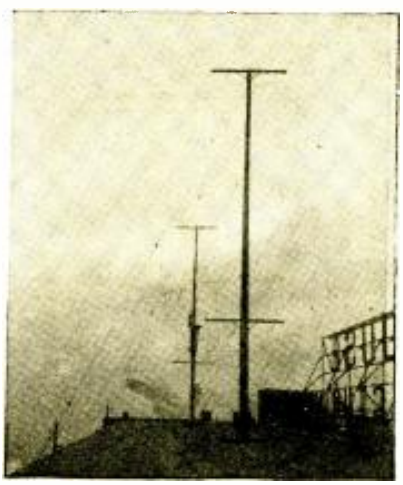
By 1926 other parts of the world were

(Continued on page 246)

A veri from 5SW, Chelmsford, England, July, 1928. The card is a veri from W6XN, Oakland, Cal., in 1929. W6XN is no longer active.

The half-wave vertical doublet aerial at W2XAD, S. Schenectady, today.

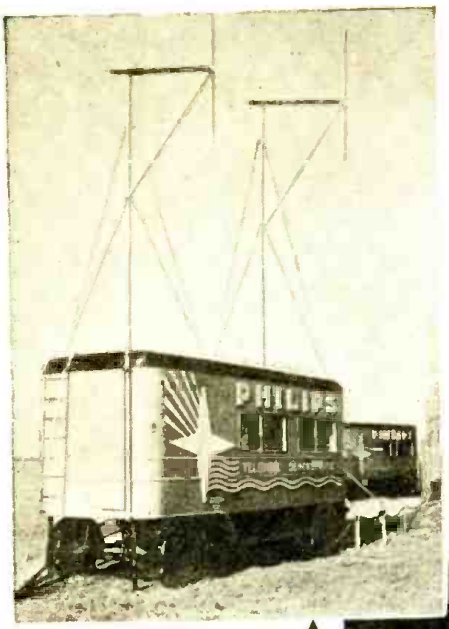
WGY's portable s.w. transmitting set in 1923. The forerunner of modern mobile stations.



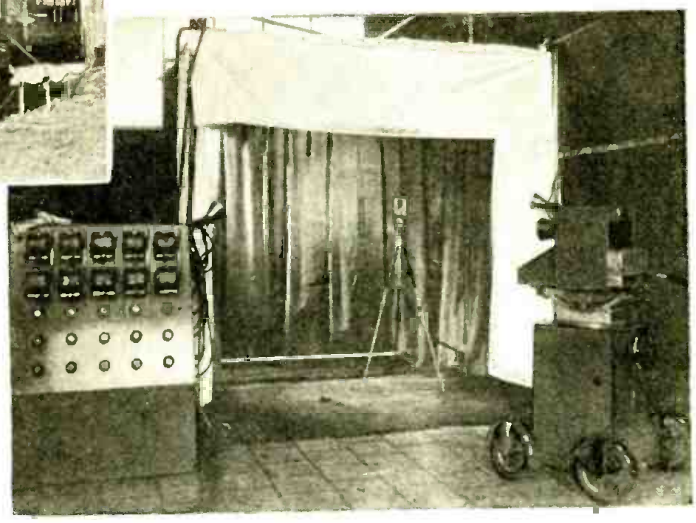
Station 8XS s.w. antenna at East Pittsburgh in 1923.

WHEN Holland Televises

TELEVISION HAS TECHNICALLY BEEN DEVELOPED TO A HIGH DEGREE. THIS ARTICLE PROVIDES THE LATEST INFORMATION. IT WILL BE SOME TIME BEFORE HOME TELEVISION IS REALIZED. THE ART HAS GREAT OPPORTUNITIES FOR EXPERIMENTERS AND TECHNICIANS



In the foreground above—transmitter car with the two aluminum aerial masts set up. The aerial is a center-fed half-wave doublet.



Right—The studio installation is an easily demountable frame of steel tubing, on which special mercury lamps may be fastened. This frame can be covered with cloth. The cabinet contains apparatus for operation of the lamps.

● IN order to be able to give demonstrations of television at any desired place, the Philips Laboratory has built a portable apparatus, some particulars of which are here described and illustrated.

The installation, which makes possible the transmission of studio and outdoor scenes as well as of films, is housed in two automobile trailers, each one having a floor surface of about 20 x 6½ ft. In the first is found the apparatus for the generation of the auxiliary signals and direct voltages necessary for the working of the iconoscope of the recording camera. In addition we find apparatus for the conversion of the picture signals from the iconoscope and of the sound signals from the microphone or film, and finally apparatus for monitoring the picture and sound. Two kinds of pictures may be obtained; in a small fireproof cabin there is an apparatus for the scanning of films by means of an iconoscope camera, which is connected with the trailer by a cable.

The signals from this first trailer are conducted through a cable to the second trailer, in which there are two small transmitters for broadcasting the picture and the accompanying sound. For each transmitter there is an aerial at the top of a demountable mast about 32 ft. high.

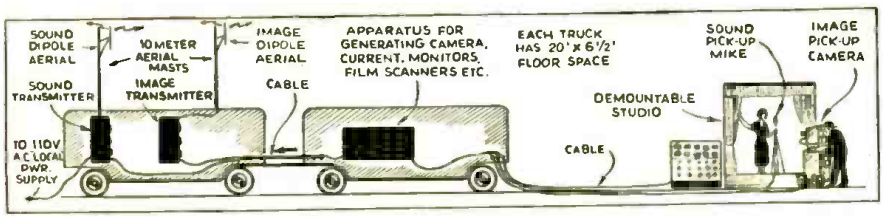
The installation is suitable for the broadcasting of 25 pictures per second, with 405 or 567 lines per complete picture, while interlaced scanning is employed. (If 567 lines are used, a frequency spectrum must be dealt with which extends from about 50 cycles per second to about 5.5 megacycles per second) for 405 lines the necessary frequency spectrum extends only to 2.5 megacycles per second.

As the circuit of a television transmitter has been described in previous numbers, we shall not go into it again. Various refinements have been introduced but the basic principle has remained the same A small studio is also carried, which consists of an easily demountable framework of steel tubing, upon which five water-cooled super

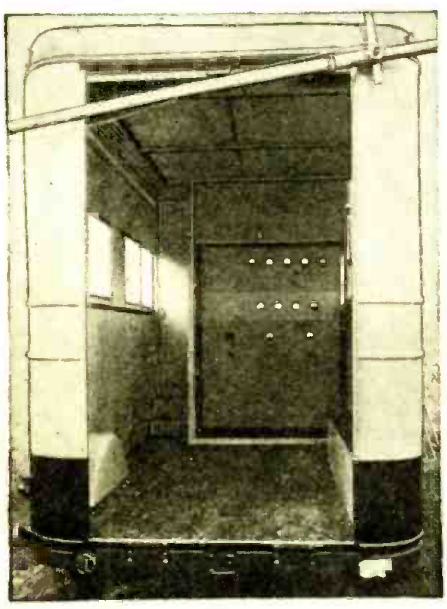
(Continued on page 238)

Below—Interior of car with the picture transmitter. The sound transmitter is in another compartment.

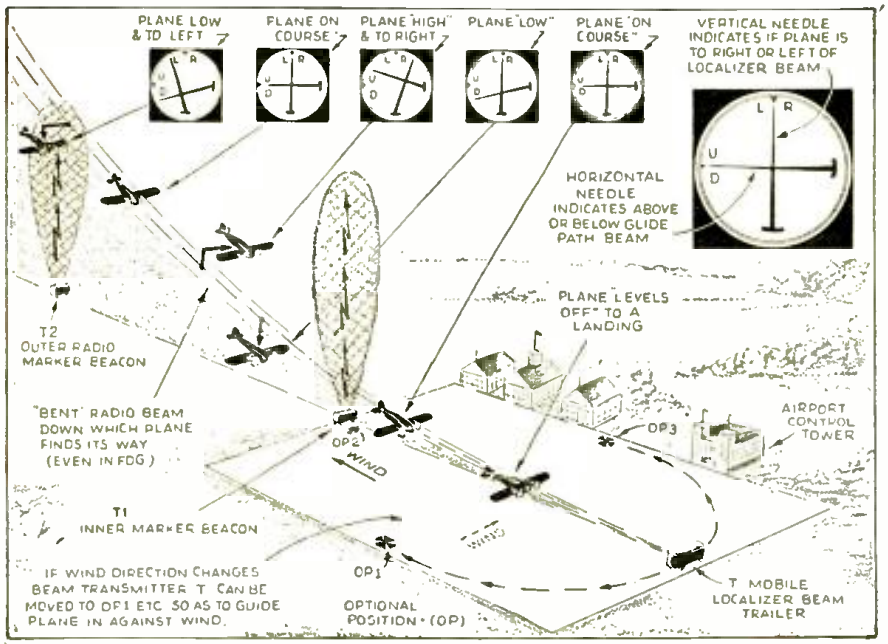
Right — Arrangement of Television trailers, also studio.



Below — Philips iconoscope camera. Steering gear can be operated by left hand. Right hand directs camera upon the object. Twisting the steering rod handle focusses lens.



Short Waves Land Plane in Fog



Short wave beam system for landing planes "blind," even though the airport is obscured by fog. The instrument before the plane's pilot shows whether he is on the beam or off it and in what direction.

● THE principal air lines in this country are now actively engaged in trying out some one of several different types of *blind-flying* systems. There is nothing so helpless as a plane trying to land on a fog-covered field, and radio engineers have labored for a long time to perfect a system which would be fool-proof and which would enable a pilot to bring his plane down to a safe and sure landing on such an airport.

One of the newest systems which has received a great deal of consideration is that known as the Air-Track. The diagram herewith shows one of the principal features of this plan which involves a *portable* transmitter. The transmitting apparatus is mounted in a trailer which can be quickly moved to the other side of the field, in the event that the wind direction should change; thus the direction of the localizer beam can be shifted as found necessary. Planes should land into the wind, so this feature is a very valuable one. As the drawing shows, there are two main indicating needles constantly before the plane's pilot. The vertical needle shows whether he is to the right or to the left of the runway localizer radio beam. The horizontal needle shows the pilot whether he is above or below the glide path beam. When the vertical and horizontal needles cross each other at right angles, the pilot knows that his plane is flying exactly on the glide beam. Usually an outer warning beacon indicates to the pilot, either visually or aurally, when he is approaching the glide beam; as he nears the landing field, a second marker beacon gives him a warning that he is starting to fly over the airport. He then proceeds to reduce his flying angle and gets ready to level off and make a landing. A fair amount of experience with

(Continued on page 245)

Second *Radio Amateur* Honored

by William S. Paley Award

Hams and radio authorities congratulate Robert T. Anderson, W8DPY, Harrisburg, Ill., Flood Radio Hero.

Robert T. Anderson (left) receiving award of trophy from William S. Paley, President of the Columbia Broadcasting System.

● WILLIAM S. PALEY, president of the Columbia Broadcasting System, on June 9th presented the second annual Paley Amateur Radio Award to Robert T. Anderson of Harrisburg, Ill., for valiant service rendered during the January, 1937, flood emergency in the Ohio River valley.

At the presentation ceremony in the Waldorf-Astoria Hotel in New York, Rear-Admiral Russell Randolph Waesche, Commandant, United States Coast Guard, and Captain Stanford C. Hooper, United States Navy, joined Mr. Paley in paying glowing tribute to Anderson and to the 55,000 amateur operators in this country and Canada for the public service they perform in times of national emergency.

George W. Bailey, vice-president of the American Radio Relay League, spoke on behalf of his organization in retaining perma-

(Continued on page 251)

Rob't T. Anderson, awarded Paley trophy for his heroic work as a Ham during the Jan. 1937 flood.

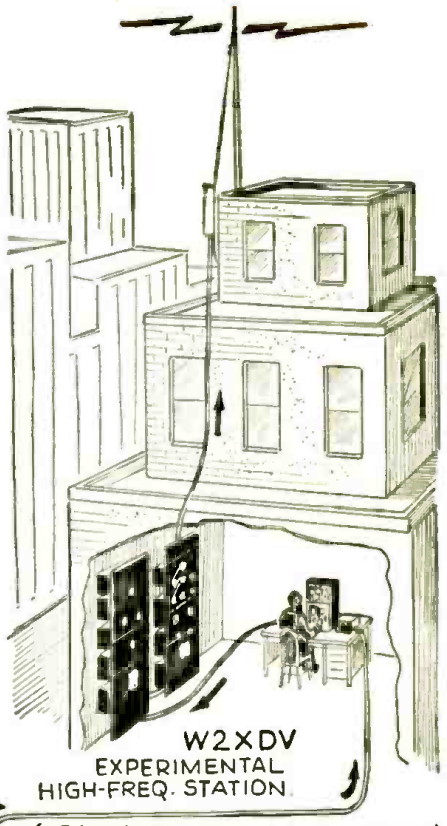
W2XDV—PIONEER H-F *Broadcaster* Reaches Europe

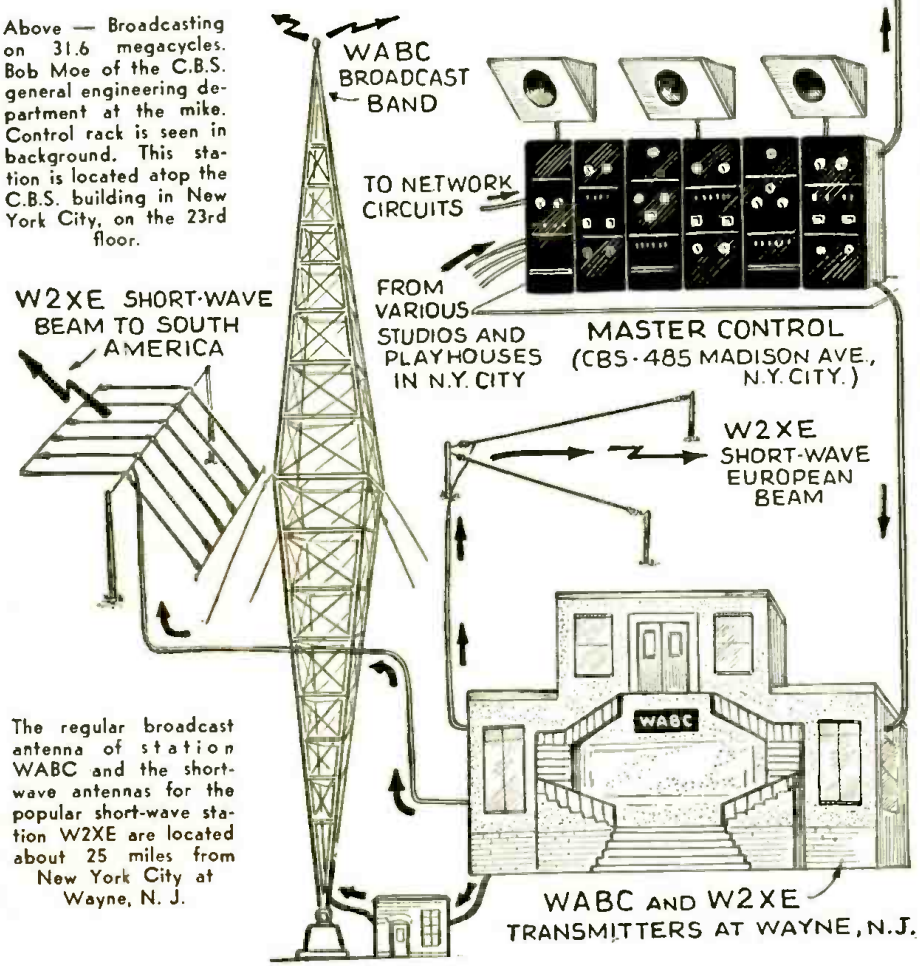
W. H. Moffat
General Engineering Dept., Columbia Broadcasting System

9-meter broadcasting a commonplace tomorrow? W2XDV's success indicates it will be.

Above — Broadcasting on 31.6 megacycles. Bob Moe of the C.B.S. general engineering department at the mike. Control rack is seen in background. This station is located atop the C.B.S. building in New York City, on the 23rd floor.

● SHORT-WAVE radio listeners who tune inquiring dials above 25,000 kc. will find an increasing number of pioneer stations, including not only commercial and amateur, but also experimental *high-frequency broadcast* stations. The U. S. high-frequency broadcast stations are to be found on frequency assignments between 25,950 kc. and 41,800 kc. Perhaps the most popular frequency assignment at present is the group "C" assignment which is composed of the four frequencies, 31,600, 35,600, 38,600, 41,000 kc. (9.49 to 7.31 meters.) Proposed changes in the regulations will shift most of the high-frequency broadcast stations now operating above 30,000 kc. to individual frequency assignments, with 40 kc. separation between channels, in the recently-proposed 42-megacycle (7.13 meters) broadcast band.





The regular broadcast antenna of station WABC and the short-wave antennas for the popular short-wave station W2XE are located about 25 miles from New York City at Wayne, N. J.

W2XDV Located Atop Skyscraper

W2XDV, owned and operated by the Columbia Broadcasting System, was first licensed as a *general experimental* station on February 6, 1932. For several years under this classification, it conducted an active program of experimentation and scheduled broadcast transmissions. Then on November 5, 1935, W2XDV went on the air with a daily program schedule on 31.6 mc. (9.49 meters) under a new classification as an *Experimental High-Frequency Broadcast* station. W2XDV was, therefore, one of the *first* experimental high-frequency broadcast stations to undertake the pioneer development of these new broadcast frequencies. W2XDV is located on the 23rd floor of the Columbia Broadcasting System building at 485 Madison Avenue, New York City. (It has been heard in Europe as explained later in this article. —Editor) It broadcasts C.B.S. network programs daily from 5:00 p.m. to 9:00 p.m., Eastern Standard Time, with an additional period of transmission from 2:00 p.m. to 4:00 p.m. on Saturdays and Sundays. Due to the availability of network programs, recordings are not used for program material.

Half-Wave "Vertical" Antenna Used

The W2XDV transmitter is licensed for a carrier power of 50 watts. The complete installation is composed of three sections, each contained on an individual rack. The control rack contains the crystal-controlled heterodyne frequency monitor, the microphone amplifier, the volume indicator panel, the transmitter stop-start control panel, and key-switches for switching from the

(Continued on page 239)

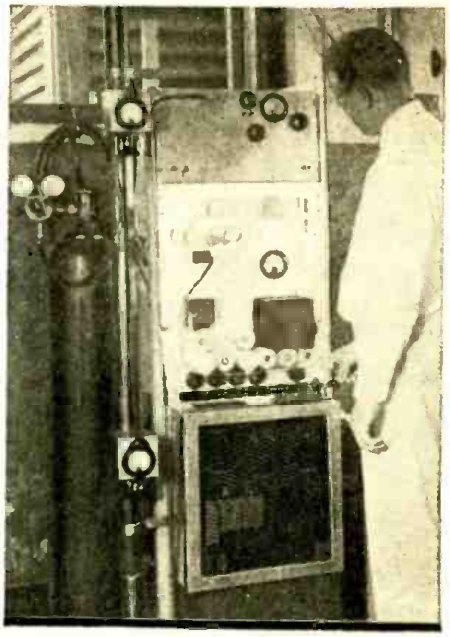
Reception on 2-Meter Wavelength

2-meter transmitter and receiver which were recently tested under various weather and seasonal conditions by the Research Department of the Bell Telephone Labs.

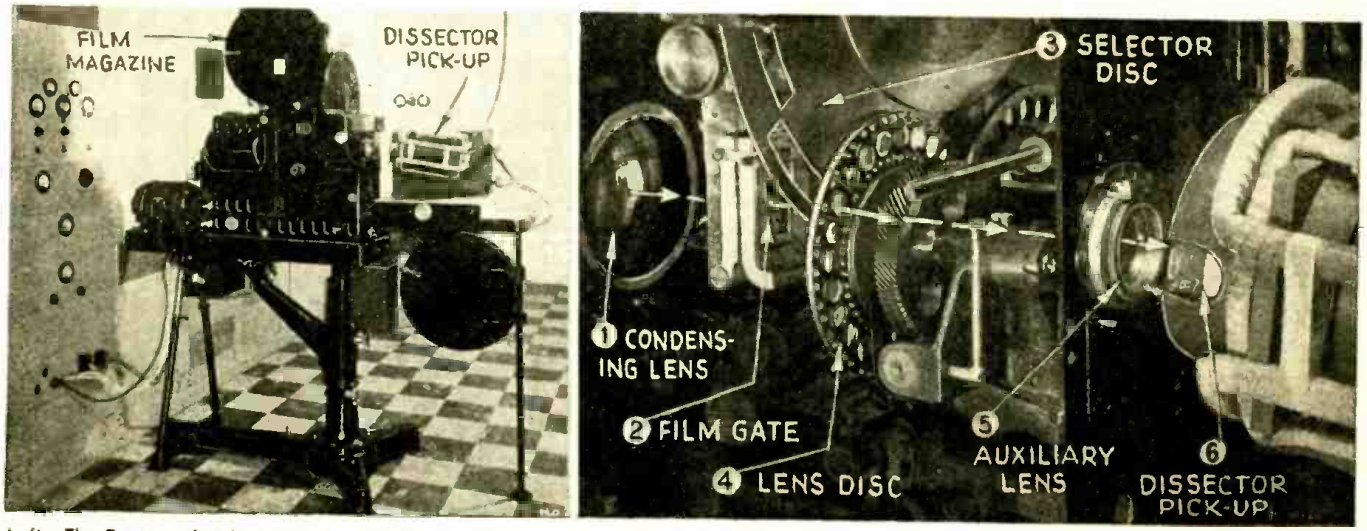
● ULTRA-short waves which are transmitted to points well beyond the optical horizon undergo variations in the received field intensity which are usually not observed over the shorter distances.

This fading, as pointed out by Mr. Decino in the *Bell Laboratories Record*, is attributed to variations in the amount the waves are bent back to earth by the reflecting property of the lower atmosphere. Extensive tests were carried out over a 60 kilometer (36 mile) path between Lawrenceville and Deal (both in New Jersey) with these two meter waves. One type of fading which occurred more often during the colder days of the year, might be produced by an air-mass moving across the path of the waves and re-directing some of the energy to the receiver, it is pointed out. A large object intercepting the waves might have the same

(Continued on page 240)



New Method of Televising Films



Left—The Farnsworth telecine projector with camera cover removed, showing the dissector tube with its scanning and focusing coil system. Right—Optical path through the projector.

● THE Farnsworth television experts are thoroughly convinced that the transmission of motion pictures by means of films will always, and particularly in the beginning, constitute a substantial part of any television program.

This, of course, does not necessarily mean the transmission of motion pictures as they are now produced, but motion pictures made up of subjects especially adapted to television, which will bring to the home a type of entertainment and education not otherwise available.

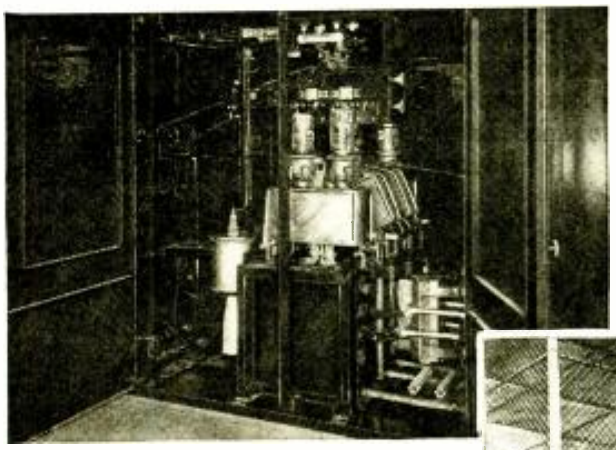
Such films can be readily transported from station to station, and transmitted without awaiting the time when suitable radio or wire line connections are available between stations for the relaying of television programs. The Farnsworth Company has, therefore, devoted a considerable amount of effort to the development of suitable apparatus for this purpose. This effort has been appreciably enhanced by the excellent adaptability of the high fidelity dissector tube for this phase of the art.

The development of a new model motion picture projector for telecine operation, including many novel features, has just been completed.

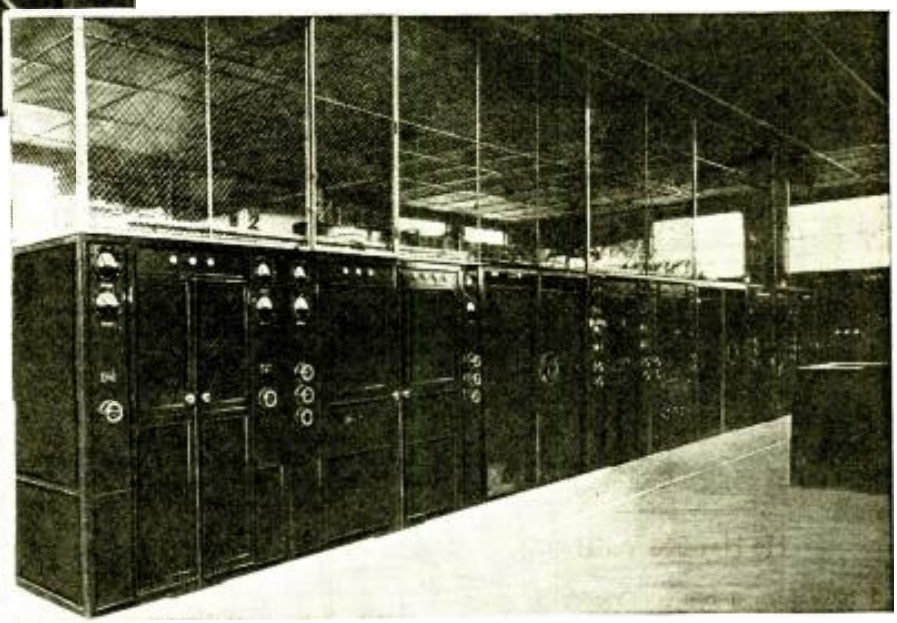
This projector is of the so-called "continuous", rather than "intermittent" type, and the film, therefore, passes through

(Continued on page 252)

"Ici Paris Mondial"— "This Is Paris World Wide"



Above—Close-up view of part of the new s.w. transmitter, showing large tubes used.



Right—General view of the new Essarts-le-Roi s.w. transmitter.

Below—Exterior of the new French transmitting station, showing antenna masts.

The present article describes the new French short-wave broadcasting station at Essarts-le-Roi.

● SINCE the inauguration in 1931 of the original short-wave station at Pontoise, many foreign countries have built and put into service powerful short-wave transmitters, and the French radio authorities realized that the construction of a new one, with more modern transmitters, was imperative. The experts of the French broadcasting service some time ago made a special study of the problems involved in the modernizing of short-wave broadcasting facilities, both for the purpose of maintaining contact with the French colonial possessions, as well as general world broadcasting. These studies of the problems in hand finally led to the installation of a medium power transmitter (25 kw.) at Essarts-le-Roi, this location being considered an extremely favorable one, so far as the radiation of powerful waves was concerned, and it also lent itself very well to the installation of the special aerials necessary.

This new transmitter will operate on all the usual wavelengths necessary to maintain an efficient broadcasting service, and it incorporates all of the very latest technical developments.

The construction of the new building and masts to support the antennas for the new Essarts transmitter was carried out some months ago, and the first test transmissions were made late in 1937. After the first successful tests of the new short-wave broadcasting station, various changes were made in the types of antennas used, and tests were also made on various frequencies to determine which ones were best for day and night transmission over long distances. Daily telegraphic connections with a number of foreign radio laboratories were maintained and a great deal of valuable information was amassed.

The new French short-wave transmitter has been in operation since April 1st in regular service (refer to our world short-wave station list for time schedules and frequencies).

Very favorable reports have been received by the French broadcasting service concerning the reception of the test transmissions from the new station, especially from listeners in the United States and Canada.

The great improvement which has been noted in the reception of signals from the new short-wave station at Essarts, in comparison to those previously received from the Pontoise station, is due principally to the following reasons:

(1) While the Pontoise station can only transmit on two-wavelength bands and three frequencies, the Essarts station can transmit on 5 wavebands and 14 frequencies. That is to say:

2 frequencies in the 16-meter band
3 frequencies in the 19-meter band
3 frequencies in the 25-meter band
4 frequencies in the 31-meter band
2 frequencies in the 50-meter band

(2) The power of the station is nearly three times as great as that of the transmitters at Pontoise.

(3) Lastly, and above all, the aerials used were the object of an exhaustive study on the part of the French Broadcasting Service. The principle of these new aerials, which have never been used in France before, was gathered in the United States by a French commission during 1936. The aerials are of the type described as "lozenge-shaped." The radiating elements are disposed following the sides of a horizontal lozenge at a height varying from 15 to 25 meters (49 to 81 feet). There are two copper wires at the side, supported by insulators fixed on wooden poles from 15 to 25 meters high. The polarization of radiation is horizontal, this being directed in the vertical flat of the large side of the lozenge, and its maximum being a direction forming an angle of 15° to 35°. A special

(Continued on page 252)

WHAT DO YOU THINK?

Come on, boys, send the Editor some good photos of those crack short-wave listening posts we just know you operate. Read the prize offer for best Listening Post photo below. Note that photo should be as large as possible and sharply focussed. Include photo of yourself.

He Built Eight Sets

Editor,

I am writing to tell you I think your magazine is swell. I have read it since January 1936, and since then have built about eight sets. I have heard dozens of foreigns, here's a few of them: KTO, JYK, JYT, TPA2, JZK, GSF, LSX, TPA3, 2RO, DJD, GSP, TPA4, COCX, LSX, COCQ, LRX, RAN, GSG, DJA, GSB, PRF5, COCH, KKH, HC2BL, GSL, EAQ2, XU8MC, KAIME, UK, HF, PCJ, SUICH; not to mention dozens of HJ's, Cubans and several from Dixon and Bolinas, California.

The amateurs were all "phone." I like everything about your magazine. The television articles are very interesting. The receiver on which I heard the above stations was a 58, 57, 56, 2A5 regenerative line-up.

I would enjoy corresponding with any Hams, SWL's, or "what have you" who are interested in chemistry and physics. I've had a chemistry lab. for seven years.

Jeffrey Musgrove,
708 4½ St., N.E.,
Calgary, Alta.

He Has 800 Veris!

Editor,

I have been a constant reader of your magazine for the last four years and I can say without hesitation that it is the best radio magazine on the newsstand. I have no difficulty whatsoever in getting your magazine in Australia.

The first thing I read is the *editorial* and always find something of benefit in this article. Joe Miller's department is always full of interest. Please keep up with these articles. I have built a number of your small sets and have had no trouble at all in getting them to function.

I will now describe the receivers which I use here, these sets are all home-made and very fb, hi! Top to bottom: 7-tube super-het., using 58, 57, 58, 55, 59's in PP and 80 rectifier. Speaker for this receiver is above and is an 8" dynamic.

Underneath and to the left is a 2-tube converter, using a 224 as detector and a 227 as an oscillator. Next to it is a beat-frequency oscillator; this unit uses a single 30 tube and it uses no "B" supply whatever. Underneath this again is a 3-tube battery set using an A442 as detector, resistance-capacity coupled to an A415, then transformer-coupled to a B443 pentode. Headphones are used. I use an eliminator for the "B" supply for the converter and 3-tube battery set, and a separate filament transformer for the converter.

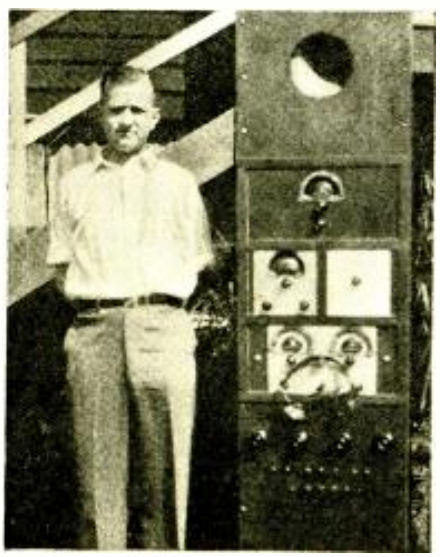
I have heard 58 countries up to the present and have 24 verified. Have over 800 veris and SWL cards. I did not have the photo taken in the shack, as the light is none too good, hi, hi!

If any hams or SWL's would like to swap cards and photos with me, I can assure them that I am 100% QSL.

Well I am QRU here so I will QRT now, wishing your magazine the best of success.

Radiofully yours,
Cecil J. R. Howard,
219 Ellena Street,
Maryborough,
Queensland, Australia.

Australia Ho! Listening post of Cecil J. R. Howard, Maryborough, Queensland. This month's Prize Winner.



Finds S.W.&T. Circuits Valuable

Editor,

I have been a reader of your very FB magazine for well over four years and wish to say there is not a magazine in Australia half as good.

As for the television section, I think it is O.K. as it is, because there are certain Hams and Fans that can afford television equipment and others that are only interested in the circuits found in the magazine; therefore, your layout is O.K. A man might pick up your magazine and read through the television section and find a useful hint in it.

Well, OM, keep up the good work with the What Do You Think? section and the Question Box; they are just swell! Joe Miller's page is very fine, indeed.

At present my receiver is a 5-tube super-het., a very fine set, too. *It uses one of your circuits.* I have built up about a dozen circuits from your FB magazine.

I would also gladly correspond with anyone who reads this letter. I especially wish to thank the Editor for giving us this FB magazine.

Wishing you 73 and all the best from sunny Australia.

Ernest Jones,
McKellar Street,
Teneriffe N. 1,
Brisbane, Queensland, Australia.

English Listener Likes Us

Editor,

I have been a reader of your excellent journal for some time now, and I don't know of a magazine in the same class to beat it. As you may know, we "limeys" do not get it over here until it is at least two months old, yet the articles it contains are all *new* to us.

Enclosed is a list of some of the calls of stations I heard for the two weeks, March 13th to the 27th:

FA3HC, HB9CL, F8BT, OZ3U, F8XN, HB9J, W1IED, W1AXA, W1CGY, W1GEX, W1COI, W1CND, W1JFG, W2AZ, W2UK, W2IUV, W2GIZ, W3PC, W3CHF, W3CHE, W3EMM, W8CNA, W8RL.

J. Hughes,
9 Olga Street,
Bow E. 3,
London, England.

Wants More "Ham" News

Editor,

I have been reading Short Wave & Television for about a year and a half and I think it's swell, but I would like a little less *television* and more *Ham news.*

I've been fooling with radio for about a year now and am slowly but surely building up to becoming a Ham. On the right of the table in the picture is an ACR-155, a 9-tube super. To the right of this is an A.C.-D.C. regenerative receiver, using a 6D6, 6F7, 12A7. The key on the table is used for code practice. On the small shelf in the corner is an old Utah magnetic speaker.

Lawrence Kryger,
1440 Townsend Ave., Detroit, Mich.

The ACR-155 9-tube Superhet "Rolls 'em in" for Mr. Kryger.

Pan-Am Stations! Please Announce More Clearly!

Editor,

I read the recent letter submitted by Roy Chisholm of Jackson, Mich., to your *"What Do You Think?"* page. I too, have had difficulty with the Spanish-speaking broadcasting station announcers. On March 5, between 8 and 9 pm. I listened to a magnificent program of music and song. The volume was tremendous—R5S 9 with little QRN. The announcer made *frequent* announcements but all I could get out of his pidgeon English was *"Republica Colombia."* There ought to be a law!!!

The Havana stations are even worse! They talk for hours at a stretch and seldom pause for station announcements! Won't these stations please announce more often and much more clearly?

BEN LAWRENCE,
Brooklyn, N. Y.

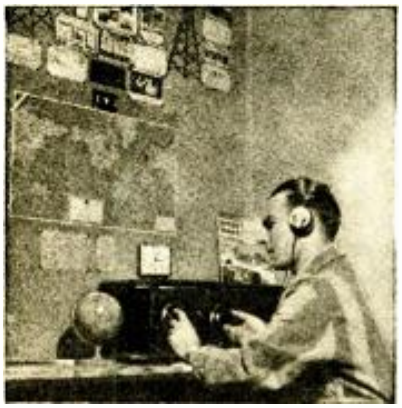
He Logged 29 Countries!

Editor,

I am enclosing a picture of my short-wave listening station with which I've logged stations in 29 countries, listening mostly to the 20-meter band. The receiver is a 3-tube set I built myself and have heard some FB DX. Among some of my best catches: HH2B, PY8AH, K5AA, VP3BG, K6NZQ, YV5AE, XESW, F3KH, LU7AC, G6VX, VK2LP, VP7NI, T12DC, OA4AK, PY2AR, OZ8JB, NY2AE, VP9R.

Heard all districts in Canada. Would like to hear from other *Short-Wave Listeners* and will answer all letters. I keep your "mag." handy as you may see in photo.

LOUIS LINDENMAYER,
3150 N. Sheridan St.,
Philadelphia, Pa.



Mr. Lindenmeyer, Phila., Pa., is a regular "DX" hound. It must be 3 A.M.! WHAT?

"Guest" Editorial Complaint

Editor,

I am a newsstand subscriber to SHORT WAVE & TELEVISION, and am glad to say I enjoy it very much, and eagerly look forward to each copy. However I have one complaint to make and that is the "Guest" Editorials. It seems that your February Editorial encouraged my desire to write you. Mr. McNicol's article was called, *"Television—How Soon?"* and it seemed that he is one of those sceptics that thinks Television will have to perform miracles in order to become a success. If you read between the lines, you will notice that he expressed very little hope for Television. Among his comments was the one in which he stated that there were only seven Television channels available, but he must remember that Television is yet an infant and lots can happen between now and the commercialization of it as shown by its progress during the short time of 1937. So, why not do away with these guest editorials and substitute in its place more helpful articles such as suggested by J. Miller of New York?

I also notice in your magazine that the Daventry stations do not verify. I have only been DX'ing for four months and in October I asked England for a verification and promptly received one. It wasn't very elaborate but it did serve its purpose. It consisted of the Coat of Arms and had the following on it—"The British Broadcasting Corporation acknowledges with many thanks receipt of your report on your reception of the transmissions from the Empire Broadcasting Station. Broadcasting House, London."

VIRGIL OLIVER,
620 N. 20th St.,
Mattoon, Illinois.

(Thanks very much for your communication, Virgil. We are always glad to receive criticism or an expression of different opinion from that presented by our "Guest" editors or other authors. We are sorry to disillusion you, but we are quite familiar with the acknowledgement card sent out by the British Broadcasting Corp., and while it contains the "coat of arms" and an official sounding statement imprinted thereon, it is NOT a verification card, but merely an acknowledgement that your communication has been received.—Editor.)

Anent Call Letters for S-W Listeners

Editor, SHORT WAVE & TELEVISION,
Dear Sir:

Receipt is acknowledged of your letter of February 23, 1938, in which you inquire concerning the adoption of "call letters" by short wave listeners.

In reply, may I say that the identification of receivers in this way is not, in itself, a matter within the purview of this Commission. Radio call letters as referred to in treaty, statute and regulation, have to do with the identification of transmitting stations. There would seem to be a possibility that the use of letter groups which have been assigned as amateur calls might give rise to unfortunate situations as between the persons involved; and this, in a proper case, might present issues within the jurisdiction of local courts. However, as stated, this Commission would not appear to be concerned in the matter.

The Commission has received requests for assignment of letters to short wave listeners. These requests have been declined for the reasons set forth above.

Very truly yours,

T. J. SLOWIE,
Secretary,
Federal Communications Commission,
Washington, D. C.

He Thinks Dr. Tesla Is Right

Editor,

As I am a new fan in this radio world of ours, who receives SHORT WAVE & TELEVISION every month, and as you ask for our version of the opposite side of the story, here is my idea of it.

Regarding the Martians, I am inclined to think that Dr. Tesla is right, but we must have more definite proof of all that. Suppose the Martians have one big signal generator, then the signal emitted should be very, very strong, so strong that we cannot receive it here on the earth because we do not have, as yet, a receiver powerful enough to contact that plus-ultra short wave-length. Then what should we do?

Mr. Editor, here is an idea. We all know that the compass needle is attracted by the North Pole, so the N.P. must be positive (+), and if the N.P. is (+), then the South Pole is negative (−), because that pole repels the needle. Then the South and North Poles must be the two terminals of that big battery comprising the earth globe; this big round battery (or the globe) in its rotation around the sun, accumulates electricity; if we only could use that electricity to produce a kind of spark then, perhaps, we could signal to the Martians.

H. DESORMEAUX,
2737 St. Donat St.,
Montreal, Canada.

P.S.—Of course, it's only an idea.

Felix E. Quayle, P.O. Box 4, France Field, Canal Zone, sends us this picture—"An s.w. fan at ease"—we calls it. He sent along a fine list of "stations heard."

A Voice from England

Editor,

I always find your magazine full of interest, which is more than I can say about most of our English ones.

My present hookup is a six-tube all-wave superhet, and I find that your stations, W8XK, W2XAD, W3XAL, W2XAF, W1XK, W2XE, W1XAL, W3XAU in the 13, 16, 19, 25, 31 and 49 meter bands come over fairly well on this. However, I find that for real DX reception, a 2-tube receiver using headphones is best. This is a 1-V-O working from batteries.

I am a regular listener to your Ham stations. I should like to hear from any S.W.&.T. reader of either sex, in any part of the world, and would be glad if you would put my name in your swappers section. Here's wishing every success to your fine paper.

A. J. WHITE,
Fore St.,
Buckfastleigh,
Devon, England.

Short Wave League

When to Listen In

ULTRA SHORT WGY has an ultra-short wave broadcaster, W2XOY, working on 41 mc. Address reports to G. E., Schenectady, N. Y. The transmitter is located in Albany. At the moment programs are aired on Monday, Wednesday and Friday from 7 to 8 p.m. and on Saturday from 2 to 4 p.m. They've had reports from the Pacific coast already.

INDIA SPEAKS The new Indian s.w. stations are getting thick as flies. The latest additions are VUD3, Delhi, on 15.16 mc. from 1.30 to 3.30 a.m. and 8.30 to 10.30 p.m. VUD3 also shares the 9.59 mc. channel with VUD2, also of Delhi. VUD2 has 10 kw., VUD3 5 kw.

11 METER SIGS A newcomer to this band is W2XJI in New York on 26.3 mc. This station is a 100 watter relaying WOR, Newark, from 8 a.m. to 1 a.m.

RANCHO GRANDE Enrique Ziegler, Callao, Peru, reports a station RANCHO GRANDE on 12.2 mc. The location is Trujillo, Peru. We don't know anything about its schedule.

PANAMA Panama City is heard via a new station, HP5G on 11.78 mc. It's heard with fair volume in New York as late as 12 m. Address reports to Box 1121.

A CATCH Radio Noumea at Noumea, New Caledonia, on 6.1 mc. is a signal worth chasing due to its distance and low power. Broadcasts are in French only, Tuesday through Saturdays 2 to 3.30 a.m. Address reports to Charles Gaveau, 44 Rue de l'Alma.

IN THE NEWS W4XB at Miami, Florida, is back on the air after a long silence on 6.04 mc. Generally it is heard from 9-11 p.m. relaying WIOD.

W8XAL has been given authority to use 15.27 and 11.83 mc. in addition to its present 6.06 mc. channel. These two new channels are also used by W2XE, New York.

The *Pillar of Fire*, religious sect, has asked F.C.C. authority to build a 5 kw. transmitter for broadcasting on 6.08, 11.83 and 17.78 mc. Transmitter location would be Zarephath, N. J.

9MI SCHEDULE The seagoing broadcaster aboard the M.V. *Kanimbla* sailing out of Melbourne, Australia, will operate on the following schedule in August. 7 to 7.30 a.m. on August 3, 7, 10, 14, 25, 28, and 30. In addition it will broadcast from 2.15 to 2.45 a.m. on August 3. This information is from a sheet sent to R. Murphy, Auckland, New Zealand, by the ship's owners, McIlwraith, McEacharn, Ltd., of Melbourne.

BRITANNIA RULES THE WAVES is no idle statement these summer afternoons and evenings as a little dial twiddling will soon prove. Daventry can be heard with tremendous signals any day from 4.15 to 6 p.m. and again from 6.17 to 8.30 p.m. on GSG, 17.79 mc. and GSP, 15.31 mc. From 12.45 to 4 p.m. GSG is also heard by North American listeners but the signal doesn't really build up to peak strength before four o'clock. GSC and GSD, 11.75 and 9.58 mc., are also well heard from 9.17 to 11.20 p.m.

JAPAN The Japanese seem to be having trouble putting a decent signal into the East Coast during the evening hours. At present JZK, 15.16 mc., is rarely heard in its broadcast from 6 to 6.30 p.m. JZL on 17.785 mc. is testing for the U.S. from 8 to 8.30 and 10.30 to 11.30 p.m. We heard the 8 p.m. broadcast once, about R1. JZL is sandwiched 5 kc. away from W3XAL and GSG so it hasn't much of a chance. On the other hand JZJ, 11.8 mc., is heard R8 any morning from 7 to 7.30 a.m.

