

SHORT WAVE & TELEVISION

The Popular Radio Magazine



**SHORT WAVES LAND
PLANE IN FOG**
SEE PAGE 204



**HUGO
GERNSBACK**
EDITOR

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

25
IN U.S. AND
CANADA

**AUG.
1938**



BUILD IT YOURSELF!



The Publishers of Short Wave & Television Present
fifty 10¢ publications featuring construction

of the most popular short-wave receivers and transmitters

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ALL RECEIVERS AND TRANSMITTERS ARE STRICTLY UP-TO-DATE; THERE ARE NO ANTIQUES OR OUT-OF-DATE PUBLICATIONS IN THIS LIST.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.
Please order each project by its serial number, and use the special coupon on this page. We accept money orders, cash, checks or new U.S. stamps (no foreign stamps or currency accepted.) If you send cash or stamps register your letter against possible loss.
THE PUBLISHERS OF "SHORT WAVE & TELEVISION" WILL REFUND YOUR MONEY INSTANTLY IF YOU ARE NOT FULLY SATISFIED WITH ANY ONE OF THE PROJECTS.

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 3-tube results. Back 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 on 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-TUBE.** 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 BUILD 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 16-550 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 PIRATES.** 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 on 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-TUBE.** This is the receiver for the Ham or Fan who wants a really high class receiver of simple design. It employs an unusual band-spread 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-tube giving 3-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 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 300 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, uses a pair of 1K33's in parallel with a 1K339 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 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 pack. 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
- THE BRIEF-CASE SHORT-WAVE RECEIVER AND HOW TO BUILD IT.** So small that the entire set, batteries, head set, aerial and everything, goes into a briefcase. Stations from Europe are often received. By Hugo Gernsback and Clifford E. Denton. No. 42
- HOW TO BUILD THE POCKET SHORT-WAVE RECEIVER.** One of the smallest, book-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
- HOW TO BUILD THE PORTABLE MIDNIGHT SHORT-WAVE BATTERY SET.** Uses no aerial, no ground. The total weight is 3½ lbs. and measures 6x3x6 inches. Self-contained, batteries, tube, condensers, and loop. Highly sensitive circuit. No. 47
- HOW TO BUILD THE HAM-BAND "PEE-WEE" 2-TUBE.** A dandy receiver with high efficiency and band-spread tuning. Works a loudspeaker, yet the entire receiver is no larger than your hand. Works with either batteries or an A.C. power pack. No. 48
- HOW TO BUILD THE DUO-AMPLIDYNE.** The ideal 1-tube set for the beginner. One of the finest 1-tube sets; it really gives 2-tube performance. Made for battery operation. With only ten-foot antenna brings in the good European stations. No. 49
- HOW TO BUILD THE "MONO-COIL 2".** No more "plug in" coils. This set eliminates bothersome coils and is made to cover short-wave bands. Works with either batteries or A.C. power pack. No. 50

SHORT WAVE & TELEVISION, 99 Hudson Street, New York, N. Y.

I enclose \$..... for the publications listed by number at right at 10c each (\$1.00 for 12). You are to send all publications to me postpaid. I have drawn a line through each number that I wish.

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	26	27	28	29	30
	31	32	33	34	35
	36	37	38	39	40
	41	42	43	44	45
	46	47	48	49	50

SHORT WAVE & TELEVISION
99 HUDSON STREET
NEW YORK, N. Y.