JAVA? Several mornings around 7 a.m. we've heard an R5 signal on about 18.83 mc. broadcasting music with Dutch announcements. The frequency corresponds with that of PLE at Bandoeng which used to broadcast irregularly in the morning before working telephony with Amsterdam. We haven't been able to decipher the announcements which apparently give the call and frequency.

EAQ RETURNS Madrid's old standby EAQ on 9.86 mc. is back on the air almost every night (if it hasn't been bombed by the time this appears in print) broadcasting news in English at 7.30 and again at 8.40 p.m. EAR on 9.49 mc. still is heard, too, but not with English announcements.

(Continued on page 251)

All schedules in Eastern Standard Time

Can You Answer These Radio Questions?

1. What type of directional antennas are used at the Westinghouse short wave broadcast stations? See page 197.
2. Who operates the famous "flying radio laboratories" and where is their test base located? See page 198.
3. How is the effect of a sunspot communicated to the earth? See page 199.
4. How old is short wave broadcasting and in what city was the first station located? See page 200.
5. How does a plane's pilot know when he is approaching the field when attempting a "blind landing" by short wave beam? See page 204.
6. Where is the new French S.W. broadcast station located and how many frequencies can it use? See page 207.
7. How does the Hogan facsimile apparatus reproduce the picture? See page 211.
8. How do modern television systems compare with the human eye as to the manner of reproducing the image? See page 217.
9. What new short wave station in this country will help to counteract the "foreign" S.W. propaganda enveloping South America? See page 223.
10. Do you know how to connect an "R" meter to a receiver? See page 224.
11. Of what use is an alarm clock in a radio control for model planes? See page 228.
12. What other uses can you name for the audio frequency amplifier described on page 230, and how can 2 inputs be faded in and out? See page 230.

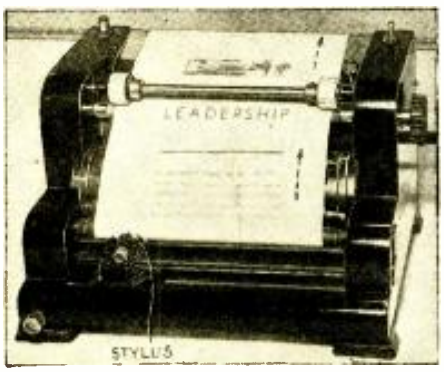
The Hogan Facsimile System

One of the principal American systems of transmitting photos, drawings and other material by facsimile line-by-line process, is that developed by the well-known American radio pioneer, John V. L. Hogan.

This picture was reproduced via radio, 100 lines per inch, at a speed of six square inches per minute.

● JOHN V. L. HOGAN'S first experimental station, W2XR, in New York, was originally licensed by the Federal Radio Commission on March 26, 1929. This was primarily a television development station, but from those earliest days Hogan and his associates carried on investigations in the field of transmitting and recording "still" pictures, or *facsimile*. The television station operated on 2050 kilocycles, and had associated with it a "sound track" using the 1550 kilocycles. This sound track station, with Hogan's developments in *high fidelity* broadcasting of speech and music, has since then graduated from the laboratory stage and on December 5, 1936, was licensed as WQXR to the Interstate Broadcasting Company, Inc., which Mr. Hogan controls. WQXR has made substantial progress in its so far short commercial life, and is already well known to New York's music lovers. The experimental stations which Mr. Hogan and his associates now operate are W2XAR, for general experimental investigations; W2XDR, for television developments, and W2XR, for *facsimile* on 2012, 2398 and 41,000 kilocycles. Mr. Hogan says that he believes the *facsimile* station will be the next to come out of the laboratory form and assume the stature of a public service.

Mr. Hogan feels that *facsimile* is a more useful and important service than television, for the following reasons: (1) Facsimile apparatus much less expensive than television apparatus; (2) Programs much less costly; (3) Text and pictures can now be acceptably reproduced by facsimile, whereas the best television technique is still unacceptable to many; (4) Facsimile programs may be watched as they are presented, or the user's attention may be diverted elsewhere and pick up the programs later with no loss of content; (5) Provision of advertising coupons where desired, and (6) Transmission by wire, or on long, medium, short or ultra-short waves, with very moderate channel-width requirements, whereas television is inordinately greedy in its demands for channel space and consequently is considered to be limited to special cables and the ultra-short waves.



Front view of the Hogan Facsimile Receiver

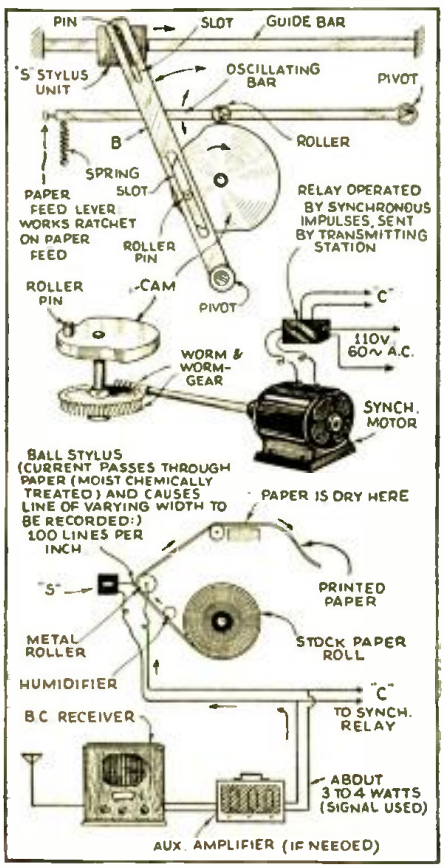


Diagram at right shows details of the Hogan facsimile apparatus and how a cam drives the oscillating arm, which builds up the picture line by line.

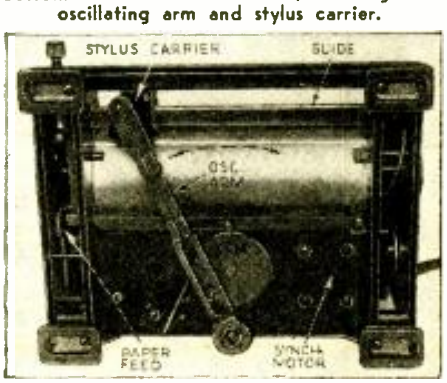
Photographic System Discarded

In the studies leading to the design of a suitable recorder for *home* use, Mr. Hogan discarded photographic methods because of the processing and skill required; he set up as his first requirement that the recording should be visible and instantaneous, so that the user could see what was going on at all times, and could in fact check the tuning and other adjustments of his receiver, simply by observing the action of his recorder. This important characteristic requires that each recorded mark should be seen on the recording paper practically at the instant it is made; if the picture is recorded inside a box and, after a delay of some seconds or minutes, is fed out through a slot, the user is not only deprived of the fascination of seeing the picture build up line by line but, more importantly, has great difficulty in tuning or setting the volume of his receiver.

A second requirement set up by Hogan in his earliest work was that the recording should be *continuous*, i.e., that the recording

(Continued on page 242)

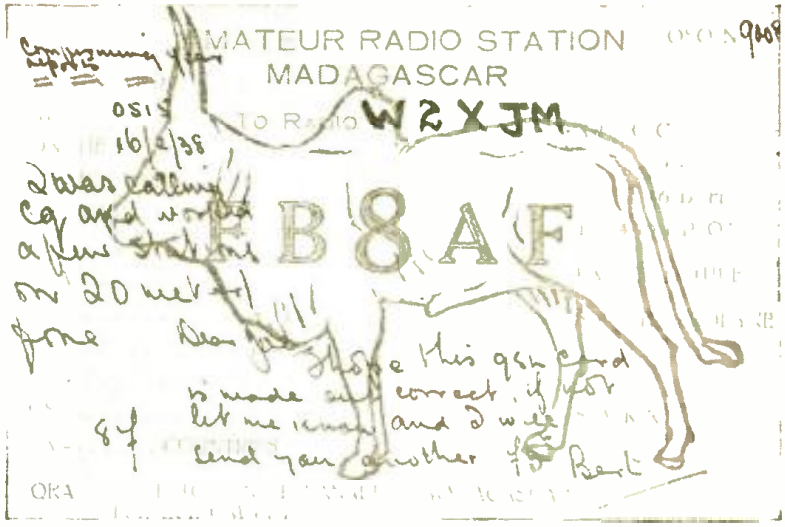
Bottom view of the receiver, showing the oscillating arm and stylus carrier.



← Left — This excellent Foto from our DX friend, Bert, of FB8AF, shows him at the controls of his world-famous DX station.

•

→ Right — Card received from FB8AF — Madagascar. A much coveted DX QSL with call and water buffalo outlined in pink.



Let's Listen In with Joe Miller "DX" Editor

● THE good ol' summer time is here again!

We all welcome with enthusiasm the warm weather, and the good times ahead out-of-doors in this most enjoyable season of the year.

This is also the time of the year when many of our DXing brethren say, "Well, I guess I'll put the ol' rig in moth-balls for the summer. I need a vacation from DX, and I won't miss much anyway."

To that last, we'll say "Oh, yeah?" True, there may not be as much good DX to hear as during the cooler months, but there is plenty of FB DX around the dials daily, if one but gives his curiosity a fling, to find out for himself!

We can make no case concerning the necessity for a DX vacation, as we all need periods of respite from the dials, in order that after a week to a month of surcease from dial-twisting, we may return with renewed interest to our beloved hobby, refreshed by such a vacation.

Especially is this the case with "Ye DX Ed.," who has travelled many millions of miles by air, and finds it absolutely necessary to at times just forget about DX entirely, and to "kind-of" change the subject of our interest occasionally.

But, if one is to take a DX vacation for the entire summer, he is sure to miss some good DX, *that would not be heard as well* during the peak DX months!

Yes, there are a number of stations, and real DX, too, that actually can be better heard during the warm weather!

We refer in particular to Asiatic SW BC, and commercial phone stations, which are actually pounding in here, on the East Coast, with better signal strength than during the winter and spring months!

This is no unusual occurrence, as it has been the same for the past few years.

So take a tip, fellow globe-travellers, and do give the dials an occasional twirl during the summer and you may reap some surprising DX as your reward! Some of the following tips may show you what to look for in improving your summer SW listening results.

Regarding the W8JK Flat-top Beam, with which we have had some very fine DX results, we have been assured by the Editor that the data we supplied will be published in this issue, giving full details as to its construction. (See page 250.)

Some unusually fine DX has been heard from Asia on 20 meters using this beam, directed north over the North Pole, at Asia, the nearest route to Asia for us, this far up north in New York.

We wish to acknowledge the kindness of Mr. John Kraus, who operates W8JK, for his courtesy in supplying us with every detail of construction, so that we might obtain the best results, which we surely did! Complete details of this excellent antenna also appeared in *Radio*, Jan., 1938, and in *QST*, same date, by Mr. Kraus.

Well, here goes:

ZT6AM—South Africa. A fine QSL with call and springbok in blue, border lines and sun printed in gold.

BECHUANALAND

ZNB, 5.90 mc. at Mafeking, has been QSL'd here with the very attractive card shown in this issue, and we were certainly glad to get this one!

Due to its schedule of operation, we hardly feel that ZNB will ever be well enough heard here to merit a QSL of its

broadcast programs. After a month or more of perseverance during the early morning hours we were rewarded one day with a "log" on one of ZNB's commercial transmissions and that FB card was our reward!

According to a completely detailed description of all broadcasters in Bechuanaland, kindly sent us by the Station Engineer, the schedule of ZNB is as follows: 6-7 a.m. and 1-2.30 p.m., e.s.t., with programs of recorded music, power 200 watts.

However, ZNB does communicate with other lower-powered transmitters in the Protectorate, and may be heard best, if at all, during the early morning hours, when it has any traffic to carry.

Following stations occasionally communicate with ZNB:

ZNC, at Maun; ZNF, at Ghanzi; ZND, at Isabon, all with 40 watts, and ZNG, at Gaberones, 7½ watts, this last battery-operated. ZNC, ZNF and ZND all operated with ZNB on 5.90 mc., while ZNG is on 7.60 mc., all frequencies are mentioned as "approximate" in the letter.

Other stations may be added to these.

The QRA (address) is: Radio ZNB, Director of Public Works, P.O. Box 166, Mafeking, Bechuanaland Protectorate.

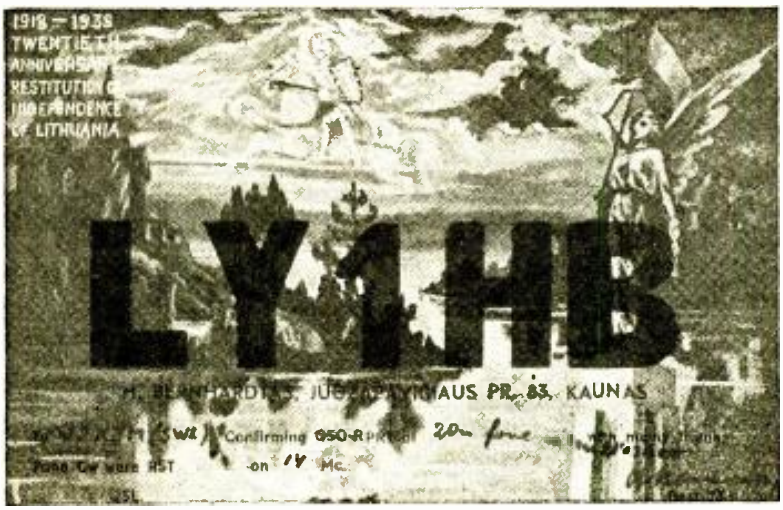
ZNB — Bechuanaland. Here's a rare and handsome DX QSL. Background in red, red and blue border lines.

FINLAND

A new station has just been heard, located at Lahti, using 1 kw., on 9.50 mc. approx., from 2-5 p.m. daily, and affords DXers the opportunity to cross off their "wanted" list this new country, on the air at last. Announcements are in several languages, including English, on the hour. Other frequencies which may also be used are 11.78 and 15.19 mc. Reports should be sent to: Finnish Broadcasting Co., Helsinki, Finland.

STRAITS SETTLEMENTS

ZHO, which is believed to be the assigned call of the Singapore station on 9.53 mc., is being reported here in the East by several DXers during the early morning hours, although no definite schedule is known. It is suggested that one try between 5:30-6:30 a.m., E.S.T., for the East Coast, the peak reception period for Asiatics here.



LY1HB—Lithuania. A beautiful card comes from this small European nation. Call in Autumn red, and scenery in blended pink and pale olive green.

However, out on the West Coast, Jim Lanyon, VE5, airmails to us his reception results of this station. Sez Jim: No call letters announced. Announcements as follows—"This is the Singapore station broadcasting on 31.48 meters, 9 point 5-3 megacycles per second." Jim reports reception at 9:15-9:40 a.m., at which time program ends, and announcements are made of following day's fare. ZBW interferes with ZHP's signal on the L.F. side. Music always of western type, and announcer's accent "veddy veddy" British, hi! Watch for this one.

JAPAN

The commercial transmitters are quite in evidence these mornings, and the "J" signals do pound in! Those heard are JVF, 15.62 mc., 7:15 a.m.; JVH, 14.60 mc., 7 a.m.; JVO, 10.37 mc., 5:50 a.m.; JZE, 13.02 mc., and reported by G. C. Gallagher, W6, JVE, 15.66 mc., 10 p.m.; JVD, 15.86 mc., 9-10 p.m.

Other transmitters heard are JIB, 10.535 mc., Taiwan, Formosa, at 6 a.m., and then the broadcasters.

JDY on 9.925 mc., is still very well heard, while JFO, 9.625 mc., is rather difficult to receive well.

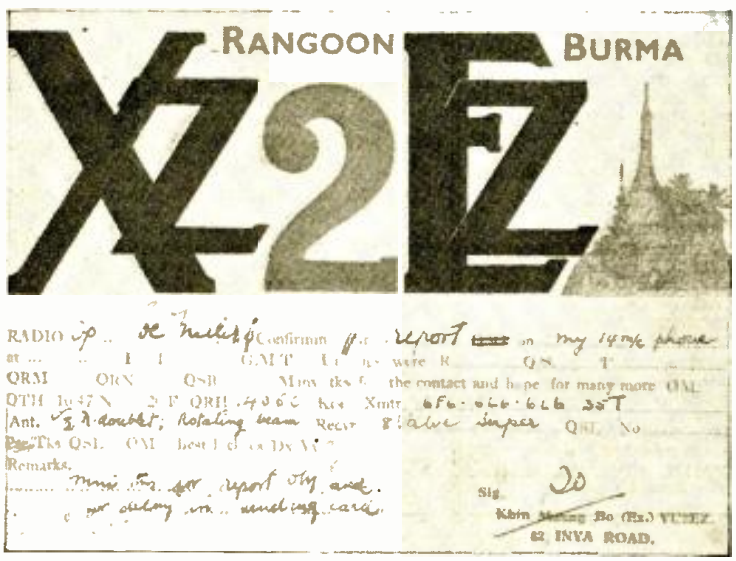
Regarding JFO, letter veris received by several DXers are very courteous and definite in verifying. JFO's QRA, from these letters, is: Radio JFO-JFAK, Mr. Jiro Hayashi, manager of the Taihoku Broadcasting Station, Taihoku, Taiwan (Formosa).

JZL on 17.785 mc. is now being heard on the East Coast from 8-8:30 p.m., although not with a very good signal as yet. Later in the summer, JZL should be heard better at this time of transmission.

INDO-CHINA

Radio Boy-Landry has added a new transmitter to their other two, this one using 9.76 mc., all transmitting simultaneously daily until 9:15 a.m. The 49 meter station, which is shifting quite often, has

(Continued on page 249)



XZ2EZ—Burma. Our Burmese radio friend, "BO," sends us this strikingly unusual QSL. Call in varied colors, X-E in green, figure 2 in blue, Z's in Red. Many thanks, "BO"!

World Short Wave Stations

Revised Monthly

Broadcasters' Calls in bold type
Phones' in light type

Reports on station changes are appreciated.

Mc.	Call	
31.600	W1XKA	**BOSTON, MASS.**, 9.494 m., Addr. Westinghouse Co. Daily 5 am.-12 m., Sun. 7 am.-12 m. Relays WBZ.
31.600	W1XK8	**SPRINGFIELD, MASS.**, 9.494 m., Addr. Westinghouse Co. Daily 5 am.-12 m., Sun. 7 am.-12 m. Relays W8Z.
31.600	W3XEY	**BALTIMORE, MD.**, 9.494 m., Relays WFBR 4 pm-12 m.
31.600	W2XDV	**NEW YORK CITY**, 9.494 m., Addr. Col. Broad. System, 485 Madison Ave. Daily 5-10 pm.; Sat. and Sun. 12.30-5, 6-9 pm.
31.600	W9XHW	**MINNEAPOLIS, MINN.**, 9.494 m. Relays WCCO 9 am.-12 m.
31.600	W3XKA	**PHILADELPHIA, PA.**, 9.494 m., Addr. NBC. Relays KYW 9 am.-10 pm.
31.600	W5XAU	**OKLAHOMA CITY**, 9.494 m., Sun 12 n-1 pm., 6-7 pm. Irregular other times.
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.
26.450	W9XA	**KANSAS CITY, MO.**, 11.33 m., Addr. Commercial Radio Eqpt. Co. Testing after August 1st.
26.400	W9XAZ	**MILWAUKEE, WIS.**, 11.36 m., Addr. The Journal Co. Relays WTMJ from 1 pm.
26.300	W2XJI	**NEW YORK, N. Y.**, 11.4 m., Addr. Bamberger Broad. Service, 1440 Broadway. Relays WOR 8 am.-1 am.
26.100	W9XJL	**SUPERIOR, WIS.**, 11.49 m. Relays WEBC daily.
26.100	GSK	**DAVENTRY, ENG.**, 11.49 m., Addr. B.B.C., London. Operates irregularly.
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 6.45-9 am. Exc. Sun.
21.530	GSJ	**DAVENTRY, ENG.**, 13.93 m., Addr. (See 26.100 mc.) 5.45 am.-12 n.
21.520	W2XE	**NEW YORK CITY**, 13.94 m., Addr. Col. Broad. Syst., 485 Madison Ave. Sun. 7 am.-12 n.
21.500	W2XAD	**SCHENECTADY, N. Y.**, 13.95 m., General Electric Co., 7 11 am.
21.470	GSH	**DAVENTRY, ENG.**, 13.97 m. (See 26.100 mc.), 5.45 am.-12 n.
21.450	DJS	**BERLIN, GERMANY**, 13.99 m., Addr., Broadcasting House. 12.05-11 am.
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 morn.
20.020	DHO	**NAUEN, GERMANY**, 14.99 m., Addr. Reichspostzenstralamt. Works S. Am. mornings.
19.900	L5G	**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 7-8.30 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 London and Paris 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 GAU 6.30-7 am.
18.830	PLE	**BANDOENG, JAVA**, 15.93 m. Calls Holland 6-11 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. Calls ZSS 6.30-7 am.
18.480	HBH	**GENEVA, SWITZERLAND**, 16.26 m. Addr. Radio Nations. Sun., 10.45-11.30 am.
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. Broadcasts 5-6 pm. Friday.
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.

16 Met. Broadcast Band

Mc.	Call	
17.810	—	**ROME, ITALY**, 16.84 m., Addr. (See 2RO, 11.81 mc.) Relays 2RO to 6 pm. irregularly.
17.800	TGWA	**GUATEMALA CITY, GUAT.**, 16.84 m., Addr. Ministre De Fomento. Irregular.
17.790	GSG	**DAVENTRY, ENG.**, 16.86 m., Addr. B.B.C., London. 12 m.-2.15 am., 5.45 am.-12 n., 12.20-6, 6.17-8.30, 9.17-11.20 pm.
17.785	JZL	**TOKYO, JAPAN**, 16.87 m. Irregular. 6-6.30, 9-9.30, 10.30-11.30 pm., 12.30-1.30 am.
17.780	W3XAL	**BOUND BROOK, N. J.**, 16.87 m., Addr. Natl. Broad. Co. 8 am.-8 pm.
17.770	PHI2	**HUIZEN, HOLLAND**, 16.88 m., Addr. (See PHI, 11.730 mc.) Daily except Wednesday, 7.25-9.30 am., Sun. 6.25-9.30 am.
17.765	TPB3	**PARIS, FRANCE**, 16.88 m. Addr. (See 15.245 mc.) 8.30-10 am.
17.760	DJE	**BERLIN, GERMANY**, 16.89 m., Addr. Broadcasting House. 12.05-10 am.; also Sun. 11.10 am-12.25 pm.
17.760	W2XE	**NEW YORK, N. Y.**, 16.89 m., Addr. Col. Broad. System, 485 Madison Ave. Daily exc. Sun. 6.30-9 am.
17.755	ZBW5	**HONGKONG, CHINA**, 16.9 m., Addr. P.O. Box 200. 4-10 am. Irregular.

End of Broadcast Band

17.741	HSP	**BANGKOK, SIAM**, 16.91 m. Works Germany 6-7 am., 8-9 pm. Works JVE 11 pm.-6 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. Works Siam 6-7 am., 8-9 pm.
17.480	VWY2	**KIRKEE, INDIA**, 17.16 m. Works London 7.30-8.30 am.
17.310	W2XGB	**HICKSVILLE, L. I., N. Y.**, 17.33 m., Addr. Press Wireless, Box 296. Tests 9.30-11.30 am. except Sat. and Sun.
17.280	FZE8	**DJIBOUTI, FR. SOMALILAND, AFR.** 17.36 m., Phones Paris near 8 am. Tests 1st Thurs. in the month, 8-8.30 am.
17.120	WAQ	**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. and early am. irreg.
16.233	FZR3	**SAIGON, INDO-CHINA**, 18.48 m. Calls FTK 6-9 am.
		KAHUKU, HAWAII, 18.71 m., Addr. RCA Comm. Works Dixon 3-10 pm.
15.880	FTK	**ST. ASSISE, FRANCE**, 18.9 m. Works Saigon 6-9 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.

(Continued on page 216)

All Schedules Eastern Standard Time

Second Silver Trophy *Award*

This month's trophy winner — Albert C. Uthe, W2JZO, New York City.

Goes to

Albert C. Uthe

W2JZO, New York, N. Y.

For best HAM STATION Photo of the Month

This beautiful silver trophy stands 11¾" high and is awarded monthly by SHORT WAVE & TELEVISION magazine for the best photo of a Ham station. The silver statue stands on a handsome bakelite base on which is a silver plate. The name of the winner will be engraved on this plate before the trophy is sent to him.

● THE radio shack of Albert C. Uthe, owner and operator of W2JZO, is located in the heart of New York City, and as usual is entirely surrounded by large apartment buildings.

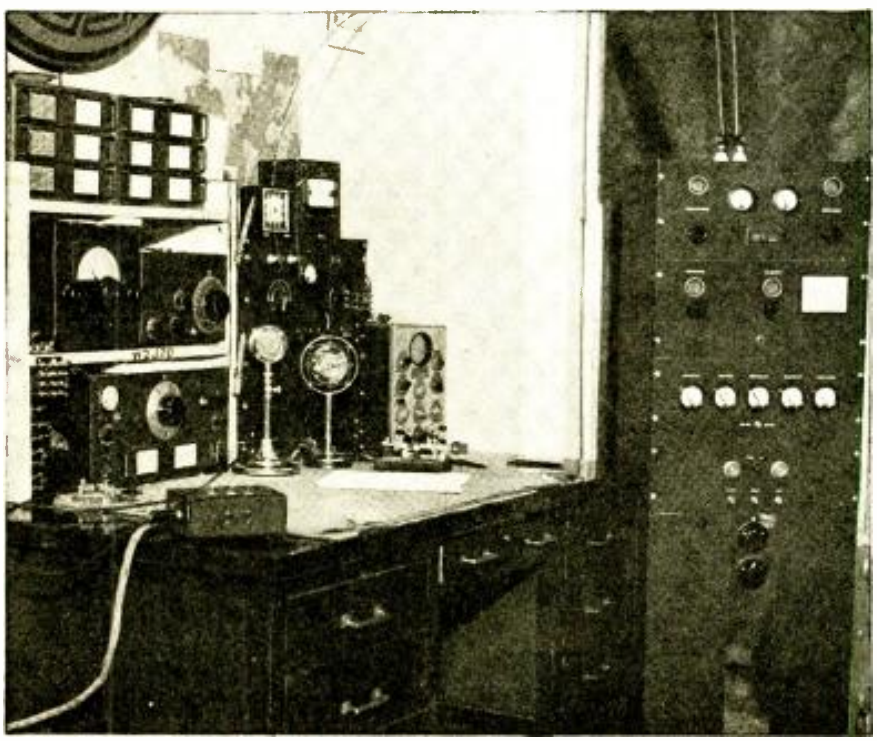
Although he has been associated with a communications organization for fifteen years, he has only been a ham for about two years. In that time he has, however, set up one of the finest ham stations we have had the pleasure of looking at. A place for everything and everything in its place.

Although the station is rarely on the air more than three or four hours each week, yet, during the first year his log indicated over 750 contacts on five meters alone. During the year just ending, he has made over 875 contacts on both ten and twenty meter phone.

The big transmitter is a Collins 30 FXC with 275 watts input. The RF lineup consists of a C-100D crystal oscillator, 6L6 first buffer doubler, 6L6 second buffer doubler, RK 20 intermediate amplifier and an Amperex 211H in the final. The audio lineup has a 6C5G first voltage amplifier, a 6C5G second voltage amplifier, two 6F5G audio drivers and a pair of ZB 120 as class B modulators. A Du Mont 'scope is constantly used to check all transmissions in order not to over-modulate.

The five meter transmitter is a Peak with about 27 watts input. The lineup in this job is: 76 speech, 6A6 driver, 6A6 modulator with a 6A6 modulated oscillator.

The prize-winning "Ham Station" photo—that of W2JZO. A high-grade "shack" and a "live" operator.



A Triplett Modulation Monitor is inductively coupled to the five meter antenna to check for over-modulation.

A National 1-10 receiver is used for five meter work. An HRO with coils for all

(Continued on page 245)

Mc.	Call	
15.660	JVE	NAZAKI, JAPAN, 19.16 m. Works Java and Siam early am.
15.620	JVF	NAZAKI, JAPAN, 19.2 m. Works Cal. near 5 am. and 8 pm.
15.550	CO9XX	TUINICU, ORIENTE, CUBA, 19.29 m., Addr. Frank Jones, Central Tuinicu, Tuinicu, Santa Clara. Broadcasts irregularly evenings.
15.450	IUG	ADDIS ABABA, ETHIOPIA, 19.44 m. Works Rome 9-10.30 am.
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.

19 Met. Broadcast Band

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 11.30 am.-6 pm.
15.320	OLR5B	PRAGUE, CZECHOSLOVAKIA, 19.58 m. Addr. (See 11.840 mc.) Sun., Wed., Sat. 5-5.10 pm.; Mon., Tues., Thurs., Fri. 6.55-9.55 pm.; Sun. 5.55-8.55 pm.
15.310	GSP	DAVENTRY, ENG., 19.6 m., Addr. (See 26.100 mc.) 12.17-1.15, 4.15-6, 6.17-8.30 pm.
15.300	XEBM	MAZATLAN, SIN., MEX., 19.61 m., Addr. Box 78, "El Pregonero del Pacifico." Irregularly 9-10 am., 1-2, 8-10 pm.
15.300	—	ROME, ITALY, 19.61 m., Addr. (See 2RO, 11.81 mc.) Relays 2RO to 9 pm. irregularly.
15.290	LRU	BUENOS AIRES, ARG., 19.62 m., Addr. El Mundo. Relays LRI, 7-9 am.
15.280	HI3X	CIUDAD TRUJILLO, D. R., 19.63 m. Relays HIX Sun. 7.40-10.40 am. Weekdays 12.10-1.10 pm.
15.280	DJQ	BERLIN, GERMANY, 19.63 m., Addr. Broadcasting House. 12.05-10 am., 4.50-10.45 pm. Also Sun. 11.10 am-12.25 pm.
15.270	W2XE	NEW YORK CITY, 19.65 m., Addr. (See 21.520 mc.) Daily except Sat. and Sun., 12 n-5 pm., Sat. & Sun. 1.30-5 pm.
15.260	GSI	DAVENTRY, ENG., 19.66 m., Addr. (See 26.100 mc.) 12.17-4, 9.17-11.20 pm.
15.252	RIM	TASHKENT, U.S.S.R., 19.67 m. Works RKI near 7 am.
15.250	WIXAL	BOSTON, MASS., 19.67 m., Addr. University Club. Daily 1-2 pm., Sun. 10 am.-12 n. Tues., Thurs. 3.30-5.30 pm.
15.245	TPA2	PARIS, FRANCE, 19.68 m., Addr. 98 bis. Blvd. Haussmann. "Paris Mondial" 5-10 am.
15.230	HS8PJ	BANGKOK, SIAM, 19.7 m. Irregularly Mon. 8-10 am.
15.230	OLR5A	PRAGUE, CZECHOSLOVAKIA, 19.7 m. Addr. (See OLR4A, 11.84) Sun., Wed., Sat. 5-5.10 pm.; Mon., Tues., Thurs., Fri. 6.55-9.55 pm.; Sun 5.55-8.55 pm.
15.220	PCJ2	HUIZEN, HOLLAND, 19.71 m., Addr. N. V. Philips' Radio Hilversum. Tues. 12.30-2 am., Wed. 9.30-11.30 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.) 12.05-11 am., 4.50-10.45 pm. Also Sun. 11.10 am.-12.15 pm.
15.190	ZBW4	HONGKONG, CHINA, 19.75 m., Addr. P. O. Box 200. Irregular. 11.30 pm. to 1.15 am., 3-10 am.,
15.180	GSO	DAVENTRY, ENG., 19.76 m., Addr. (See 26.100 mc.) 12 m.-2.15 am., 4.15-6, 6.17-9 pm.
15.170	TGWA	GUATEMALA CITY, GUAT., 19.77 m., Addr. (See 17.8 mc.) Daily 10.45-11 am.; Sun. 10.45 am.-6 pm.
15.160	XEWW	MEXICO CITY, MEXICO, 19.79 m., 12 n.-12 m., irregular.
15.160	JZK	TOKYO, JAPAN, 19.79 m. 12.30-1.30 am., 4.30-5.30, 6-6.30 pm.
15.160	VUD3	DELHI, INDIA, 19.79 m., Addr. All India Radio. 1.30-3.30 am., 8.30-10.30 pm.
15.155	SM5SX	STOCKHOLM, SWEDEN, 19.79 m., Daily 11 am.-5 pm., Sun. 9 am.-5 pm.
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., daily 5.30-10.30 am.
15.140	GSF	DAVENTRY, ENG., 19.82 m., Addr. (See 26.100 mc.) 12 m.-2.15, 5.45 am.-12 n., 4.15-6, 6.20-8.30 pm.
15.130	TPB6	PARIS, FRANCE, 19.83 m., Addr. "Paris Mondial," 98 Bis Blvd. Haussmann. 6-8.15 pm.
15.130	WIXAL	BOSTON, MASS., 19.83 m., Addr. World-Wide B'cast'g Foundation. University Club. 10-11 am., Mon.-Fri.
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., 10.40 am. to 4.30 pm. Sun. also 6-8 am.
15.080	RKI	MOSCOW, U.S.S.R., 19.87 m. Works Tashkent near 7 am. Broadcasts Sun. 12.15-2.30 pm. Daily 7-9.15 pm.

End of Broadcast Band

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 Is. Mornings.
14.960	PSF	RIO DE JANEIRO, BRAZIL, 20.05 m., Works with Buenos Aires daytime.
14.950	HJB	BOGOTA, COL., 20.07 m. Calls WNC daytime.
14.940	PSE	RIO DE JANEIRO, BRAZIL, 20.08 m., Broadcasts Wed. 3.45-4.15 pm.
14.940	HII	CIUDAD TRUJILLO, D. R., 20.08 m. Phones WNC daytime.
14.940	HJA3	BARRANQUILLA, COL., 20.08 m. Works WNC daytime.
14.920	LZA	SOFIA, BULGARIA, 20.10 m., Addr. Radio Garata. Mon., Tues., Thurs., Fri. 11.30 am.-2.45 pm., Wed. 11.30 am.-4.45 pm., Sat. 11.30 am.-5 pm., Sun. 2 am.-5 pm. Daily except Sun. 5-6.30 am.
14.845	OCJ2	LIMA, PERU, 20.21 m. Works South America 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. Broadcasts 6-9 pm. irregular.
14.653	GBL	RUGBY, ITALY, 20.47 m. Works JVH 1-7 am.
14.640	TYF	PARIS, FRANCE, 20.49 m. Works Saigon and Cairo 3-7 am, 12 n.-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 Sun. 1.45-2.30 pm., Mon. 1.30-1.45 am.
14.530	LSN	BUENOS AIRES, ARG., 20.65 m. Addr. (See 20.020 mc.) Works N. Y. C. afternoons.
14.500	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	MANAGUA, NICARAGUA, 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.
14.480	IBS	ROME, ITALY, 20.7 m. Works Eritrea and Addis Ababa 6.30-7.30 am.
14.470	WMF	LAWRENCEVILLE, N. J., 20.73 m., Addr. A.T.&T. Co. Works London and Paris daytime.
14.460	DZH	ZEESEN, GERMANY, 20.75 m., Addr. (See 15.360 mc.) Irregular.
14.440	—	RADIO MALAGA, SPAIN, 20.78 m. Relays Salamanca 8.15-8.45 pm. Sometimes 2-4 pm.
14.440	GBW	RUGBY, ENG., 20.78 m. Works U.S.A. afternoons.
14.166	PIIJ	DORDRECHT, HOLLAND, 21.15 m., Addr. (See 7.088 mc.) Sat. 12 n.-12.30 pm.
14.004	EA9AH	TETUAN, SPANISH MOROCCO, 21.4 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.-2 pm. Works GBB daily at 11 am.
13.690	KKZ	BOLINAS, CALIF., 21.91 m., Addr. RCA Comm. Irregularly.
13.635	SPW	WARSAW, POLAND, 22 m. Daily 6-8 pm, Sat. & Sun. 6-9 pm.
13.630	ZGB	KUALA LUMPUR, F.M.S. 22 m. Works Java, VVS, VVN and Siam, 6.30-8 am.
13.585	GBB	RUGBY, ENG., 22.08 m. Works Canada afternoons. Works SUZ at 11 am.
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.
13.350	VVN	FT. ST. GEORGE, MADRAS, INDIA, 22.46 m. Works VVS, Burma, near 7 am.
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 Tokyo 5-9 am., irregularly.
12.870	VVS	MINGALADON, BURMA, 23.30 m. Works ZGB, VVN, and Siam, 6.30-7.30 am.
12.862	W9XDH	ELGIN, ILL., 23.32 m. Press Wireless, Tests 2-5 pm.
12.840	WAQ	OCEAN GATE, N. J., 23.36 m., Addr. A.T.&T. Co. Works with ships irregularly.
12.830	CNR	RABAT, MOROCCO, 23.38 m., Addr. Director General Tele. & Teleg. Stations. Works TYA, Paris 6-7 am., 2.30-4 pm.
12.800	IAC	PISA, ITALY, 23.45 m. Works Italian ships mornings.
12.780	GBC	RUGBY, ENG., 23.47. Works ships irregularly.
12.325	DAF	NORDDEICH, GERMANY, 24.34 m. Works German ships daytime.
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.
12.200	——	TRUJILLO, PERU, 24.58 m., "Rancho Grande." Address Hacienda Chiclin. Irregular.
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.
12.120	TPZ	ALGERS, ALGIERS, 24.75 m. Calls Paris near 6 am., and 2.30-4 pm.
12.060	PDV	KOOTWIJK, HOLLAND, 24.88 m. Tests irregularly.
12.060	RNE	MOSCOW, U.S.S.R., 24.88 m. Daily 6-7 am., 12.15-1 pm., 8-9.15, 10-11 pm., also Sun. 6 am.-1 pm.
11.991	FZS4	SAIGON, INDO-CHINA, 25.02 m. Phones Paris irregular.

(Continued on page 218)

All Schedules Eastern Standard Time

Television for the Beginner

This elementary article has been especially prepared for the average student interested in television who does not always have a mathematical background which will enable him to understand the more technical articles and books on the subject.

● TELEVISION, so far as the beginner or general student is concerned, has been the subject of many technical articles and books which have frequently been so involved with mathematical formulas that they were very difficult to understand. An attempt has here been made to present some of the interesting and important angles of television so that the average reader can understand them.

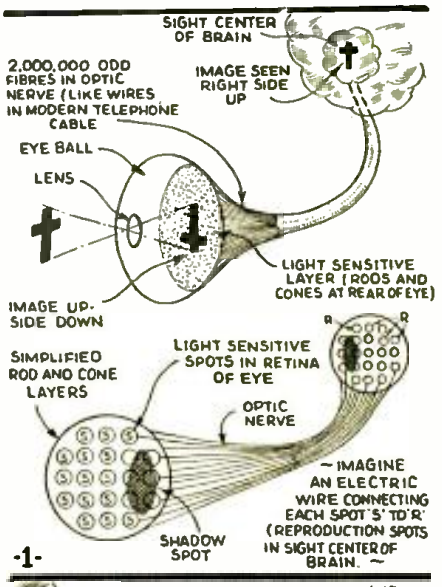
Eye a Good Example

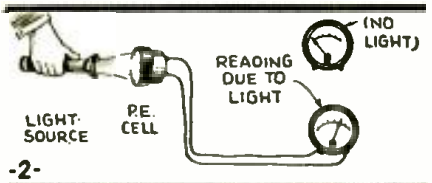
The human eye and the mechanism connecting it with the sight-center in the brain represents a very perfect form of television and one toward which all of our best engineering research is directed. The illustration, fig. 1, shows in simplified form how the image of an object or a scene is viewed by the lens of the eye and focused on the light-sensitive layer known as the retina, located at the rear of the eyeball. Note that the image flashed on the retina is inverted, but when this image is interpreted by the sight-center in the brain, it is seen *right-side* up. Here we see a perfect television system in actual operation. Nature has done a much better job than we have, so far.

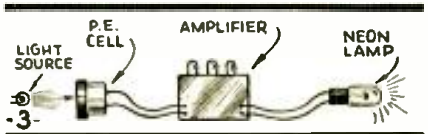
The optic nerve carries the image flashed on the retina to the sight-center in the brain, at which point we mentally perceive the image. This optic nerve is composed of about two million different fibers, or subdivisions, corresponding to the wires of a telephone cable. (Incidentally the transfer of the image along the optic nerve is now believed to be electrical in nature.) Nature's television system in the form of the human eye gives us a very perfect reproduction of an image, and the young television student may well ask why our engineers do not follow the same system for our present-day television apparatus.

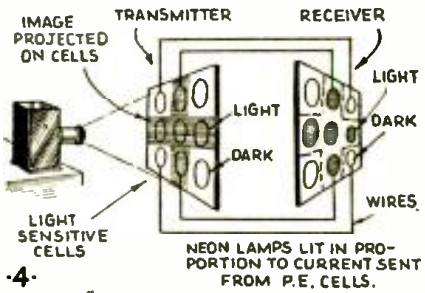
As a matter of fact, the first attempt at a laboratory demonstration of television, or the projection of an image over a wire circuit, used this self-same principle. The flea in the ointment is that the subdivisions of the light-sensitive surface in the human eye are so great in number (approximately two million) that it would be a very impractical solution of our television problems if we attempted to use two million wires to connect the various light-sensitive cells (see fig. 4) with the image reproducing units at the other end of the circuit. As early as 1908, Ruhmer actually demonstrated the transference of the image of a simple figure in the manner shown in fig. 4. But in any case, he was only able to use a relatively small number of light-sensitive cells (the

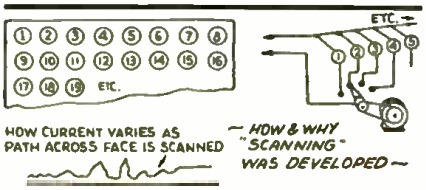
(Continued on page 243)

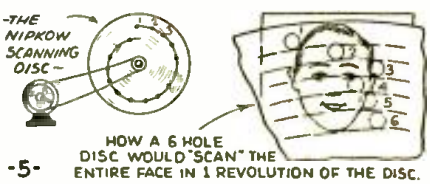


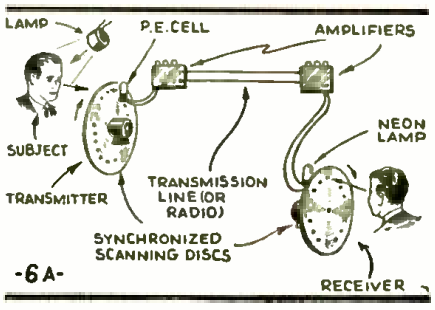




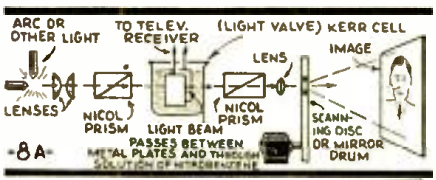


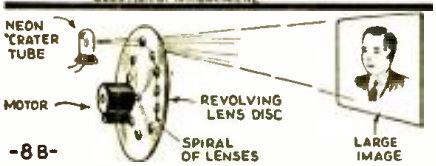


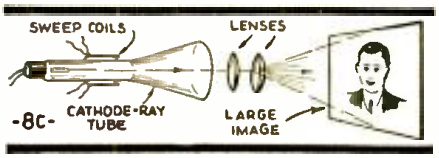


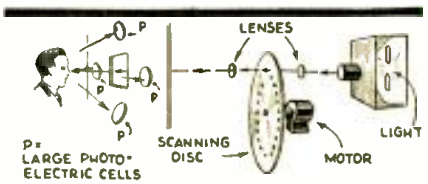


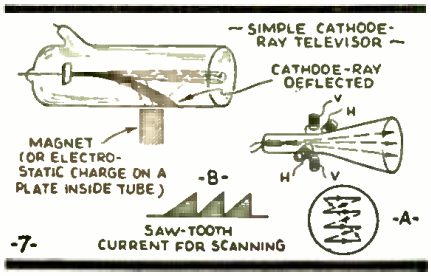
The accompanying diagrams show some of the basic elements of television, such as the action of the human eye; how scanning takes place; the pick-up and transmission of the image over a television circuit, etc.











Mc.	Call	
11.970	HI2X	CIUDAD TRUJILLO, D. R., 25.07 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 m.
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.

25 Met. Broadcast Band

11.910	CD1190	VALDIVA, CHILE, 25.2 m., P. O. Box 642. Relays CB69 10 am.-1 pm., 11 am.-10 pm.
11.900	TPA3	PARIS, FRANCE, 25.21 m., Addr. (See 15.245 mc.) 1-4 am., 10.15 am.-5 pm.
11.900	XEWI	MEXICO CITY, MEXICO, 25.21 m., Addr. P. O. Box 2874. Mon., Wed., Fri. 3-4 pm., 9 pm.-12 m. Tues. and Thur. 7.30 pm.-12 m., Sat. 9 pm.-12 m.
11.895	HP5I	AGUADULCE, PANAMA, 25.22 m. Addr. La Voz del Interior. 7.30-9.30 pm.
11.885	TPB7	PARIS, FRANCE, 25.24 m. (See 15.245 mc.) 8.30-11 pm.
11.870	W8XK	PITTSBURGH, PA., 25.26 m., Addr. (See 21.540 mc.) 7-11 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.-4, 7-10.45 pm.
11.840	KZRM	MANILA, P. I., 25.35 m. Addr. Erlanger & Gallinger, Box 283. 9 pm.-10 am. Irregular.
11.840	CSW	LISBON, PORT., 25.35 m. Nat'l Broad. Station. 11.30 am.-1.30 pm. Irregular.
11.840	OLR4A	PRAGUE, CZECHOSLOVAKIA, 25.35 m., Addr. Czech Shortwave Sta., Praha XII, Fochova 16. Daily 1.55-4.40 pm.
11.830	W9XAA	CHICAGO, ILL., 25.36 m., Addr. Chicago Federation of Labor. Irregular 7 am.-6 pm.
11.830	W2XE	NEW YORK CITY, 25.36 m., Addr. Col. Broad. System, 485 Madison Av., N.Y.C. 5.30-10 pm.
11.826	XEBR	HERMOSILLA, SON., MEX., 25.37 m., Addr. Box 68. Relays XE8H. 1-4 pm., 9 pm.-12 m.
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.A.R., Via Montello 5. Daily 5-8.45 am., 10 am.-9 pm.
11.805	COGF	MATANZAS, CUBA, 25.41 m., Addr. Gen. Betancourt 51. Relays CMGF. 2-3, 4-5, 6-11 pm.
11.805	OZG	SKAMLEBOAEK, DENMARK, 25.41 m. Addr. Statsradiofonien. Irreg.
11.800	JZJ	TOKYO, JAPAN, 25.42 m., Addr. Broadcasting Co. of Japan, Overseas Division. 12.30-1.30, 7-7.30, 8-9.30 am., 2.30-4, 4.30-5.30, 6-6.30 pm.
11.795	DJO	BERLIN, GERMANY, 25.43 m., Addr. (See 15.280 mc.) 7.15-11 pm.
11.790	—	VIENNA, AUSTRIA, 25.45 m. Irreg.
11.790	WIXAL	BOSTON, MASS., 25.45 m., Addr. (See 15.250 mc.) Mon., Wed., Fri. 3.30-5.30 pm., Sat. 5-5.30 pm., Sun. 2-4.30 pm.
11.780	HP5G	PANAMA CITY, PAN., 25.47 m., Addr. Box 1121. Heard till 12 m.
11.770	DJD	BERLIN, GERMANY, 25.49 m., Addr. (See 15.280 mc.) 10.40 am.-4.30 pm., 4.50-11 pm.
11.760	TGWA	GUATEMALA CITY, GUAT., 25.51 m. (See 17.8 mc.) Sun., Tues. and Thurs. 8 pm.-12 m.
11.760	OLR4B	PRAGUE, CZECHOSLOVAKIA, 25.51 m., Addr. (See 11.840 mc.) Irregular.
11,750	GSD	DAVENTRY, ENG., 25.53 m., Addr. B.B.C., London. 12 m.-2.15 am., 12.17-4.00 pm., 6.17-8.30, 9.17-11.20 pm.

Mc.	Call	
11.740	COCX	HAVANA, CUBA, 25.55 m, P. O. Box 32. 6.55 am.-1 am. Sun. till 12 m. Relays CMX.
11.740	HVJ	VATICAN CITY, 25.55 m. Testing irregular.
11.730	XETA	MONTEREY, MEX. 25.57 m., Addr. Box 203. Relays XET, 12 n.-2 pm.
11.730	PHI	HUIZEN, HOLLAND, 25.57 m., Addr. N. V. Philips' Radio.
11.730	WIXAL	BOSTON, MASS., 25.57 m., Addr. World-Wide B'cast'g. Foundation, University Club. Daily exc. Sat. and Sun. 8-10 pm.
11.720	CJRX	WINNIPEG, CANADA, 25.6 m., Addr. James Richardson & Sons, Ltd. Daily 6 pm.-12 m., Sun. 5-10 pm.
11.718	CR7BH	LAURENCO MARQUES, PORTUGUESE E. AFRICA, 25.6 m. Daily 12.05-1, 4.30-6.30, 9.30-11 am., 12.05-4 pm., Sun. 5-7 am., 10 am.-2 pm.
11.715	TPA4	PARIS, FRANCE, 25.61 m., (See 15.245 mc.) 6-8.15 pm., 8.30-11 pm.
11,710	SBP	MOTALA, SWEDEN, 25.63 m., 1.20-2.05, 6-9 am., 11 am.-1 pm., Sat. 1.20-2 am., 6 am.-1.30 pm., Sun. 3 am.-1.30 pm.
11,710	YSM	SAN SALVADOR, EL SALVADOR, 25.63 m., Addr. (See 7.894 mc.) Irregular 1.30-2.30 pm.
11.700	HP5A	PANAMA CITY, PAN., 25.65 m. Addr. Radio Teatro, Apartado 954. 10 am.-10 pm.
11.700	CB1170	SANTIAGO, CHILE, 25.65 m. Addr. P.O. Box 706. Relays CB89 6 pm.-12 m.

End of Broadcast Band

11.690	——	SAIGON, INDO-CHINA, 25.66 m., Addr. Radio Boy-Landry, 17 Place A. Foray. 11 pm.-1 am., 5.30-9.15 am.
11.680	KIO	KAHUKU, HAWAII, 25.68 m., Addr. RCA Comm. Irregularly.
11.595	VRR4	STONY HILL, JAMAICA, B. W. I., 25.87 m. Works WNC daytime.
11.560	VIZ3	FISKDALE, AUSTRALIA, 25.95 m., Addr. Amalgamated Wireless of Australasia Ltd. Tests irregularly.
11.530	SPD	WARSAW, POLAND, 26 m., Addr. 5 Mazowiecka St. 6-8 pm., Sat. & Sun. 6-9 pm.
11.500	XAM	MERIDA, YUCATAN, 26.09 m. Irregular 1-7.30 pm.
11.500	PMK	BANDOENG, JAVA, 26.09 m. Tests irreguiarly.
11.413	CJA4	DRUMMONDVILLE, QUE., CAN., 26.28 m. Tests irregularly.
11.402	HBO	GENEVA, SWITZERLAND, 26.31 m., Addr. Radio Nations. Sun. 7-7.45 pm., Mon. 1-1.15 am.
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. Broad. Sta. 1.30-5 pm.
11.000	PLP	BANDOENG, JAVA, 27.27 m. Relays YD8. 6-7.30 p.m., 5.30-10.30 or 11 am. Sat. until 11.30 am.
10.970	OCI	LIMA, PERU, 27.35 m. Works Bogota, Col., evenings.
10.960	——	TANANARIVE, MADAGASCAR, 27.36 m., Addr. (See 9.53 mc.) 12.30-45, 3.30-4.30, 10-11 am.
10.910	KTR	MANILA, P. I. 27.41 m. Phones ships 6-10 am.
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.
10.680	PLQ	BANDOENG, JAVA. 28.09 m. Works Javanese Isles and other Asiatic phones 6-8.30 am.
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. Irregular.
10.660	JVN	NAZAKI, JAPAN, 28.14 m. Broadcasts daily 2-8 am. Works Europe irregularly at other times.
10.600	ZIK2	BELIZE, BRIT. HONDURAS, 28.25 m., Tues., Thurs., Sat. 7.30-7.45 pm.

Mc.	Call	
10.550	WOK	LAWRENCEVILLE, N. J., 28.44 m., Addr. A.T.&T. Co. Works S. A. nights.
10.535	JIB	TAIHOKU, TAIWAN, 28.48 m. Works Japan around 6.25 am. Broadcasts, relaying JFAK 9.05-10 am., 1-2.30 am. Sun. to 10.15 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. Calls Java 5.30-6.30 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. Works TDE 3-8 am.
10.370	EAJ43	TENERIFFE, CANARY ISLANDS, 28.93 m. Relays Salamanca, Spain, 2-4, 5-9.45 pm.
10.350	LSX	BUENOS AIRES, ARG., 28.98 m., Addr. Transradio International. Tests irregularly.
10.330	ORK	RUYSSELEDE, BELGIUM, 29.04 m. Broadcasts 1.30-3 pm. Works OPM 1-3 am., 3-5 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	L5K3	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 JANEIRO, BRAZIL, 29.35 m., Addr. Box 709. Broadcasts 6-9 pm.
10.160	RIO	BAKOU, U.S.S.R., 29.5 m. Works Moscow 10 pm.-7.30 am.
10.140	OPM	LEOPOLDVILLE, BELGIAN CONGO, 29.59 m. Works Belgium 1-3 am. and 3-5 pm.
10.080	RIR	TIFLIS, U.S.S.R., 29.76 m. Works Moscow 12 m.-8 am.
10.065	TDE	SHINKYO, MANCHUKUO, 29.81 m. Works JVO 3-8 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. Reichspostzenstralamt. Irregular.
9.990	KAZ	MANILA, P. I., 30.03 m., Addr. RCA Communications. Works Java early morning.
9.980	COBC	HAVANA, CUBA, 30.04 m., Addr. P. O. Box 132. Relays CMBC 6:55 a.m.,-12:30 a.m.
9.950	GCU	RUGBY, ENGLAND, 30.15 m. Works N.Y.C. night time.
9.940	JDY	DAIREN, MANCHUKUO, 30.18 m. Relays JOAK daily 7-8 am. Works Tokyo occasionally in early am.
9.930	HKB	BOGOTA, COL., 30.21 m. Works Rio evenings.
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.
9.865	COCM	HAVANA, CUBA, 30.41 m., Addr. Transradio Columbia, P. O. Box 33. 7 am.-12 m. Relays CMCM.
9.860	EAQ	MADRID, SPAIN, 30.43 m., Addr. Post Office Box 951. 7.30-8, 8.40-9 pm.
9.830	IRF	ROME, ITALY, 30.52 m. Works Egypt afternoons. Relays 2RO, 6-9 pm.
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	CSW	LISBON, PORTUGAL, 30.74 m. Addr. Nat. Broad. Sta. 5-8 pm.
9.760	VLZ-VLK	SYDNEY, AUSTRALIA, 30.74 m., Addr. Amalgamated Wireless of Australasia Ltd. Works Java and New Zealand early morning.

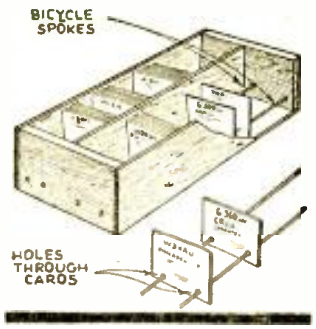
(Continued on page 220)

All Schedules Eastern Standard Time

Short Wave Kinks

Each month the Editor will award a 2 year subscription for the best short-wave kink submitted. All other kinks published will be awarded eight months' subscription to SHORT WAVE & TELEVISION. Look over these kinks; they will give you some idea of what is wanted. Send a typewritten or ink description, with sketch, of your favorite to the "Kink" Editor.

A QSL File



A very neat filing arrangement for QSL cards may be constructed from a few pieces of wood and four bicycle spokes. As shown in the sketch, each of the cards has two holes punched into it and is then slipped over the bicycle spokes. The bicycle spokes may easily be removed for adding new cards through the use of a screw-driver. In addition to serving as a QSL file it may also be used as a log book, a card being made out for every station logged with all pertinent data entered on a card. One compartment may be used for indexing stations by call letters, the other by frequency.—*George Tetreault.*

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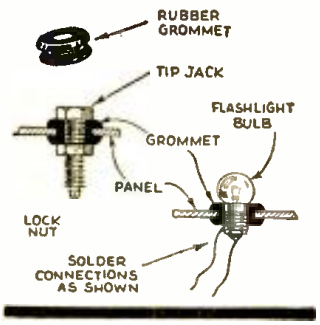
Grommets

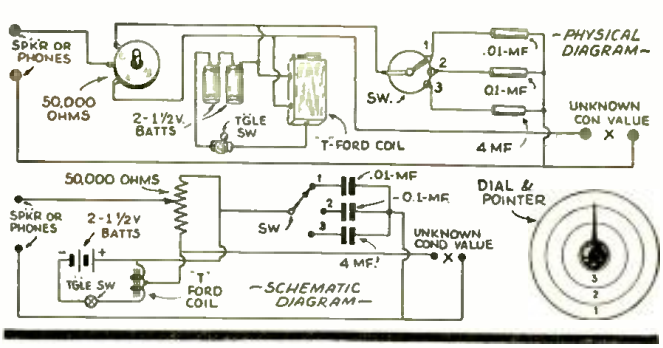
A simple rubber grommet can be used for a variety of purposes, a few of which are sketched. Insulating tip-jacks from metal panels is a simple matter, even if the fibre insulating washers have been lost. Secure a grommet through which the tip-jack will snugly pass, then drill a hole in the panel which will fit the outside diameter of the grommet, force the grommet into the hole in the panel and insert the tip-jack which should fit snugly. The securing nut for the jack is then attached and tightened and the job is done.

Another use for a grommet is as a flashlight bulb holder. Connection wires may be soldered to the bulb as shown.—*Edward Gleason, W8DVY.*



Condenser Tester

1st Prize

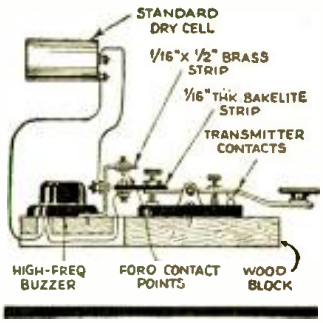


A portable condenser tester may be made from a few odds and ends found in most junk boxes. The circuit shown is a variation of the Wheatstone bridge. A pair of phones or a loud speaker are connected to the output jacks and a condenser of known value (between .01 and .1 mf.) shunted across the input. The selector switch during this procedure should be set to position 1. The 50,000 ohm potentiometer should be adjusted for minimum sound in the speaker or phones. Condensers of known value are then placed across the input jacks and the potentiometer adjusted for minimum response for each. The first scale of the dial is calibrated by hand during this procedure, the minimum response point indicating the capacity of each known condenser. This calibration should be repeated with a series of known condensers for the second and third range and the corresponding scales on the dial calibrated.

To test an unknown condenser simply connect it across the input terminals and adjust the potentiometer and the selector switch until the sound is weakest, then read the value of the condenser from the calibration on the dial.—*Richard Dickerson.*

Monitor Key

A simple gadget which may be attached to the ham's station key will enable the operator to check on his timing and spacing when sending c.w. As the sketch shows, an extra pair of contacts are mounted on the end of the key and connected to an ordinary dry cell and high frequency buzzer. These contacts are entirely separate from those connected to the transmitter. When the key is depressed, putting the transmitter on the air, the circuit to the buzzer is also closed—causing it to vibrate. Thus an audible check on the c.w. transmissions is readily secured.—*Oscar H. Bonter, W8RHX.*



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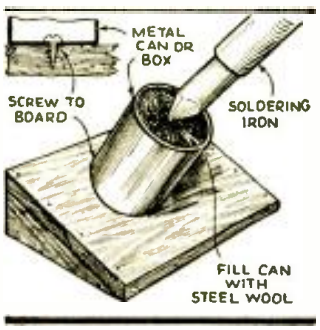
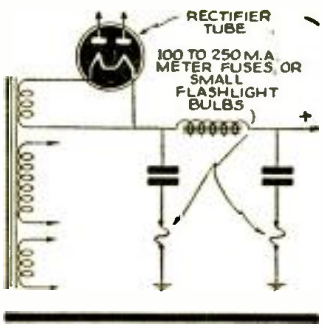


Iron Cleaner

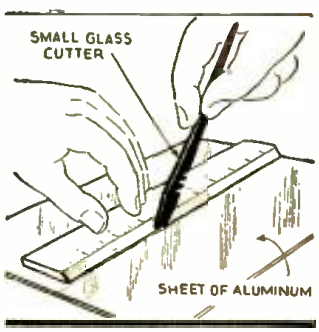
A simple but effective means of keeping clean the tip of a soldering iron is shown. It will be seen that a small metal box screwed to the workbench is filled with steel wool. Inserting the iron in the steel wool and withdrawing it, repeating this operation several times, will clean off the oxidation scale quite readily.—*J. T. Kelly.*

Cheap Insurance

To protect power transformers and rectifiers in power units when the filter condensers short out, place a small flashlight bulb in series with one leg of each of the condensers. If a condenser shorts, the bulb will burn out, thus opening the circuit and preventing a short across the power transformer and rectifier. —*Paul Reed.*



Chassis Bender



For chassis or panel construction a handy tool for marking the aluminum, as a preliminary to breaking and bending, is a small glass cutter. Cut deeply on both sides of the aluminum to make a complete break, but take care not to make the cut too deep when the marking is made for bending.—*Daniel N. Wisner.*

Mc.	Call	
9.760	——	SAIGON, INDO-CHINA, 30.72 m., Addr. 17, Place A. Foray. "Radio Boy-Landry." Heard 6-9.15 am.
9.750	WOF	LAWRENCEVILLE, N. J., 30.77 m., Addr. A.T.&.T. Co. Works London and Paris night time.
9.720	COCQ	HAVANA, CUBA, 30.85 m. Addr. 25 No. 445, Vedado, Havana. 6.55 am.-1 am. Sun. till 12 m.
9.710	GCA	RUGBY, ENGLAND, 30.9 m. Works S. A. evenings.
9.700	FZF6	FORT DE FRANCE, MARTINIQUE, 30.9 m., Addr. P. O. Box 136. 11.30 am.-12.30 pm., 6.15-7.50 pm.
9.690	TI4NRH	HEREDIA, COSTA RICA, 30.94 m., Addr. Amando C. Marin, Apartado 40. Sun. 7-8 am. Tues., Thurs., Sat. 9-10 pm.
9.685	TGWA	GUATEMALA CITY, GUAT., 30.96 m. Daily 10-11.30 pm.; Sun. 6-11.30 pm.
9.675	DZA	ZEESEN, GERMANY, 31.01 m., Addr. (See 10.042 mc.) Irregular.
9.660	LRX	BUENOS AIRES, ARG., 31.06 m., Addr. El Mundo. Relays LRI, 9.30 am.-11.30 pm.
9.650	CS2WA	LISBON, PORTUGAL, 31.09 m., Addr. Radio Colonial. Tues., Thurs. and Sat. 3.30-6 pm.
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.
9.640	CXA8	COLONIA, URUGUAY, 31.12 m., Addr. Belgrano 1841, Buenos Aires, Argentina. Relays LR3, Buenos Aires 7 am.-11 pm.
9.635	2RO	ROME, ITALY, 31.13 m., Addr. (See 11.810 mc.) Daily 3-6 pm.
9.630	HJ7ABD	BUCARAMANGA, COL., 31.14 m. 10 am.-12 n., 4-11 pm.
9.625	JFO	TAIHOKU, TAIWAN, 31.16 m. Relays JFAK irreg. 4-10 am.
9.616	HJ1ABP	CARTAGENA, COL., 31.20 m., Addr. P. O. Box 37. 11 am.-1 pm., 5-11 pm., Sun. 10 am.-1 pm., 3-6 pm.
9.615	ZRK	KLIPHEUVAL, SOUTH AFRICA, 31.2 m., Addr. P. O. Box 4559, Johannesburg. Daily, exc. Sat. 11.45 pm.-12.50 am. Daily exc. Sun. 3.20-7.20, 9-11.45 am., Sun. 3.30-4.30 or 4-5, 8-11.40 am.
9.607	HP5J	PANAMA CITY, PANAMA, 31.23 m. Addr. Apartado 867. 12 n. to 1.30 pm., 6-10.30 pm.

31 Met. Broadcast Band

9.600	RAN	MOSCOW, U.S.S.R., 31.25 m. Daily 7-9.15 pm.
9.595	HBL	GENEVA, SWITZERLAND, 31.27 m., Addr. Radio Nations. Irregular.
9.590	VUD2I VUD3	DELHI, INDIA, 31.28 m. Addr. All-India Radio. 8.30-10.30 pm., 1.30-3.30 am., 7.30 am.-12.30 pm.
9.590	PCJ	HUIZEN, HOLLAND, 31.28 m., Addr. (See 15.220 mc.) Sun. 2-8, 7-9.25 pm., Tues. 1.45-3.40, 7-10.15 pm., Wed. 7-9 pm.
9.590	VK6ME	PERTH, W. AUSTRALIA, 31.28 m., Addr. Amalgamated Wireless of Australasia, Ltd. 6-8 am. exc. Sun.
9.590	VK2ME	SYDNEY, AUSTRALIA, 31.28 m., Addr. Amalgamated Wireless of Australasia, Ltd., 47 York St., Sun. 12 m.-2 am.; 4.30-8.30 am.; 11.30-am.-1.30 pm.
9.590	W2XE	NEW YORK, N. Y., 31.28 m., Addr. CBS, 485 Madison Ave., Irregular.
9.590	W3XAU	PHILADELPHIA, PA., 31.28 m. Relays WCAU Mon., Thurs., Sat. 12 n.-12 m.; Tues., Fri., Sun. 11 pm.-12 m.; Wed. 9 pm.-12 m.
9.580	GSC	DAVENTRY, ENGLAND, 31.32 m., Addr. 8. B. C., Portland Pl., London, W. 1, 9.17-11.20 pm.
9.580	VLR	MELBOURNE, AUSTRALIA, 31.32 m. Addr. Box 1686, G. P. O. Daily 3.30-8.30 am. (Sat. till 9 am.) Sun. 3-7.30 am. Daily exc. Sat. 9.35 pm.-2.15 am.
9.580	OAX5C	ICA, PERU, 31.32 m. Radio Universal 6-10 pm.
9.570	KZRM	MANILA, P. I., 31.35 m., Addr. Erlanger & Galinger, Box 283. 4.30-6 pm., 5-9 am., Sun 4-10 am.
9.570	W1XK	SPRINGFIELD, MASS., 31.35 m., Addr. Westinghouse Electric & Mfg. Co. Relays WBZ 6 am. to 12 m. Sun. 7 am.-12 m.
9.570	TPB11	PARIS, FRANCE, 31.35 m. Addr. (See 15.245 mc.) 1-3 am., 10.15 am.-5 pm.
9.560	DJA	BERLIN, GERMANY, 31.38 m., Addr. Broadcasting House. 12.05-11 am., 4.50-10.45 pm.
9.550	W2XAD	SCHENECTADY, N. Y., 31.41 m., General Electric Co., 6.30-10 pm.
9.550	OLR3A	PRAGUE, CZECHOSLOVAKIA, 31.41 m. (See 11.840 mc.) Mon., Tues. 4.40-5.10 pm.
9.550	XEFT	VERA CRUZ, MEX., 31.41 m. 10.30 am.-4.30 pm., 10.30 pm.-12.30 am.
9.550	YDB	SOERABAJA, JAVA, 31.41 m., Addr. N.I.R.O.M. Daily exc. Sat. 6-7.30 pm., 5.30 to 10 am. Sat. 5.30-11.30 am.
9.550	VUB2	BOMBAY, INDIA, 31.41 m., Addr. All India Radio. 1-3.30 am.
9.540	DJN	BERLIN, GERMANY, 31.45 m., Addr. (See 9.560 mc.) 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	TOKYO, JAPAN, 31.46 m.. Addr. (See 11.800, JZJ) 12.30-1.30 am., 2.30-4, 4.30-5.30 pm.
9.535	HB9D	ZURICH, SWITZERLAND, 31.46 m., Addr. Radio Club of Zurich, Post Box Zurich 2. Sun. 9-11 am., Thur. 1-3 pm.
9.530	W2XAF	SCHENECTADY, N. Y., 31.48 m., Addr. General Electric Co. 3-11 pm.
9.530	ZHP	SINGAPORE, CHINA, 31.48 m., Mon.-Fri. 12.40-1.40 am., Sat. 12.25-1.40 am., 10.40 pm.-1.10 am. Irreg. 5.40-9.40 am.
9.526	XEDQ	GUADALAJARA, GAL., MEXICO, 31.49 m. Irregular 7.30 pm. to 12.30 am.
9.526	ZBW3	HONGKONG, CHINA, 31.49 m., Addr. P. O. Box 200. 11.30 pm. to 1 am., 3-10 am.
9.525	LKJ1	JELOY, NORWAY, 31.49 m. 5-8 am.
9.523	ZRH	ROBERTS HEIGHTS, S. AFRICA. 31.5 m., Addr. (See ZRK, 9.606 mc.) Daily exc. Sun. 5-7.30 am.; Sun. 3 or 3.30 to 4.30 or 5 am.
9.520	HJ4ABH	ARMENIA, COLOMBIA, 31.51 m. 6-10 pm.
9.520	OZF	SKAMLEBOAEK, DENMARK, 31.51 m., Addr. Statsradiofonien, Heibergsgade 7, Copenhagen., 2-6.40, 8-11 pm.
9.520	YSH	SAN SALVADOR, EL SALVADOR 31.51 m., Addr. (See 7.894 mc.) Irregular 6-10 pm.
9.510	GSB	DAVENTRY, ENGLAND, 31.55 m., Addr. (See 9.580 mc.—GSC) 12 m.-2.15 am., 1.30-6, 6.17-9, 9.17-11.20 pm.
9.510	HJU	BUENAVENTURA, COLOMBIA, 31.55 m., Addr. National Railways. Mon., Wed. and Fri. 8-11 pm.
9.500	VK3ME	MELBOURNE, AUSTRALIA, 31.58 m., Addr. Amalgamated Wireless of Australasia, 167 Queen St. Daily except Sun. 4-7 am.
9.500	XEWW	MEXICO CITY, MEX., 31.58 m. Addr. Apart. 2516. Relays XEW. 6 pm.-12 m.
9.500	——	LAHTI, FINLAND, 31.58 m., Addr. Finnish Broadcasting Co. 2-5 pm.
9.500	HS8PJ	BANGKOK, SIAM, 31.58 m. Thursday, 8-10 am.
9.488	EAR	MADRID, SPAIN, 31.6 m., Addr. (See 9.860 mc.) 7.30-8.30 pm. Mon., Tues., Thur., Sat. at 9.30 pm. also.

End of Broadcast Band

9.460	ICK	TRIPOLI, N. AFRICA, 31.71 m. Works Rome, 5.30-7 am.
9.445	HCODA	GUAYAQUIL, ECUADOR, 31.77 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 5.30-9 am.
9.380	—	TANANARIVE, MADAGASCAR, 31.96 m. Addr. Le Directeur des PTT, Radio Tananarive, Administration PTT. 12.30-12.45, 3.30-4.30, 10.11 am.
9.355	HC1ETC	QUITO, ECUADOR, 32.05 m., Addr. Teatro Bolivar, Thurs. until 9:30 p.m.
9.345	HBL	GENEVA, SWITZERLAND, 32.08 m., Addr. Radio Nations Fri. 7:15-8:30 p.m., 6:45-8 p.m.
9.330	CGA4	DRUMMONDVILLE, CANADA, 32.15 m. Works England irreg.
9.330	OAX4J	LIMA, PERU, 32.15 m., Addr. Box 1166, "Radio Universal." 12 n.-3 pm., 5 pm.-1 am.
9.290	HIG	CIUDAD TRUJILLO, D. R., 32.29 m. 7.10-8.40 am., 11.40 am.-2.10 pm., 3.40-8.40 pm.
9.280	HC2CW	GUAYAQUIL, ECUADOR, 32.31 m., 11.30 am.-12.30 p.m., 8-11 pm.
9.280	GCB	RUGBY, ENGLAND, 32.33 m. Works Canada and Egypt evenings and afternoons.
9.200	COBX	HAVANA, CUBA, 32.59 m. Addr. San Miguel 194, Altos. Relays CMBX 7 am.-12 m.
9.180	ZSR	KLIPHEUVEL, SOUTH AFRICA, 32.66 m. Phones London late afternoon.
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	BUDAPEST, HUNGARY, 32.88 m., Addr. "Radiolabor," Gyali-ut, 22. Sun. and Wed. 7-8 pm., Sat. 6-7 pm.
9.120	YCP	BALIKPAPAN, DUTCH BORNEO. 32.88 m. Phones Bandoeng 5.30-7.30 am.
9.100	COCA	HAVANA, CUBA, 32.95 m., Addr. Galiano No. 102. Relays CMCA 9 am.-12 m.
9.060	TFK	REYKJAVIK, ICELAND, 33.11 m. Works London afternoons.
9.030	TYA2	PARIS, FRANCE. 33.2 m. Works TPZ2 near 2 am. and 4-5 pm.
9.020	COBZ	HAVANA, CUBA, 33.26 m., Radio Salas Addr. P. O. Box 866, 7:45 am.-12.10 am. Irreg. 12.30-2 am. Relays CMBZ.
9.020	GCS	RUGBY, ENG., 33.26 m. Works N. Y. C. evenings.
9.010	KEJ	BOLINAS, CAL., 33.3 m. Relays NBC and CBS programs in evening irregularly.
8.967	VWY	KIRKEE, INDIA, 33.43 m. Works with England 1.30-3 am.
8.965	COKG	SANTIAGO, CUBA, 33.44 m. Addr. Box 137. 9-10 am., 11.30 am.-1.30 pm., 3-4.30, 5-6, 10-11 pm., 12 m.-2 am.
8.960	TPZ2	ALGIERS, ALGERIA, 33.48 m. Works TYA2, near 2 am. and 4-5 pm.
8.841	HCJB	QUITO, ECUADOR, 33.5 m. 7-8.30 am., 11.45 am.-2.30 pm., 5-10 pm., except Mon. Sun. 12 n.-1.30 pm., 5.30-10 pm.
8.840	ZMBJ	S.S. AWATEA, 33.92 m. Steamer out of New Zealand. Saturday at 11 pm. Phones Australia early am, irregularly.
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, ENG., 34.25 m. Works Africa afternoons.
8.730	GCI	RUGBY, ENG., 34.36 m. Works India 8 am.
8.700	HKV	BOGOTA, COLOMBIA, 34.46 m. Tues. and Fri. 7-7.20 pm.
8.860	GBC	RUGBY, ENG., 34.56 m. Works ships irregularly.
8.665	COJK	CAMAGUEY, CUBA, 34.64 m., Addr. Finlay No. 3 Altos. 5.30-6.30, 8-11 pm., daily except Sat. and Sun.
8.665	W2XGB	HICKSVILLE, N. Y., 34.64 m., Addr. Press Wireless, Mon. to Fri. News at 9 am. and 5 pm.
8.580	YNPR	MANAGUA, NICARAGUA, 34.92 m. Radiodifusora Pilot.
8.560	WAQ	OCEAN GATE, N. J., 35.05 m. Works ships irregularly.
8.380	IAC	PISA, ITALY, 35.8 m. Works Italian ships irregularly.

(Continued on page 222)

All Schedules Eastern Standard Time

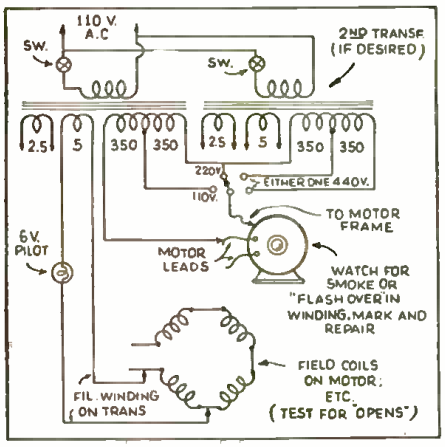
New Experiments with Radio Apparatus

MONEY FOR YOUR IDEAS! Each month we will award 2 prizes, the first of $10, the second $5, for the best NON-RADIO uses of ordinary radio parts and radio instrumentalities.

First Prize — $10.00

Simple "Motor Test"

● I HAVE a non-radio use for a transformer for your "new experiments" department. This idea is practical and it has been used by myself for two years. I am an electrician for a milk plant and play with radio as a sideline. My plan is this:



Motor-tester improvised from old high-voltage transformers.

Take one, or possibly two, transformers that were formerly used in a seven- or eight-tube set, having secondary voltages of 350 volts on a side, plus a few filament windings. Assemble them in a box with an extension cable so they will be portable, connect as shown on diagram and you have a means of locating intermittent as well as permanent grounds in electric motors that have been grounded either through dampness or other causes.

This test is conducted as follows: For 110 volt motors use the first tap or 350 volt winding to show up the ground; 700 volts for 220 volt motors. For higher voltage motor windings, it will be necessary to use another transformer. I have two transformers in use to check motors and transformers up to 440 volts. It is advisable not to check any longer than is necessary for the bad section to show up, which will be either by *flashing across* or *smoking;* after that is seen the bad section is marked and is ready for the repair expert.

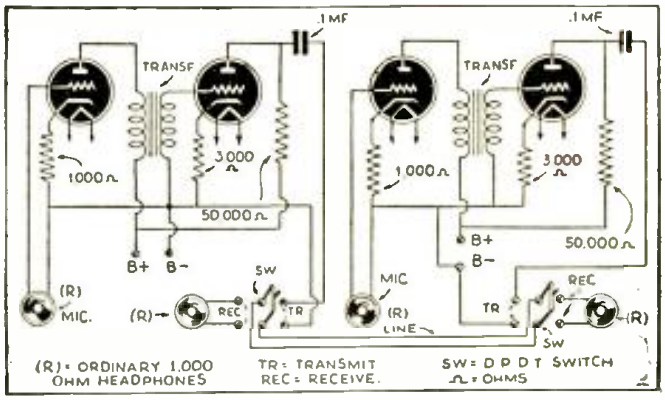
This electrician's test saves a lot of guess-work and is handy for anyone that has to do motor testing and repairing.

I might mention that it is possible to add a 6 volt pilot light in series with a 5 or 6 volt filament winding; this can be used to check coil sections, etc.—KENNETH GRAY.

Second Prize — $5.00

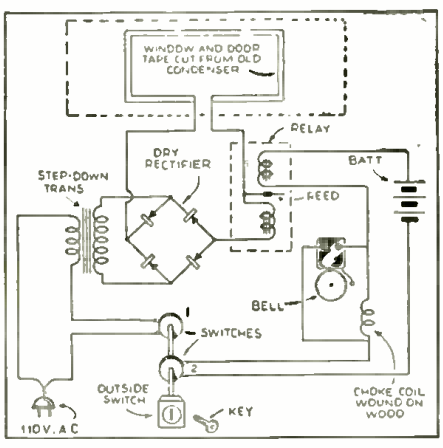
2-Way Phone

● A 2-WAY phone for office or home use can be readily constructed by following the diagram herewith. An ordinary triode tube, such as the 56 type, serves to amplify the voice. A headphone receiver of the 1000 ohm or similar type, is used as a microphone; a similar headphone receiver serves to receive the speech. A double-pole, double-throw switch, preferably a quick action cam or jack type, switches the apparatus from the *send* to the *receive* positions. The voice passes through a .1 mf. condenser as it comes from the amplifier tube, while the plate of this tube has battery current impressed upon it through a 50,000 ohm receiver. The tubes should be biased, as indicated, in order to keep the plate current down to an economical limit.—HAYWOOD E. WEBB.



Simple 2-way phone made from radio parts.

Burglar Alarm



Burglar alarm useful for store, garage or home protection.

● HERE is a burglar alarm system that is quite effective.

1.—When the A.C. line is cut off the bell will ring.

2.—In case of fire the tape will melt or burn off and the bell will ring.

3.—If window should be broken bell will ring.

4.—If door is open bell will ring continuously, even if door is closed after the circuit is once broken.

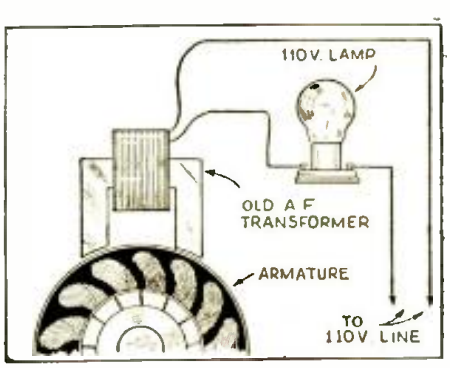
The most important factor to be considered—the tape resistance in the windows and doors must be high enough to overcome the current in the relay from the battery side, so that the bell will ring continuously after the door is once opened.

The switches, taken from old volume controls, must be adjusted so that the A.C. is applied before the battery. The lock must be revamped so that the key will come out at one-half turn.

The choke must be wound on wood so that it will pass current across and through the bell when door is open.—RUDOLPH STEMPEL.

A.C. "Growler" for Testing Armatures

● THE accompanying sketch shows how a *growler* may be made from an old a.f. transformer. This device proves useful when testing small motor armatures. The A.C. magnetic field induced in the armature core between the poles of the magnet causes alternating currents to be induced in the adjacent windings of the armature. If a telephone receiver or other indicating device is connected, by means of test leads, from bar-to-bar of the commutator, it will be found that a sound of certain strength indicates a *healthy* coil, while a different distinct sound indicates an *open* or *shorted* coil. It will usually be found desirable to connect a 110 volt lamp of about 20 to 40 watt size, in series with the transformer winding to prevent overheating of the coil.—H. W. S.



An A.C. "growler" for testing motor armatures.

Mc.	Call	
8.185	PSK	RIO DE JANEIRO, BRAZIL, 36.65 m. Irregularly.
8.036	CNR	RABAT, MOROCCO, 37.33 m. Works Paris irreg. in afternoons.
7.901	LSL	BUENOS AIRES, ARGENTINA, 37.97 m. Works Brazil at night.
7.894	YSD	SAN SALVADOR, EL SALVADOR, 37.99 m., Addr. Dir. Gent. Tel. & Tel. 7-11 pm.
7.870	HCIRB	QUITO, ECUADOR, 38.1 m. La Voz de Quito. 9-11 pm.
7.860	SUX	ABOU ZABAL, EGYPT, 38.17 m. Works with Europe, 4-6 pm.
7.854	HC2JSB	GUAYAQUIL, ECUADOR, 38.2 m. Evenings to 11 pm.
7.797	HBP	GENEVA, SWITZERLAND, 38.48 m., Addr. Radio-Nations.
7.780	PSZ	RIO DE JANEIRO, BRAZIL. 38.54 m. Phones 6-11 pm. irregularly.
7.715	KEE	BOLINAS, CAL., 38.89 m. Relays NBC and CBS programs in evening irregularly.
7.680	YBZ	MENADO, CELEBES, N.E.I., 39.04 m. Phones PNI and Bandoeng 5.30-7 am.
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.
7.560	FZE9	DJIBOUTI, FRENCH SOMALILAND, 39.66 m. Phones Paris early am.
7.540	RKI	MOSCOW, U.S.S.R., 39.76 m. Works RIM early am.
7.520	KKH	KAHUKU, HAWAII, 39.87 m. Works with Dixon and broadcasts irregularly nights.
7.510	JVP	NAZAKI, JAPAN, 39.95 m. Irreg.
7.410	HCJB4	QUITO, ECUADOR, 40.46 m., 7-9.30 pm. irregularly.
7.390	ZLT2	WELLINGTON, N. Z., 40.6 m. Works with VLZ near 4 am.
7.380	XECR	MEXICO CITY, MEX., 40.65 m., Addr. Foreign Office. Sun. 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. Irregular at 9 pm.
7.177	CR6AA	LOBITA, ANGOLA, PORT. WEST AFRICA. 41.75 m., Wednesday and Saturday 2.45-4.30 pm.
7.100	FOBAA	PAPEETE, TAHITI, 42.25 m., Addr. Radio Club Oceanien. Tues. and Fri. 11 pm.-12.30 am.
7.088	PIIJ	DORDRECHT, HOLLAND, 42.3 m., Addr. Dr. M. Hellingman, Technical College. Sat. 11.10-11.50 am.
6.990	XEME	MERIDA, YUCATAN, 42.89 m., Addr. Calle 59, No. 517. "La Voz de Yucatan desde Merida." Irregular.
6.980	KZGG	CEBU ISLAND, P. I. 42.95 m. Phones Manila near 4 am.
6.977	XBA	TACUBAYA, D. F., MEX., 43 m. 9.30 am.-1 pm., 7-8.30 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.
6.805	HI7P	CIUDAD TRUJILLO, DOM. REP., 44.06 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.
6.790	PZH	PARAMIRABO, SURINAM. 44.16 m., Addr. P. O. Box 18. Daily 6.06-8.36 am., Sun. 9.36-11.36 am. Daily 5.36-8.36 pm.
6.775	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.
6.755	WOA	LAWRENCEVILLE, N. J., 44.41 m., Addr. A.T.&T. Co. Works Eng. evenings.
6.750	JVT	NAZAKI, JAPAN, 44.44 m., Addr. Kokusai-Denwa Kaisha, Ltd., Tokyo. 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.
6.690	TIEP	SAN JOSE, COSTA RICA, 44.82 m., Addr. Apartado 257, La Voz del Tropico. Daily 7-10 pm.
6.675	HBQ	GENEVA, SWITZERLAND, 44.94 m. Addr. Radio-Nations. Sun. 1.45-2.30 pm.
6.672	—	—— 44.74 m., relays Salamanca, Spain, 7-9.45 pm.
6.672	YVQ	MARACAY, VENEZUELA, 44.95 m. Irregular.
6.650	IAC	PISA, ITALY, 45.11 m. Works ships irregularly.
6.635	HC2RL	GUAYAQUIL, ECUADOR, S. A., 45.18 m., Addr. P. O. Box 759. Sun. 5.45-7.45 pm., Tues. 9.15-11.15 pm.
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.
6.520	YV4RB	VALENCIA, VENEZUELA, 45.98 m. 11 am.-2 pm., 5-10 pm.
6.516	YNIGG	MANAGUA, NICARAGUA, 46.02 m., Addr. "La Voz de los Lagos." 8-9 pm.
6.500	HIL	CIUDAD TRUJILLO, D. R., 46.13 m. Addr. Apartado 623. 12.10-1.40 pm., 5.40-7.40 pm.
6.490	HIIL	SANTIAGO DE LOS CABALLEROS, D. R., 46.2 m., Addr. Pres., Trujillo 97, Altos., 5.40-7 pm.
6.470	YNLAT	GRANADA, NICARAGUA, 46.36 m., Addr. Leonidas Tenoria, "La Voz del Mombacho." Irregular.
6.465	YV3RD	BARQUISIMETO, VENEZUELA, 46.37 m. Radio Barquisimeto, irregular.
6.450	HI4V	SAN FRANCISCO DE MACORIS, D. R., 46.48 m. 11.40 am.-1.40 pm., 5.10-9.40 pm.
6.440	TGQA	QUEZALTENANGO, GUATEMALA, 46.56 m. Mon.-Fri. 9-11 pm., Sat. 9 pm.-1 am., Sun. 1-3 pm.
6.420	HIIS	SANTIAGO, D. R., 46.73 m. 11.40 am.-1.40 pm., 5.40-7.40, 9.40-11.40 pm.
6.416	YV6RC	BOLIVAR, VENEZUELA, 46.73 m. Radio Bolivar.
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.
6.388	HI8J	LAS VEGAS, D. R., 46.92 m., Irreg.
6.384	VP2LO	STE. KITTS, B.W.I. 46.96 m. ICA Service Labs, Box 88. Daily 4-4.45 pm., Sun 10-10.45 am. and irreg. at other times.
6.380	YV5RF	CARACAS, VENEZUELA, 46.92 m., Addr. Box 983. 6-10.30 pm.
6.370	TI8WS	PUNTARENAS, COSTA RICA, 47.07 m., Addr. "Ecos Del Pacifico", P. O. Box 75. 6 pm.-12 m.
6.365	YVIRH	MARACAIBO, VENEZUELA, 47.18 m., Addr. "Ondas Del Lago," Apartado de Correos 261. 6-7.30 am., 11 am.-2 pm., 5-11 pm.
6.360	HRPI	SAN PEDRO SULA, HONDURAS, 47.19 m. 7.30-9.30 pm.
6.350	JZG	NAZAKI, JAPAN, 47.22 m. Relays Tokyo 5-7.30 am. irreg. Phones ships early am.
6.340	HIIX	CIUDAD TRUJILLO, D. R., 47.32 m. Sun. 7.40-10.40 am., daily 12.10-1.10 pm., Tues. and Fri. 8.10-10.10 pm.
6.335	OAX1A	ICA, PERU, 47.33 m., Addr. La Voz de Chiclayo, Casilla No. 9. 8-11 pm.
6.324	COCW	HAVANA, CUBA, 47.4 m., Addr. La Voz de las Antillas, P. O. Box 130. 6.55 am.-1 am. Sun. 10 am.-10 pm.
6.310	HIZ	CIUDAD TRUJILLO, D. R., 47.52 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.
6.300	YV4RD	MARACAY, VENEZUELA, 47.62 m. 6.30-9.30 pm. exc. Sun.
6.295	OAX4G	LIMA, PERU, 47.63 m., Addr. Apartado 1242. Daily 7-10.30 pm.
6.290	HIG	TRUJILLO CITY, D. R., 47.67 m. 7.10-8.40 am., 11.40 am.-2.10 pm., 3.40-8.40 pm.
6.280	COHB	SANCTI SPIRITUS, CUBA, 47.77 m., Addr. P. O. Box 85. 9-11.30 am., 12.30-1.30, 4-7, 8-11 pm.
6.270	YV5RP	CARACAS, VENEZUELA, 47.79 m., Addr. "La Voz de la Philco." Daily to 10.30 pm.
6.255	YV5RJ	CARACAS, VENEZUELA, 47.18 m.
6.243	HIN	CIUDAD TRUJILLO, D. R., 48 m., Addr. "La Voz del Partido Dominicano." 12 n.-2 pm., 6-10 pm.
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.
6.225	YVIRG	VALERA, VENEZUELA, 48.15 m. 6-9.30 pm.
6.210	——	SAIGON, INDO-CHINA, 48.28 m., Addr. Radio Boy-Landry, 17 Place A. Foray. 4.30 or 5.30-9.15 am.
6.210	TG2	GUATEMALA CITY, GUAT., 48.28 m., Addr. Dir. Genl. of Electr. Commun. Relays TGI Mon.-Fri. 6-11 pm., Sat. 6 pm.-1 am. Sun. 7-11 am., 3-8 pm.
6.205	YV5RI	CORO, VENEZUELA, 48.32 m., Addr. Roger Leyba, care A. Urbina y Cia. Irregular.
6.200	HI8Q	CIUDAD TRUJILLO, D. R., 48.36 m. Irregular.
6.200	ZGE	KUALA LUMPUR, FED. MALAY ST., 48.36 m. Sun., Tue. and Fri. 6.40-8.40 am.
6.185	HIIA	SANTIAGO, D. R., 48.5 m., Addr. P. O. Box 423. 7 am.-5 pm.
6.171	XEXA	MEXICO CITY, MEX., 48.61 m., Addr. Dept. of Education. 7-11 pm.
6.156	YV5RD	CARACAS, VENEZUELA, 48.71 m. 11 am.-2 pm., 4-10.40 pm.
6.153	HI5N	MOCA CITY, D. R., 48.75 m. 6.40-9.10 pm.