A FREE LESSON SHOWED BILL HOW HE COULD MAKE GOOD PAY IN RADIO



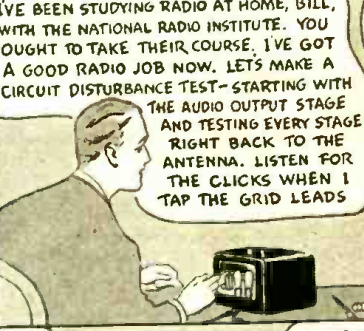
I CAN'T FIND OUT WHAT'S WRONG --- GUESS I'LL MAKE A FOOL OF MYSELF WITH MARY



HELLO, BILL --- GOT A TOUGH ONE TO FIX? LET ME HELP YOU



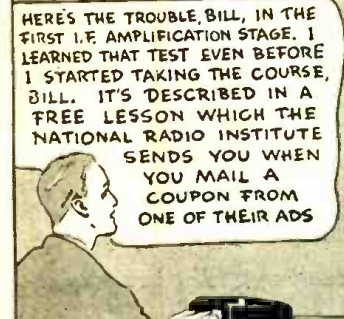
HELLO JOE --- WHERE'VE YOU BEEN LATELY --- AND WHERE DID YOU LEARN ANYTHING ABOUT RADIO?



I'VE BEEN STUDYING RADIO AT HOME, BILL, WITH THE NATIONAL RADIO INSTITUTE. YOU OUGHT TO TAKE THEIR COURSE. I'VE GOT A GOOD RADIO JOB NOW. LET'S MAKE A CIRCUIT DISTURBANCE TEST --- STARTING WITH THE AUDIO OUTPUT STAGE AND TESTING EVERY STAGE RIGHT BACK TO THE ANTENNA. LISTEN FOR THE CLICKS WHEN I TAP THE GRID LEADS



SAY --- WHERE DID YOU LEARN THAT TEST? IT'S A GOOD ONE



HERE'S THE TROUBLE, BILL, IN THE FIRST I.F. AMPLIFICATION STAGE. I LEARNED THAT TEST EVEN BEFORE I STARTED TAKING THE COURSE, BILL. IT'S DESCRIBED IN A FREE LESSON WHICH THE NATIONAL RADIO INSTITUTE SENDS YOU WHEN YOU MAIL A COUPON FROM ONE OF THEIR ADS



I'VE SEEN THEIR ADS BUT I NEVER THOUGHT I COULD LEARN RADIO AT HOME --- I'LL MAIL THEIR COUPON RIGHT AWAY



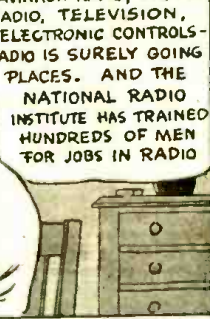
I'M CONVINCED NOW THAT THIS COURSE IS PRACTICAL AND COMPLETE. I'LL ENROLL NOW

AND THEN I CAN MAKE REAL MONEY SERVICING RADIO SETS

OR INSTALL AND SERVICE LOUD SPEAKER SYSTEMS



OR GET A JOB WITH A RADIO BROADCASTING OR TRANSMITTING STATION



AVIATION RADIO, POLICE RADIO, TELEVISION, ELECTRONIC CONTROLS --- RADIO IS SURELY GOING PLACES. AND THE NATIONAL RADIO INSTITUTE HAS TRAINED HUNDREDS OF MEN FOR JOBS IN RADIO

I will send you a Lesson on Radio Servicing Tips FREE TO SHOW HOW PRACTICAL IT IS TO TRAIN AT HOME FOR GOOD JOBS IN RADIO

Do you want to make more money? I'm sure I can train you at home in your spare time for a good Radio Job and for opportunities coming in Television. I'll send you a sample lesson FREE. Examine it, read it, see for yourself how easy it is to understand even if you have no knowledge of Radio or electricity.

Many Radio Experts Make \$30, \$50, \$75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to \$5,000 a year. Spare time Radio set servicing pays as much as \$200 to \$500 a year. Full time Radio servicing jobs pay as much as \$30, \$50, \$75 a week. Many Radio Experts operate their own full time or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to \$6,000 a year. Radio operators on ships get good pay, see the world besides. Automobile, police, aviation, commercial Radio, and loud speaker systems offer good opportunities now and for the future. Television promises many good jobs soon. Men I trained have good jobs in these branches of Radio.