49 Met. Broadcast Band

6.150	CJRO	WINNIPEG, MAN., CANADA, 48.78 m., Addr. (See 11.720 mc.) Daily 6 pm.-12 m., Sun. 5-10 pm.
6.150	ZPI4	VILLARRICA, PARAGUAY, 48.75 m. 5-6 pm.
6.147	ZRD	DURBAN, SOUTH AFRICA, 48.8 m., Addr. (See ZRK, 9.606 mc.) Daily exc. Sat. 11.45 pm.-12.50 am.; Daily exc. Sun. 3.30-7.30 am., 9 am.-3.45 pm.; Sun. 8-11.30 am., 12 n.-3.20 pm.
6.147	ZEB	BULAWAYO, RHODESIA, S. AFRICA, 48.8 m. Mon., Wed., and Fri. 1.15-3.15 pm.; Tues. 11 am.-12 n.; Thurs. 10 am.-12 n. Sun. 3.30-5 am.
6.145	HJ4ABE	MEDELLIN, COL., 48.79 m. La Voz de Antioquia. 11 am.-12 n., 6-10.30 pm.
6.140	WBXK	PITTSBURGH, PA., 48.86 m., Addr. Westinghouse Electric & Mfg. Co. Relays KDKA 11 pm.-12 m.
6.137	CR7AA	LAURENCO MARQUES, PORT. E. AFRICA, 48.87 m. Daily 12.05-1, 4.30-6.30, 9.30-11 am., 12.05-4 pm., Sun. 5-7 am., 10 am.-2 pm.
6.130	VP3BG	GEORGETOWN, BRIT. GUIANA. 48.94 m. From 5 pm. on.
6.130	COCD	HAVANA, CUBA, 48.94 m., Addr. Box 2294. Relays CMCD 7 am.-1 am.
6.130	VE9HX	HALIFAX, N. S., CAN., 48.94 m., Addr. P. O. Box 998. Mon.-Fri. 7 am.-11.15 pm., Sat. 11 am.-11 pm., Sun. 12 n.-11.15 pm. Relays CHNS.
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.
6.122	HJ3ABX	BOGOTA, COL., 49. m. Addr. La Voz de Col., Apartado 26-65. 12 n.-2 pm., 5.30-11 pm.; Sun. 6-11 pm.
6.122	HP5H	PANAMA CITY, PAN., 49 m., Addr. Box 1045. 10 am.-1 pm., 5-11 pm.

(Continued on page 253)

All Schedules Eastern Standard Time

The Signal MUST Be Good!

Boyd W. Bullock

E. S. Darlington broadcasting letters received at station W2XAF.

How is a strong short-wave signal, free from interference, projected to a country like South America? This article explains how some of the larger problems were solved.

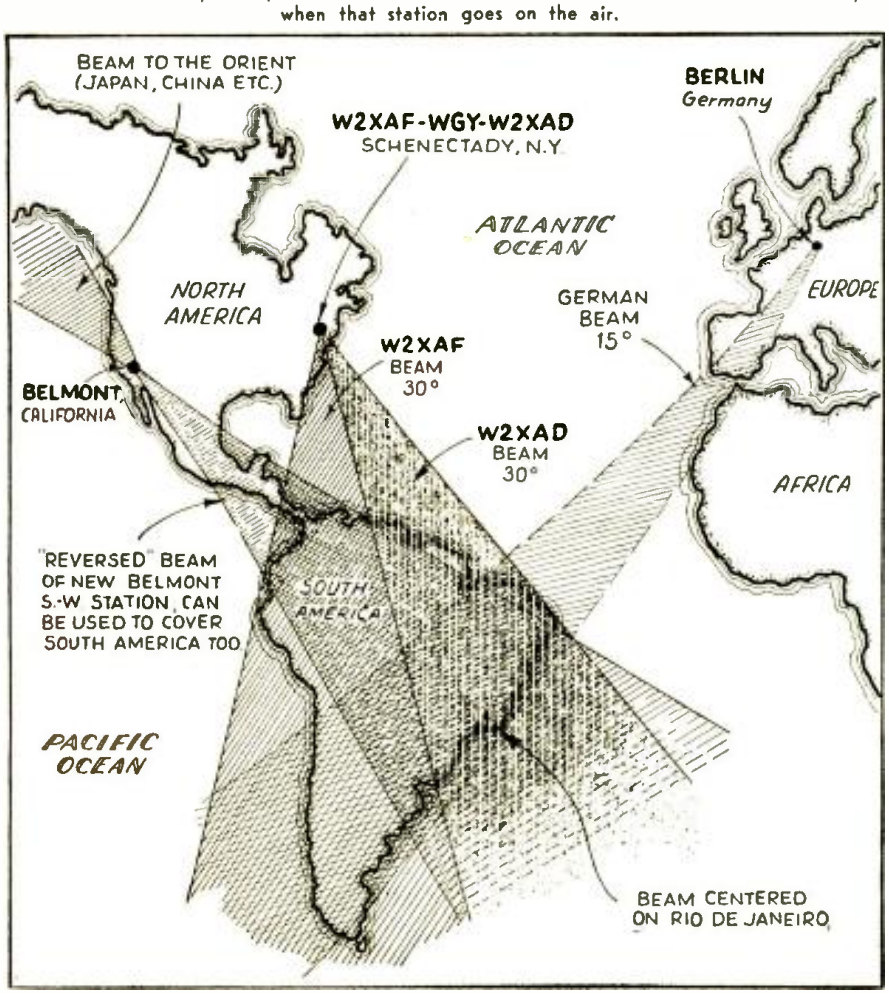
● ONE of the vital considerations in international short-wave broadcasting—without question the most fundamental—is the problem of providing the intended foreign audience with a signal which is sufficiently good to enable consistent and satisfactory reception of programs.

A good signal, of course, is of primary importance in the regular broadcast band at home—but when operating in the short-wave, or high-frequency, portion of the radio spectrum—over great distances—the problem is more complex.

In the first place, radio waves exhibit the characteristic of jumping off into space from the transmitting antenna and not returning to earth until considerable distance has been traversed. This behavior becomes more pronounced and the effective distance greater as the frequency is increased, until, in the short-wave broadcast regions, "skip distance," as it is called, becomes a very important factor.

Now if "skip distance" for a given frequency remained constant, the problem of picking a frequency to reach a given area would be relatively simple. But "skip distance" varies widely for a given frequency—being affected by daylight and darkness, by the seasons, by such remote phenomena as sunspots, and by the direction (geographical bearing) of the line between transmitter and receiver.

The map below shows how "foreign" short-wave broadcasts to South America are counteracted by the two powerful S-W beams from the Schenectady, N. Y., stations; the new Belmont, Calif., S-W beam can also be "reversed" to cover South America, when that station goes on the air.



Factors Affecting Transmission

All these seemingly unrelated factors resolve themselves into one basic influence, and that is the ionization of the atmosphere, the degree of which is governed by the *amount* and *quality* of sun radiation through the atmosphere. Thus do *daylight and darkness*, the *seasons*, and *sunspots* enter the problem. Also direction of propagation of the radio waves—for, traveling east and west, they may traverse both daylight and darkness, while on a north-south circuit, they may move entirely in either day or night. All other directions involve varying conditions between these extremes.

The general situation is that daylight decreases skip distance—and therefore effective range.

A frequency such as 15,330 kc. (19 meter band) is good for broadcasting service to South America from Schenectady, N. Y., in the daytime—afternoon especially—but is not very suitable after dark. At night, frequencies in the 9000-kc. (31-meter) band are much more effective. In the morning, the 21,000-kc. (13-meter) band is best.

Moreover, the portions of the day during which the above frequencies are most suitable vary with the seasons of the year, since with the changing seasons, not only do the hours of sunrise and sunset change, but also the angle at which sunlight passes through the atmosphere.

Even these fairly predictable variations occurring with the seasons have been upset

(Continued on page 235)

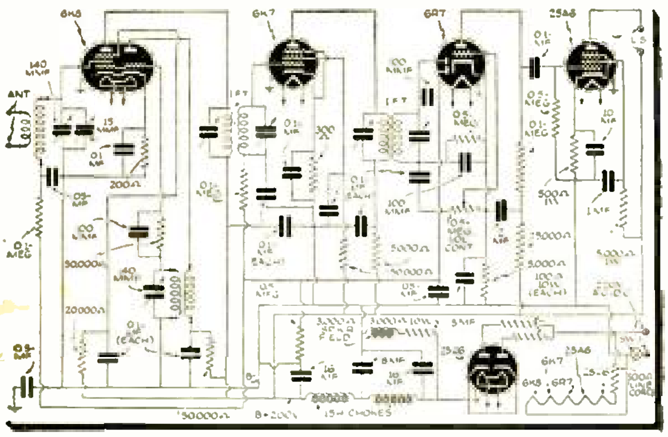
Question Box

220 Volt A.C.-D.C. Superhet

I have never seen a circuit drawn for use on a 220 volt a.c.-d.c. line. In this country, all power lines are of the 220 volt type. Will you please publish a circuit of a 220 volt DX receiver using metal tubes and 4-pin plug-in coils?—J. Edwards, Johannesburg, South Africa.

A. There are a number of sections of the U. S. where 220 volt power lines are the only ones available, so we think it would be interesting to a considerable number of readers to see a circuit especially designed for 220 volt operation.

The superheterodyne shown makes use of the new 6K8 heptode-triode frequency converter tube, which is much more efficient than the pentagrid converter tube. The receiver employs one stage of intermediate frequency amplification using an i.f. of 465 kc. Iron core i.f. transformers are used. The 6R7 tube is used as a combination diode detector, AVC tube and first a.f. amplifier. The volume control is in the grid of the 6R7 triode. A 25A6 is used as the power output tube. The output transformer for the 25A6 should have a primary impedance of 5000 ohms.



220 Volt A.C.-D.C. Superhet—1139

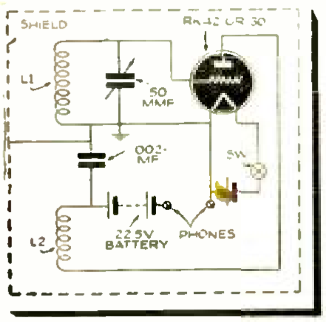
The 25Z6 rectifier tube is connected as a half-wave type. It is essential that the 100 ohm resistors be placed in series with each plate of this tube for 220 volt operation.

Frequency Meter-Monitor

Please print the diagram of a simple but compact frequency meter-monitor, using a tube such as a 30 and a small C battery or dry cell. The unit must be stable.—James Williams Finlayson, W2KYD, New York City, N. Y.

A. We have shown a diagram of a frequency meter-monitor which should meet your requirements. A type 30 or an RK42 tube may be used. The RK42 requires a filament voltage of 1.5, the 30 tube requires 2 volts. 22.5 volts of B battery are required.

This unit will serve as a monitor only for c.w. signals, due to the fact that the circuit is in continuous oscillation when turned on.



Frequency Meter—1140

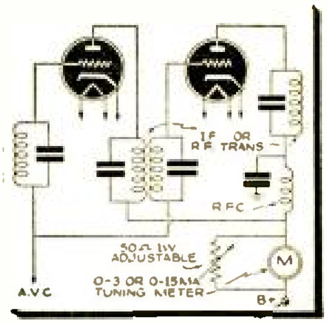
The coils L1 and L2 will vary, depending on the band that is desired to cover. For the 80 meter amateur band, L1 should have about 33 turns of No. 30 wire and L2 about 9 turns. For 40 meter operation, L1 should have approximately 14 turns and L2, 5 or 6 turns. For 20 meter operation, L1 should have from 4 to 6 turns and L2 about 4 turns. Coils should be wound on a 1½" form with a spacing of about 3/16 of an inch between L1 and L2.

Batteries may be mounted inside the shield.

Adding an R Meter to a Receiver

I have a Sky-Buddy receiver and I would like to add an R meter to it. Will you please publish a circuit showing how this may be done?—Henry Ritzman, Flushing, L. I.

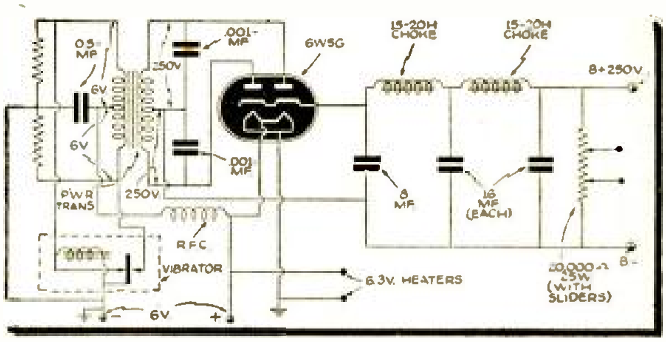
A. We believe the addition of a signal-strength or R meter to any receiver employing automatic volume control is of interest to most experimenters, so we have prepared a circuit showing how this addition may be made to any receiver employing avc. It will be noted from an examination of the diagram that a milliammeter is connected in series with the plate lead of one or more tubes *whose grids are controlled by the avc voltage.* The range of this meter may be anywhere from 0 to 1 up to 0 to 15 ma., depending on the number of tubes in series with it. Ordinarily, it is safe to assume that each tube's plate will take from 5 to 9 ma. If a low-range meter is used and shunted with an adjustable resistor, as shown, it will simplify adjustment matters considerably. The manner in which this receiver is adjusted is as follows: Disconnect the aerial from the receiver and be sure that no signal is being received. The meter should read *full scale.* If it reads less than full scale, the resistance of the shunting resistor should be *increased.* If it reads more than full scale, the resistor should be *decreased.*



"R" Meter Connections—1141

Proper operation is obtained when the meter reads exactly *full scale* with no signals being received.

With this simple type R meter, it is possible that very weak signals will not cause any deflection of the meter. There is nothing that can be done about this, however, unless a much more elaborate arrangement is used.



Vibrator Power Pack—1142

Battery-Operated Power Supply

I wish you would publish a diagram of an efficient B battery eliminator suitable for use with modern 5 or 6 tube battery-operated receivers. It should have as low battery drain as possible, and any hints on shielding would be appreciated. The unit is to be used with all-wave receivers in rural districts.—E. L. Slinger, Jamaica, N. Y.

A. The diagram we have prepared shows such a unit, making use of a vibrator for supplying interrupted direct current to the primary of the power transformer. A separate rectifier tube, a 6W5G, is used. With the filter circuit shown, practically all hum should be reduced to a very low level, if reasonably good filter chokes are used. In some cases, increasing the value of the 16 mf. filter condensers to as much as 32 mf. may be helpful. The vibrator unit should be well shielded. Most of the commercially available vibrator units come already mounted in a shield, so no difficulty should be experienced on this score. The r.f.

A fee of 25c (stamps, coin or money order) is charged for letters that are answered by mail. This fee includes only hand-drawn schematics. We cannot furnish full-size working drawings or picture layouts. Letters not accompanied by 25c will be answered on this page. Questions involving considerable research will be quoted upon request. Names and addresses should be clearly printed on each letter.

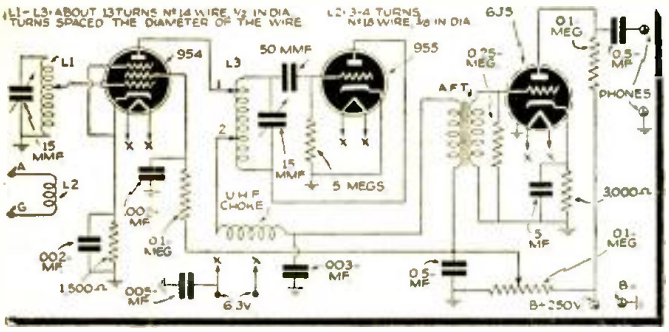
choke shown in series with the primary of the power transformer should be wound with wire capable of passing at least 2 amperes. There are commercial chokes of this type available, but they may be home-made, if desired, by winding 50 to 100 turns of No. 16 d.c.c. wire on a form about ½" in diameter.

This unit may also be used on 32 volt farm-lighting systems, provided that the primary of the power transformer is designed for 32 volts each side of center tap instead of 6 volts. However, the heaters of all the tubes, including the rectifier, must be connected in a series arrangement so that each individual tube will be receiving its proper voltage. Five 6.3 volt tubes, connected in series, may be operated directly from the 32 volt battery source. When in series, it must be remembered that the heater amperage of each tube must be identical.

? 5-Meter Acorn Tube Receiver

I want to build an efficient super-regenerative receiver for use in the 5-meter band. I believe for this purpose, it would be best to use acorn type tubes. I would also like to have a t.r.f. amplifier in it. It is to be for headphone operation.—Wilbur Evans, Burlington, Vt.

A. A receiver employing two acorn tubes and one metal tube is shown in the diagram. A 954 pentode tube is used as a t.r.f. amplifier and a 955 triode as a self-quenched super-regenerative detector. A 6K5 is used as a.f. amplifier.



5-Meter Acorn Tube Receiver—1143

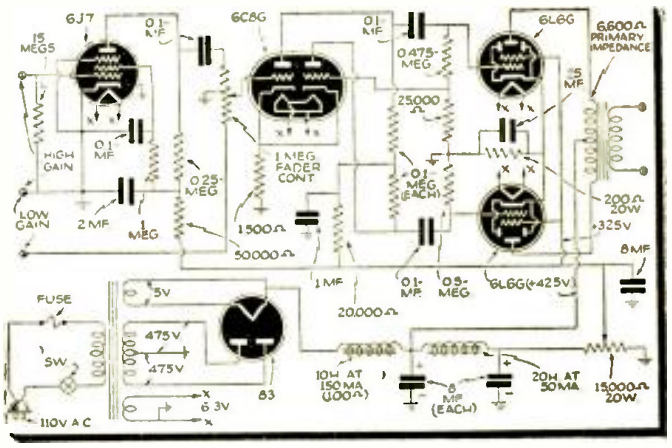
The tap on coil L1 should be adjusted for best results. Generally, the best position will be somewhere near the top end of the coil. Tap No. 1 on coil L3 should be located close to the grid end of the coil while tap 2 must be carefully adjusted to give best results. Ordinarily, it will be somewhere near the plate end of the coil.

In building a receiver of this type, placement of parts is very important for successful operation. All ground returns to the chassis should be brought to one point and the layout should be such that all wiring is as short as possible. The leads from the .003 mf. condenser in the plate circuit of the 955 tube should be kept as short as possible and the grounded end should be returned directly to the cathode terminal of that tube. The u.h.f. choke is critical and may consist of about 40 to 60 turns of No. 30 wire wound on a ¼" rod, with the turns spaced to occupy about one inch. It may be necessary to make slight changes in this choke to eliminate dead-spots in tuning the receiver. If possible, the tuning coils L1 and L3 should be mounted directly on the frames of the 15 mmf. tuning condensers to keep leads as short as possible.

? 25-Watt Audio Amplifier

In May, 1937, you published a good diagram of a 7-watt amplifier with mixer for phonograph and mike. How could the wattage be boosted to 20 or 25 watts? If it can't be done, please publish a simple diagram of the amplifier that will deliver this output.—Charles Eletson, Bloomington, Ill.

A. It is not practical to increase the power output of the amplifier shown in the May, 1937, issue, without extensive rebuilding, so we have drawn a diagram for a completely new audio amplifier which is conservatively rated at 25 watts undistorted output. You will note that it makes use of 2-beam power tubes in the output stage, connected in pushpull. Two input circuits are provided; one, high gain—for use with a crystal or velocity microphone, feeds into the grid of a 6J7 tube. Note that a 15 meg. grid-leak is used on this tube and that no bias resistor is provided. With this arrangement, the tube grid receives sufficient bias automatically and it is more stable in operation than with the more conventional arrangement. The low gain input is for use with a phonograph pickup or the output of a receiver and feeds into the grid of one of the sections of the 6C8G tube. The one meg. fader control permits shifting from the high gain to the low gain circuit by simple adjustment of the control. The 6C8G is used as a combination second a.f. tube and *phase inverter.*



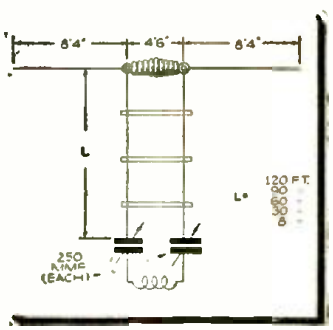
Beam Power A.F. Amplifier—1144

To realize the maximum output of this amplifier, it is essential that the regulation of the power transformer be very good. A small cheap transformer will reduce the undistorted power of the amplifier very considerably. It is also essential that the 10-henry choke coil have a resistance no greater than that specified, for the same reason.

? A Doublet Antenna Tuner

Will you please publish a diagram for an efficient antenna tuner to be used on a quarter-wave doublet for 10-meter operation?—Robert D. Hart, Collinsville, Conn.

A. The diagram shows the simplest way of tuning a doublet. There are two 250 mmf. condensers in series with the feeder wires of the antenna. This type of tuner will not work effectively with a twisted lead-in but will work well with a higher impedance lead-in, such as a transposed lead-in system, or that shown in the diagram. The length of the lead-in should be one of the figures shown in the diagram, in order for it to resonate properly. The tuning condensers must be readjusted for each frequency tuned to, although when tuning across the 10-meter band, good efficiency can be obtained at one setting of the condensers. The coil is the receiver antenna coil.



Antenna Tuner—1145

It should be noted, however, that when the feeder is 8 feet long the 250 mmf. condensers *must* be replaced by a single 250 mmf. condenser connected *in parallel with* the receiver coil instead of in series as shown. This arrangement is optional with the other lengths of feeders.

An Alignment Oscillator

for "Single-Sig." Receivers

Herman Yellin, W2AJL

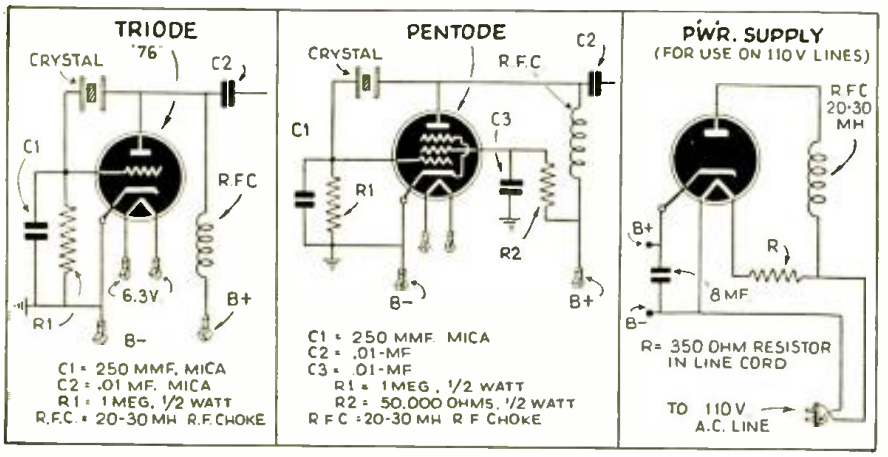


Diagram for triode and pentode oscillators with crystal and also hook-up of optional power-supply.

Simple yet effective oscillator used for aligning the I.F. stages in a receiver.

● COMMUNICATION type short-wave receivers employing a quartz crystal filter in the I.F. stage have become quite common. Not only the amateur, but also the serious type of short-wave "fan" has found them a necessity for effective listening. Their extreme selectivity enables the operator to hear stations thru interference that would be impenetrable with the ordinary type of receiver. However, for the crystal I.F. receiver to remain at its peak of efficiency, it is necessary to occasionally re-align the I.F. stages. Besides a periodic check-up, the I.F.'s should be re-aligned if at any time the receiver has been subjected to rough handling, or when tubes are replaced.

The ordinary super-heterodyne receiver requires a costly and precision-built oscillator for lining-up purposes. But the owner of a crystal I.F. receiver has in that receiver the means of aligning the I.F. stages without recourse to an expensive instrument, for the quartz crystal itself can be used to generate oscillations at its own exact frequency. This, incidentally, is a much more accurate method than using the ordinary service-man's test oscillator, which is really not accurate enough for this type of work.

The oscillator built by the writer is one of the new and popular Pierce oscillators, which is characterized by its lack of tuned circuits. The change in frequency of the oscillator circuit from the rated frequency of the crystal, is thus considerably less than in an oscillator having tuned circuits, which must be tuned to resonance with the crystal. The Pierce type oscillator is extremely simple to construct, and has the desirable attribute of working well with practically any triode or pentode tube. The first diagram shows the circuit using a triode tube, the writer having used a "76" tube. Other tubes that were tried worked equally as well. The second circuit shows the additions required when a pentode is employed. As stated before, the circuit is not at all critical regarding the type of tube being used. The test oscillator shown was designed to receive its filament and plate supply from the power-supply of the receiver being aligned. Four flexible leads with test clips at their extremities are used to connect the oscillator to the power-supply terminals. If the power supply is built into

(Continued on page 244)

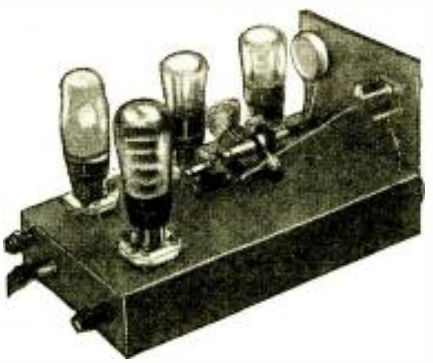
An Ultra-High Frequency Receiver

● IN one of the recent issues of *Television and Short-Wave World* (London) a small 4 tube receiver for the reception of ultra-high frequencies—especially the sounds which accompany the television broadcasts was shown.

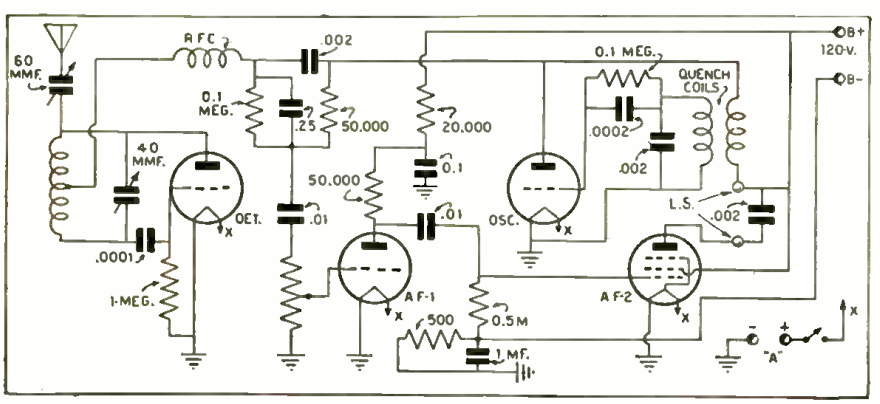
The appearance of this set can be seen from the photo. It is a straight-forward super-regenerator of the type which has proven most satisfactory for the frequencies adjacent to the 56 mc. amateur band. In addition to the detector and quench oscillator, the set has two stages of A.F. amplification of the resistance-capacity variety.

The tuning coil contains 6 turns of No. 14 bare copper wire wound to a diameter of 1 inch and tapped at the 4th turn from the grid end. The quench oscillator coils are the usual low-frequency type. Suitable coils for this purpose can be obtained from a number of makers of radio coils.

The radio constructor who lives in the vicinity of one of the experimental television stations is in for a pleasant surprise on first listening to the music which accompanies the television broadcasts. The fidelity is far better than that on the usual broadcast and short-wave bands, even with simple equipment such as this little set.



An interesting ultra-high-frequency receiver. This set is a super-regenerator with 2-stages of A.F. amplification.



Interesting vacuum tube circuits which the experimenter and set-builder may find valuable.

For Your Notebook

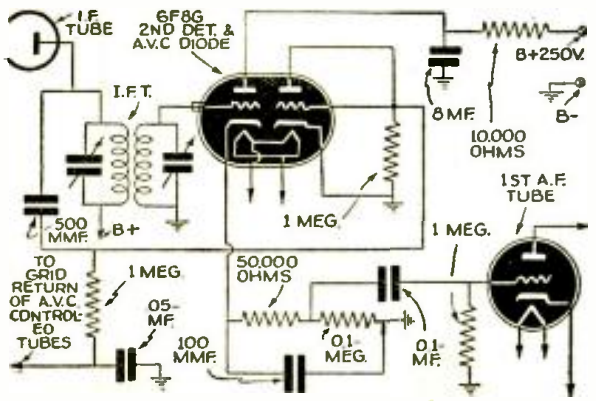
AN INFINITE IMPEDANCE DETECTOR

● A DETECTOR circuit which is not widely used is the infinite impedance detector. Its advantages are very low distortion, relatively high gain compared to a diode detector, and complete absence of damping of the tuned circuits, a bad characteristic of the diode detector. This type of detector is capable of handling strongly modulated signals with little or no distortion in much better fashion than the diode.

When using the circuit it is necessary to employ a separate tube in order to secure AVC action.

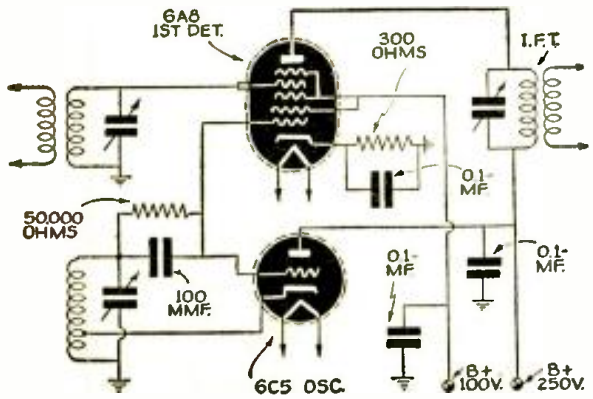
In the circuit shown a 6F8G dual triode is used. One triode is the detector and the other is connected as a diode to secure AVC voltage. Any hum generated in this detector circuit can generally be overcome by employing a decoupling circuit in the plate of the tube. The decoupling values shown in the diagram should be satisfactory, although a resistor ranging from 5,000 to 25,000 ohms may be employed.

Particular note should be made that the output is taken from the cathode circuit of the tube rather than from the plate.



IMPROVING THE MIXER STAGE

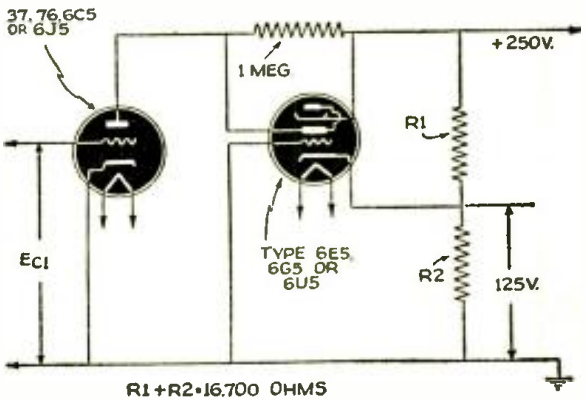
● PENTAGRID converter tubes do not function very effectively at frequencies above 15 mc. It is possible to improve the performance of the mixer stage by employing a separate triode as high frequency oscillator. The connections for this are shown. Note that the anode grid of the pentagrid tube is tied directly to the screen-grid rather than to ground. This is done to eliminate the possibility of circuit oscillation, which sometimes occurs when the anode grid is connected directly to ground.



AN EYE-OPENER

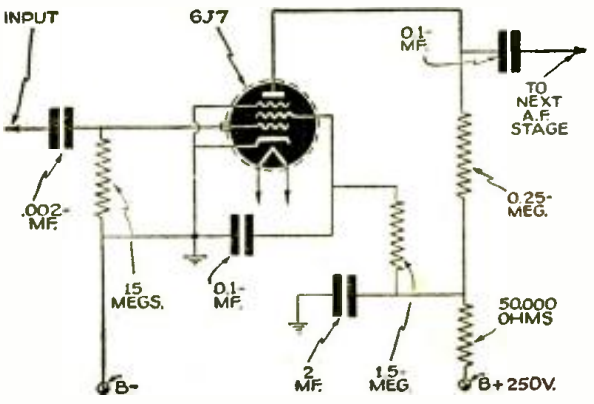
● WHEN using a cathode ray tuning tube in a conventional circuit, the maximum shadow angle is 90°. By using this 2-tube arrangement, it is possible to increase this shadow angle to approximately 180°. The circuit makes use of an extra triode tube for securing the effect. In the circuit shown using a 76 tube, a potential of —16 volts is required to close the eye completely. Zero volts will result in the 180° opening.

The advantages of the wider angle are that the given change in signal voltage will make less of a change on the magic eye pattern, which is desirable in certain applications. The bleeder, R1, R2, should always be arranged so that there is at least 15 ma. current flowing through it. With an applied voltage of 250, a bleeder totalling 16,700 ohms will meet this requirement. Signal voltage is applied at E_{c1}.



A SIMPLIFIED A.F. AMPLIFIER

● A NEW circuit arrangement for resistance coupled audio amplifiers is shown below. This circuit is interesting in that no grid biasing arrangements are provided. The grid leak is of the unusually high value of 15 megohms. The tube receives its bias through the voltage drop across this resistor which occurs from the minute grid current in the tube. Experiments have shown that with this arrangement there is no increase in distortion, tube life remains the same and there is a greater uniformity of performance, regardless of tube changes, than when using the conventional method of supplying bias to the tube. In addition, the circuit is simplified by the omission of a cathode biasing-resistor and a by-pass condenser or an external bias source.



Simplified Radio

Ben F. Porter and P. J. Sweeney

The radio-controlled plane on the ground preparatory to take-off. Note the control switch in the operator's hand.

Radio control of models is a subject of interest to all experimenters. The authors of this article have successfully demonstrated this radio-controlled device for guiding a model airplane in flight. The principles may be applied to any other type of model.

● IN recent years hundreds of experimenters and amateurs have devised all sorts of radio-control circuits and systems for many different applications of radio control. It may be an apparatus to copy code, a weather balloon on which is a transmitter whose signals are copied automatically in terms of temperature and humidity; an airplane on whose dashboard is a small light that flashes on when the plane hovers over a vertical radio beam, to tell the pilot he is over a certain field; a dreadnaught of the navy whose maneuvers are decided from some distant point, powerful and certain as to its destination; and then again it might be a small model boat or airplane, having all the potentialities of its big brother. Summed up radio control is simply remote control with radio; to do something, using radio as an intermediary, without wires and untouched by human hand.

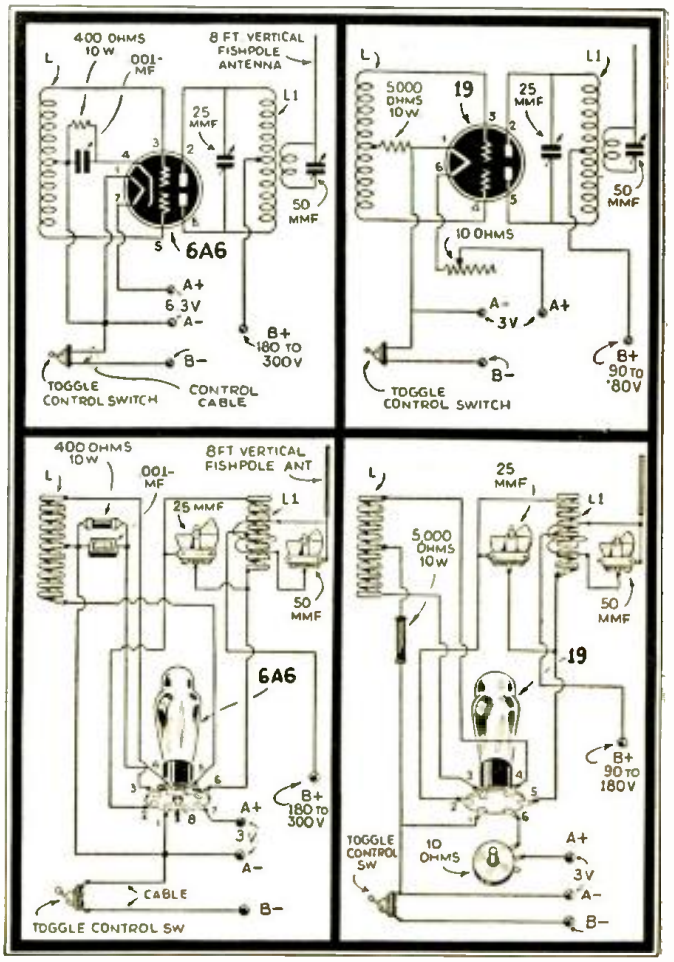
In the last few years tremendous interest has been aroused over the radio-controlling of working models of boats, autos and airplanes. These miniatures are prone to be tricky and get out of hand quite easily, especially when powered with small gas engines. Model boat builders usually tie their boats to the end of a wire and let them proceed in circles around a stake until they stall or the gas gives out. Gas model airplane builders use timers in the ignition, or fuel allowances to keep their planes from starting out on cross-country treks that last for hours and cover many miles. No small wonder then that the boat builder, dizzy from following his craft, and the model airplane builder, who is eyed by the Department of Commerce man much as the radio "ham" is watched by the radio inspector, are asking about radio control.

Although model builders have been experimenting for the last ten years there really has been no absolutely fool-proof design brought forth. It would be hard to say which designs that have been published are the best or whether they would become popular. There is one line of reasoning that has been adopted by gas model airplane builders and it is almost identical to that which is presented here. Although ideas of advanced experimenters in this field may differ, they will agree, for simplicity, that this is the ideal one for the beginner.

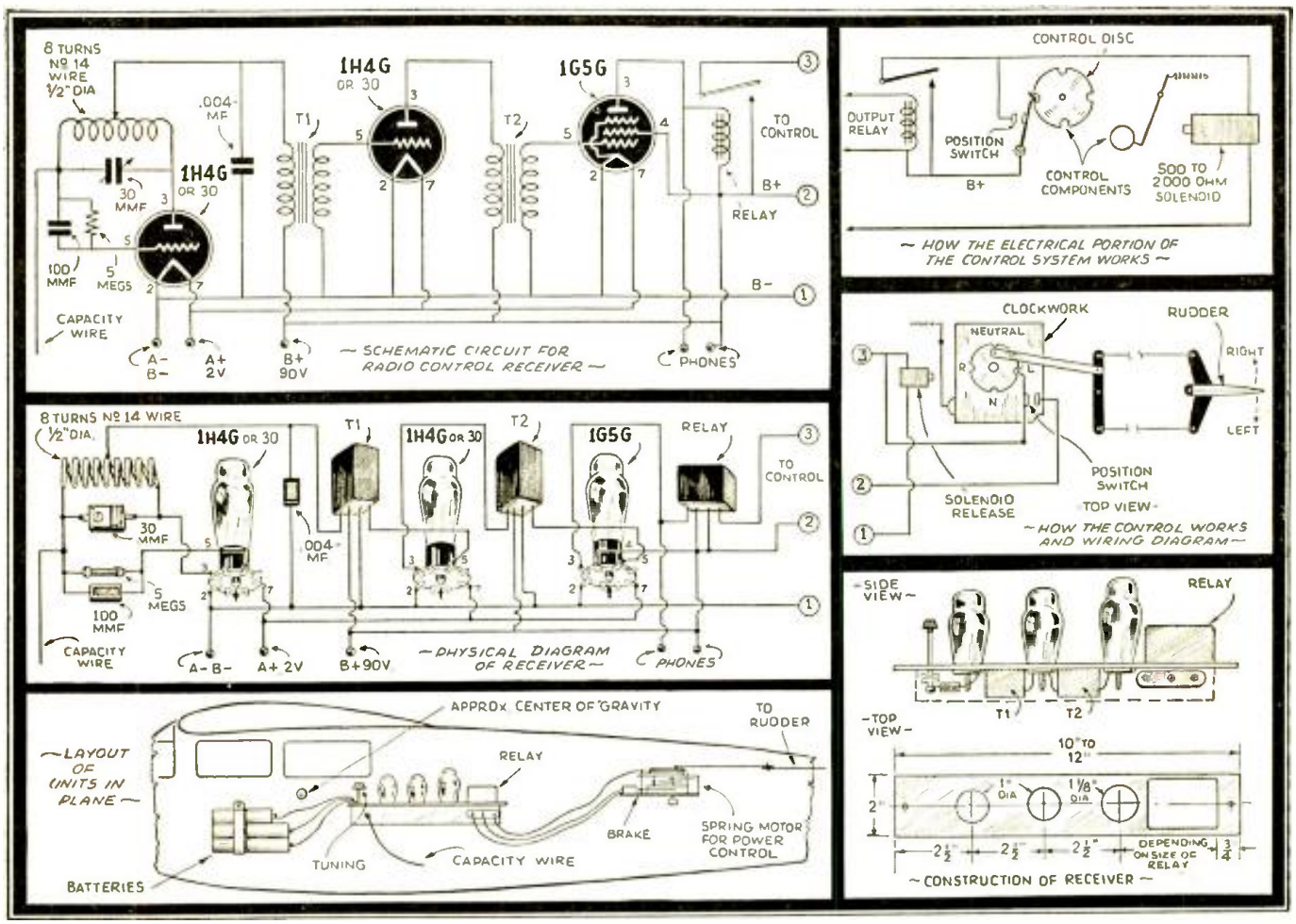
Every summer at Detroit there has been a *National Model Airplane Meet* in which contestants from all over the country compete for national honors. Not the least surprising in the contest of last year was the radio-control event, that stole the show and did so at every meet where it was shown.

The authors began and finished their entry in about a month, complete with radio equipment. This equipment has been satisfactory from the very beginning, which proved it had the stuff. But in designing a small ship such as this to carry a heavy payload, naturally there were many defects to be ironed out in a very short allotment of time. Under these very trying circumstances the plane proved to be a bad flyer as are all other planes designed for this purpose. But in spite of this

Diagrams of the 5-meter transmitter, showing it built around either a 19 or a 6A6 tube.



Control for Model Planes and Boats



Schematic and physical wiring diagrams of the 3-tube super-regenerative 5-meter receiver used in the model plane. Chassis layout details and sketches of the control unit are also shown.

it made the world's first official radio-controlled gas model airplane flight in history.

Receiver Works on 5 Meters

The receiver is the most important part of the set-up. To view this circuit there seems to be nothing extraordinary about it. It operates on 5 meters with audio coupling stages and winds up with a relay in the output instead of a loud-speaker or phones. It is assumed that the modulated signal passes through these stages, is amplified and operates the relay. Simple, eh! But nothing like this occurs. It could, quite easily, if a powerful transmitter were available. The average amateur who operates a portable knows that there is no such thing. He also knows that for portable short-range work, 5 meters can't be beaten. So with this in mind we build our *radio-control* receiver.

All radio transmitters require a license from the Federal Communications Commission and cannot be operated by unlicensed persons. The transmitter for this remote control apparatus must be licensed and operated by a licensed operator.

For simplicity we use the 5-meter, self-quenched, super-regenerative type of detection, which without a doubt delivers more amplification than any other known. When the receiver is in tune with the carrier, the "squash" goes out of the picture and stays out with reasonable stability, even when the receiver is subject to vibration. Also because this receiver is very broad in tuning, vibration and the shift of carrier that must be tolerated in this type of equipment is not unsatisfactory as in a more selective receiver.

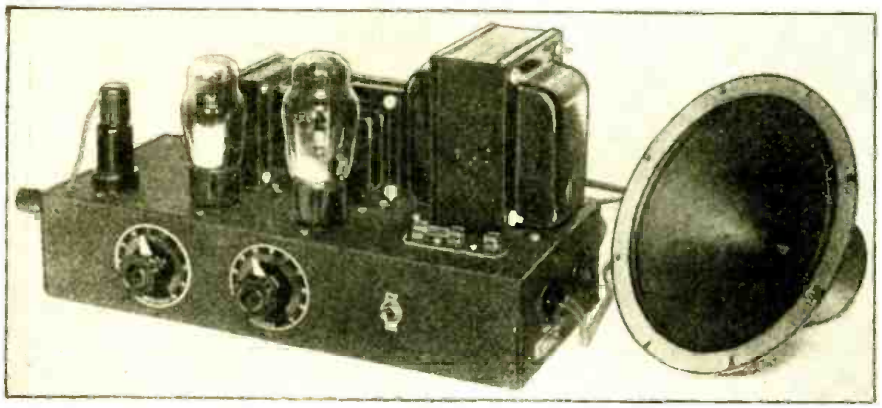
The reason that it differs is in the audio channel portion. The relay is in the plate circuit of the last amplifier tube; with no bias on the amplifier a fairly large amount of current is drawn. In this condition when no signal is applied to the grid, no change occurs in the plate voltage; and because it is drawing maximum current the relay should be closed. When operating normally the super-regeneration impressed on the grid as an a.c. voltage modulates the plate voltage, and there is less current drawn.

The trick is to adjust the tension spring on the relay so that the contacts are open when the receiver is operating normally. When a signal is received the "squash" disappears and the relay should close because the plate current rises. This also shows conclusively that an audio modulated carrier received on this same set would have little or no effect if the power of transmitter was the same. A small piece of wire connected where an antenna should go is varied in order to load the detector properly. *Otherwise no antenna is used.*

(Continued on page 247)

Audio Amplifier and Power-

This audio amplifier gives loud-speaker results on any S-W tuning unit; it supplies all operating voltages as well. Useful for many other purposes—low in cost—high efficiency.



General appearance of the "all-around" A-F amplifier. Compactness, reasonable cost, high efficiency—a few of its features.

● THERE are many short-wave receivers in *existence* that have insufficient audio output to properly actuate a loud-speaker. Owners of such sets often desire to listen to dx stations on the speaker, not only for their own enjoyment but to enable their friends to enjoy their "catches." Most of these receivers derive their power from batteries. While the initial cost of batteries may be small, their upkeep, in the form of replacements, is quite high. As batteries are used, their voltage gradually decreases, resulting in continually decreasing receiver sensitivity. Frequently the batteries run down just when some choice bit of dx is being heard.

It is thus seen that a combination audio-amplifier and power-supply would be an extremely valuable adjunct to the owner of a battery-operated receiver; such a device was recently constructed by the writer. The audio amplifier consists of a 6J7 tube, feeding into a 6N6G power tube and uses a 5X4G as a rectifier. The use of the 6N6G tube allows the amplifier to have a normal output of 6 watts, with a peak output of 10 watts. Resistance coupling between the two stages results in an essentially flat frequency response up to 10,000 cycles. Having an overall gain of 80 db., the amplifier will deliver full output, even when being fed a weak signal from a receiver using a diode detector, making it very flexible.

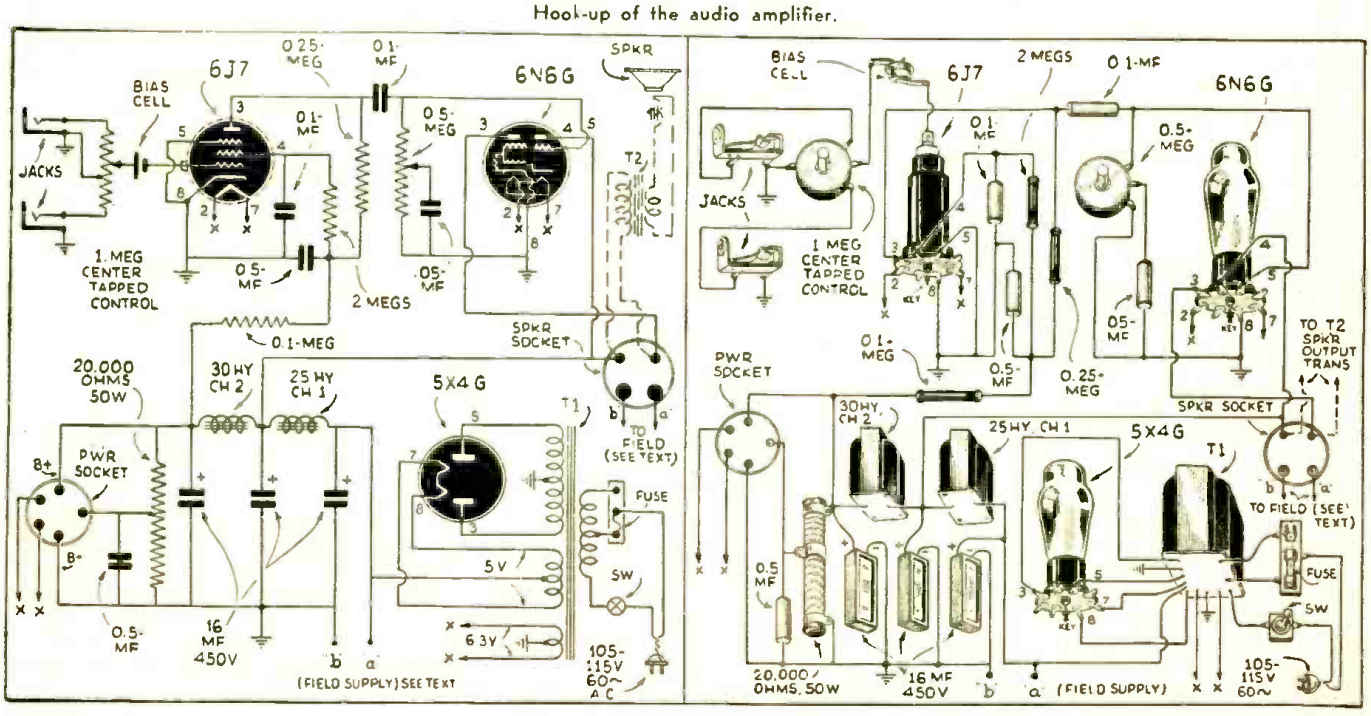
Adapted to Phonograph Pick-up

Provision has been made to allow the amplifier to be used for phonograph reproduction, with a minimum of inconvenience. Two input receptacles have been wired into the amplifier; this enables the user to have both the *receiver* and a *phonograph pick-up* permanently connected. Either input is quickly selected by the 1 megohm *fader unit* mounted on the front of the chassis. This is the left-hand knob shown in the photo. When the knob controlling the center-tapped fader unit is in the center position, no signal is fed into the amplifier. As the knob is rotated either to the left or to the right, the volume of the particular input desired is increased. A continuously variable tone control has been placed in the grid circuit of the 6N6G tube. Frequency response can be adjusted to suit room conditions and the user's personal preferences.

Since this unit furnishes power for the receiver itself, an exceptionally quiet power supply is necessary. This has been easily attained by using a two-section filter with three 16-mf. electrolytic condensers. Careful tests with an oscilloscope failed to show even the slightest trace of ripple voltage. Actual tests with a sensitive superhet short-wave tuner further attested to the power supply's hum-free nature.

The combination audio-amplifier—power-supply was built on a chassis 6" wide by

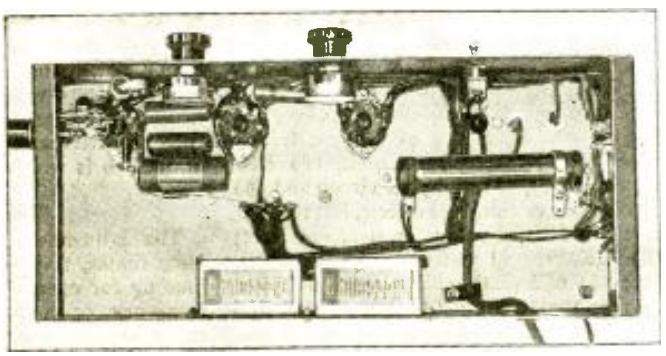
Hook-up of the audio amplifier.



Supply

Herman Yellin, W2AJL

14" long by 3" high. This allows plenty of room without being cramped for space. An over-size power transformer was purposely used; this obviates any difficulty that may be encountered from poor regulation, since the smaller transformers have an appreciable winding resistance. Thus, under a varying load, the output voltage will also vary. Since an unsteady plate voltage is quite undesirable for short-wave receiver operation, it is preferable to employ a transformer of ample size and low ohmic resistance. If it is desired to use the unit merely as an audio amplifier and not make use of its power-supply feature, a much smaller transformer may be used. Also one choke and condenser can be eliminated. The resulting unit can then be built on a much smaller chassis.



Bottom view of Audio Frequency amplifier. The parts are mounted on a substantial chassis and the "fader" control enables the operator to use the amplifier for many different purposes.

Grid Bias—How Provided

The bias for the 6J7 tube is obtained from a small 1.5 volt bias cell. The use of a bias cell instead of the customary cathode resistor allows the cathode to be grounded and results in lower hum level. In any case, however, the *hum level* of the amplifier is too low to be measured. The bias cell is mounted in a small holder which in turn is mounted directly on the rotor terminal of the fader control. The cell should not be too close to the filament heater wires; about one inch being sufficient clearance. Shielded wire is used for the 6J7 grid lead and a shield cap is placed over the top of the tube. This is necessary to prevent oscillation. The shielding should extend to within one-eighth inch of the grid cap. Input connections to the amplifier are made through two phone jacks located on the left-hand side of the chassis. Leads from the jacks to the fader control are thus very short.

The power transformer has a tapped primary, allowing efficient operation at line voltages of either 105 or 115 volts. To enable the user to most effectively make use of the tapped primary, a novel type of fuse holder has been incorporated in the amplifier. It can be seen in front of the power transformer and consists of a laminated bakelite strip having three fuse clips. The 105 and 115 volt taps of the transformer are connected to the outside clips, the middle clip being wired to one side of the supply voltage. A two ampere auto type fuse is then clipped into the center clip and either end clip, depending on whether the line voltage is 105 or 115 volts. Adjacent chokes and the transformer have been mounted at right-angles to each other to minimize hum through magnetic coupling between the units. The filter condensers, of the cardboard case type, were mounted underneath the chassis.

Loud-Speaker Requirements

On the right-hand side of the chassis are mounted a five-prong and a four-prong socket. The four-prong socket is for connection to the speaker. The writer uses and recommends a permanent-magnet dynamic speaker which requires no field supply. However, if a speaker requiring a field supply is used, the voltage is readily available. If a 5000 or 10,000 ohm field is used, the voltage is taken directly off the rectifier tube, as shown on the diagram at "a" and "b." If a low resistance field of about 1000 ohms or less is used, then the field is

(Continued on page 240)

Beginner's Transmitter Becomes

A Modern 35-

Harry D.

Front view of the 35-Watt Exciter Unit. The cost of building the unit can be reduced by eliminating some of the meters but, if possible, they should all be used.

● THE average ham, being a progressive sort of chap, starts out with a simple, low-power rig, usually one built up from receiving parts and tubes, and gradually expands as soon as his experience and finances will permit. During this period of transition, however, unless a definite plan of construction is laid out and followed, a considerable amount of money is often wasted through the process of tearing down, discarding and rebuilding. It was with these conditions in mind that the *"Beginner's Transmitter,"* described last month was designed; this set can, with only a few minor changes, become a flexible and efficient *exciter* or *transmitter unit*, capable of from 25 to 35 watts output on all of the bands, down to and including 10 meters!

Can Be Used as a Phone or C.W. Transmitter

This is sufficient driving power for most of the up-to-date medium and high power tubes, especially the new "beam" types such as the RK-47 and RK-48; or, if desired, the exciter may be used as a *complete* low-power transmitter for either phone or C.W. work. The addition of a suitable *modulator* would make this an ideal 10-meter phone transmitter for either fixed, portable or mobile work as very little power is required for the higher frequencies.

As the photographs and fig. 2 show, the mechanical construction has been changed but little; one 6L6G has been removed and an RK-39 substituted for it. The second 6L6G has been replaced by the RK-39 grid coil. A one-inch hole is cut at the rear of the chassis, just behind the 6L6 tube, for the new *triode oscillator* socket. The circuit line up is now as follows: 6C5 crystal oscillator, 6L6 buffer-doubler and an RK-39 output. The 6C5-6L6 circuit is the famous "Les-tet" arrangement developed by Frank Lester, W2AMJ, and is really one of the most flexible in common use. The coupling between the 6L6 and the RK-39 may be either *link coupling* through the usual pick-up coils and twisted pair or *capacity coupling* as shown in fig. 1. The author prefers the capacity coupling with the condensers inside the RK-39 grid coil forms; in this way the excitation to the RK-39 grid can be readily adjusted to its correct value on each band; once the coupling condensers are set, it is not necessary to re-adjust C10 each time a new coil is inserted as any small differences can be taken care of by the amplifier grid tuning condenser (C3) adjustment.

Layout of Exciter

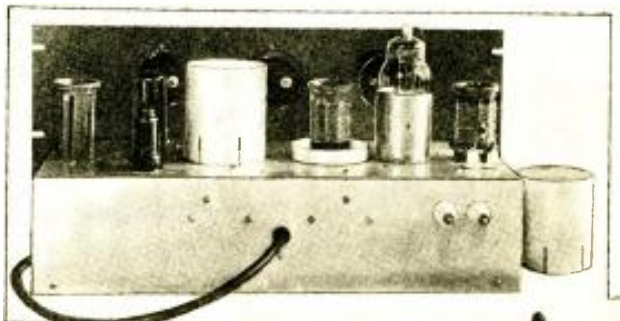
The *exciter*, as the photographs and drawings show, is built up on a 17 x 8 x 5 inch aluminum chassis and a standard 8¾ x 19 inch steel panel. The four dials along the front of the panel are as follows, left to right: (1) RK-39 plate circuit, (2) RK-39 grid circuit, (3) 6L6 plate circuit and (4) 6C5 cathode circuit. The meters, left to right, are: (1) Heater voltmeter, 0-10 volts a.c.; (2) RK-39 grid milliammeter, 0-15 ma. d.c.; (3) 6C5 plate milliammeter, 0-75 ma. d.c.; at the bottom: (4) RK-39 and 6L6 plate and screen milliammeter, 0-200 ma. d.c. The jack at the right of the 6L6 plate dial is in the 6L6 cathode lead; the jack at the left of the RK-39 grid dial is in the cathode circuit of the RK-39 tube. The plug-in coils in all stages are standard Hammarlund "XP-53" receiving type revamped, according to the data given at the end of this article. Complete specifications for bending, cutting and drilling the chassis and panel are given in figs. 2 and 3.

Construction Extremely Simple

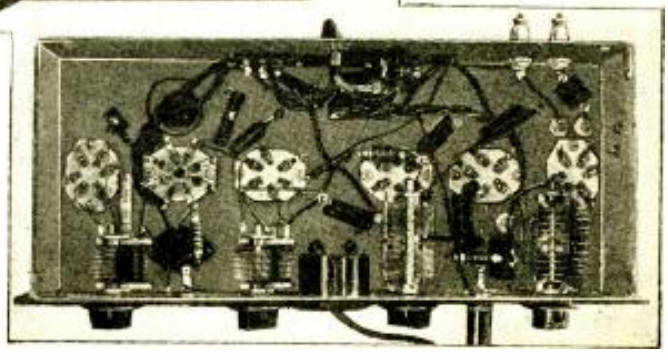
The construction of the set is extremely simple and no difficulty whatever should be encountered. It is best to start with the 6C5 circuit, finishing each stage before going on to the next. Use either standard push-back type hook-up wire or tinned No. 14 bare copper for the connections between the various parts. The by-pass condensers, especially the RK-39 screen condenser, the r.f. chokes and resistors are mounted directly on the socket terminals in order to keep the leads short and direct. Solder each joint carefully with a clean, hot iron and *resin-core* solder. Work slowly and carefully; a little extra time spent on this part of the job is well worth while.

"Tuning Up"

The adjustment of the transmitter is quite simple, taking only a few minutes to tune up for operation on either the crystal frequency or a harmonic. Using an 80 meter crystal, the tune-up procedure for 40 meter operation is as follows: Plug in the crystal and cathode coil and insert an open phone plug in each cathode jack; place a 40 meter coil in the doubler plate, amplifier grid and amplifier plate circuits. Turn on the power and adjust the sliding clip on the voltage divider until about 250 volts are applied to the 6C5 plate. Rotate the oscillator tuning condenser for the maximum dip in plate current, which will go down to around 20 or 25 milliamperes at the specified plate voltage. Adjust the



The rear view of the exciter unit, showing the extra deep sub-panel and the coil shields.



Bottom view of the exciter unit, showing the addition of dual-unit tuning condensers and other parts.

The average "ham" will find this 35-watt Exciter both economical to build and very efficient in operation. It can also be used as a low-power transmitter.

Watt Exciter

Hooton, W8KPX

resistor in series with the 6L6 cathode lead until its full value is in the circuit, remove the "dead" plug from the doubler jack, plug in the 0-200 milliammeter and tune the 6L6 plate circuit to resonance. A neon lamp is useful for this purpose also. Tune the RK-39 grid circuit for maximum grid current as indicated by the 0-15 milliammeter in series with the grid return. As the stages are tuned, check the oscillator and doubler dial settings, using the neon lamp and milliammeter as indicators, to make sure that these circuits have not been "pulled" out of adjustment. Tune the RK-39 plate circuit to resonance. With an insulated screw-driver, adjust the small air-dielectric trimmer condenser inside the amplifier grid coil until the RK-39 grid current is about 5 milliamperes or slightly higher; any small variations in grid current can be taken care of by running the amplifier grid circuit slightly off resonance.

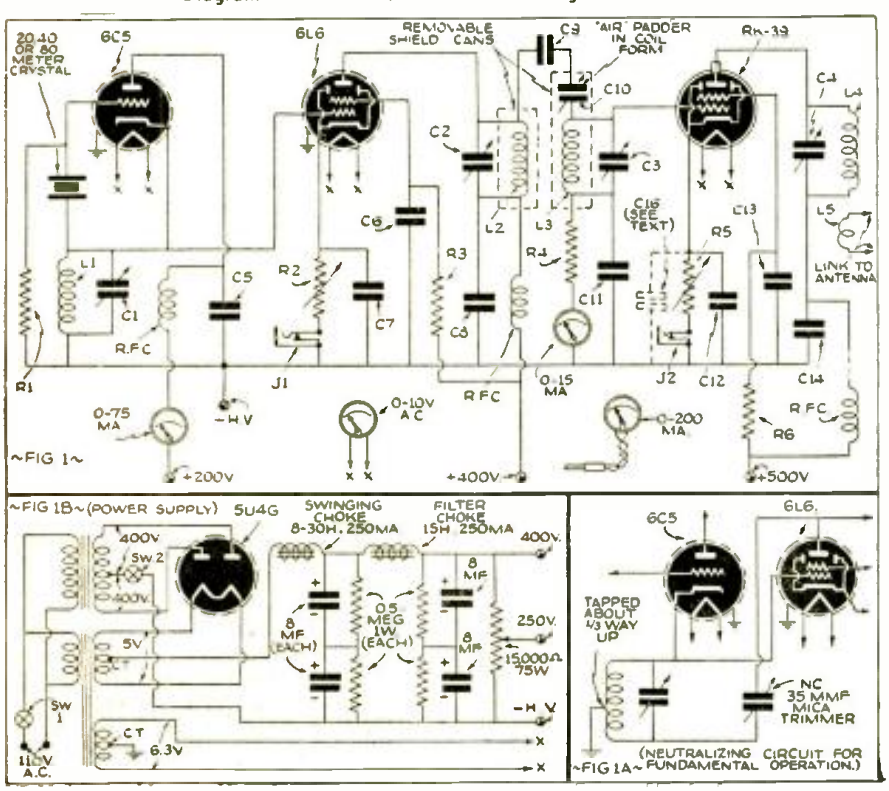
10 and 20 Meter Operation

For 10 or 20 meter operation, the tune-up procedure is the same as outlined above, except that 10 or 20 meter coils would be used in the buffer-doubler and amplifier stages. When working on "ten," especially if the amplifier is being modulated for phone, a 40 or 20 meter crystal should be used; few 80 meter crystals are active enough to permit efficient doubling all the way down to this band.

Neutralizing: For operation on the *fundamental* frequency of the crystal, the 6L6 will have to be *neutralized*. The procedure is as follows: Tune the oscillator as outlined above and place in the buffer and amplifier sockets coils which will cover the same frequency as that of the crystal. Set the small 35 mmf. neutralizing condenser for its minimum capacity. Place the *dead* plugs in the cathode jacks of the 6L6 and RK-39 and rotate the buffer plate circuit tuning condenser slowly through its full 180 degrees. As the condenser passes through the point of resonance, a violent change in the oscillator plate current will take place and the crystal may *kick out* of oscillation altogether. The neutralizing condenser is now adjusted until no change in oscillator plate current takes place at *any* setting of the buffer tuning dial. The plug is removed from the 6L6 circuit and

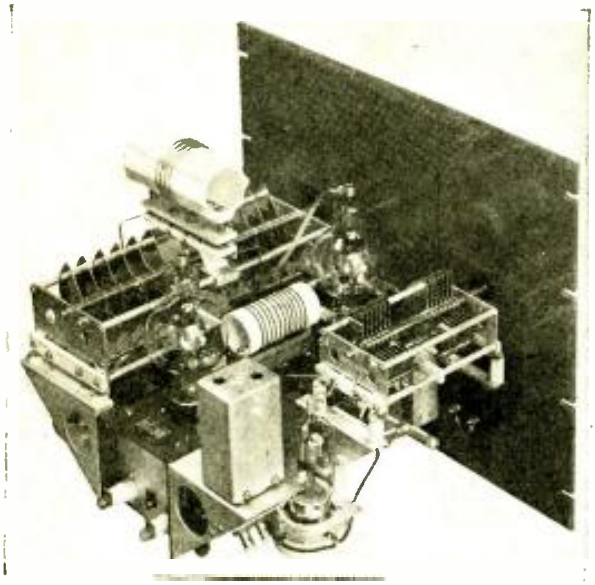
(Continued on page 241)

Diagram for the 35-watt Exciter Unit is given below.

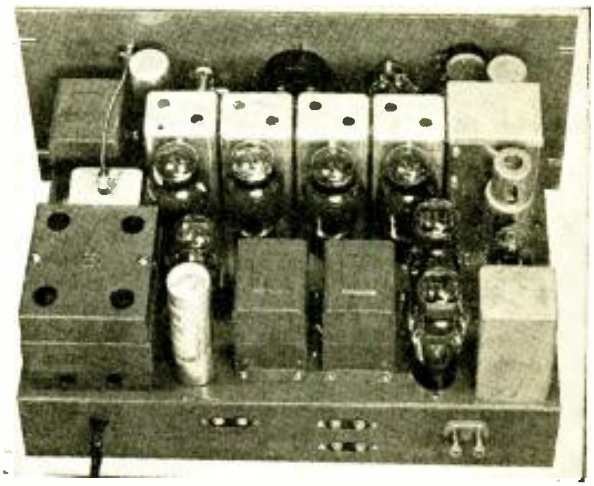


What's New in S-W Apparatus

New Transmitter Kit and Ham Exciter Unit



Left — National Foundation Unit for 600-watt amateur transmitter; class "C" r.f. amplifier is here shown. (No. 719)



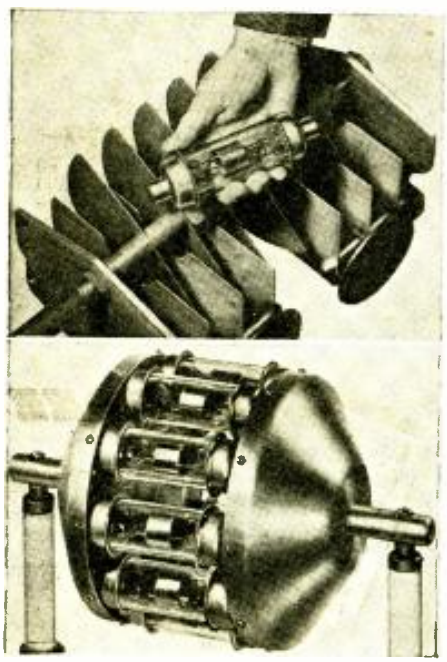
Right—New all-band crystal-controlled exciter, which comes complete with power supply and speech amplifier. (No. 720)

● A NEW *foundation unit*, available in a variety of styles, which makes possible the easy assembly of a 600-watt amateur transmitter. The class "C" r.f. amplifier unit is illustrated herewith. All the units, such as the condensers, etc., are substantially constructed so that the whole assembly constitutes a rugged and reliable transmitter. The various parts have been designed with great care so that they fit accurately together and, moreover, can be assembled with a minimum of time and trouble. Any "ham" who follows the simple instructions furnished with the foundation unit can put it together easily and feel assured of very efficient results.

The photo on the right, above, shows the new National *speech*

(Continued on page 252)

Vacuum Tank Condenser



● RADIO engineers have tried many different methods of improving the insulation of high voltage condensers such as those used in transmitters, including the use of compressed air as a dielectric. The latest idea is the vacuum tank condenser, herewith shown. Perfect insulation at all times is assured as the plates of the condenser are enclosed in a glass container from which the air has been exhausted.

The top photo shows the relatively small size of one of these new vacuum condenser units, equivalent to an ordinary transmitting condenser which occupies several times the volume in cubic inches. The lower photo shows how a number of the vacuum condenser units are connected in parallel to supply a high capacity. For still larger capacities several banks of these vacuum condensers can be connected in parallel or series parallel, depending upon the voltage involved. The single units are available in 6, 12, 25 and 50 mmf. capacities. (No. 721.)

Our Information Bureau will gladly supply manufacturers' names and addresses of any items mentioned in SHORT WAVE & TELEVISION.

Radio Wave Selects Station

● THE most startling improvement on receivers for 1938 seems to be the remote control tuning box featured by one prominent manufacturer in two of his new models. The control unit, shown in the picture above, permits any one of eight different stations to be tuned in by spinning the dial; the volume can be raised or lowered at will. The receiver may also be turned *on* and *off* from the remote control box. There are no wires or cables of any sort attached to the control box which contains a small tube and a battery. The control impulses are sent to the receiver console by *radio*. The manufacturer claims that there is no danger of the control box of one receiver interfering with the

(Continued on page 252)

The Signal Must Be Good!

(Continued from page 223)

somewhat in the last several years, and the deviation ascribed to the influence of coincident sunspot phenomena.

The broadcaster is up against another problem—also fixed by the laws of nature.

Frequency Allocation Important

Radio waves recognize no international boundaries, so in order to prevent utter confusion, the matter of allocation and register of frequencies is an organized international function handled by the *International Radio Convention* at Berne, Switzerland. This does not mean that broadcasters deal direct with the Berne Convention. In the United States, such matters are the province of the *Federal Communications Commission.* Broadcasters—and all other radio enterprises—must apply to the F.C.C. for frequency assignment and licensing. But the F.C.C. can assign only those frequencies made available to the U. S., and must register such assignments at Berne.

Both the Convention at Berne and the F.C.C. maintain engineering sections which continually study the complex and changing problem of frequency (and power) assignments—the purpose being to permit as many stations as possible to operate within the relatively limited bounds of the radio spectrum—without undue interference with each other.

This is no arbitrary matter, but one fixed by the laws of nature—so man is obliged to conform or spite his own face if he fails to heed.

Many stations, of course, may be assigned the same frequency—but in such a case it has been deemed that geographical separation and limited power (and perhaps restrictions on the hours of operation) are sufficient to prevent interference and confusion harmful to the services of the individual stations.

In numerous instances, such happy lack of interference has failed to result. In these cases the authorities attempt to rearrange assignments to correct the trouble. Nearly everyone is familiar with cases of station interference in the "regular" broadcast band, and, if he has been sufficiently interested, can recall that certain steps were taken to prevent this interference. It is not always possible, with so many stations clamoring for their place in the ether, to completely solve the interference problem. However, to a person whose technical knowledge enables him to grasp the intricacies of the question, a very commendable job has been done—and is being done from month to month as the requirements change.

From the fact that the higher frequencies —those falling within the so-called *short-wave region* (1600 kc. and up) and particularly those above 4000 kc.—exhibit remarkable distance-covering ability, it is apparent that the problem of interference prevention becomes world-wide in scope.

In February and September of 1925, W2XAF and W2XAD were first licensed to General Electric as *experimental short-wave broadcast* stations. Ever since that time, both stations have transmitted programs for the benefit of listeners in other countries. During this period, their schedules have grown heavier, and more and more program features have been presented which were specifically designed for particular foreign audiences—especially our Latin-American neighbors.

In 1928, the assigned frequency of W2XAF was raised slightly to 9530 kc., its present frequency. In 1929, W2XAD was dropped from 15,340 kc. to 15,330 kc. and at the latter figure its frequency has remained.

Both changes were required by the Federal Radio Commission (antecedent of the Federal Communications Commission) in order to conform with international agreements.

During recent years, W2XAF has operated with a power output of 25 kilowatts, while about a year ago, W2XAD went to 20 kilowatts from its previous 10.

Until the latter part of 1936, the broadcasting from W2XAF and W2XAD brought constant evidence of strong, consistently received signals in Central and South America. Then reports began to come in of interference by a growing number of other short-wave broadcast stations. Some of these were local Latin-American stations, while others were European.

Foreign Station Interference

The most consistently complained of was DJN, a station in Berlin, Germany, operating on 9540 kc.—10 kc. higher than W2XAF.

The nature of this interference was "sideband" interference—a form of trouble which occurs when two powerful signals are received which, although they may be working 10 kc. apart on adjacent channels, still

(Continued on page 236)

The Signal Must Be Good!

(Continued from page 235)

become *mixed*. This effect occurs because the modulating or voice frequency which is superimposed on the carrier frequency tends to widen out the carrier by an amount *plus* and *minus* the modulating frequency. Technically, a modulated carrier wave can be resolved into three component frequencies—one the fundamental carrier frequency, one this fundamental minus the modulating frequency, and the third the fundamental plus the modulating frequency.

It can be readily seen that when modulating frequencies go above 5000 cycles (5 kc.), carriers separated by only 10 kc. will cross up. Modern *high-fidelity modulation* involves frequencies at least as high as 8 or 9 kc.

Then what could be done to reduce the new interference and restore the consistent program reception which many letters from South America begged for?

Here was the situation:

Because of the difference in direction, DJN could cover South America effectively by using a narrow beam—only 15 degrees wide. Right away, the DJN signal was powerful because most of its energy appeared to be crowded into this narrow beam.

As for the broadcasts from Schenectady, a *much wider* beam had to be used to properly spread out and cover the South American continent—with corresponding *loss* in signal strength, even though higher power might be used in the antenna.

After a careful study of the situation and of the frequencies still available, the G. E. Co. applied to the F.C.C. for certain new authorizations.

100 K.W. Power Soon Available

One of these was a power increase to 100 kilowatts for both W2XAF and W2XAD. Another was for the use by W2XAD of two additional frequencies, 9550 kc. and 21,500 kc. Still a third was for permission to build an international broadcast station (the present proper designation for a short-wave broadcast station) at Belmont, California.

The latter station is to use 20 kilowatts and operate on W2XAF's or W2XAD's frequencies of 9350 and 15,330 kc. while they are not on the air at Schenectady.

The object of all these provisions was to enable us not only to improve reception in Latin America, but also to make such reception as consistent as possible throughout a 24-hour day; and also to provide a practical and consistent service to the regions comprising the Far East.

All these new facilities have been granted by the F.C.C., and at present the two new frequencies have been in use by W2XAD for approximately two months. Reports from Latin America are already gratifying.

The Belmont, California, station is under construction, while the new 100-kilowatt amplifier at Schenectady will be ready in a few weeks. This amplifier, available to either W2XAF or W2XAD, utilizes a newly developed tube particularly suited to *high power* at *high frequencies*.

While directive antennas, of the Alexanderson *panel-type*, have been used for many years by W2XAF and W2XAD—particularly by the latter—the new plan contemplates the regular use of such antennas for all transmissions to particular countries or areas.

For instance, on the evening schedule to South America, a 30-degree beam from W2XAD on 9550 kc. is centered on Rio de Janeiro, while W2XAF sends out a second such beam, on 9530 kc., and adjacent to the 9550 beam on the west. W2XAD thus specializes to the predominantly Portuguese eastern half of South America, while W2XAF uses Spanish announcements, etc., to the western half. Both beams carry programs carefully adapted to the desires of their respective predominant audiences. This is the technical and program arrangement which has already elicited pleased comment.

The effect of the directive antenna is such that the beam signal strength—or *field intensity*, as it is called—at a given point is several times what it would be with the same power in an ordinary antenna.

A directive antenna at Belmont will enable the new California station to serve the Orient effectively. Such transmission from this station will encounter a far more favorable daylight-darkness situation on the Far Eastern circuit than could be possible from Schenectady. At the same time, "listening hours" in the Far East come at a time which, on the Pacific Coast, interfere in no way with other schedules.

Another feature is this: The long *great circle* path from Belmont to the Orient cuts across South America—a coincidence which will enable Belmont, by *reversing its directivity*, to transmit to Latin America! Such operation will thus complement the South American service from Schenectady and will be of help in providing that *good signal* which is so necessary.

Concomitant with the primary purposes mentioned above, the new facilities will make possible improved transmission to most of the rest of the world.

(A talk given over S-W stations W2XAD and W2XAF by Boyd W. Bullock, Assistant Manager of Broadcasting, General Electric Company, Schenectady, N. Y.)

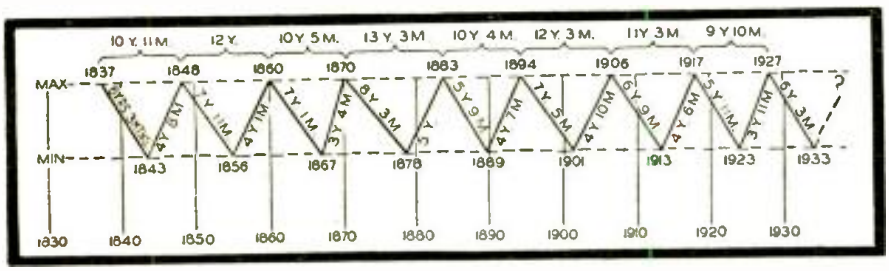
Aurora, Sun-spots and Radio

(Continued from page 199)

Radio Reception at Times of "Sunspot Minimum"

It is believed, rightly or wrongly—remember, that the whole history of DX radio, as you and I know it, does not yet contain a complete cycle—that long-distance reception of medium-wave transmissions is at its very best near the time of a sunspot minimum. Certainly, in 1923 and 1924, the former being the year of a minimum, remarkable reception with the simplest receiving sets was recorded in Europe of U.S.A. stations that we should now regard as quite small fry. Another good year was 1933, again the time of a sunspot minimum. But trans-Atlantic medium-wave stations are still pretty well received, even though we are not now far from a sunspot maximum. This may be due partly to the increases in output power that have taken place in transmitters and partly to the much wider use of the sensitive superheterodyne receiver. We shall know more about that when the next minimum occurs.

On the other hand, short-wave reception on the higher frequencies appears to deteriorate towards a sunspot minimum and to grow better and better—save for occasional "fade-outs"—as a maximum approaches. Broadly speaking, the optimum wavelength on the band between 10 and 100 meters increases as we near a minimum and decreases as we recede from it.



The varying lengths of Sunspot cycles is apparent from this chart.

A certain amount of solar activity, it would seem, is necessary for good short-wave reception at long ranges. We know comparatively little as yet about long-distance reception on the ultra-short waves. But here again such experience as we have appears to indicate that the best results are obtained when the presence of smallish sunspots show that some solar activity is in progress.

The Aurora—Its Probable Cause

Next, the Aurora. This is by no means an uncommon phenomenon in high northern latitudes, though it is rarely seen so far south as it was on January 25. Big sunspots are accompanied, as a rule, by Auroral displays, though this is not always the case. The Aurora, which is a sign that some great electrical disturbance is taking place in the upper atmosphere—and possibly in the Earth itself—may occur when there are *no great spots on the Sun*, or may not occur when there are. That of January 25, for example, happened not when the great sunspot group—the sixth largest recorded since these were first measured—was in the middle of the Sun's disk, but when it had almost passed out of view.

Nor is it true, as I have already mentioned, that an Auroral display wipes out *all* short-wave signals; it usually affects those coming from a northerly direction, though its effects may be much more widespread when it is visible in latitudes unusually far south. When Professor E. V. Appleton took an expedition to the north of Norway for the purpose of investigating the effects of the Aurora on radio reception he found that during its occurrence the various layers in the upper atmosphere that are normally reflectors of short and medium radio waves ceased to perform this function. In other words, the *sky-wave* of any short-wave or medium-wave transmission passing through the Auroral area was liable to be no longer effective.

What are sunspots? What is the Aurora? No one, probably, could give a definite answer to either question. We believe that sunspots are huge whirlpools in the outer gaseous layers of the Sun, which is all that we can see of him, caused by tremendous activity within. Big sunspots go, as a rule, in pairs, and it is stated by Dr. Smart* that one of the pair is magnetically a North Pole and the other a South. "It is," he writes, "as if a gigantic horseshoe magnet were embedded within the Sun, its ends or poles, just protruding through the photosphere." Sometimes large spots may appear to be "singletons." Hale, however, discovered that single spots of great size are invariably accompanied by corresponding "invisible spots"—centers, that is, of terrific solar activity which do not break through the photosphere to become visible.

And the Aurora? So far as we know, this is due to a bombardment of our atmosphere by charged particles shot out from the Sun. The Aurora itself is generally not less than some 60 miles above the Earth's surface, which corresponds fairly well with the height of the Heaviside Layer. It has, however, been observed at far greater heights.

Once we have banished the idea that visible sunspots are the immediate causes of magnetic storms or of Auroræ we can admit that such phenomena are most commonly brought to the notice of the listener at times of great sunspot activity. At a sunspot maximum or during the period shortly before or shortly after it is recorded, this activity is at its height. We are approaching a sunspot maximum now; when shall we reach the culminating point?

How Long Is a Sunspot Cycle?

There is a common belief that sunspot maxima recur regularly every eleven years, but this is by no means true, as you will see if you spend a few moments in examining the accompanying graph, which covers the sunspot cycles during the past hundred years. I use the term "sunspot cycle" with its usual connotation—the period that elapses between one maximum and the next.

No such cycle during this period has

*W. A. Smart, M.A., D.Sc., F.R.A.S., Couch Adams Astronomer, Cambridge University, "The Sun, the Stars and the Universe" (p. 97).

(Continued on page 238)

Aurora, Sun-spots and Radio

(Continued from preceding page)

occupied exactly eleven years. Actually, it was not until 1843 that the existence of the cycles was suspected, and not for more than ten years after that was it accepted. The longest cycle of the past hundred years was that of 1870–1883, which extended over thirteen years and three months; the shortest, 1917–1927, was just nine years and eleven months. It is worth noting that this latter very short cycle (not the shortest on record, for that of 1829–1837 was of but seven years and five months if we can trust the observations of those days) immediately precedes the one that is now being completed.

The average for the eight complete cycles shown in the graph is eleven years and three months, which is exactly the duration of that between 1906 and 1917. The longest on record was the 1816–1829 cycle, which occupied thirteen years and five months.

But there is some doubt whether what we call a complete cycle is really anything of the kind. Smart mentions that if the leading spot of each pair corresponds to a North Pole in one eleven-year cycle, the polarity is reversed in the next. He suggests that the complete cycle may be not eleven years and a bit, but 22–23 years.

Looking at the graph, we notice that the maximum-to-maximum cycles between 1837 and 1917 run: short—long—short—long—short—long—average. This suggests that there may well be something in this "double-cycle" theory. If so, we may now be in for a very slow rise from the minimum of 1933 to absolute maximum—or possibly for a longish period of great sunspot activity with no pronounced maximum peak—for the present still incomplete cycle follows the phenomenally short one of 1917–1927.

Many expected that the culminating point would occur towards the end of this year, but there are signs that we are still some way from it. It is agreed by astronomers that at times of sunspot maxima all main groups are found to be within 12–14 degrees of the solar equator. At minima they are seen in latitudes as much as 30 degrees north or south, but as a maximum approaches they move nearer and nearer to the Sun's equator. The recent great group was in latitude 19 degrees North: it was, therefore, some 5 degrees outside the "maximum zone." This suggests that the coming maximum may not be recorded this year.

At the same time it must not be overlooked that the rise from minimum to maximum is, as a rule, very much more rapid than the fall from maximum to minimum. During the period covered by the graph the fall averaged six years and eleven months; the rise, four years and four months. The last fall (1927–1933) occupied but six years and three months. It may be, therefore, that the rise which we are experiencing will prove to be more than usually speedy.

My own prediction, made after a long study of the sunspot figures available, is that the approaching maximum is more likely to occur next year than this. Rather than a sharply-defined maximum point, I expect a long period of great solar activity, followed by a very slow fall to minimum. One must, though, bear in mind that the recorded observations of sunspot maxima and minima cover little more than a century out of the hundreds of millions of years during which they must have been taking place. It may be that the cycle now accepted is but one half, one quarter, one eighth, or some other unknown fraction of a real cycle.

In any event, we are assured of plenty of medium-wave, short-wave, and ultra-short wave adventures for a good many months to come.

When Holland Televises

(Continued from page 203)

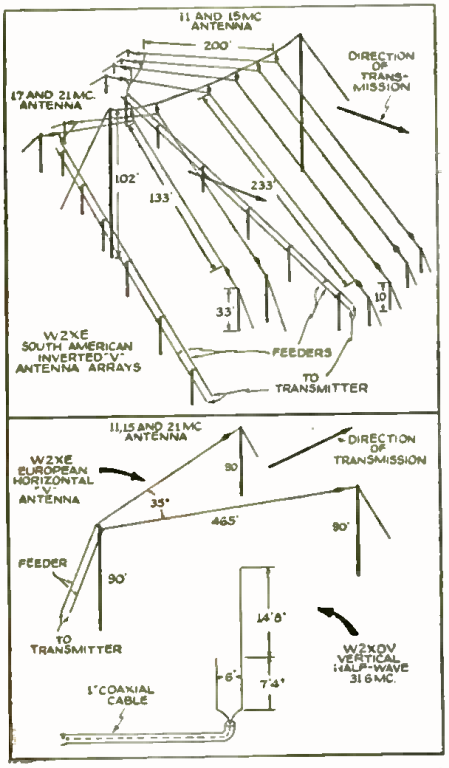
high-pressure mercury lamps, each of 1000 watts rating, can be attached wherever necessary. These lamps have a closed water-cooling system. During transport the studio set-up as well as the camera and the aerials can be carried in the transmitter car. All sensitive parts of the installation are spring-supported, so that they may withstand jarring.

The whole apparatus is fed with alternating current; no generators or batteries need thus be transported to supply the necessary electrical energy, which must be taken from the *local* mains. The whole thus forms a complete low-powered television transmitting station. In giving demonstrations several receivers may be set up in the neighborhood in order to exhibit the picture received "through the ether"; there is, however, the possibility of transmitting the picture by means of a cable directly to several demonstration receivers, in case local conditions make the use of a radio link impossible.

W2XDV—Pioneer High-Frequency Broadcaster

(Continued from page 205)

announce to the *program* circuit and from the audio to the radio monitor circuit. The audio rack contains the class "B" modulator, the driver amplifier, and the monitor amplifier, together with associated power supplies and control relays. The radio-frequency section is composed of the 802 crystal oscillator, the 304-B tripler, the 304-B doubler, and the 304-B modulated final class "C" amplifier, together with associated power supplies and control re-



Directive aerials for South America and Europe at the C.B.S. short wave station W2XE, Wayne, N. J.

lays. An r-f monitor rectifier is also mounted in the radio-frequency section. The output of the modulated final amplifier is fed by means of a 1-inch *coaxial* transmission line approximately 50 feet long to the base of the quarter-wave matching section, which transfers the power into a half-wave *vertical* antenna. This antenna, approximately 14 feet, 8 inches in length, is mounted on top of the water-tank pent house at the highest point on the building, 275 feet above the ground level.

As is the case with all experimental high-frequency broadcast stations, W2XDV is licensed for the purpose of investigating the transmission characteristics of these frequencies, particularly with regard to their suitability for a *broadcast* service. Much valuable information has been obtained through the effort of these investigations. A thorough knowledge of the conditions to be encountered will eventually lead to the full utilization of this new range of frequencies, which will result in another contribution of science to the everyday interest, convenience and necessity of the general public.