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In addition to my Sample Lesson, I will send you my 64-page Book, "Rich Rewards in Radio." Both are free to any fellow over 18 years old. My book points out Radio's spare time and full time opportunities and those coming in Television; tells about my Training in Radio and Television; shows my Money Back Agreement; shows you letters from men I trained, telling what they are doing, earning. Find out what Radio offers YOU! MAIL THE COUPON in an envelope, or paste it on a penny postcard --- NOW!

**J. E. Smith, Pres., National Radio Institute
Dept. 8HB3 Washington, D. C.**



J. E. SMITH
President
National Radio Institute
Established 1914
The man who has directed the home study training of more men for the Radio Industry than any other man in America.



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THANKS! IT CERTAINLY IS EASY TO LEARN RADIO THE N.R.I. WAY. I STARTED ONLY A FEW MONTHS AGO, AND I'M ALREADY MAKING GOOD MONEY.

THIS SPARE TIME WORK IS GREAT FUN AND PRETTY SOON I'LL BE READY FOR A FULL TIME JOB

OH BILL --- I'M SO GLAD I ASKED YOU TO FIX OUR RADIO. IT GOT YOU STARTED THINKING ABOUT RADIO AS A CAREER, AND NOW YOU'RE GOING AHEAD SO FAST

OUR WORRIES ARE OVER. I'M MAKING GOOD MONEY NOW, AND THERE'S A BIG FUTURE AHEAD FOR US IN RADIO



**J. E. SMITH, President, Dept. 8HB3
National Radio Institute, Washington, D. C.**

Dear Mr. Smith: Without obligation, send me a sample lesson and your free book which points out spare time and full time Radio opportunities, and shows how I can train for them at home in spare time --- about the N.R.I. Set Servicing Instrument you give. (Please write plainly.)

Name Age

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City State 14-x-1

Please say you saw it in SHORT WAVE & TELEVISION

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

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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."



Certified Circuits

When you see this seal on a set it is a guarantee that it has been tested and certified in our laboratories, as well as privately in different parts of the country. Only construction—experimental sets are certified.

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H. C. Lewis

Radio—Television—Sound Equipment

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H. C. LEWIS, President,
Radio Division, Coyne Electrical School,
500 S. Paulina St., Dept. C8-2K, Chicago, Ill.

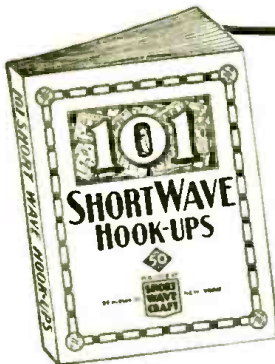
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CITY.....STATE.....

H. C. LEWIS, President RADIO DIVISION Founded 1899
COYNE ELECTRICAL SCHOOL
500 S. Paulina St., Dept. C8-2K, Chicago, Ill.

... THESE OUTSTANDING SHORT WAVE BOOKS ARE NOW AVAILABLE AT YOUR DEALER!

YOU buy parts, tubes, kits, accessories from your local radio dealer—that's what countless thousands of short-wave fans do. Now through a nation-wide distribution service our numerous books are available at your favorite radio dealer—right where you buy other radio equipment. It's more convenient, saves time and you can inspect the books before you buy. Ask your dealer to show you all the books advertised on this page—they're always in stock.



101 SHORT WAVE HOOK-UPS

Compiled by the Editors of
SHORT WAVE and TELEVISION

Here is a worthwhile book that every short wave listener, every short wave fan, and every short wave amateur has wanted for a long time. It gives you the 101 best short wave hook-ups which have appeared heretofore.

100 Illustrations 50c
72 Pages

HOW TO BUILD AND OPERATE SHORT WAVE RECEIVERS

This is the best and most up-to-date book on the subject. It is edited and prepared by the editors of **SHORT WAVE and TELEVISION** and contains a wealth of material on the building and operation, not only of typical short wave receivers, but short wave converters as well.