Purpose of "High-Frequency" Broadcaster

In connection with these investigations, each licensee of an experimental high-frequency broadcast station is required by the terms of his license to submit to the Federal Communications Commission an annual report of the program of research and development conducted during the current license period.

These studies include data taken in field surveys on the signal strength and signal-to-noise ratios observed in the surrounding area, as well as data on technical developments in equipment. The high-frequency broadcast stations in the higher frequency groups are engaged in the development of a community, or short-range *local* broadcast service. The primary service area, in fact the only effective service area, of this type of transmission is based upon direct *line-of-sight* transmission and is thus a function of the height of the transmitting and receiving antennas. This must not be construed to mean that small obstructions in the line of transmission will make reception of high-frequency broadcasts impractical, but it does mean that normal transmission much beyond the effective horizon will be rapidly attenuated. For average conditions, this range may be considered to be approximately 20 miles, although for exceptional antenna heights or very high power transmissions, the range may be considerably greater.

Since the received signal strength is directly proportional to the receiving antenna height for reception at these high frequencies, it should be evident that much more importance must be placed upon receiving antenna installations, if the full possibilities of reception at these frequencies are to be realized. The advantages to be gained by locating high-frequency receiving antennas *above roof-level* and at sites well removed from street traffic are three-fold. First, a much stronger field strength is generally available; second, a high order of reduction in noise-voltage pickup is to be expected; and third, a higher stability in field strength is accomplished, due to the reduced possibility of reflection phenomena caused by moving objects such as automobiles.

Station Heard Across Atlantic!

As contrasted to the effective service area for which these very high frequencies are best suited, mention should be made of occasional *long-distance* reception possible at these frequencies. Long-distance transmissions occur when unusual conditions of ionization in the upper atmosphere exist. Such conditions of the ionosphere follow the trend of the eleven-year-sun-spot cycle. Under conditions of abnormal sun-spot activity, the lowest layer of the ionosphere provides short periods of *sky-wave* transmission even at frequencies as high as 60 megacycles. During the past year, as the sun-spot cycle has been approaching a maxima, W2XDV has received a number of reports of *long-distance* reception, including reports from Michigan, California, Nova Scotia, Quebec and Ireland! During this same period, W9XHW, Minneapolis, Minnesota, which is also a 50-watt experimental high-frequency broadcast station, operated on 31.6 mc. (9.49 meters) by the Columbia Broadcasting System, has received *long-distance* reports from Ireland, Scotland, Germany, and Australia.*

*However, the occurrence of conditions favorable to long-distance transmission is believed to be so infrequent that little interference will result to the reception of local stations, even when high-frequency broadcast assignments are duplicated at comparatively short geographical intervals.

S-W FANS and HAMS alike will find many valuable articles in the Sept. number.

Reception on 2-Meters

(Continued from page 206)

effect, and in fact a similar flutter was noticed coincident with the passing of an airplane, and there were occasions during the test when the field dropped out completely for a few seconds.

Some of the test curves showed that the fading was least around the midday period from 10-4 o'clock. Most fading of large amplitude occurred during the evening and early morning hours. Theoretical formulas, which have been verified experimentally, are available and these—together with some of the curves shown in the article which appeared in the March 1938 issue of the *Bell Laboratories Record*—make it possible to calculate the average field strength and the power required to maintain this field.

Audio Amplifier and Power-Supply

(Continued from page 231)

substituted for the second filter choke. No output transformer was included in the amplifier, since most speakers have transformers mounted directly on them. A 7000 ohm transformer must be used for a proper match between the 6N6G and speaker voice coil.

The five-prong socket furnishes power to the receiver. 6.3 volts is supplied for the heaters besides the plate voltages. By means of the slider on the 20,000 ohm, 50-watt resistor, any desired voltage may be obtained. If necessary, several different voltages may be had merely by using additional sliders on the adjustable resistor. Each tap should be by-passed by at least a one-half or one mf. condenser. If more than two voltages are required, a socket with a larger number of contacts will be necessary.

As with all types of audio equipment, the amplifier chassis should be connected to a good *ground*. This will prevent the amplifier from oscillating and result in no hum being evident.

I.R.C. (Resistors)
1—0.1 meg., ¼ watt
1—0.25 meg., ½ watt
1—2 megohm, ½ watt
1—20,000 ohm, 50-watt adjustable
1—1 meg. fader control
1—0.5 meg., tone control

CORNELL-DUBILIER (Condensers)
2—.1-mf., 400 v. paper Dwarf Tiger
2—.5-mf., 400 v. paper Dwarf Tiger
1—.05-mf., 400 v. paper Dwarf Tiger
3—16 mf., 450 v. electrolytic, type JR

MEISSNER
3—Octal sockets

STANCOR (Transformers)
1—Power transformer, type P-5059
1—choke, 25 henries, 140 ma., type C-1421
1—choke, 30 henries, 80 ma., type C-1420

RAYTHEON
1—6J7 tube
1—6N6G tube
1—5X4G tube

CINAUDAGRAPH (Speaker)
1—8" speaker, type EZ-8-10, with universal output transformer

MISCELLANEOUS
1—5-prong socket
1—4-prong socket
1—Double fuse mounting
1—SPST toggle switch
2—Phone jacks
2—Dial plates
2—Knobs
1—Line cord

KORROL
1—6" x 14" x 3" black krinkle steel chassis

Here's Your Button

The illustration shows the beautiful design of the Official Short Wave League button, which is available to everyone who becomes a member of the League. The button measures ¾ inch in diameter and is inlaid in enamel—3 colors—red, white and blue. The requirements for joining the League are explained in a booklet, copies of which will be mailed upon request.

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.

A Modern 35-Watt Exciter

(Continued from page 233)

the tuning procedure is carried out as outlined above. In order to obtain the maximum output, the 5,000 ohm buffer bias resistor would have to be readjusted; this, however, is unnecessary as there is plenty of excitation for the RK-39, either on the fundamental or when doubling.

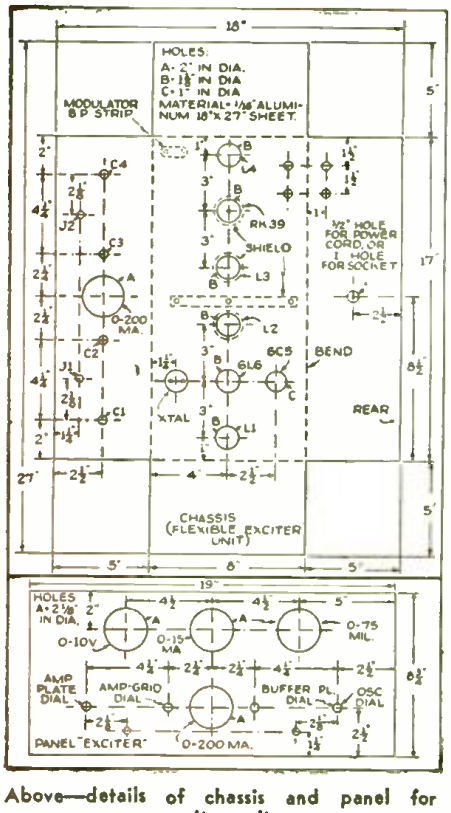
No provision has been made for *antenna tuning*. The author has been using a single-wire fed matched-impedance antenna for 20 meter C.W. work, the feeder being clipped directly to the amplifier tank coil as shown in the photograph. When using this type of antenna, always insert a good quality mica blocking condenser of about .002 mf. or larger to keep the high d.c. voltage off the feeder line; even 400 volts can be fatal, so be careful when making changes or adjustments with the power turned on.

The author would be interested in hearing from those who build this little exciter-transmitter and to learn of the results obtained with it, especially on 10 meters. If a reply is desired, enclose a *stamped and self-addressed* envelope. Address him in care of this magazine.

List of Parts, Exciter

HAMMARLUND

C1—140 mmf. tuning condenser, MC-140-M
C2—140 mmf. tuning condenser, MC-140-M
C3—140 mmf. tuning condenser, MC-140-M
C4—70 mmf. tuning condenser, double-spaced, MCD-35-MX, with the two sections connected in parallel.
C10—"Air-padding condenser," 100 mmf. APC-100
L1—Oscillator coil, see text and coil table
L2—Doubler plate coil, see text and coil table
L3—Amplifier grid coil, see text and coil table
L4—Amplifier plate coil, see text and coil table
RFC—R.F. chokes, 2.5 mh. receiving type, CH-X
4—Isolantite sockets, six-prongs, S-6
1—Isolantite socket, eight-prong, octal, S-8
1—Isolantite socket, five-prong, S-5
1—Isolantite or bakelite socket, spring mounting type, 8 prong
2—Removable coil shields, CS-3



Above—details of chassis and panel for exciter unit.

C5—Mica condenser, 0.006 mf.
C6—Paper tubular condenser, 0.05 mf., 600 volts
C7—Paper tubular condenser, 0.05 mf., 600 volts
C8—Mica condenser, 0.006 mf.
C9—Mica condenser, 0.0005 mf.
C11—Mica condenser, 0.00025 mf.
C12—Paper tubular condenser, 0.05 mf., 600 volts
C13—Paper tubular condenser, 0.05 mf., 600 volts
C14—Mica condenser, 0.006 mf.
C16—Electrolytic condenser, 16 mf., 450 volts*

R1—Fixed resistor, 100,000 ohms, 1 watt
R2—Adjustable wire-wound resistor, 5,000 ohms, 25 watts
R3—Wire-wound resistor, 15,000 ohms, 25 watts
R4—Non-inductive wire-wound resistor, 5 watts (see text)
R5—Wire-wound resistor, 400 ohms, 50 watts
R6—Wire-wound resistor, 15,000 ohms, 25 watts
L5—Coupling or "link" coil, see coil table
J1-J2—Closed-circuit jacks (see text)

TRIPLETT

1—0-10 A.C. voltmeter (optional), model 231
1—0-75 D.C. milliammeter, model 221
1—0-15 D.C. milliammeter, model 221
1—0-200 D.C. milliammeter, model 221

BLILEY

1—Crystal (see text)

NATIONAL

4—1⅝" dials

RAYTHEON

RK-39, 6L6 and 6C5 tubes

MISCELLANEOUS

3—Feed-through insulators, ⅝" size
2—Feed-through insulators, ⅜" size
1—Power cable, heavy-duty, 5-wire
1—17 x 8 x 5 inch chassis and 8¾ x 19 panel (see text and figs. 1 and 2)
Miscellaneous machine screws, hook-up wire, solder, etc.

*Used only if RK-39 is modulated.

Power Unit

STANCOR

1—P-4022 filament transformer, 5 v. at 6 amp. and 6.3 v. at 6 amp.
1—P-4024 plate transformer, 400 v., 300 ma.
1—C-1402 swinging choke, 8-30 henries, 250 ma.
1—C-1412 filter choke, 15 henries, 250 ma.

SOLAR

4—Heavy-duty wet electrolytic condensers, 8 mf. 600 v.

RAYTHEON

1—Type 83 or 83V tube

HAMMARLUND

1—Isolantite socket, four-prongs, spring mounting type

I.R.C.

1—Voltage-divider resistor, 20,000 ohms, 75 watts

MISCELLANEOUS

1—Standard 8¾ x 19 inch steel panel
1—10 x 17 x 3 inch steel chassis
2—Toggle switches, S.P.S.T.
Power cord, machine screws, etc.

Coil Data

(Hammarlund)

Band Meters	Turns on L1	L2	L3	L4
160	55*1	55	55	55
80	28	28	28	28
40	28	18	18	18
20	28	6	6	6
10	15*2	2½	2½	2½

* (1) Using 160 meter crystal; (2) using 40 meter crystal. All coils are Hammarlund "XP-53" receiving type with part of the turns removed. The link coils L5 between the amplifier tank and the antenna circuit and between the 6L6 and RK-39 stages (if link-coupling is used) would consist of 4 turns each wound about ¼ inch from the "cold" end of each coil.

CORRECTION NOTICE

Through an error, a credit for condensers was omitted in the list of parts for the "W8KPX" Beginner's Transmitter on page 185 of the July issue. Credit for the four wet electrolytic condensers, 8 mf., 600 volts each, should have been given to the Solar Manufacturing Corporation.

The Hogan Facsimile System

(Continued from page 211)

paper should be fed from a continuous roll, rather than used in sheets which would have to be individually placed upon an easel or around a drum. The advantages of the continuous feed, both at transmitter and receiver, are self-evident.

2 Images on 1 Receiver

At the transmitter there are two forms of pick-up, or scanner, used interchangeably. One type resembles the conventional drum scanner, around whose cylinder is wrapped a paper sheet carrying the text or illustrations to be transmitted. The drum scanners are used in pairs, the second one usually being reloaded for a coming program during the time that the first one is actually being used for transmission. However, the two drum scanners may be used simultaneously, each one transmitting a different program on the same channel, with only a *single* radio transmitter. In such dual-program operation, any home user of a Hogan facsimile may reproduce whichever of the two programs he desires, or, if he has two recorders, he may reproduce both programs at the same time—and with only a *single* radio receiving set.

The second form of transmitting scanner takes the copy to be transmitted as a continuous strip of paper 8½ inches wide.

How Picture Reproducer Works

The reproducer is a compact and simple device for attachment to any *home* radio receiver or for incorporation within the cabinet of a special facsimile set. The user loads it with a carton containing a roll of electro-sensitive paper, threading the dry leading end of the roll through the reproducer, much as a sheet of paper is inserted into a typewriter or a film placed in a camera.

After the paper has been turned into place by means of the typewriter knob on the right side of the reproducer, the user turns on his radio set and tunes to the facsimile broadcasting station, just as he would tune to a sound broadcasting station. He can adjust his tuning and volume controls either by listening to the facsimile signals (which usually sound like "peep-scratch, peep-scratch, peep-scratch") on a loud-speaker, or by watching his facsimile reproducer at the visible marking point, or by means of a tuning-meter or magic eye on his receiver. That is all he has to do, for the act of turning on his receiver also starts his facsimile recorder.

The first ten or twenty strokes of the recording pen may be consumed in the automatic process of "framing" or centering the picture or text. The receiving machine does this all by itself, and thereafter remains *in frame* and in *synchronism* as long as it is in operation. The automatic centering system, which prevents the machine from showing only part of a picture, off center either to the left or to the right, has been designed so that it cannot be disturbed by static, interference or electrical noises so as to throw the picture off center.

Recording Always Visible

The finished copy is visible from the instant it is recorded until it is fed out of the top of the reproducer as a dry, continuous strip of paper 7 inches in width. A tear-off edge is provided so that individual pictures or text units may conveniently be cut from the strip, if desired, as they are finished. The width of the pictures and text lines is 6 inches, and the paper feeds at the rate of one inch per minute, so that 6 square inches of copy or 7 square inches of paper are delivered each minute. The copy is reproduced in successive lines spaced by 1/100 of an inch, center to center, and slightly more than 1/100 of an inch wide, so that the *lines overlap* enough to give the appearance of smooth, unbroken text or picture reproduction. The precision of operation is sufficiently high to give clear reproduction of newsprint in small type, of even the 6-point size occasionally used. Any larger type is easily readable, and text is transmitted at speeds to and beyond 100 words per minute.

When this facsimile system is used in territories where power-line synchronism is available, the transmitter and receivers are kept in step by the use of synchronous motors. These provide the simplest reliable means of synchronizing. However, in point-to-point services over long distances, or in broadcasting to airplanes or to homes in direct-current or non-synchronous districts, the synchronous motors cannot be used. To meet such special conditions, the Hogan laboratories have developed a simplified type of automatic independent synchronizing system. This has been used successfully in service demonstrations of the picture transmission system between New York and San Francisco.

Television for the Beginner

(Continued from page 217)

slow-acting selenium cells were the only ones available at the time), and only the simplest and crudest sort of figures (really shadowgraphs) could be reproduced at the far end of the circuit. In some of these early television experiments the translating units at the receiver were simply small electric lamps.

Figs. 2 and 3 show how the modern light-sensitive unit known as a *photo-electric cell* makes it possible to transmit different gradations of light and shadow electrically over a wire or radio circuit. There are different types of photo-cells, a number of which are self-generating; that is when a light is flashed on the cell, the photo-chemical effect is such that an electric current is produced and this effect can be read directly on a meter as shown in fig. 2.

Another elementary stage in the story of television is that shown in fig. 3, where variations in the degree of light flashed on the photo-electric cell are passed through an amplifier, and these amplified currents caused to produce variations of light in a neon lamp. Up until the advent of the cathode-ray television system at present in vogue, the neon lamp was very useful as it worked sufficiently fast to permit its use in high-speed scanning, which was not the case with filament type lamps. The neon bulb merely has two insulated wires projecting into a glass bulb containing neon gas.

What is Scanning?

At this point we come to the subject of *scanning*, the bugaboo of many purists in television research who believe that our physicists should be able to provide us with instantaneous transmission, without having to scan an object line by line. We have seen from the foregoing discussion that if we were to have an image pick-up unit provided with 200 cells in a row and 200 rows, that we would have to have 40,000 wires connecting the 40,000 light cells with a similar number of lamps at the image *reproducing* end of the circuit. Keep in mind that today we are scanning with 441 lines and we are only now reproducing a fairly respectable image, so far as the fidelity of detail is concerned. Multiply 400 x 400 and we find that 160,000 wires or short-wave frequency channels would have to be utilized for the instantaneous transmission of an image, *if scanning was not to be resorted to.*

Now glance at fig. 5, and we see that if we could scan the image subdivisions, such as or points, 1, 2, 3, 4, etc., fast enough so that the eye could not detect it, in the end we would obtain the same effect as if we had provided the immense number of wires required for instantaneous transmission of the image. This is a clever subterfuge of our television engineers and the first attempts at rapidly scanning an image in this fashion were made by Nipkow. He did not attempt electrical scanning, but he provided a means of optically scanning the image by means of a whirling disc containing a spiral of holes as shown in fig 5. A study of this picture shows that as the number 1 hole on the disc moves across the image, it will describe a path covering the top part of the forehead. Next, as the disc continues to rotate, No. 2 hole scans a second path just below path No. 1. Likewise the 3rd hole will scan another path which might take in the eyes, etc. The number of holes in the disc determines the fidelity of the reproduced image.

Some of the early experiments with scanning discs by Baird and others employed as low as 24 holes, but this gives a coarse reproduction, lacking in the finer details. Later 40 hole scanning was tried and then we had 60 hole discs. A disc containing as high as 100 holes was tried out by the Bell Laboratories, ten years ago, and a very excellent image was reproduced. However, there was always a lack of fine detail and television engineers continuously stepped up the number of lines by which the image was scanned, until it has finally reached 441 lines; 800 lines and more have been predicted for the future.

If you examine any reproduction of a photograph in this magazine with a magnifying glass, you will find that the picture is made up of a series of dots of different sizes. A similar effect takes place in the scanning of a television image, whether it is by means of a rapidly revolving scanning disc or one of the new cathode-ray scanning tubes.

Scanning Devices Must Be Synchronized

It goes without question, of course, that the scanning device used at the transmitter must be synchronized or maintained in perfect step at all times with the scanning device used at the receiver. If scanning discs containing a spiral of holes, of the same number at both the transmitter and receiver are employed, then the discs have to be driven by synchronous motors which will rotate them at exactly the same number of revolutions per minute.

Referring to fig. 6, we see a simple circuit for television by means of a scanning disc. The person or object whose image is to be transmitted by television is illuminated by one or more powerful lamps, and the reflected light rays pass through the openings in the scanning disc onto a light-sensitive device, such as a photo-electric cell. The light pulsations are transformed into varying electric currents and these pass through an amplifier of several stages and finally arrive at the receiving station. Here the impulses may have to be amplified again, and the fluctuating electric currents corresponding to the light variations at the transmitter are, for example, fed into a neon lamp. In front of the neon tube we place a scanning disc containing the same number of holes as the one at the transmitter. If we look at the neon lamp through this whirling disc and its spiral of holes, the face of the person in front of the transmitter will be seen. The size of the reproduced image will depend, of course, upon the dimensions of the neon tube and the diameter of the scanning disc. The bigger the tube and the disc, the larger the reproduced image. The fidelity or fineness of detail is dependent upon the number of holes in the disc.

Note the method of picking up the image of a person's face at the transmitter in fig. 6A: at B a second method of picking up the image at the transmitter is shown; this one was widely used a few years ago by leading experimenters. Here a powerful source of light, such as an arc, is mounted behind the scanning disc, and with suitable lenses a beam of light is projected onto the face of a person sitting in front of the large photo-electric cells at P. The light rays reflected from the face are projected onto these photo-electric cells (or light-sensitive cells), and the resultant electric currents are fed to an amplifier and then passed on to the receiver.

Fig. 7 shows the elementary action taking place in a cathode-ray tube; if a magnet is placed near the tube in which a cathode ray is projected on a

(Continued on page 244)

Television for the Beginner

(Continued from page 243)

screen at the end of the tube, the ray will be deflected more or less, depending upon the strength and polarity of the magnet. The cathode beam can also be deflected by placing an electric charge upon a metal plate mounted within the tube. It is easily conceivable that if we utilize a deflection current of constantly changing magnitude that the cathode ray will follow these current changes or pulsations, and move back and forth across the screen, as we see at A —fig. 7. At present there are two methods of scanning or *sweeping* the cathode ray across the screen. One uses the electrostatic plate method, while the second uses magnetic scanning. The sweep currents have to have a saw-tooth wave form as shown at B, so that the ray will be swept back to its starting point very rapidly.

By utilizing two sets of sweep coils or plates, placed at right-angles, and exciting these with pulsating currents, which will cause the ray to sweep rapidly back and forth horizontally and also vertically, the two combined motions will give us complete scanning of the image.

Large Image Television

One of the problems in television has been to enlarge the image at the receiver, so that a group of people can enjoy the reproduction. In fig. 8, we see three of the principal methods that have been employed to produce a large image at the television receiver. The method of fig. A, which still has many friends, employs either an arc light, a pointalite (tungsten arc in an evacuated glass bulb) or a powerful incandescent lamp as a source of illumination. The trick here is to use a light-valve or modulating device such as a Kerr cell. This cell in its simplest form is composed of a pair of metal plates, immersed in a solution of nitro-benzine, and the sharply focused light from the lamp passes between these plates. The pulsating television currents picked up from the transmitter are applied to the plates of the Kerr cell and in this way the light beam is modulated (by twisting the light beam). The beam is polarized* by means of a pair of Nicol prisms, with a number of lenses to concentrate the beam. A scanning disc may be used to project the image onto a large screen; a disc containing a spiral of lenses instead of plain holes is usually employed in this case, but a mirror drum has been used, particularly by the English experimenter Baird. About twelve years ago, Dr. Alexanderson of the G.E. Company, demonstrated theatre-sized television images using this method (with a lens disc driven by a synchronous motor).

Fig. B shows how a neon *crater* tube (in which the light was highly concentrated, like a crater) was used for supplying a modulated beam of light. The scanning was accomplished by whirling a lens type disc in front of the tube. In some cases an extra stationary lens or two was added to the set-up for concentrating or enlarging purposes. In any case, the disc was rotated by a synchronous motor.

One of the latest methods of producing a large television image is by using a small high-intensity cathode-ray tube, which produces a brightly illuminated image on the screen. A set of projection lenses are mounted in front of the screen-end of the tube and the intensely brilliant image is projected onto a canvas or other screen.

*In polarized light the paths of the light vibrations are in straight lines and in only one plane. (In ordinary unpolarized light the vibrations emanate in all directions and in any plane perpendicular to the light ray.) Light may be polarized by passing it through a crystal manifesting double refraction. A Nicol prism has this property. When a current passes through a certain solution such as nitro-benzol or carbon disulphide, it causes an optical rotation or twisting of the polarization plane of the light ray passing through the Kerr cell. The degree of twisting depending upon the strength of the current.

When the two Nicol prisms are set into position in the optical train employed in television, one of the prisms is turned at right-angles to the other, or until no light is observed on the television screen, with zero signal current applied to the Kerr cell.

An Alignment Oscillator

(Continued from page 226)

the receiver, as is mostly the case, an adapter can be used to slip under the power tube. The filament voltage of the oscillator tube should of course be the same as that used in the receiver. Plate voltage is not critical, approximately 200 volts being more than sufficient to make quite a powerful oscillator. If a modulated signal is desired, the test unit can be arranged to plug into the 110 volt A.C. line. A line cord resistor will facilitate matters. The modulation frequency will then be 120 cycles.

Aligning the I.F.'s with this test oscillator is simple. Although it is possible to make the adjustments by ear alone, some sort of indicating device such as a meter or magic-eye tube should be used. An output meter connected across the output of the receiver is perhaps the simplest. Lacking an output meter, an ordinary A.C. voltmeter can be used. Use a half-microfarad condenser in series with the meter. Another method is to place a milliammeter in the plate circuit of the second detector tube. Having hooked up the indicating device, the receiver should be allowed to warm up for about half an hour, as frequency drift is often appreciable in some receivers. The crystal filter is then turned to the "off" position and the beat frequency oscillator turned on if a meter is used in the output of the receiver. If the meter is in the 2nd detector circuit, the b.f.o. need not be turned on. The test oscillator can be coupled to the receiver by bringing a lead from the .01 mf. condenser to a position near the control grid of the first detector tube. Coupling can be varied from a maximum to lesser degree by either wrapping the coupling lead several times around the grid lead, or merely placing it near the grid lead of the tube.

With the test oscillator signal feeding into the first detector, the I.F. transformer trimmers are carefully adjusted for maximum output on the output meter. The 2nd detector plate milliammeter will show a dip in plate current. It is best to start with the I.F. next to the 2nd detector and proceed through the successive I.F.'s to the first detector.

With the I.F.'s aligned, the crystal should be replaced in the receiver and the I.F. trimmers given a final going-over. This final adjustment is a very slight one, sometimes not even being required, since this type of test oscillator has so very little detuning effect on the crystal. One will often be pleasantly surprised at the improved results obtained with the receiver after it has been re-aligned. The effort is well worthwhile.

Flying Radio Laboratories

(Continued from page 198)

listen. Since all Bell System radio transmitters and some of the radio receivers are held on their assigned frequencies by quartz crystal controls, there is no adjusting whatsoever. To shift from one of these frequencies, the pilot merely rotates a small crank which in a few seconds, through remote control, selects any one of the three frequencies, in the present air transport equipment.

The radio receivers ordinarily found aboard the "Flying Laboratories" are two in number: one mechanically and electrically locked to the transmitter for two-way conversation, and hence automatically tuned to a new channel with the transmitter; the other a *variably tuned* receiver using the band for government beacon or weather broadcasts. The latter receiver is manually operated (by a separate control, dubbed "the coffee grinder," or by selective "push-button" if desired) and tunes to any of the radio range beacon stations giving continual guidance over the present 22,400 miles of Federal airways.

In the typical flight we are considering, the pilot flies to a predetermined location in space. By a remote control and indicator wired temporarily into his cockpit, he may take several bearings on land radio stations in order to check the accuracy of direction indicated with known direction. Or, he may check such details as the sharpness of beam in degrees of width while using the aural feature; or the degree of steadiness in received signal strength. During flight, engineers may make adjustments to parts of the equipment mounted on a cabin bench and connected to the rotatable loops hanging outside under the cockpit.

All flights except the very first few have been made with scheduled *two-way* radio telephone contacts maintained with a Laboratories' ground station, as well as with commercial airports or government radio stations.

In the ordinary course of procedure for test flights from Hadley Field, informal conferences are usually held, at which project engineers and the air operations supervisor discuss plans pertaining to the immediate objective of the flight, the equipment to be used, the scope of the ground or flying test, the routes to be flown, the altitudes to be maintained, and the data to be obtained.

"Blind" Flying Test

The field of investigation has included such matters as radio aids for instrument or "blind" flying. This received first attention in the test and furnishing of special two-way radio equipment for investigations sponsored by the Guggenheim Fund. Later the Laboratories' Fairchild was equipped with tandem control, the rear pilot being enclosed in a cabin section which could be entirely darkened. Approaches and simulated "blind" landings, testing radio aids in the form of suitable indicating instruments (in cooperation with the Bureau of Air Commerce), were made at Newark, N. J., where a "bent beam" was available to mark the path for a plane to glide to earth much as if coasting down an invisible tobogan slide.

Other radio receivers were assembled from quite different specifications, such as one to enable a fog-bound pilot to identify his position positively over a known but *unseen* point on the earth. Known as the "cone-marker," this type advises the pilot (who has brought his plane "blind" to the vicinity of the airport by utilizing the now well established radio range stations) the moment he enters the area influenced by *localized* special high-frequency transmission from the point on the ground; once definitely fixed as to location, the pilot proceeds with his "blind" or instrument approach, which lands him safely at the airport.

Tests of facsimile and teletypewriter transmission and reception apparatus have likewise been made in the Laboratories' planes. And various developments such as *anti-static* direction findings and *homing loops* have received consideration.—*Excerpted from Bell Telephone Quarterly.*

Second Silver Trophy Award

(Continued from page 215)

bands takes care of the remainder of the bands. A DB 20 preselector is also available, which can be switched in at will with a four-pole double-throw switch. It is only used on very rare occasions when extremely weak signals are encountered.

The transmitting antennas for both ten and twenty meters are Johnson Qs, while an 8 foot rod does the job for the five meter transmitter. Although eight different antennas can be switched in at will for receiving, yet peculiar as it may seem, the antenna that gets the best results for all bands at his QRA is a piece of No. 12 gauge wire, one hundred feet long, hung up around the top of the apartment house.

Mr. Uthe has several mottoes that do have real merit:

1. Put out only a *decent* signal.
2. Do not over-modulate. (You can't guess at this, but must have equipment to assist you.)
3. Remember that you are not the only ham on the band.
4. Assist your fellow ham whenever and wherever you can, as you may need his help some day.
5. Don't be a sore-head when you are told of some defect in the operation of your station.
6. And not last nor least, remember that what you say is heard by many ears. Be careful what you say and how you say it, when you speak.

Short Waves Land Plane in Fog

(Continued from page 204)

this method of landing a plane enables the pilot to judge his landing distance, after he has passed the second marker beacon, as his altitude when passing this beacon is predetermined.

If a pilot should miss the localizer beam, he can swing around in a circle until he strikes it again. This new radio beam landing system for bringing planes down to the airport, even though they are obscured by fog, is the result of thousands of experiments with short waves. At the present time, there are installations at Oakland, Calif., College Park, Md., and Pittsburgh, Pa., while another is being built at Fort Worth, Tex.

It should be mentioned that the inner marker beacon, on the edge of the airport, has a field that extends across the width of the airport. It was shown small for the sake of clearness.

18 Years of S-W Broadcasting

(Continued from page 202)

experimenting with short-wave broadcasting. The first recorded European s.w. broadcaster was built by the enterprising Dutch to see if broadcasting to the Dutch East Indies was practical. PCJJ at Eindhoven, Holland, made its début in the spring of 1927. It was an immediate success. Soon letters arrived from all continents with news that PCJJ was pounding in. These first tests from Holland were made on 9.59 mc., the same channel that PCJ (as it is now known) uses today.

PCJ went off the air in 1930 and remained silent for four years until December, 1934. On its return it became a dual channel station using the 9.59 and 15.22 mc. channels. Last fall it celebrated its tenth birthday by raising its power to 60 kw. and installing a novel rotary beam aerial.

Chelmsford

In the fall of 1927 the English decided to try their hand at this short-wave broadcasting business and 5SW at Chelmsford, England (how familiar that name is to oldtimers!) came into being. The station operated on 12 mc. with a power of about 7 or 8 kw. The operating channel was shifted to 11.75 mc. in a short time. This channel is still used by GSD, Daventry, successor to 5SW. 5SW was put on a regular daily schedule relaying London programs and soon became renowned for its midnight broadcasts of "Big Ben." After giving faithful service to listeners all over the world for four years, 5SW at Chelmsford bowed to the march of progress and closed down for the last time on December 18, 1931, to make way for a new twin-transmitter station of higher power at Daventry. But there was still life in the old 5SW transmitter and in 1935 it was moved to Daventry, had its face lifted and was put to work again. Recently a high power stage was added, increasing its power to 25 kw. and today it goes on giving daily service on any one of the numerous Daventry channels, together with the two 10 kw. transmitters put in service in 1931 and the three 50 kw. youngsters added in May, 1937. It must feel slightly contemptuous of the elaborate directional antenna system now used at Daventry when it thinks back to the old days at Chelmsford when a non-directional antenna was all it needed to be heard around the world.

NRH, Costa Rica

No discussion of pioneer stations would be complete without reference to NRH (now T14NRH) at Heredia, Costa. Rica, the station operated by Amando Cespedes Marin. NRH began broadcasting on May 4th, 1928. A frequency of 7.69 mc. was used at first. Although the power of NRH was supposed to be only 7½ watts it soon received reports from all parts of the earth.

By 1930 the rush to the short waves had begun and soon Germany, France, Italy, and other countries began to fill the air with a mounting babel of words and music. In the U. S. new stations sprang up and when the value of s.w. broadcasters for propaganda purposes dawned on the world the rush became a stampede.

The development of short-wave broadcasting has been characterized by a persistent trend to waves of ever-shorter length. Today the *ultra-shorts* are coming into their own for specialized broadcasting. Tomorrow—but this is a story of the past, not the future.

Simplified Radio Control for Model Planes and Boats

(Continued from page 229)

Construction of Receiver

The relay must not be too heavy or bulky. But this is hard to get away from because it would mean sacrificing too much efficiency for weight. So in building your own or rebuilding a standard make, parts not really needed or too bulky can be eliminated or cut down. When this is decided upon, the base could be laid out. The bases of the tubes are unnecessary weight and can be removed by cutting off the prongs and boiling the tube with the bases submerged in water for about ten or fifteen minutes. Immediately on removing from the water a twist will loosen the cement on the base. If, on the other hand, you prefer the convenience of plug-in tubes, small wafer sockets are not objectionable.

Audio transformers are rebuilt from standard small audios by using only the legs of the laminations. Cut off all iron except the center leg and reassemble and seal in place with wax.

Next wire the detector portion which consists of the grid leak, condenser and resistor, the coil and a 30 mmf. trimmer. A small rod is butt soldered to the trimmer screw so that external control may be had. This is mounted as in drawing in such a manner that it can be cemented in place, so that it will not be affected by vibration.

The Control System

The four point system for simplicity and light weight is ideal for this purpose. Several boys from different parts of the country thought of this system about the same time, each one thinking he was the originator, but finding to his surprise that some one else was using it. Probably you can attribute this to extra-sensory perception or something. The way it works is easily visualized by comparing with the drive of a steam locomotive. The source of power such as springs or rubber bands is applied to the axis of control, and at a point off the axis the control is taken to form a concentric action. As the axis of control revolves, this point when farthest from the rudder is one control, and the nearest is the other, while in between the rudder is neutral.

The basic unit is an alarm-clock "works." First, remove the alarm portion and the hair spring wheel, leaving a train of gears that revolves freely under power of the spring. On the hour hand shaft is attached a notched disc. The position switch is made of flexible metal such as thin sheet brass with contacts soldered to it. One of the contact strips may be soldered to the chassis of the control unit. Which one depending on whether the disc is fibre or metal. Thus the construction is simplified and the chassis used for an electrical connection. The other contact should be mounted on insulation of some kind. One contact rides the disc in such a manner that when it is at the notch in the disc the contacts are open. When it is in between the notches the contacts are closed. The pent up energy of the spring or rubber motor is held at bay by *braking the gear that travels at the highest rate of speed.* This is the one that operates off the hair spring arm, requiring very little braking power. The brake arm is made of iron or steel so that an electro magnet can attract it to release the control. The electro-magnet is a solenoid from an old speaker or headphone unit. Or it can be specially wound for the purpose with No. 36 or 38 enameled wire with a resistance from 500 to 2,000 ohms. Plate supply batteries of the receiver are used, requiring no auxiliary batteries.

How the Control Works

On an impulse from the relay the brake releases the gear, allowing the control axis to revolve. When it starts to revolve the position switch leaves the notch and closes the contacts. These contacts, because they are parallel to the relay contacts, *keep the circuit closed to the release solenoid, even though the relay contacts are open.* If the position switch reaches the notch and the relay is open, then there is no voltage at the release solenoid, and the arm falls, *stopping the rotation!* If, when the position switch reaches the notch, the relay is still closed, it then proceeds to the next notch.

When actually using the control to change from one direction to another with the control in neutral, one impulse is transmitted and if the control direction is satisfactory it is left to proceed in that direction. Another impulse will shift it to *neutral* position again. If it is desired to change the direction from the one in which it was going to the opposite, merely send a *longer* impulse, predetermined by experiment and depending on the time it takes to slip through the neutral notch. If it is proceeding in neutral and there is no account of the last direction, and control is desired, an impulse is transmitted. If the direction then taken is not satisfactory, then a *long* impulse is sent so that it will *slip through neutral* into the desired position. This all happens so fast that the swerve in the wrong direction is easily rectified by a longer control before neutralizing. This last fact is the only objection to the four-point system and its good points easily outbalance this shortcoming. However, pilots will tell you that when turning a ship a little rudder in the opposite direction helps to effect a turn.

Batteries

The authors use the 11 ounce 45 volt battery units because of the amount of current that this set and the release electro-magnet consumes and for practical reasons.

In designing this receiver the future of the art was not overlooked. It seems that this circuit (although more powerful than any that have been introduced) to be more fool-proof must be made *even more powerful* by adding a tube or so. This is the reason 90 volts is used, which means two 11 ounce units.

The filament battery can be almost any small three volt unit. If a small enough battery is used the drain of the filaments causes a sufficient voltage drop, requiring no dropping resistor. A filament voltage of 2.2 volts is advisable, allowing the filaments to become red. Under no circumstances should it be below 2 volts.

Tubes draw a filament current of only .24 amp. for the three tubes. This is 300 per cent more economical than just one of the 6.3 volt types.

Transmitter

A very simple layout is used because on 5 meters all that is needed is an oscillator to knock out the "squash" in the receiver. It is suggested that the oscillator be mounted in breadboard fashion with an isolantite socket for the tube mounted on bushings or small insulators. Coils can be mounted on insulators with the tuning condenser on a bracket mounted either horizontically or vertically. The antenna is an

(Continued on page 248)

All about the

SHORT WAVE LEAGUE

A FEW WORDS AS TO THE PURPOSE OF THE LEAGUE

The SHORT WAVE LEAGUE was founded in 1930. Honorary Directors are as follows:

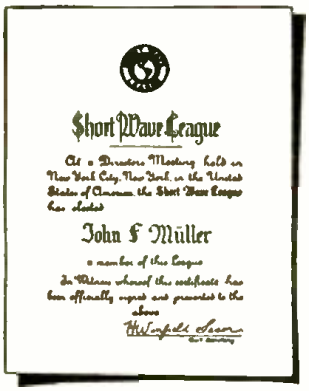
Dr. Lee de Forest, John L. Reinartz, D. E. Replogle, Hollis Baird, E. T. Somerset, Baron Manfred von Ardenne, Hugo Gernsback, Executive Secretary.

The SHORT WAVE LEAGUE is a scientific membership organization for the promotion of the short wave art. There are no dues, no fees, no initiations, in connection with the LEAGUE. No one makes any money from it; no one derives any salary. The only income which the LEAGUE has is from its short wave essentials. A pamphlet setting forth the LEAGUE'S numerous aspirations and purposes will be sent to anyone on receipt of a 3c stamp to cover postage.

FREE MEMBERSHIP CERTIFICATE

As soon as you are enrolled as a member, a beautiful certificate with the LEAGUE'S seal will be sent to you, provided 10c in stamps or coin is sent for mailing charges.

Members are entitled to preferential discounts when buying radio merchandise from numerous firms who have agreed to allow lower prices to all SHORT WAVE LEAGUE members.



If you wish your name engraved on the Free membership certificate, as illustrated above, please send 25c to cover cost.

SHORT WAVE ESSENTIALS LISTED IN OPPOSITE COLUMN SOLD ONLY TO SHORT WAVE LEAGUE MEMBERS

They cannot be bought by anyone unless he has already enrolled as one of the members of the SHORT WAVE LEAGUE or signs the blank below (which automatically enrolls him as a member, always provided that he is a short wave experimenter, a short wave fan, radio engineer, radio student, etc.).

Inasmuch as the LEAGUE is international, it makes no difference whether you are a citizen of the United States or any other country. The LEAGUE is open to all.

Application for Membership SHORT WAVE LEAGUE

SHORT WAVE LEAGUE 6-38
99-101 Hudson Street, New York, N. Y.

I, the undersigned, herewith desire to apply for membership in the SHORT WAVE LEAGUE. In joining the LEAGUE I understand that I am not assessed for membership and that there are no dues and no fees of any kind. I pledge myself to abide by all the rules and regulations of the SHORT WAVE LEAGUE, which rules you are to send to me on receipt of this application.

I consider myself belonging to the following class (put an X in correct space): Short Wave Experimenter ☐ Short Wave Fan ☐ Radio Engineer ☐ Student ☐

I own the following radio equipment:

Transmitting .....

Call Letters .....

Receiving .....

Name .....

Address .....

City and State .....

Country .....

I enclose 10c for postage and handling for my Membership Certificate.

Simplified Radio Control for Model Planes and Boats

(Continued from preceding page)

eight-foot fishpole type constructed by using three 3-foot pieces of brass tubing telescoping to the desired length (about 8 feet). It is mounted on a bracket directly to the output coupling coil and is used in a vertical position. Dipole antennas may be used. These are 2 lengths of tubing of about 4 feet connected to each side of the output coupling coil and used horizontally. Commercial equipment may be used, but such an outlay is not really necessary. Either a type '19 or 6A6 in a push-pull tuned plate squeeze grid circuit is used, depending on the amount of power, effective range desired and the power supply equipment available.

For experimental purposes a type '19 is suggested, because of its economy of operation. It can be used with portable batteries. Batteries may be used for the 6A6 or it may be genemotor operated from a 6 volt storage battery.

The layout just described is designed for use in gas model airplanes capable of a payload of *three pounds*. Installation and the distribution of weights naturally is important. Because the batteries comprise almost two-thirds of the payload, they are placed slightly ahead of the center of gravity in your plane. The control unit is placed about eighteen inches back of the receiver so that the rudder cords or wires can be as short as possible. You can gather enough information from the description to test your receiver and control. Make sure that your rudder is *neutral* before letting your plane take off.

Coil Data

Receiver
8 turns No. 14 wire, ½" in diameter, self-supporting

Transmitter
11 turns No. 14 wire, 1¾" long, ½" in diameter, self-supporting
7 turns No. 14 wire, 1½" long, ⅝" in diameter, self-supporting

Receiver Parts

RAYTHEON (Tubes)
1—1G5G
2—1H4G or 30

HAMMARLUND (Condensers)
1—30 mmf. Isolantite base neutralizing condenser

I.R.C. (Resistors)
1—5 meg. ½ watt fixed

CORNELL-DUBILIER (Condensers)
1—.001 mf. midget
1—.004 mf. midget

WHOLESALE RADIO SERVICE
2—Small a.f. transformers, W1619

Miscellaneous*
1—2-screw terminal strip
1—3-screw terminal strip
1—chassis of balsa or other wood, ⅛" x ¼" x 2"
1—1 ma. relay
2—45 volt B batteries

Transmitter Parts

RAYTHEON (Tubes)
1—6A6 or 19

HAMMARLUND
1—6- or 7-prong tube socket (Isolantite)
1—25 mmf. midget variable condenser
1—50 mmf. midget variable condenser

I.R.C.
1—400 ohm or 5000 ohm 10-watt resistor

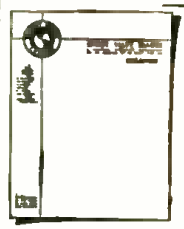
Miscellaneous*
1—10 ohm rheostat
1—.001 mf. fixed condenser
1—off-on toggle switch

*Most radio mail order houses can supply these items if properly identified as to title of article, issue (month) of SHORT WAVE & TELEVISION and year.

Accessories for Members of the

SHORT WAVE LEAGUE

Every member of the SHORT WAVE LEAGUE wants to identify himself in some way. For your convenience the League directors have prepared suitable letterheads, lapel buttons, stickers, etc. In addition there are many short-wave accessories, such as maps, globes, etc., which the League offers only to members at special prices. Take your choice from this advertisement. THESE ESSENTIALS ARE SOLD ONLY TO LEAGUE MEMBERS.



A—50c per 100

LEAGUE LETTERHEADS

A beautiful, official letterhead has been designed for members' correspondence. The letterhead is invaluable when it becomes necessary to deal with the radio industry, mail order houses and radio manufacturers, as many houses offer members of the LEAGUE preferential discount. The letterhead is also absolutely essential when writing for verification to radio stations either here or abroad. It automatically gives you a professional standing.

A—SHORT WAVE LEAGUE letterheads, per 100 ..... **50c**

WORLD GLOBE

This important essential is an ornament for every den or study. It is a globe, 6 in. in diameter, printed in fifteen colors, glazed in such a way that it can be washed. This globe helps you to intelligently log foreign stations. The base is of solid walnut, and the semi-meridian of a nickel-like metal. Entire device substantially made, and will give an attractive appearance to every station, emphasizing the long-distance work of the operator.

D—Globe of the World ..... Prepaid **89c**

D—89c each

SHORT WAVE MAP OF THE WORLD

This beautiful map, measuring 18x26 in. and printed in 18 colors is indispensable when hung in sight or placed "under the glass" on the table or wall of the short wave enthusiast. It contains a wealth of information such as distances to all parts of the world, political nature of the country in which a broadcast station is located, etc., and from the manner in which the map is blocked off gives the time in different parts of the world at a glance.

F—SHORT WAVE Map of the World.....Prepaid **25c**

WORLD RADIO MAP AND STATION FINDER

The finest device of its kind published. The world's map on heavy board is divided into 23 sections, while the rotary disc shows you immediately the exact time in any foreign country. Invaluable in logging foreign stations. Also gives call letters assigned to all nations. Size 11"x22".

C—Radio Map of the World and Station Finder, ... Prepaid **25c**

C—25c each

LEAGUE LAPEL BUTTON

E—35c each

This beautiful button is made in hard enamel in four colors, red, white, blue and gold. It measures three quarters of an inch in diameter. By wearing this button, other members will recognize you and it will give you a professional air. Made in bronze, gold filled, not plated. Must be seen to be appreciated.

E—SHORT WAVE LEAGUE lapel button ..... Prepaid **35c**

EE—SHORT WAVE LEAGUE lapel button, like the one described above but in solid gold. ..... Prepaid **$2.00**

LEAGUE SEALS

G—15c for 25

These seals or stickers are executed in three colors and measure 1¼ in. in diameter, and are gummed on one side. They are used by members to affix to stationery, letterheads, envelopes, postal cards and the like. The seal signifies that you are a member of the SHORT WAVE LEAGUE. Sold in 25 lots or multiples only.

G—SHORT WAVE LEAGUE seals, per 25. ..... Prepaid **15c**

SHORT WAVE LEAGUE
99-101 Hudson St.,
New York, N. Y.

SHORT WAVE LEAGUE. 6-38
99-101 Hudson Street, New York, N. Y.
Gentlemen.
☐ I am a member of the SHORT WAVE LEAGUE
☐ Please send me application for membership in the SHORT WAVE LEAGUE
Please send me the following short wave essentials as listed in this advertisement:
.....
.....
.....
.....
.....
for which I enclose $..... herewith.

Name .....
Address .....
City and State .....
Country .....
(The LEAGUE accepts money order, cash or new U. S. Stamps in any denomination. Register cash and stamps.)

Let's Listen In with Joe Miller

(Continued from page 213)

managed to settle on the same frequency as ZGE, on 6.21 mc., and on ZGE's 3 days-a-week transmissions, Saigon is completely blocked out by ZGE's more powerful signal.

In our verification of Boy-Landry recently received (for the 11.7 mc. signal), the QRA is given as Ets. Boy-Landry, 17, place A. Foray, Saigon, French Indo-China. Look for Saigon on 11.69 and 9.76 mc. now, the 11.69 mc. signal heard most a.m.'s here, with a pronounced Asiatic "flutter."

Thanks for above data to Ashley Walcott, W6, and G. C. Gallagher, W6, reports Saigon on 6.21 mc., logged at 7 a.m.

CHINA

XGOW, Hankow, operated by the Chinese Gov't, now moved up to between 9.28-9.30 mc., is being reported by Ashley Walcott from 5-9 a.m., or even later, daily. It has already been heard at all points between 8.93-9.18 mc., so you can never tell where next it will be. XGOW transmits English news daily from 8:45-9 p.m. and has other English announced programs often.

Another transmitter believed to be in Shanghai, is being heard on 9.29 mc., and is doubtless operated by the Japanese military occupants in Shanghai. This one operates daily, 8-9:10 a.m. Ashley notes English spoken on this station Weds. only, 8:20-9 a.m. This station signs on and off, and changes each program with American dance records. Otherwise, Chinese news and music is the usual fare. This transmitter identifies itself by a series of 8 chimes as an interval signal, while Hankow uses none, or occasionally 4 chimes.

XGOW announces its call in Chinese very frequently, Shanghai very rarely.

At present one may be mistaken for the other, due to proximity in frequencies.

Due to Japan's objective of Hankow, XGOW may not long be on the air.

PHILIPPINES

KZGF, 5.47 mc., Manila, logged often near 9 a.m., phoning KZGH, 5.44 mc., Iloilo, Philippines, by Ashley Walcott.

G. C. Gallagher reports KAZ, 9.97 mc., at the early time of 9 p.m. Also heard here around 6 a.m., using inverted speech.

KZRM, 9.57 mc., Manila, is being heard with a fine signal of late, and all should avail themselves of this opportunity to earn KZRM's handsome QSL.

ASIATIC REVIEW

RV15, 4.275 mc., Khabarovsk, U.S.S.R., is reported at up to R8 on West Coast, by Harry Honda, W6.

ZBW3, 9.523 mc., Hong Kong, now signs off at 11 a.m., E.S.T., and plays dance recordings from 9:30 a.m. continuously without any announcements at the half-hour or hour periods!

Attention, American broadcasters! This from Harry Honda, W6.

Harry reports a mystery signal on 8.58 mc., broadcasting from 7-10:30 a.m., using French, and again, Chinese. Any news on this one?

PLV, 9.415 mc., Bandoeng, Java, was logged with an R8 signal while phoning YBG, 10.43 mc., Medan, Sumatra, at 5:45 a.m.

PLP, 11.00 mc., is now heard daily, often peaking R8-9, while PMN, 10.26 mc., both at Bandoeng, is logged at R5-6. These signals are better heard in the summer, oddly!

VVS, 12.87 mc., Mingadadon, Burma, heard phoning, inverted speech, at the very early time for VVS of 5:50 a.m.

OTHER DX

ITK, 16.385 mc., Mogadiscio, Italian Somaliland, heard phoning in clear speech, while IAC, 17.70 mc., Coltano, Italy, used inverted speech, this at 7:20 a.m.

CR7BH, 11.718 mc., Lourenco Marques, Mozambique, is still to be heard with a good signal, usually just before sign-off at 4 p.m., E.S.T. Best time to log is between 3:30-4 p.m. This is definitely a cold weather signal, much better in winter.

ZMBJ, 8.84 mc., *S. S. Awatea*, out of New Zealand, working ZLT4, 10.96 mc., Wellington, N. Z., at 12 p.m., by G. C. Gallagher. G. C. G. also reports VLR, 9.58 mc., old 3LR, heard almost every night from 1 a.m. on West Coast.

OZF, 9.52 mc. Skamleboack, Denmark, is reported on a new sked of 9:30-11 p.m., by Edw. Petersen, W2, this for N. A. For S. A. OZF is on from 8-9:30 p.m. Also, a new transmitter is reported, OZH, 15.165 mc., but no sked as yet.

* * * HAM STARDUST * * * ASIA

Japanese transmitters are now being heard quite regularly, although before they just weren't there! Japanese Gov't regulations allow J hams to operate only on this schedule: 12 noon-2 p.m.; 4-6 p.m.; 8-10 p.m.; 12 mid.-1 a.m.; 2-4 a.m.; 8-10 a.m. This data from a QSL of J2NF here.

Other nice J-QSL's are J7CR, and J7CJ, heard while using the W8JK beam here.

J3FI, 14280, heard at 3:50 a.m., and J7CB, 14060, approx., also heard at 3:50 a.m.

KA1CS, 14146, Manila, sent us a radio message via W6DEP that he would call us 5 days in a row during June, and we heard him OK, regretting we could not receive data in time for publication.

DX reported: J2KN, 14400; J7CR, 14260; J7CB, 14070, by Ashley Walcott, W6; J2LL, 14000 and 14090; J2NI, 14000; J2MI, 14090 and 14290; J2NG, 14320; J2NF, 14320, by Harry Honda, W6, and also J7CB, 14280; and J2KG, 14050; J2KN, 14400.

J5CC, 14330, moves all over band; J2LL, 14110, by Roy Myers, W6.

J2MI, 14135; J7CB, 14107; J2KG, 14190; J2KN, 14149, by Max Fisher, W6.

On the VS sigs. we have: VS1AI, 14080, per Ashley and Roy, this one in Straits Settlements.

VS2AE, "America-England," 14360, VS2AS, 14310, from the Federated Malay States.

2AE by Harry Honda, and 2AS by OM Ashley, who also heard 2AR on 14370.

VS6AG, 14084; VS6AJ, 14060, Hong Kong, reported by Harry Honda.

XU8DT, 14130, China, by Roy Myers, also XU8RB, which is reported by many, including John De Myer, W8, and Ye Ed., on 14080. XU8EF, 14050, 14128, by Ashley and Max Fisher, W6.

XZ2EZ, 14350, Burma, which QSL is shown this month, a prize catch quite well heard, reported by Roy Myers, Harry Honda, Max Fisher, and XZ2DX, 14060, 14040, by Roy and Ashley.

A couple of late VS: Gail T. Beyer, W9, reports VS1A1 on 14040, and a prize catch, VS7RF, Ceylon, 14330, was logged by our former B'klyn friend (now in the Bronx!), Murray Buitekant, at 6:30 a.m. What kind

(Continued on following page)

Let's Listen In with Joe Miller

(Continued from preceding page)

o' bait did you use, Murr, OB? Hi! VU2LL, 14340, India, by Roy Myers.

PK's in Java follow:

PK1ZZ, 14320; PK3GD, 14290 and 14010; PK1DB, 14300; PK1MO, 14280; PK1JD, 14020; PK3LW, 14070; PK1RL, 14280; PK4JD, 14090; PK2WL, 14100, all by Harry Honda, W6. Congrats, OM!

PK4DG, 14350; PK4VD, 14380, in Sumatra, by Ashley.

FI8AC, 14340, Fr. Indo-China, Harry Honda, W6.

KA's in Philippines:

KA1HS, 14280; KA1ZL, 14260; KA1ME, 14270; KA1MH, 14290; KA1MG, 14280; KA1BH, 14130; KA1CS, 14310; KA2OV, 14030, by Harry Honda.

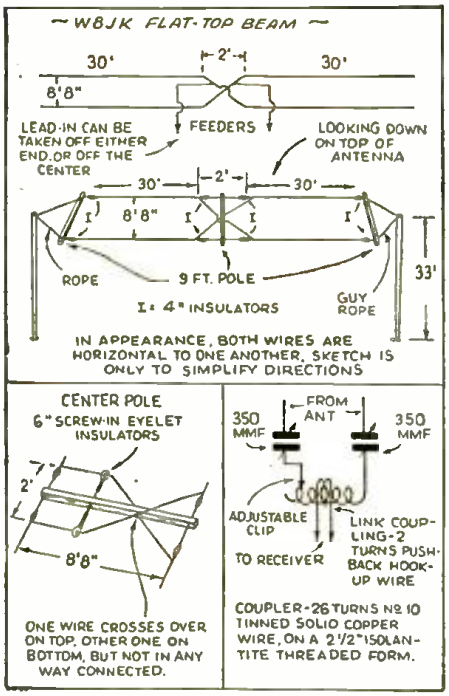
The other W6 OMs did not log their PKs and KAs; let's have *all* the dope, OMs, please.

A few notes on Africans, which are very scarce lately.

An ace catch, CR7AC, 14140 and 14245, reported by Roy Myers and Harry Honda, this one in Mozambique, FB DX! Also heard on 14100. Heard mornings on West Coast.

FA8CF, 14130, Algeria, reported by Max Fisher, W6, at 9-10 p.m.

ZS2X, 14100; ZS5AY, 14105; ZS5CL, 14120; ZS2BB, 14390, all in So. Africa, reported by Max.



W8JK's flat-top beam used by Joe Miller. The three cross-poles should be of the lightest wood, about 1" x 1"; bamboo best. Use No. 12 solid enamelled wire. Directional effect broadside, sharply pronounced, with a minimum of pick-up off the ends. Lead-in may be two wires spaced 6" apart, using feeder spreaders every 2 or 3 feet. Lead-in length best 1/4 or 3/4 wavelength (about 15' or 45'). Use an antenna coupler, otherwise results will be disappointing. Retune the coupler when going from one side of the 20 meter band to the other.

ZS5CL, 14090; ZS1R, 14030; ZS6CT, 14070; ZS2X, ZS6AJ, 14040; ZS2AL, 14080, reported by Harry Honda, and also ZE1JR, 14060, Southern Rhodesia.

The Africans are heard between 6-8 a.m. on West Coast.

ZS1BV, 14030, here at 1:27 a.m., also ZS3F, S. W. Africa, 14065, 1:30 a.m., this reported, too, by Murray Buitekant.

VP2GB, Grenada, B.W.I., QSL's after a year's delay, saying he'd been away from the island for that period. Sez that a lookout should be kept for VP2GD, soon to be on 20 phone off H.F. end of American phone band, about 14260. This being a new country, all will be glad to get a log on 2GD.

OM SM6WL QSL's and says he'd like mention in our column that he's very anxious to work hams in New Mexico and Nevada, needing only these for his WAS certificate (WAS—Worked All States). That's some FB DX from Sweden, Hans, OB!

A few of the better QSL's rec'd here lately: CN8AF, CN8AL, FA8CC, 20 and 40 m., J7CR, VS6AB, SM6WL, XZ2DP, VQ4CRE, etc.

Second Amateur Honored

(Continued from page 204)

nent custodianship of the trophy symbolizing the award to Anderson. The speakers were heard over a nationwide network of the Columbia Broadcasting System.

The award is presented each year to that individual who, in the opinion of an impartial board of awards, has contributed most usefully to the American people and is to be open to all amateur radio operators in the United States and Canada. Presentation of the award for 1937 to Anderson was based on his having worked for four days, obtaining only 10 hours' sleep, to secure relief for the beleaguered town of Shawneetown, threatened with inundation by the raging Ohio River. Largely through his efforts all 1,500 of Shawneetown's inhabitants were evacuated without the loss of a single life.

It is interesting to note that all of the equipment that Anderson uses in his transmitter and receiver is *home-made.*

Anderson, a 32-year-old employee of the Harrisburg Standard Electric Company, was chosen for the award by a board of judges comprising the Hon. Norman H. Davis, chairman of the American Red Cross; Lieutenant Commander Charles P. Edwards, Chief of Air Services for the Dominion of Canada; Dr. J. H. Dellinger, chief of the Radio Section of the United States Bureau of Standards; Professor A. E. Kennelly, professor emeritus of electrical engineering at Harvard University, and Rear Admiral Waesche.

When to Listen In

(Continued from page 210)

LISBON CSW is now on about 9.76 mc. nightly 'till 8 p.m. with a very strong signal. The signals' quality is not too good. There seem to be no English announcements.

THIS AND THAT Denmark is testing a new frequency, OZH, 15.17 mc., on Sundays and holidays from 8 a.m. to 1.30 p.m.

HJ7ABD, Bucaramanga, Colombia, normally on 9.63 mc. has been reported on 5.97 mc. LZA, Sofia, is reported on 8.48 mc. Formerly it was on 14.92 mc. Address reports, to Radio Sofia, 19 Moskovska St., Sofia, Bulgaria.

COMMERCIAL NOTICES 10¢ A WORD

Under this heading only advertisements of a commercial nature are accepted. Remittance of 10c per word should accompany all orders. Copy should reach us not later than the 10th of the month for the second following month's issue.

AGENTS WANTED

300% PROFIT SELLING GOLD Leaf Letters for Store Windows; Free samples. Metallic Co., 446 North Clark, Chicago.

MAKE CASH WHEREVER YOU go, a necessity for young and old either sex, identification key tags light as a coin, beautiful chrome finish in various insignias, sample and full particulars, 25c postpaid. R. Lauria, 67 Everett St., Everett, Mass.

SELL ELECTRIC ENGRAVERS. 100% profit, sample 50c. Hudson Bros., East Syracuse, N. Y.

COINS AND STAMPS

JOIN "THE EAGLE HOBBY EXchange." Exchange stamps, postcards, letters, etc. Your name, address and hobby listed free. Send only 10c and stamp for list of members who will exchange with you. C. Kurtz, 523 N. Elliger St., Allentown, Pa.

CORRESPONDENCE COURSES

500,000 USED CORRESPONDENCE Courses and Educational Books. Sold, Rented, Exchanged. All subjects. Satisfaction guaranteed. Cash paid for used courses. Complete details and bargain catalog free. Send name. Nelson Company, 3281 Manhattan Building, Chicago.

HELP WANTED MALE

YOUNG MEN WANTED FOR REAL estate business; make big money; experience unnecessary. Send stamp for particulars. M. Radler, 182 Varet St., B'klyn, N. Y.

INSTRUCTION

RADIO ENGINEERING, BROADcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Colt St., Valparaiso, Ind.

AMATEUR RADIO LICENSES, home study course in code and theory. Reasonable, efficient and thorough. Results guaranteed. American Radio Institute, 1430 North Dearborn Parkway, Chicago, Illinois.

MAKE YOUR OWN ELECTRIC plug fuses. Model and instructions $1.00. W. Stonebraker, 6006 Harney, St. Louis, Mo.

"SHORTHAND SIMPLIFIED," complete, $1.00. Folder-lesson 10c. Erskine Simmons, Rocky Hill, Conn.

MISCELLANEOUS

3½ INCH TR. 0-125 VT. A.C. Voltmeter, 0-10 A.C. Ammeter, $2.75 each. Weston D.C. 0-7 and 0-140 Voltmeter, 2¼" with 9 pt. D.P. Switch $2.75. Nat'l. MB27-4 Stg. T.R.F. chassis and Thord. 45 P.P. Pack. $7.50. 10" MUTER DYN. SPKR. $3.00 Victor 72" Hi-Fi Orthophonic Horn, Mag. and Acoustic Pick-ups. $10.00, plus express. $400.00 RCA battery Superhet—$25.00. Harry Ackerson, Ramsey, N. J.

WE ORIGINALLY HAD FIVE thousand Stoppani Compasses for which the U.S. Government paid over $30.00 each. We sold all but a very few. We cannot obtain more to sell at three times our present price. Send in your order before they are all sold at $7.50 each. Gold Shield Products, 350 Greenwich St., New York City.

$1000—500 EACH FOR SOMEthing you have! Particulars, 10c (refunded). Kise, 43 North Albemarle, York, Penna.

$50 A WEEK WITH A KODAK, booklet describing 100 magazine markets, 25 cents, stamps or silver. J. C. Hudson, Box 351, Dept. S, Cranford, N. J.

HYDROPONICS: GROW PLANTS without soil. Chemical crop culture. Interesting, educational. Experiment now. Unusual yields. Utilize small space intensively. Can be used year around. Formulas, instructions and selected bibliography, $1. Hydroponics, Box 613, Guthrie, Ky.

MONEY MAKING

SELL "SUPER-KNIFE"! USES old razor blades. Cuts, rips, and scrapes, also has cigar cutter feature. Folds up like a regular knife. Beautiful in appearance. Sells fast at 25c. Costs you only $1 per dozen (8¼c each) postpaid, or $10.40 per gross (7¼c each) postpaid. Sample knife 12c postpaid. A generous supply of illustrated, order-pulling 3x6 circulars with blank space for your name and address, furnished free with each order. Lorrac Products Co., Albany, N. Y.

HONEST PROPOSITION. REAL money makers. With unique sales plan. 50c postal money order brings prepaid marked price $15.00 remarkable physical therapy chart size 21x36 simplifies drugless therapy. Diet. Remarkable item. Demonstrate it and grow independent in exclusive territory. Astounding lot prices F.O.B. A. Chaussee Service, 103 E. Marquette Rd., Chicago, Ill.

OPPORTUNITIES — LATEST money makers. We have them. Write. Monogram, 24 Callender, East Providence, R. I.

HUNDREDS HOME MONEY-MAKing opportunities, 10c list you—brings magazine, Mail Trade Guide, Arlington, Kentucky.

YOUR COPY, NATIONAL SALES Register (3) Months. For dime. 3515 Overhill, Chicago.

MUSIC

ORCHESTRAS — MUSICIANS — Attention. Orchestrations 10—$1. Sheet music 25—$1. Silverman Music Mart, 3303 Lawrence, Chicago.

NOVELTIES

FREE—SURPRISE TRICK, JOKE novelties to everyone sending 10c for large illustrated joke and magic catalog. Hobby Shop, 956 Broadway, Lorain, Ohio.

THE SMALLEST HOLY BIBLE IN the world is about the size of a postage stamp. Believed to bring good luck. 20c. B. Warn, 501 Broadway, Grand Rapids, Mich.

OFFERED FOR SALE

POSTMARKS AND ADDRESSES, 50 different, our return envelopes, 50c delivered. Rainbow Silk Co., Decherd, Tenn.

WATCH STRAPS MADE TO SELL for 50c and 75c, our price only 25c coin. Warn, 501 Broadway, Grand Rapids, Mich.

NOVELTY ELEPHANT — G.O.P. 1940 model. Height 2¾ inches. 25c postpaid. F. C. Schultz, Noel, Mo.

OFFICE SUPPLIES

RUBBER STAMPS FOR ANY purpose. First line .35, each additional .20. Ink pad .20 postpaid. Mail orders to H. B. Miller, 141 Cleveland Ave., Elkhart, Ind.

$100 TYPEWRITERS, FIVE AND $10 each. Lingles Shop, Dept. S, Anna, Ill.

PATENT ATTORNEYS

INVENTORS—PROTECT YOUR rights before disclosing your invention to anyone. Form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions sent free. Lancaster, Allwine & Rommel, 436 Bowen Building, Washington, D. C.

PICTURES

INTERESTING VIEWS OF CHIcago, twenty for 11c. Arnold, 103 S. Halsted, Chicago.

PRINTING

BEAT THIS — 2000 BUSINESS cards $1.50. Samples for Stamp. Free Cuts. Cash with order. Postage paid. J. C. Hudson, Dept. S, Box 351, Cranford, N. J.

500 STICKERS, FOUR LINES, 25c. Bottle Labels, Cott's, Spickard, Missouri.

PUBLICATIONS

ADVERTISE IN TRADERS BULletin. Oldest monthly magazine for swappers and sellers. Lists over 1500 swap or sell offers. 10c copy. Ads 5c word. Published by Traders Exchange, 190 N. Wells St., Chicago's only actual Swap Shop. Maintained to help advertisers swap or sell.

ADVERTISE — INTERNATIONAL Messenger Magazine for results. Circulation 128,000. Classified 15c word. Display $6.58. Column inch (48 words). Three times price two. Sample copy 10c. A. Mirable, Box 9238, Albany, N. Y.

50 DIFFERENT MAIL ORDER publications 10c. Home Publishing Service, Box 373, Lafayette, Indiana.

QSL—CARDS—SWL

100 NEAT SWL CARDS PRINTED with your name and address sent postpaid for $1. Bunch of samples and RST Chart for five cents in stamps. WIREF, 16 Stockbridge Ave., Lowell, Mass.

QSL, SWL CARDS, NEAT, ATtractive, reasonably priced, samples free. Miller, Printer, Ambler, Pa.

RADIOS

HAVE LARGE LIST USED RAdios for sale, for instance Philco console $89.50 original cost. Sell $39.50. 3 months old. Easy terms. Full details dime. Phillips, Box 212, Gypsy, W. Va.

WANTED TO BUY

WANTED TO BUY U. S. COPPER cents dated 1799 over 1798 in brilliant uncirculated red condition. 1802 U. S. half dimes in good condition, and 1894 S. mint U. S. dimes. Warren Unger, Atwater, Ohio.

HIGHEST CASH FOR YOUR OLD gold. Your shipment will be held one week for your approval of our check. Warn, 501 Broadway, Grand Rapids, Mich.

WANTED—USED 4 AND 5c ARMY-Navy Stamps. Will pay 1c each for same. C. H. Kurtz, 523 N. Elliger, Allentown, Penn.

FOR SALE (NON COMMERCIAL) 3¢ A WORD

Under this heading we accept advertisements only when goods are offered for sale without profit. Remittance of 3c per word should accompany all orders. Copy should reach us not later than the 10th of the month for the second following month's issue.

RELAY PANEL MOUNTED SKY-Buddy, nine tube xtal superhet, set analyzer two Jewel meters, ⅛ VP Cassar f2.9 Compur, Dialytar lens f4.5 7.5 cm. in barrel with iris, Monel dev. tank 127 to 116 incl. Sacrifice for cash. Dale L. Cosper, Auburn, Indiana.

1938 HAYNES SUPER CLIPPER 3 months old—$20. Richard Burson, 453 Vinewood, Wyandotte, Mich.

POSTPAID: 585 1937 SUPREME Diagnometer $60. OS12 Hickok Oscillator $20. Rider Manuals IV to VIII incl. $20. Ray Terry, S/S Alabama, Pt. Arthur, Texas.

The World's Smallest Candid Camera or your choice of three Short Wave or Television Books FREE with subscriptions to SHORT WAVE & TELEVISION. See pages 242 and 250.

New Method of Televising Films

(Continued from page 206)

it at a constant rate of speed without interruption. The projector focuses its picture upon the cathode area of a high fidelity dissector tube.

Continuous projection is accomplished fundamentally by two lens discs, each carrying a total of 24 lenses, and rotating in opposite directions, but overlapping sufficiently so that at any instant two lenses are acting in conjunction with each other. These lens discs act both as an optical compensator and as a projection lens.

A shutter is provided which masks all lenses except the two functioning at a given moment.

The projector is synchronized with the scanning system of the *dissector tube*, so that alternative frames are scanned two and three times respectively, providing an interlaced picture at a rate of 30 frames per second.

The transition period, i.e., the time required to change from frame to frame, occurs coincident with and during the "flyback" of the scanning system, during which no television signal is transmitted, so that this does not detract in any way from the excellence of the transmitted picture. The transition is accomplished in less than 1/600th of a second, as compared to approximately 1/120th of a second for the most rapid intermittent type projector.

"*Ici* Paris Mondial"—

(Continued from page 207)

arrangement, worked out by the Broadcasting Service experts, allows simultaneous feeding of several aerials without loss of energy.

The Administration of the P.T.T. is considering the question of the urgent need of other short-wave transmitters. These transmitters are necessary to allow France to effect as efficient a service as those of other European countries. It is anticipated that toward the end of the year, the first transmissions from a new 100-200 kw. center will be effected.

What's New in Short-Wave Apparatus

(Continued from page 234)

Exciter Unit

amplifier and all-band, crystal-controlled *exciter*, all built in a self-contained unit. This exciter unit is complete with power-supply. The unit is known as model NTE and greatly simplifies the construction of amateur band transmitters. The usual headaches encountered in building the more elaborate transmitters are eliminated, and the builder is assured of high efficiency and proper results.

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

Radio Wave Selects Station

action of a similar receiver nearby. Ordinary manual control of the receiver can be had by tuning at the console in the conventional way. This seems to be the answer to the lazy man's dream. (No. 723))

Our Information Bureau will gladly supply manufacturers' names and addresses of any items mentioned in SHORT WAVE & TELEVISION.

World S-W Stations

(Continued from page 222)

Mc.	Call	
6.120	W2XE	NEW YORK CITY, 49.02 m., Addr. Col. B'cast. System, 485 Madison Ave. 10.30-11.30 pm.
6.117	XEUZ	MEXICO CITY, MEX., 49.03 m., Addr. 5 de Mayo 21. Relays XEFO 1-3 am.
6.115	OLR2C	PRAGUE, CZECHOSLOVAKIA, 49.05 m. (See 11.40 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 2.06-4.36 am., 6.36 am.-12.06 pm.; Sat. 10.06 pm.-2.06 am., Sun. 7.36 am.-12.36 pm.
6.110	VPB	COLOMBO, CEYLON, 49.1 m. Daily 7-9.30 am; Sun. 6.30-9.30 am.
6.108	HJ6ABB	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	YUA	BELGRADE, JUGOSLAVIA, 49.18 m. 12.45-2.30, 4-8 am., 1-6 pm.
6.100	W3XAL	BOUND BROOK, N. J., 49.18 m., Addr. Natl. Broad. Co. 8.25 pm.-12 m.
6.100	W9XF	CHICAGO, ILL., 49.18 m., Addr. N.B.C. 4-6.50 pm., 1.05-2 am. Sun. 1-5.50 pm.
6.100	——	NOUMEA, NEW CALEDONIA, 49.18 m., Radio Noumea, Addr. Charles Gaveau, 44 Rue de l'Alma. Tues.-Sat. 2-3.30 am.
6.097	ZRK	KLIPHEUVEL, S. AFRICA, 49.2 m., Addr. S. African Broad. Co., Johannesburg. Daily 12 n.-4 pm., Sun. 12 n.-3.20 pm.
6.097	ZRJ	JOHANNESBURG, S. AFRICA, 49.2 m. Addr. S. African Broad. Co. Daily exc. Sat. 11.45 pm.-12.50 am.; Daily exc. Sun. 3.15-7.30, 9-11.30 am. (Sat. 8.30-11.30 am.) Sun. 3.30-4.30 or 4-5 am., 8-11.30 am.
6.095	JZH	TOKYO, JAPAN, 49.22 m., Addr. (See 11.800 mc., JZJ.) Irregular.
6.090	CRCX	TORONTO, CAN., 49.26 m., Addr. Can. Broadcasting Corp. Daily 7.45 am.-5 pm., Sun. 10.30 am.-12 n.
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. 12 n.-1.30 pm., 5.10-9.40 pm.
6.083	VQ7LO	NAIROBI, KENYA, AFRICA, 49.31 m., Addr. Cable and Wireless, Ltd. Mon., Fri. 5.30-6 am., 11.15 am.-2.15 pm., also Tues. and Thurs. 8.15-9.15 am.; Sat. 11.15 am.-3.15 pm.; Sun. 10.45 am.-1.45 pm.
6.081	YVIRD	MARACAIBO, VEN., 49.32 m. 6-11 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.
6.077	OAX4Z	LIMA, PERU, 49.35 m. Radio National 7-11 pm.
6.075	VP3MR	GEORGETOWN, BRI. GUIANA, 49.35 m. Sun. 7.45-10.15 am.; Daily 4.45-8.45 pm.
6.070	HJ3ABJ	BOGOTA, COL., 49.42 m., La Voz de Bogota.
6.070	CFRX	TORONTO, CAN., 49.42 m. Relays CFRB 7.30 am.-12 m., Sun. 10 am.-12 m.
6.070	VE9CS	VANCOUVER, B. C., CAN., 49.42 m. Sun. 1.45-9 pm., 10.30 pm.-1 am.; Tues. 6-7.30 pm., 11.30 pm.-1.30 am. Daily 6-7.30 pm.
6.069	——	TANANARIVE, MADAGASCAR, 49.42 m., Addr. (See 9.53 mc.) 12.30-12.45, 3.30-4.30, 10-11 am., Sun 2.30-4.30 am.
6.065	SBO	MOTALA, SWEDEN, 49.46 m. Relays Stockholm 1.30-5 pm.
6.060	—	TANANARIVE, MADAGASCAR, 49.5 m., 12.30-12.45, 3.30-4.30, 10-11 am.
6.060	W8XAL	CINCINNATI, OHIO, 49.5 m., Addr. Crosley Radio Corp. Relays WLW Tues., Fri., Sun. 5.45 am.-12 n., 11 pm.-2 am.; Wed. 5.45 am.-12 n., 9 pm.-2 am.; Mon., Thurs., Sat. 5.45 am.-2 am.

(Continued on page 254)

BARTER AND EXCHANGE — FREE!

NO ADVERTISEMENT TO EXCEED 35 WORDS, INCLUDING NAME AND ADDRESS

Space in this department is not sold. It is intended solely for the benefit of our readers, who wish to buy or exchange radios, parts, phonographs, cameras, bicycles, sporting goods, books, magazines, etc. As we receive no money for these announcements, we cannot accept responsibility for any statements made by the readers. Use these columns freely. Only one advertisement can be accepted from any reader in any issue. All dealings MUST be above board. Remember you are using the U. S. mail in all these transactions and therefore you are bound by the U. S. Postal Laws. Describe anything you offer accurately and without exaggeration. Treat your fellow men the way you wish to be treated. We welcome suggestions that will help to make this department interesting and helpful to our readers.

Copy should reach us not later than the 10th of the month for the second following month's issue.

TRADE: $21.00 NIFTY POWER Dauer telescope on tripod, toy electric racer with track, $5.00 magician's set, Morris $4.50 coil winder set, used radio parts for 5 meter transceivers, one or two. John Broughton, Harrison, Ark.

WILL TRADE A GOOD RCA VICtor portable phonograph. Value when new $55. For good car radio or a good short wave receiver, or what? Kenneth Lessman, R. 2, Wakefield, Nebr.

WILL TRADE CANDLER CODE Course for B flat clarinet or good used shortwave receiver. George Stewart, 2529 Ainquith St., Baltimore, Maryland.

WANTED JUNIOR CANDLER Course. Will buy or trade for Packard Lectro Electric Razor. Leslie Merz, 132 Millbank St., Rochester, N. Y.

TRADE—SW3 2V DC PHILCO storage battery, also 3,000 foreign stamps in album catalog about $75.00. Want—candid camera, F3.5 lens, or what? W. E. McLain, 105 West Michigan Ave., Marshall, Michigan.

WILL TRADE 10" SPEAKER, 8X telescope, 20 issues Popular Mechanics, 10 Popular Science, 60 scientifiction magazines, fine postage stamps for good RCA record player, or what have you? Frank Stoj, 121 Passaic Street, Passaic, N. J.

IF YOU ARE INTERESTED IN Radio a SWL card or 10 diff. stamps will bring you a membership card of a corresponding radio club. F. Frantz, Box 87, Coplay, Pa.

WILL PAY CASH FOR TRUMpet mutes—solo tone, cup, wa wa, etc. Also want good bug. Will trade Kodatoy 16mm. projector and films. Please write, giving details, to Bob Ferguson, 605 Santa Barbara Rd., Berkeley, Calif.

WILL TRADE COMPLETE BUSIness correspondence course costing $65.00 new for 8mm camera and projector. Write for details. Alfred Johnson, Cleveland, Minnesota.

SWAP—SPANISH GUITAR (arched body and key board, ebony arm rest; guaranteed good as new; $22.50 value) for good 22 rifle; late Rider's manuals, or what have you? Write Ervin Quade, % Cavanagh, Walhalla, N. D.

WILL GIVE AN ATWATER KENT Genemotor, hi-impedance magnetic pickup and motor, for the use of your code machine for one month. Teleplex, etc. Or what have you? Ernest Marko, 3252 33 Str., Astoria, L. I. C., N. Y.

WANTED: HAMMARLUND 4 prong 17-270 meter coils, 140 mmf variable condenser, pocket volt-ohm-ma meter. Have two good 12A7 tubes, 2000 ohms phones, daisy air rifle, transformer. G. Chovinard, 4599 Papineau Ave., Montreal, Que.

WANTED— SW RECEIVER 3 OR 4 tube A.C. Would like Sky Buddy. Have Packard Lectro-Shaver and 4 tube A.C. 1936 model radio. R. C. Murrell, Manchester, New York.

SWAP U.S. STAMP COLLECTION, 330 diff. for a good used tube tester such as a Million or Superior make. Kenneth McLain, R. R. 3, Arcanium, Ohio.

HAVE: PHILCO CHASSIS, MODel 90, 9 tube complete, speaker, 5 tube General Electric auto radio, Arvin dual band table receiver. Best offer in Phone Xmitter takes all, or what have you? J. C. Kuhlk, 37 Pine Street, Gt. Barrington, Mass.

WANTED: TEST EQUIPMENT, will buy or trade. Have power supplies, phonograph pick-up and motor, speakers, meters, transformers, snapshot camera and many modern receiving parts. Will answer all letters. C. Fortiers, 368 Reseerer, Ottawa, Ont.

WANTED, GOOD SHORT WAVE receiver. Will trade Winchester 32 special carbine good condition. S. C. Molson, Redford, Que., Canada.

WILL TRADE COMPLETE 12 volume course in Salesmanship and Sales Management, by International Correspondence Schools, brand new; for Weltl camera case, or what have you in photographic supplies? N. R. Thornton, Somerville, Ohio.

HAVE LOTS OF BOOKS, SOME fiction, some text, some new, some old. Will trade for radio or mathematic books. List on request. Paul Bahr, 1205 W. 10th St., Marion, Ind.

"BOOK OF KNOWLEDGE" 20 volumes, good condition, educational for children, cost $50, size 10"x6"x1". Want SW3AC, 20 meter coils, power pack or Sargent 10, good condition. T. Marks, 10919 98th St., Ozone Park, L. I., N. Y.

WANTED: USED CODE TEACHing machine with tapes. Will pay cash or will trade electrical, sho-card and cartooning courses. Nfld. stamps. Archibald Bursey, Burlington, Green Bay, Newfoundland.

WILL TRADE AMPERITE VElocity Microphone—chromium plated like new. Want FB7A or X. Will make up difference. Nicholas Christo, 578 Third Street, Albany, New York.

TRADE ERECTOR SET, RADIOLA 20 electrified, Stienitz A.C. 6, 100 back issues S.W.C. and other radio magazines. Want oscilloscope, service equipment, parts, S.W. super. Fred Humphrey, New Paltz, N. Y.

TRADE—COMPLETE SET OF lessons in Taxidermy from North-Western School of Taxidermy (slightly damaged). Will swap for Kodak folding camera or any good folding camera. All inquiries answered. Al. Comperda, 4808 So. Seeley Ave., Chicago.

SWAP 70 COPIES LATEST sheet music and folios for transmitting condensers or parts. All letters answered. R. E. Ward, P. O. Box 23, Granger, Wash.

HAVE ANTIQUE RCA IIIA BATtery receiver using 4 WD11 tubes. No tubes furnished, rest is original. Trade for camera or wat sa? W. S. Crooks, W8LVG, Box 15, Stow, Ohio.

SWAP A BAIRD SHORTWAVE and television receiver and a set of (plug in Octo coils) 16 to 550 meters. Power pack for 71 tubes, beautiful Pooley cabinet for what have you? David, Gross, 2145 Ocean Ave., Brooklyn, N. Y.

WILL TRADE GOOD STAMP collection, over 500 stamps, for a 40 or 80 meter crystal. Also want type 46 tube. Jim O'Rourke, 2019 So. Nicollet, Sioux City, Iowa.

HAVE IRWIN 16MM MOVIE camera, Wright & Ditson golf clubs, 3 irons, driver and bag; 465KC crystal. Watcha got? Bill Sampson, Jr., 2208 Floyd Ave., Richmond, Va.

WANTED: ONE USED LAFAyette Minute Man receiver (5 meter) also used Knight 2 watt utility power supply and amplifier. R. Hull, W1KUM, 888 Ridge Rd., Hamden, Conn.

WILL SWAP THREE EARLE Liederman physical culture books, cost $9.00, also four Cadet System aviation books, cost $12.00. Both complete sets, almost new. What am I offered in trade? Howard Marshall, 1300 Lodi St., Syracuse, N. Y.

SHORT WAVE LISTENERS IN the United States and foreign countries who would like to exchange cards. Send me yours, get one of mine. I QSL 100%. QRA: Kenneth Robertson, 2418 North 10th Street, Philadelphia, Penna.

SWAP 2 TUBE ELECTRIC RADIO for 5 meter transceiver, good condition. Have 6 copies mechanical magazines, swap for 4 copies S.W.C. or QST. Want Radio Call book. M. Konon, 48 Edwards St., Patchogue, L. I., N. Y.

TRADE ARGUS CAMERA COMplete with carrying case and strap, also General Electric F-53 five tube 1938 receiver. W8JZT, Alfred, New York.

WILL SWAP $50.00 worth of radio parts enough to make several radios. All letters answered, picture on request. Send your list. Interested in cameras or what have you? Walter Kepner, 242 N. Oxford, Indianapolis, Indiana.

WILL TRADE: EARPHONES, "Amateur Handbook," stamps, radio parts, or camping equipment, for good handset or microphone. What have you? Will send "SWL" for one of yours. Frank Hoose, 424 Main St., New Rochelle, New York.

I WILL TRADE A RADIO FUNdamental course also a stamp collection of about 100 foreign stamps. What have you? Bill R. Schroeder, 803 Wisconsin, Peoria, Illinois.

SHORT WAVE LISTENERS OF the world, let's swap SWL cards. Also like to correspond with anyone outside of the United States. I QSL 100%. QRA: Robert D. Cooley, 247 Marion Street, Rochester, New York, U. S. A.

WILL TRADE 1 5" MAGNETIC speaker for a 365 mmf. variable condenser or a 140 mmf. midget variable condenser. Harold Ellison, 913 State Street, Albion, Nebr.

HAVE COMPLETE 8MM MOVIE outfit. Want Teleplex, Instructograph, Candler course, or what have you? Will swap SWL's 100%. Harold C. Kaley, 432 No. 9th St., Lebanon, Pa.

HAVE 200 LB. BARBELL WITH course, dumbbell and kettle bell handles, also have cash. Want: Service equipment, oscillator, analyzer, tube checker, service manuals, etc., short wave equipment, rifle, or? C. Zellabs, 314 Wright St., Wilmington, N. C.

HAVE "ALADDIN" NICKEL and copper portable electroplater in good condition. Also over 3000 different U. S. and foreign mixed. What have you to offer? Norman Basden, 1654 St. John's Place, Brooklyn, N. Y.

HAVE 25 WATT 5 METER transmitter complete, also 5 tube super-regenerative receiver. Want Sky-Chief, Sky Buddy, etc. Will answer all letters. Write Victor Samarchza, 1044 Longfellow Ave., Bronx, N. Y.

TRADE—5 TUBE DUPLEX transceiver, never used, complete, tubes, mike, 2 antennas, speaker, cost $33. Want good 10 watt P.A. system, with, without mike, speaker. Austin Swenson, 993 E. 42 St., Brooklyn, N. Y.

HAVE OLIVER NO. 9 TYPEwriter, A-1 cond., earphones, new, other articles of value, send for list. Want SW3 or similar rcvr. Daniel Platek, 225 Division Ave., Brooklyn, N. Y.

HAVE OVER 2500 DIFFERENT U. S. and foreign stamps to trade stamp for stamp, 100 cachet covers, back issues Radio News, National Geographic magazines. What have you? Norman Golubowitz, 1540 Sterling Place, Brooklyn, N. Y.

WANTED ASTATIC PICKUP AND Mike, crystal type, radio parts (any kind). I have 1 Readrite model 710 tester, will swap for value of $10.00. Alfred B. Shenton, Box 248, East Liverpool, Ohio.

WILL SWAP A MAGNAVOX DYnamic speaker, 6-12 volt field; Ford generator rewound for 6 volt slow speed wind charger and a metal locator. What have you? Amos Thorson, Rural Route 2, Verona, Wisconsin.

SWAP—VARIOUS ISSUES OF radio magazines (back issues to 1934) and radio books, banjo uke, typewriter. Want S.W. receiver or meters or what? Arthur Snape, 212 Milton Road, Lakewood, Rhode Island.

TRADE "EILEN 3B" THREE tube battery receiver and new "Pocket Sportset" kit, both in perfect condition. For a 1935 "Prof. Doerle" battery receiver in perfect condition. Alexander Podstepny, 217 Pine St., 3rd Flr., Phila., Penna.

EXCHANGE RACO 5 TUBE AC-DC 2—600 meters. Perfect condition. For SW3 or good T.R.F. rcvr. Schoonover, Oakland, N. J.

CAMERA WANTED, 1-5/8x2¼ OR 2¼x2¾ with fast lens, also Remington or Winchester 22 caliber autoloading rifle. I have Master Teleplex, also numerous radio parts. Glenn Little, Edgewood, Md.

TRADE MAGNETIC SPEAKER, camera, Picture making outfit, 300 pre-cancels, 200 post marks 3 tube B.C. kit, several books, also 10 miniature books, banjo-uke, punch boards, field glasses, other items, want candid camera and? R. Lewis, Griffithville, Ark.

HAVE STAMP COLLECTION OF about 100 foreign stamps also reproductions and clippings about stamps, also radio fundamental course. Will trade. Make me an offer. Nelson Schroeder, 521 2nd, Peoria, Ill.

WILL SWAP A THOUSAND FORelgn, a hundred and twenty U. S. stamps mounted in neat album for any kind of camera or equipment. All letters answered. John Oster, 29 Bonner St., Dayton, Ohio.

WANT BROWNING "35," SKYRuddy, Super-Clipper, Sky Chief, A.C.R. 136, "175," "155." Have All-Star Jr., complete, coils 13-565 meters, metal cabinet (16x12x8) less speaker. Settle difference if any. Elwood Brooks, 1636 E. 36th St., Cleveland, Ohio.

WOULD LIKE TO RECEIVE LETters from anyone in any country except the United States or Canada. All letters will be answered by return mail. QRA—Alan E. Arnold, 7238 Ridgeland Avenue, Chicago, Illinois, U. S. A.

WILL TRADE STEVENS 22 CAL. repeating rifle for complete Junior Candler course. Charles O. Gossick, 412 N. "C" St., Fanfield, Iowa.

(Continued on page 254)

BARTER and EXCHANGE FREE ADS (continued)

COMPLETE KIT, 9 TUBE SET, 6D6, 6A7, 76, 78, 75, 76, 6E5, 6F6, 80, 5 band, switch, coils, Iron core I.F., Jensen speaker. Instructions. Trade for smaller kit or receiver. Whitney Anderson, Quanah, Texas.

SWAP RADIO PARTS FOR UNIvex 8 mm. movie camera and projector. Write Wadel Welch, Settles Hotel, Big Spring, Texas.

HAVE RADIO PARTS, BOYS' magazines, power supply, stamps. Want 3-4 tube A.C. S.W. receiver, code machine, or SWK4 or SWK6 plug-in coils. Leonard Makela, 129 5th Ave., Hibbing, Minn.

SUPERB COLLECTION OF U. S. and foreign stamps trade for double barrel shot gun or what have you. Collection contains 2500 stamps of highest grade. John McKenna, New Paltz, N. Y.

SWAP JEWELL EXTERNALLY taped A.C. Voltmeter, 0-150-300-600, bakelite housing, newly calibrated. Want 0-1 volt ohmmeter. Harvey UHX-10 with 5 meter coils. Carl Hoban, 710 Western, Joliet, Ill.

TRADE TWO TUBE KADETTE AC-DC Pocket (apart, with diagram) and ninety standard radio and mechanical magazines for small volt-ohm-ma tester. All queries answered. Edgar Rice, Hatton, N. Dak.

TRADE: 3 TUBE=4 AC-DC SW set, described in April 1935 SW&T. Just built. Want class A or B p.p. transformers or test equipment. Luigi D. Minkace, 89 Elm Street, West Newton, Mass.

ATTENTION SWL'S, U. S. AND foreign. Will correspond and swap SWL cards. QRA—Woodrow E. Metzler, 604 S St., Bedford, Indiana, U. S. A.

SWAP: 100 MMF. SPLIT STATOR variable transmitter condenser, 160 meter crystal 1444 freq., holder, 1000 volt transformer. Straight key. P.A. equipment for any test equipment. D. Oehlson, Shine's Radio Shack, 69 W 23 St., Chattanooga, Tenn.

HAVE LARGE AMOUNT OF RAdio parts, tubes, magazines, U. S. foreign stamps and albums to swap for British Colonies and airmail stamps, cameras, meters, mikes, elec. clocks, or what have you? W2IAG, 2807 Claflin Ave., N. Y. C.

SHORT WAVE LISTENERS IN all countries. Would like to exchange SWL cards with anyone anywhere. QRA Jack DeMay, 655 90 Street, Brooklyn, N. Y., U. S. A.

WILL SWAP SWL CARDS. SEND your cards. We will send our cards. A. J. Schwartz, P. O. Box 695, Albany, N. Y.

TRADE: 30 ISSUES OF SHORT Wave Craft, used stamps, "Ma Chiang" kame, bike and radio parts. Wanted: AC-DC sets, stamps, or what have you? All replies answered. Al Miller, 22 Steiner St., Lawrence, Mass.

HAVE REMAINS OF COLLEGE chemistry course kits, 250 chemicals in small vials and jars. Want five meter receiver or transceiver or photographic enlarger. What have you? Martin Miller, 681 West 193 St., New York City.

HI-POWER FACTORY BUILT commercial radio transformer 110-220 pri. 3300-2500-1650 each side center at 3½ K.V.A. New. Trade for service manuals. Write Don M. Wherry, W9DEX, 404 N. Pinet, Jefferson, Iowa.

WILL SWAP MY SWL CARD FOR yours. All cards and letters answered. Merton Hiatt, Dryden, Wash.

WILL TRADE 11 TUBE, 2 BAND, Model FS-30, Lafayette radio for a Hallicrafter's Sky Buddy, or other suitable short wave receiver. Radio used 3 months. Good as new. John Wylie, Worley, Idaho.

I WILL TRADE 17 ISSUES OF Open Road for Boys for a crystal in good condition for any amateur band. Richard Kershaw, 846 University St., Springfield, Mo.

WOULD LIKE TO EXCHANGE SWL cards with any SWL in U. S. or in foreign countries. All cards received will be answered with my card. John Ballin, 40 East 66 St., New York, N. Y.

HAVE NUMEROUS AC-ACDC and DC shortwave sets, AC-DC two band super, all kinds radio parts. Want cameras, phono pickup, turntable or what have you? Exchange lists. John Cram, Upper Sandusky, Ohio.

WANTED—USED SW3 OR HALlicrafter Sky Ruddy, will trade Supreme model 85 tube checker or Automatic sender, cash extra if necessary, write for complete dope. J. Bradshaw, W5GPP, DG-2-C, Grand Junction, Colorado.

WANTED, A ONE OR TWO TUBE S.W. receiver, A.C. or batteries. Harold Held, 57 Clark St., Paterson, N. J.

HAVE VARIOUS RADIO MAGAzines, Modern Mechanix, Oct. 1936 to date, Popular Science, other magazines. Number of books, mostly youths'. Want radio parts, 5 meter equipment. Jarvis Hinkle, 515 Pittsburgh Ave., Fairmont, West Virginia.

TRADE FOR WHAT HAVE YOU? Readrite model 245A tester in fine condition. F. Vieweger, 1411 S. 17th St., Manitowoc, Wis.

I HAVE AN EASTMAN KODAK Auto Focus Enlarger to dispose of, perfect condition, complete. Will trade for photographic apparatus or Argus. Hoyt Reisching, 818 N. Alamo St., San Antonio, Texas.

EXCHANGE 48 ACRES OF LAND bordering on small lake near Cheboygan, Michigan, for 30 tube Scott Philharmonic radio. Land valued at $400.00-$500.00. No other deal wanted. Don Newbold, 218 Locust St., Akron, Ohio.

WOULD LIKE TO EXCHANGE SWL cards with any SWL in U. S. or foreign countries. All mail acknowledged. Jack Koeneman, 1237 West Copper St., Butte, Mont.

WANTED: NATIONAL 2 VOLT DC type SW-3 receiver. Also following coils for same, 9-15 GC, 13-25 GC, 10 BS, 20 BS. All must be first class condition. Name your lowest. H. R. Lyon, Homestead, Florida.

SWAP POLO D.X. 4 SHORT wave converter, Kingston B eliminator 135 volts, telegraph key sending and receiving mark Menominee, for Rider's, Gernshack manuals, Readrite analyzer or others. G. H. Dufour, 51-4eme, Rue, Ouelnec, Canada.

TRADE BEAUTIFULLY FINished in polished chromium, Silver Masterpiece All-wave, excellent condition. Desirous of obtaining table model receiver, such as Hammarlund or similar. Write Glenn Watt, Chanute, Kan.

MARTIN HIGH SPEED "BUG," used very slightly, in excellent condition. Will swap for what have you in radio or photographic lines. Robert L. Lanford, Avondale Estates, Ga.

WANT A STENCIL OR MULTIgraph machine. Have models, molds, etc. Will start you in plastic business manufacture bookends, statuettes, ashtrays, wall plaques, etc. Interesting and profitable work. J. A. Schaeffer, Winfield, Ill.

A NUMBER OF TEXT BOOKS National Salesman's Training Course, copies of Radio News, exchange for good short wave parts or servicing equipment. W. F. Rouse, 212 Wells St., Renton, Washington.

WANTED: PHONE X'MITTER UP to 25 watt, must be in perfect order, and as new. Send full details of results obtained and price to Kearton Gee, Glynn Brough, Hazel Grove, Cheshire, England.

SWAP TENOR GUITAR, SPALDing Blue Streak hockey skates for small A.C. or A.C.-D.C. skip-band or short-wave set. Also have new and used parts and tubes. Louis J. Hoffman, 98 Vermilyea Ave., Manhattan, N. Y. City.

190 BRONZE WATCH FOB PERpetual calendars. Sold some for 35 cents each. Exchange for high power binoculars or high power microscope. Send description. O. Dodge, Darlington, Mo.

WANTED: NATIONAL HALLIcrafter's or? receiver, candid camera, Meissner Signal Shifter, trade Rack combination McMurdo Silver communications superhet and Ultra Stratosphere "10" transceiver complete with matched speakers; "61.6" xtal cw metal cabinet transmitter. W8OQU, Wellsville, N. Y.

WOULD LIKE TO SWAP 5 prong plug-in coils for .00014 condenser 9½ to 600 meters for standard 4 prong coils for .00014 factory wound. Alex Radesky, CCC Co., 297-F-55, Lolo Creek, Missoula, Mont.

SWAP NEW ONE TUBE ALL wave radio complete with tube and coil in original carton. Want telegraph key, code oscillator, 80 meter crystal or what have you? Henry Botkin, 118 N. Main Street, St. Marys, Ohio.

WANTED: FIRST DAY COVERS, cachets, etc. Trade, buy, for radio parts, stamps, albums, developing set worth $2.00 (never used), printing box. Answers assured all. For details write S. Furukawa, P. O. Box 1230, Honolulu, Hawaii.

WANTED—10 AND 40 METER bandspread coils for A.C.S.W.3. Also short wave general coverage coils for same. State price and particulars. VE3AFY, 441 McLeod Street, Ottawa, Ontario, Canada.

WOULD LIKE TO EXCHANGE cards with anyone. Jim Doyle, 319 East 2nd St., Florence, Colo.

WILL TRADE POST CARD PROjector, key, 30, 99, 79, 80 tubes for photographic equipment. David Herbert, Jr., Box 709, Lancaster, Calif.

WANTED: RCA—B.F. AUDIO Oscillator or other make. Will trade for meters, parts, books, etc., or for cash. Stanley J. Niewicz, 79 Church St., Broad Brook, Conn.

WILL SWAP 6800 STAMPS, electric phonograph motor, Supreme 85PL tube and condenser tester, Al condition, General Motors 6 tube 110V AC radio. Need Ham parts. Wm sa: Richard Dawson, 1308-F, The Dalles, Ore.

WANTED: ONE OR TWO TUBE receivers. Also want a 4 prong 10 meter coil. Will offer radio parts, radio magazines and tubes. Also want stamps. All correspondence answered. John B. Russell, Box 145, Colfax, Wisconsin.

SWAP COMMUNICATIONS SUperhet, tunes 16-545 meters, fully self contained, for a portable typewriter. Will also swap other short wave equipment for a good folding camera. John J. Vilkas, 1515 South 49th Court, Cicero, Illinois.

TRADE BACK COPIES RADIO News from first issue to May 1938, Radio-Craft, also other books for radio parts. G. E. Martenis, Putney, Vermont.

HAVE IRWIN 8MM PROJECTOR and art films, linotype keyboard and course, magazines, motor scooter, 1 tube Crosley radio, candid cameras. Want Keystone "8" outboard motor, model plane engine, Roscoe, 1484 W. Broad St., Columbus, Ohio.

SEEKING: GEN. ELEC. EXPOSure meter; Kalart synchronizer; 9 2¼x3¼" plate holders, sheaths; current Pat. Off. Gazettes; postal scale; electrolysis course, book; prism binocular; counting machine. Offering: Cash; $40; 12-volume Pelmanism mind training course; all "popular" mechanical magazines, Consumers Union, Readers-, Science-, Fact-Digest(s); microscope; 110V AC-DC revers. sew. mach. motor (minus treadle), Andrew Vena, 117 Edgecombe Ave., New York City.

TRADE FORTY RAILROAD ENgine photos (2½"x4¼"). All different U. S. roads, for $1 any issues unused commemorative U. S. postage stamps. J. Connelly, 439 St. John St., Portland, Maine.

I HAVE BOXING GLOVES, NO. 9 Oliver typewriter, shotguns, new 410 single—12 and 10 double, Corey electric glass cuff-maker—new, etc. Want large size cuckoo clock, 22 automatic rifle, standard makes of 21 jewel watches, Civil War pistols. E. W. Goodman, 120—11th Street, Charleston, Illinois.

SWAP—WOOD WORKING TOOLS, watch knife and chain set new, welders' goggles, new folding camera, two loud speakers, big list. Want typewriter, shotguns, Mondena pigeons or? Earl Hoeft, Brainerd, Minnesota.

SIX DOZEN NEW MAGICAL SETS retail 75c each, 18 ¼"x14¼", also electric operated exterminators (new) retails $8.00 each. Swap for what have you? J. Israel, 217 N. Aiken Ave., Pittsburgh, Pa.

WANT MODEL RR ENGINES, cars, tracks, switches, etc., or piano accordion. Have Royal portable typewriter, sewing machine, radio, books; send for list. Klyce, Shade Street, Lexington, Massachusetts.

WILL SWAP COLLECTION OF 12 tricks, jokes and novelties for 10 buffalo nickels before 1930 or equal value. Vic Latto, Lorain, Ohio.

FOR SWAP: 1 MODEL 28 BOSCH radio with 8" speaker in good condition. 1 model 1873 44 cal. Winchester rifle in good condition. 1—410 double shot gun nearly new. Western Field. 1—Bolt action box magazine 22 L.R. 6 shot new. For what have you of equal value? Want short wave radio. George W. Pearson, 302 South Granite Street, Prescott, Arizona.

WANT EXTRA FINE USED U. S. stamps. Have $60 Palmer Photoplay course; new $2.95 Rexlite cigarette lighter; new $2.50 leather pocket letter case and matching bill fold. Palmer, 1101 Maple, Downers Grove, Illinois.

AMERICAN AND COLLIER'S magazines, Maywood Business Encyclopedia, Clipping Manual, Records, Falcon camera. Want radio books, parts, musical instrument or? Jerome Pfeffer, 1924 Larkins Way, Pittsburgh, Pa.

KEYSTONE 16MM PROJECTOR, motor driven and re-wind, 100 ft. capacity, used only 4 months. Seven 100 ft. film subjects. Will exchange for 8mm projector or camera. F. Lucas, 1258 Ravine St., Munhall, Pa.

FOR SWAP — KRISS-KROSS Stropper for two-edge razor blades, good as new. Will accept good books or what have you? Erskine Simmons, Rocky Hill, Conn.

WANTED: BOOKS ON MAGIC and photography, magical apparatus, for cash or swap. Have for swap razor blades, kodak, binoculars, stamp album, etc. Louis Zgoda, 704 Glenwood, Ambridge, Pa.

World S-W Stations

(Continued from page 253)

Mc.	Call	
6.060	W3XAU	PHILADELPHIA, PA., 49.5 m. Relays WCAU Tues., Fri., Sun. 12 n.-11 pm.; Wed. 12 n.-9 pm.
6.057	ZHJ	PENANG, FED. MALAY STATES, 49.51 m. 6.40-8.40 am., except Sun., also Sat. 11 pm.-1 am.
6.054	HJ6ABA	PEREIRA, COL., 49.52 m. 9.30 am.-12 n., 6.30-10 pm.
6.050	HP5F	COLON, PAN., 49.59 m., Addr. Carlton Hotel. Irregular.
6.045	XETW	TAMPICO, MEXICO, 49.6 m. Irregular 7-11 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. 9-11 pm. Relays WIOD.
6.040	W1XAL	BOSTON, MASS., 49.65 m., Addr. University Club. Irregular.
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.
6.033	HP5B	PANAMA CITY, PAN., 49.75 m., Addr. P. O. Box 910. 12 n.-1 pm., 7-10.30 pm.
6.030	VE9CA	CALGARY, ALTA, CAN., 49.75 m. Thur. 9 am.-1 am.; Sun. 12 n.-12 m.
6.030	OLR2B	PRAGUE, CZECHOSLOVAKIA, 49.75 m. (See 11.875 mc.) Thurs. 4.45-5.10 pm.; Wed. 5.15-5.40 pm.
6.023	XEUW	VERA CRUZ, MEX., 49.82 m., Addr. Av. Independencia 98. 8 pm.-12.30 am.
6.020	DJC	BERLIN, GERMANY, 49.83 m., Addr. (See 6.079 mc.) 10.40 am.-4.30 pm.
6.017	HI3U	SANTIAGO DE LOS CABALLEROS D. R., 49.85 m. 7.30-9 am., 12 n.-2 pm., 5-7 pm., 8-9.30 pm.; Sun. 12.30-2, 5-6 pm.
6.015	PRA8	PERNAMBUCO, BRAZIL, 49.84 m., Radio Club of Pernambuco, 6-9 pm.
6.010	OLR2A	PRAGUE, CZECHOSLOVAKIA, 49.92 m., Addr. (See OLR, 11.84 mc.) Thurs. 4.45-5.10 pm.; Wed. 5.15-5.40 pm.
6.010	COCO	HAVANA, CUBA, 49.92 m., Addr. P. O. Box 98. Daily 7.55 am.-12 m., Sun. until 11 pm.
6.010	VK9MI	S. S. KANIMBLA, 49.92 m. (Travels between Australia and New Zealand). Sun., Wed., Thurs. 6.55-7.30 am.
6.010	CJCX	SYDNEY, NOVA SCOTIA, 49.92 m. Relays CJCB 7 am.-1 pm., 4-8 pm.
6.007	ZRH	ROBERTS HEIGHTS, S. AFRICA, 49.94 m., Addr. (See ZRK, 9.606 mc.) Daily exc. Sun. 10 am.-3.30 pm.; Sun. 10.30 am.-12 n., 12.15-3.15 pm. Daily exc. Sat. 11.45 pm.-12.50 am.
6.007	ZRJ	JOHANNESBURG, S. AFRICA, 49.94 m., Addr. S. African Broadcast. Co., 3.30-4 pm. exc. Sun.
6.005	HP5K	COLON, PAN., 49.96 m., Addr. Box 33, La Voz de la Victor. 7-9 am., 10.30 am.-1 pm., 5-11 pm.
6.005	CFCX	MONTREAL, CAN., 49.96 m., Can. Marconi Co. Relays CFCF 6.45 am.-12 m.; Sun. 8 am.-10.15 pm.
6.005	VE9DN	DRUMMONDVILLE, QUE., CAN., 49.96 m., Addr. Canadian Marconi Co.
6.004	RV59	MOSCOW, U.S.S.R., 49.97 m. Irregular.
6.002	CXA2	MONTEVIDEO, URUGUAY, 49.98 m. Addr. Rio Negro 1631. Relays LS2, Radio Prieto, Buenos Aires. 10.30 am.-10.30 pm.
6.000	ZEA	SALISBURY, RHODESIA, S. AFRICA, 50 m. (See 6.147 mc., ZEB.) Also Sun. 3.30-5 am.
6.000	XEBT	MEXICO CITY, MEX., 50 m., Addr. P. O. Box 79.44. 8 am.-1 am.

End of Broadcast Band

5.977	CS2WD	LISBON, PORTUGAL, 50.15 m., Addr. Rua Capelo 5. 3.30-6 pm.
5.975	OAX4P	HUANCAYO, PERU, 50.16 m. La Voz del Centro del Peru. 8 pm. on.
5.968	HVJ	VATICAN CITY, 50.27 m. 2-2.15 pm. daily; Sun. 5-5.30 am.
5.940	TG2X	GUATEMALA CITY, GUAT., 50.47 m. 4-6, 9-11 pm.; Sun. 2-5 am.

Mc.	Call	
5.940	PJCI	CURACAO, CURACAO, 50.47 m., Mon., Wed., Fri. 6.36-8.36 pm., Sun. 10.36 am.-12.36 pm.
5.935	YVIRL	MARACAIBO, VEN., 50.52 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.
5.913	YV4RP	VALENCIA, VEN., 50.71 m. Irreg.
5.900	ZNB	MAFEKING, BRI. BECHUANALAND S. AFRICA, 50.84 m. Addr. The Govt. Engineer, P. O. Box 106. 6-7 am. 1-2.30 pm.
5.900	TILS	SAN JOSE, COSTA RICA, 50.85 m. 6-10 pm.
5.898	YV3RA	BARQUISIMETO, VEN., 50.86 m., Addr. La Voz de Lara, 12 n.-1 pm., 6-10 pm.
5.892	HH2S	PORT-AU-PRINCE, HAITI, 50.89 m., Addr. P. O. Box A103. 7-9.45 pm.
5.890	JIC	TAIHOKU FORMOSA, 50.9 m. Works Tokio 5-10 am. irregular.
5.885	HI9B	SANTIAGO, D. R., 50.95 m. Irregular 6-11 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 n.-2 pm., 6.30-9 pm.

Mc.	Call	
5.853	WOB	LAWRENCEVILLE, N. J., 51.26 m., Addr. A.T.&T. Co. Works Bermuda nights.
5.845	YVIRB	MARACAIBO, VEN., 51.3 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 Tokyo 5-10 am., irreg.
5.825	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.
5.813	TIGPH2	SAN JOSE, COSTA RICA, 51.59 m., Addr. Senor Gonzalo Pinto, H.
5.800	YV5RC	CARACAS, VEN., 51.72 m., Addr. Radio Caracas. Sun. 8.30 am.-10.30 pm. Daily 7-8 am., 10.30 am.-1.45 pm., 3.45-9.30 pm.
5.790	JVU	NAZAKI, JAPAN, 51.81 m. Works JIC and TDD irregular.
5.758	YNOP	MANAGUA, NICARAGUA, 52.11 m. 8-9.30 pm.
5.740	YV2RA	SAN CRISTOBAL, VENEZUELA, 52.23 m., Addr. La Voz de Tachira. 11.30 am.-12 n., 5.30-9 pm., Sun. till 10 pm.
5.740	TGS	GUATEMALA CITY, GUAT., 52.23 m. Irregular.

BARTER and EXCHANGE FREE ADS (continued)

WANT: BOOKS ON INDIA OR British East India Company. Offer: Standardyne radio, gold Elgin watch needing overhaul, Durham Duplex and Gem razors used once each, miscellaneous small-change coins of Balkans, Turkey, Syria, Palestine, Egypt, India, books of many kinds, complete file "Coronet." R. C. Rankin, 300 Fenway, Boston, Mass.

LOOK! COMPLETE INSTRUCtions for making Flexible Molds. Used for casting imitation marble statues, novelties, bones, and others. A real money making opportunity for enterprising people. What have you? Ace, 1017 North McBride, Syracuse, New York.

WANT TO BUY OR SWAP FOR old tooth puller, known as kant hooks, turn keys, or cork screws, old hand cuffs, or what have you? Write me your wants, a collector and antique dealer. A. H. Simonton, Wiscasset, Maine.

WANTED! "PSYCHIANA, THE New Psychology and Brain Building"—20 lessons by Wilmans and Puriton. Edwin J. Dinkle course, Rosicrucian, physical culture courses or? Have hypnotism course, information where to buy 5 contest publications for contesters, many other things to swap. Write!—Box 87—R2, Alpha, Minnesota.

WILL SWAP STEREOSCOPE with pictures; pair Klaxon horns; miniature talking parrot, whistling African Grey parrot; Remington hunting knife; books, old and new; Esquires; Univex movie camera; medical journals; Brandes headset; steel bear-trap. Want old prints, lithographs, engravings in color; historical flasks, bottles; music box. W. Gary Thompson, Lake View Terrace, Asheville, North Carolina.

WILL EXCHANGE BEADS OR buttons (overall and pants buttons barred). Have large list "Variety." Write first. Will send equal value. Mizanna Wolff, Tonganoxie, Kansas.

WANTED ELECTRIC DRILL OR welder, tennis restringing equipment, stamps, useful auto accessories, or? Have Mimeograph, typewriter, miscellaneous articles, books, magazines. Rudolph Zak, 2509 East 89th, Cleveland, Ohio.

WANTED, BOOKS, 15X TELEscope, piano accordion, candid camera. Have Eb. clarinet, 22 repeating rifle, reloading tool, Sinaplix typewriter, radio parts, stereoscope—100 views, kodak, books, Sofus Andersen, Lankin, N. D.

SWAP 5 TUBE A-C 1937 RADIO, in good condition, for candid camera, in A-1 condition. Give full details in first letter. Write Raymond Suxara, Cullman, Alabama.

FOR SWAP: JIFFY FOLDING Eastman Kodak (new) Agfa, Royal No. 1 same as new, ladies or gents rebuilt watch, Savage electric washer, 25/20 Marlin repeater maple stock fine. Want old watches, 30/30 repeater. Free list. O. M. Campbell, 4619 Clarissa Ave., Los Angeles.

WHAT HAVE YOU TO TRADE for $15 credit on new $54.50 Remington portable typewriter? Model No. 5 streamline. Never unboxed. Lingles Shop, Dept. S, Anna, Ill.

HAVE BASEBALL SHOES—6½, fielders glove, E.Z. player for guitar, radios, radio parts, want radio tubes, A.K. magnetic speaker, signal generator or make offer. All letters answered. William Phillips, Gypsy, W. Va.

SWAP—NOVELTY AUTOMATIC 22 year calendar for two 3c unused commemorative stamps. F. C. Schultz, Noel, Mo.

WANT BENCH PAPER CUTTER. Must cut down to ½ inch. Will trade quality printing or pay cash—or will give both. Cott's Press, Snickard, Mo.

TRADE—5 METER RECEIVER, 450 volt power pack, 2 tube Stewart Warner converter (bandswitching), Readrite 502 volt-ohm meter. Want test equipment. Trade Sky-Buddy for RSR Clipper, etc. L. Quinlan, 128-34 Street, Union City, New Jersey.

EXCHANGE FOR RADIO PARTS, British George V Jubilee stamps, seven ½d, one 1d, fourteen 1½d, Edward VIII, eight ½d, two 1d, eleven 1½d, all fine used, offers. F. E. T. Pratt, 256, St. Saviours Rd., Saltley, Birmingham, 8, England.

HAMS, SWL'S—I WOULD LIKE to exchange SWL's with any in U.S. and foreign countries. All cards answered promptly. (QRA) Ismael V. Escalona, Box 353, Conrad, Montana, U.S.A.

HAVE 1 LIONEL O-GAUGE train set, 1 American Flyer streamlined set, 1 scale model complete. Complete tracks for all and D.C. reducer, all working, for Hallicrafter's S.W. receiver. Martin Greene, 68 E. 3 Street, N. Y. C.

SWAP PORTABLE RECEIVER IN cigar box, using 1R5-43 tube, B.C. and S.W. coils, complete with earphones, batteries, aerial, for .22 calibre rifle or what have you? James N. Glass, R. 1, Box 17, Eddyville, Ky.

HAVE GOOD 5 TUBE AC TRF receiver with all coils and speaker. Built on Pilot Super Wasp chassis. Want a good candid camera, or what have you? LeRoy Krutz, Dorchester, Nebraska.

HAVE MERCURY SUPER TEN battery radio; set 24 volumes Alexander Hamilton Institute Modern Business Executive Course, cost $210.00. Want 14 or 15 inch dynamic speaker, meters, etc. E. S. Barnett, South Boston, Va.

WILL SWAP PRACTICALLY NEW Hammarlund Super Pro 10 meters for Skyrider Diversity or RME 69 plus DB 20. Satterthwaite, Box 77, Sta. "F", Toledo, Ohio.

TRADE—6L6 XTAL TRANSMITter, microphone, relay, used volume controls, 50's, 45's, other tubes. Want 40, 160 meter xtal, receiver, modulation transformer, or? Write for list hundreds of parts for trade. W5HAL, 913 Jefferson, Jonesboro, Ark.

WANTED SUPER SKYRIDER II Model SX16, 12" P.M. speaker. Have Zeiss 9x12 c.m. camera 6" F.4.5 Zeiss lens, pack adapter, 6 plate holders, filter, shade, case, $138.00 new, other accessories. Bert, Kavanaugh, 516 West 136 St., N. Y. C., N. Y.

SHORT WAVE LISTENERS IN U.S.A. and foreign countries. Would like to exchange my SWL card for yours. I will QSL 100%. Edmund Brunnier, 34-21, 89th Street, Jackson Heights, L. I., N. Y., U. S. A.

WANTED: 3 TUBE 5 METER transceiver with mike, or what have you? Will trade Stewart-Warner 16-mm movie camera and $20 Wollensak microscope. Excellent condition. R. Franck, 12280 Wilfred, Detroit, Mich.

HAVE RADIO PARTS, THOUsands magazines, etc. Want unusual books, photos, etc. Ward E. Williams, 1414 10th Ave., Lake Charles, La.

SWAP: RADIO SETS, PARTS, books, miscellaneous items, etc., for coil winder, Inductance Authority, manuals, meters, etc., or what have you. Exchange all swap lists. Wilbert L. Misner, RD No. 1, Vintondale, Penn.

HAVE GOOD WE-242-A SOCKET, filament transformer; regenerative preselector; 2-tube E.C. receiver; over 900 packeted stamps, 75 countries; 1st day covers; coins; miscellaneous articles. Want good ham-band super. W8MTZ, 3 Birch, Oneonta, N. Y.

TRADE, NEW YORK HERALD, Revolutionary edition, April 19, 1875, for SW receiver, 11 tube Philco receiver, 22.5 to 15 kc., for Sargent or SW's in perfect operating condition. Carl L. Horton, 44 Grove St., Athol, Mass.

WILL TRADE—WESTERN ELECtric, D-76527 amp, 17-B amp, 518-B volume indicator 201-A input mixer—all for standard rack. Want 110 volt automatic light plant or what have you? A. H. Dreesen, Mansfield Centre, Connecticut.

ALBUM OF OVER 1000 USED and unused stamps, all countries, about 50% over 20 years old, several dozens 19th century. Will swap for good transmitter. Donald Fray, West St., Port Antonio, Jamaica, B. W. I.

I HAVE A GOOD $17.50 BANJOuke, hardly used. Also 2 tube S.W. receiver that works good, and many other parts. Am interested in a "mike" or? All letters answered. Douglas Gates, Cotulla, Texas.

WILL SWAP BOXING GLOVES (set), crank movie projector, mechanical engineering (6 vol.), practical shopwork, complete course of mechanical, engineering and architectural drawing. For what? J. Coyle, 2257 Jackson St., Phila., Pa.

TRADE: POWER TRANSFORMers; Baird television kit; head phones; other radio parts or write for complete list. Want: Xtal mike; 16m/m movie camera; test equipment. Ernest Maass, 10 Bloomfield Road, Burlingame, Calif.

I HAVE A HALLICRAFTER SX-9 Super Skyrider in perfect condition. Will swap for small metal working lathe, piano accordion or? All letters answered. H. Carr, 924 Lafayette, Waterloo, Iowa.

TRADE 6J5G—6F6 SUPER-REgenerative receiver (verified reception of W4EDD on 5 meters from Mt. Vernon, N. Y.) for 7 mc. xtal and key, or what else? W2KRF, Apt. 2A, 485 Gramatan Ave., Mount Vernon, N. Y.

BUNDLE UP YOUR OLD OR NEW post-card views and send to me. For each one I'll forward one piece old Mexican money. (Not spendable now.) No two cards alike, please. Harold Maniss, Colorado, Texas.

WANTED OUTBOARD MOTOR, state age, model, horsepower, weight. Will answer immediately. Have electric train A-1 condition, good canal and cash. Joseph Knerr, 196 First St., Ambridge, Pa.

HAVE LARGE COLLECTION OF photos of U. S. Navy ships available for swap. Also would like to buy photos of U. S. Navy ships. What have you? Andrew D. Grantzow, 178 Brookside Ave., Irvington, N. J.

SWL'S WILL EXCHANGE SWL cards and correspondence with you, U. S. and foreign. Also have lists of articles to trade and will send list if asked. Harry F. Wood, Waverly, Washington.

Mc.	Call	
5.735	HCIPM	QUITO, ECUADOR, 52.28 m. Irregular 10 pm.-12 m.
5.145	OKIMPT	PRAGUE, CZECHOSLOVAKIA, 58.31 m., Addr. (See OLR, 11.84 mc.) Fri. 4.45-5.10 pm.; Sat. 5.15-5.40 pm.
5.145	PMY	BANDOENG, JAVA, 58.31 m. 5.30-11 am.
5.077	WCN	LAWRENCEVILLE, N. J., 59.03 m. Addr. A.T.&T.Co. Works England late at night irregularly.
5.025	ZFA	HAMILTON, BERMUDA, 59.65 m. Works N.Y.C. irregularly at night.
5.000	TFL	REYKJAVIK, ICELAND, 60 m. Works Europe night time irreg.
4.995	VUD2	DELHI, INDIA, 60.06 m., Addr. All India Radio. 7.30 am.-12.30 pm.
4.975	GBC	RUGBY, ENG., 60.3 m. Works ships irregularly.
4.905	VUB2	BOMBAY, INDIA, 61.16 m. Addr. All India Radio, 7 am.-12.30 pm.
4.900	HJ3ABH	BOGOTA, COL., 61.19 m., Addr. Apartado 565. 12 n.-2 pm., 6-11 pm.; Sun. 12 n.-2 pm., 4-11 pm.
4.880	HJ4ABP	MEDELLIN, COL., 61.44 m. 8-11 pm.
4.842	HJ3ABD	BOGOTA, COL., 61.95 m., Addr. La Nueva Granada, Box 509. 12 n.-2 pm., 7-11 pm., Sun. 5-9 pm.
4.820	GDW	RUGBY, ENG., 62.24 m. Works N.Y.C. night time irregularly.
4.800	HJIABE	CARTAGENA, COL., 62.46 m., La Voz de los Laboratorios Fuentes. Addr. Box 31. Daily 8.30 am.-11 pm., Sun. 10 am.-9 pm.
4.780	HJIABB	BARRANQUILLA, COL., 62.72 m. La Voz de Barranquilla, Addr. P. O. Box 715. 11.30 am.-1 pm., 4.30-10 pm.
4.772	HJIABJ	SANTA MARTA, COL., 62.85 m. 11.30 am.-2 pm., 5.30-10.30 pm. except Wed.
4.752	WAQ	OCEAN GATE, N. J., 63.1 m., Addr. A.T.&T. Co. Works ships irregularly.
4.740	HJ6ABC	IBAGUE, COL., 63.25 m. 7 pm.-12 m.
4.272	WAQ	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, 72.99 m. 7-8.30 am., 11.45 am.-2.30 pm., except Monday. Sunday 12 noon-1.30 pm., 5.30-10 pm.

Short Wave Broadcasting—as a Pioneer Sees It

DR. FRANK CONRAD

(Continued from page 197)

to Australia. This transmission marked the ultimate in distance transmission since it was sent half-way round the world.

Then to the Far North went these short waves, carrying messages and entertainment to the Royal Canadian Mounted Police; radio had begun its mission of carrying good will to all the world.

Since those rather crude beginnings, the technique of short wave broadcasting has advanced daily. Last February, the Westinghouse international broadcast station at Boston, W1XK, placed in operation a new directional rhombic antenna beamed on Capetown, South Africa.

The new antenna operates on 9570 kilocycles from 6 A.M. to 5 P.M., and from 5 P.M. to 1 A.M. a non-directional horizontal doublet antenna is used.

A few weeks before short wave station W8XK at Pittsburgh began operations on two similar rhombic antennas, each including four 80-foot poles arranged in the form of a diamond. One is beamed on Buenos Aires to carry programs to Brazil, Argentina and other Central and South American countries. The other is beamed on London and covers England and Continental Europe.

Each of these antennas will operate on either 6140, 11870 or 15210 kilocycles and both can operate simultaneously on any one of these frequencies.

Today every nation in Europe displays a keen appreciation of the importance of short wave transmission in inter-country mass communication. The short wave knows no borders and passes freely from one country to the other. Some nations are using this method to spread their particular ideologies, it is true, but the day will come when short waves will find their rightful use as bonds of international understanding and appreciation.

England today links the vast British Empire with such a short wave bond. The United States has for a number of years been making its South American neighbors better acquainted with it by means of short wave broadcasts.

And while we are prophesying, who knows but that the day may come when the short wave will bring forth a new and better understanding between the great nations of the earth.

BOOK REVIEW

BOTH SIDES OF THE MICROPHONE, by John S. Hayes and Horace J. Gardner. Size 5¼" x 7½", cloth bound, 180 pages. Published by J. B. Lippincott Co., Philadelphia, Pa.

This is a very lively and interesting book. Part of its appeal is due to the fact that a number of prominent radio announcers have contributed several illuminating chapters. Among these features are—"Dance Orchestra on the Air" by Guy Lombardo; "From a Program of News Comment" by Gabriel Heatter; "The Special Event and Its Announcer"—Ben Grauer; "The Variety Show"—Kate Smith and "Broadcasting a Sporting Event"—Bill Slater.

The first half of the book provides the reader with a clear idea of the many angles connected with the production of a broadcast program, including such interesting topics as the program department, the work of the announcers, continuity, the musical division, sound effects, publicity, special events and selling time on the air.

"High Frequency Broadcasting"—10 Meters and Down, by Everett L. Dillard in the next issue.

• 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.)

The NC-100X in new dress

NC 100-XA

National's policy of constant improvement in its products is well illustrated by the recent redesign of the mechanical details of the NC-100X Receiver.

THE NEW DIAL has direct reading scales for each band, calibrated in megacycles. An additional vernier dial reads to one part in a thousand, for accuracy in logging.

THE COIL-CHANGE MECHANISM is ganged to the dial pointer, which moves radially to point directly to the proper scale. The movable coil system and the electrical circuit are unchanged, as experience has shown them to be high in efficiency and sound in design.

THE SIGNAL-STRENGTH METER is new and takes the place of the less convenient "magic eye" formerly used

THE NEW CABINET has been completely restyled. Its clean simple lines are free from gadgets and superfluous trim. The new NC-100XA is a straight high-performance job, stripped for action.

THE PRICE will be no higher, for the time being.

NATIONAL COMPANY, INC., MALDEN, MASS.

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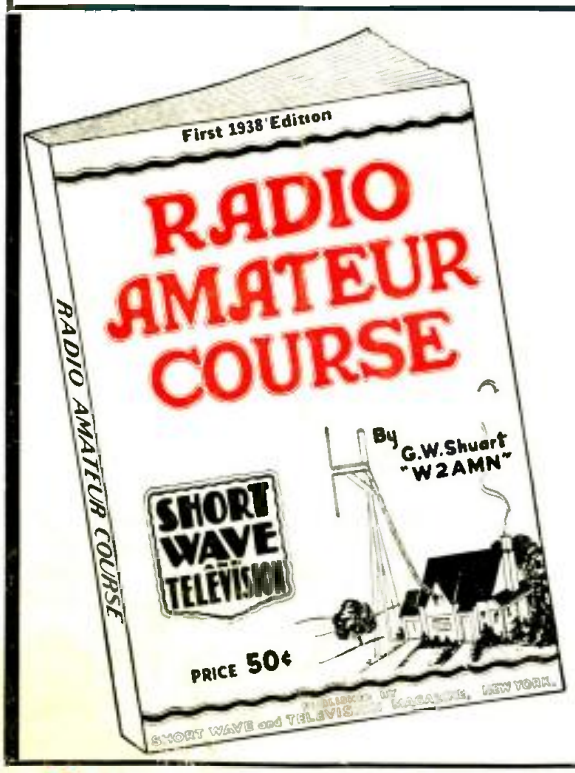

To convince you that there isn't a better book buy today the publishers of the RADIO AMATEUR COURSE make the sensational offer of a money-back guarantee on such a low-priced book. Stop in at any of the many dealers listed below and examine this volume. See for yourself if the RADIO AMATEUR COURSE is just the book you've always wanted.

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OVER 150 DIAGRAMS AND PHOTOGRAPHS

Printed on the finest quality paper—well illustrated—attractive 4-color cover—complete with radio information you must have. It contains a step-by-step program for obtaining a short-wave radio education.

Written by George W. Shuart, W2AMN, *foremost short-wave authority*

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Sam's Cigar Store,
127 N. First Ave., Phoenix.

CALIFORNIA
Scott Wholesale Radio Co.,
344 E. Fourth Street, Long Beach.
Offenbach Electric Co., Ltd.,
1452 Market Street, San Francisco.
Zack Radio Supply Co.,
1426 Market Street, San Francisco.

COLORADO
Auto Equipment Co.,
14th at Lawrence, Denver.

CONNECTICUT
Radio Inspection Service Co.,
237 Asylum Street, Hartford.
Stern Wholesale Parts, Inc.,
210 Chapel St., Hartford.

GEORGIA
Wholesale Radio Service Co., Inc.,
430 W. Peachtree St., N. W., Atlanta.

ILLINOIS
Allied Radio Corporation,
833 West Jackson Blvd., Chicago.
Newark Electric Company,
226 W. Madison Street, Chicago.
Wholesale Radio Service Co., Inc.,
901 W. Jackson Blvd., Chicago.

INDIANA
Van Sickle Radio, Inc.,
34 West Ohio Street, Indianapolis.

MASSACHUSETTS
Greater Boston Distributors,
40 Waltham St., Boston.
H. Jappe Co., 46 Cornhill, Boston.
Wholesale Radio Service Co., Inc.,
110 Federal Street, Boston.
Springfield Radio Co.,
397 Dwight Street, Springfield.
H. Jappe Co.,
37 Mechanic Street, Worcester.

MICHIGAN
Rissi Brothers, Inc.,
5027 Hamilton Ave., Detroit.

MISSOURI
Modern Radio Company,
409 No. Third Street, Hannibal.
Burstein Applebee Co.,
1012-14 McGee Street, Kansas City.
Van Sickle Radio Co.,
1113 Pine Street, St. Louis.

NEBRASKA
Radio Accessories Company,
2566 Farnam Street, Omaha.

NEW HAMPSHIRE
Radio Service Laboratory,
1187 Elm Street, Manchester.

NEW JERSEY
Arco Radio Co.,
227 Central Avenue, Newark.
Wholesale Radio Service Co., Inc.,
219 Central Avenue, Newark.

NEW YORK
Wholesale Radio Service Co., Inc.,
542 E. Fordham Rd., Bronx.
Wholesale Radio Service Co., Inc.,
90 08 166th Street, Jamaica, L. I.
Blan, The Radio Man, Inc.,
64 Dey Street, New York City.
Eagle Radio Co.,
84 Cortlandt Street, New York City.
Federated Purchaser, Inc.,
25 Park Place, New York City.
Harrison Radio Co.,
12 West Broadway, New York City.
Sun Radio Co.,
212 Fulton Street, New York City.
Terminal Radio Corp.,
80 Cortlandt Street, New York City.
Thor Radio Corp.,
65 Cortlandt St., New York City.
Tri-Mo Radio Co., Inc.,
85 Cortlandt Street, New York City.
Wholesale Radio Service Co., Inc.,
100 Sixth Avenue, New York City.
Radio Parts & Equipment Co.,
244 Clinton Avenue No., Rochester.
M. Schwartz & Son,
710-712 Broadway, Schenectady.

OHIO
News Exchange,
51 So. Main Street, Akron.
Canton Radio & Supply Co.,
1140 Tuscarawas Street, W., Canton.
United Radio, Inc.,
1103 Vine Street, Cincinnati.
The Hughes Peters Electric Corp.,
178-180 N. Third Street, Columbus.
Standard Radio Parts Co.,
135 East Second Street, Dayton.

OREGON
Portland Radio Supply Co.,
1300 W. Burnside Street, Portland.

PENNSYLVANIA
Radio Distributing Co.,
1124-26 Market Street, Harrisburg.
M. & H. Sporting Goods Co.,
512 Market Street, Philadelphia.
Cameradio Co.,
963 Liberty Ave., Pittsburgh.

RHODE ISLAND
W. H. Edwards Co.,
32 Broadway, Providence, R. I.

UTAH
O'Loughlin's Wholesale Radio Supply,
315 South Main Street, Salt Lake City.
Radio Supply, Inc.,
46 Exchange Place, Salt Lake City.

WASHINGTON
Spokane Radio Co., Inc.,
611 First Avenue, Spokane.

WISCONSIN
Radio Parts Co., Inc.,
536-538 W. State Street, Milwaukee.

TEXAS
Amarillo Electric Co.,
111 East 8th Avenue, Amarillo.

AUSTRALIA
McGill's Agency,
183-184 Elizabeth Street, Melbourne.

CANADA
The T. Eaton Co., Ltd.,
Winnipeg, Manitoba.
Canadian Electrical Supply Co., Limited,
285 Craig Street W., Montreal, Que.
Metropolitan News Agency,
1248 Peel Street, Montreal, Que.

CUBA
The Diamond News Co.,
Palacio Asturiano, Por San Jose,
Habana.

ENGLAND
Gorringe's American News Agency,
9a, Green Street, Leicester Square,
London, W.C.2.

INDIA
Empire Book Mart,
Box 631, Bombay.

MEXICO
American Book Store, S. A.,
Avenida Madero 25, Mexico City.
Central De Publicaciones,
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99 HUDSON ST., NEW YORK CITY

SHORT WAVE AND TELEVISION, 99 HUDSON STREET NEW YORK, N. Y.
Gentlemen: I enclose herewith my remittance of Fifty Cents (50c) for which please send me POSTPAID, my copy of the RADIO AMATEUR COURSE. (Remit by check or money order; register letter if you send cash or unused U.S. Postage Stamps.)

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