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72 Pages

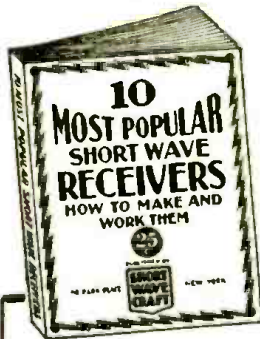
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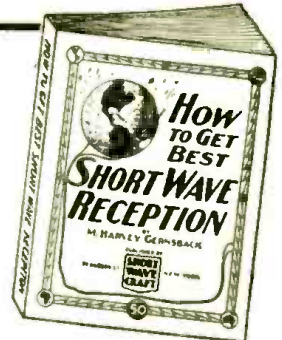
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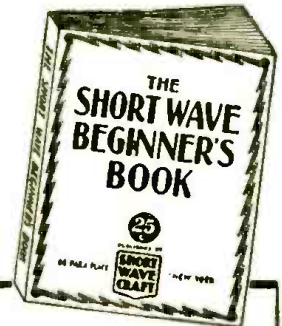
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HUGO GERNSBACK, EDITOR

H. WINFIELD SECOR, MANAGING EDITOR

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.

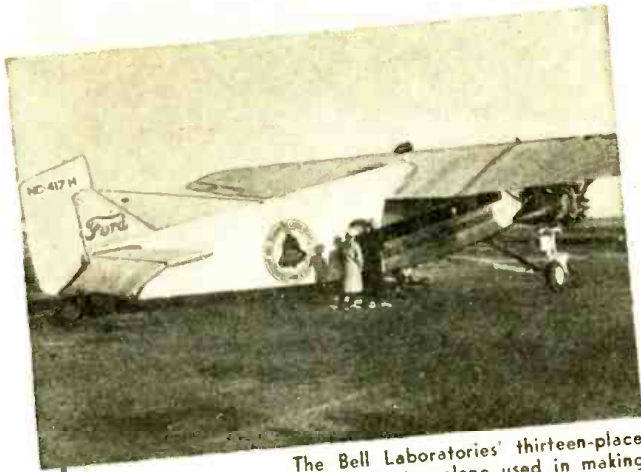
On New Year's Eve in 1923, through previous arrangement, KDKA transmitted a short wave program to Great Britain. This program was re-broadcast to British listeners through a station operated by the Metropolitan Vickers Company at Manchester, England, and was the first internationally broadcast program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

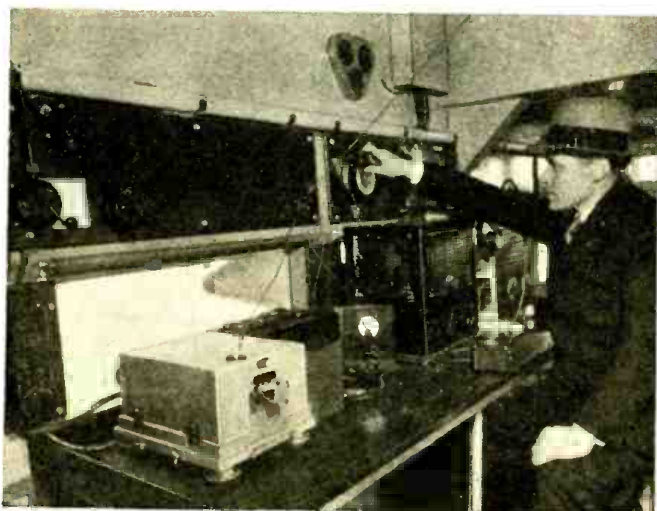


The Bell Laboratories' thirteen-place Ford tri-motor plane used in making tests of radio apparatus.



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



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

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.

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 W2X1D and at . . . mile point courses checked to . . . degrees. Two-way, during two flights, 4797.5 kes. with W2X1Z and . . . mcs. with W2X1D."

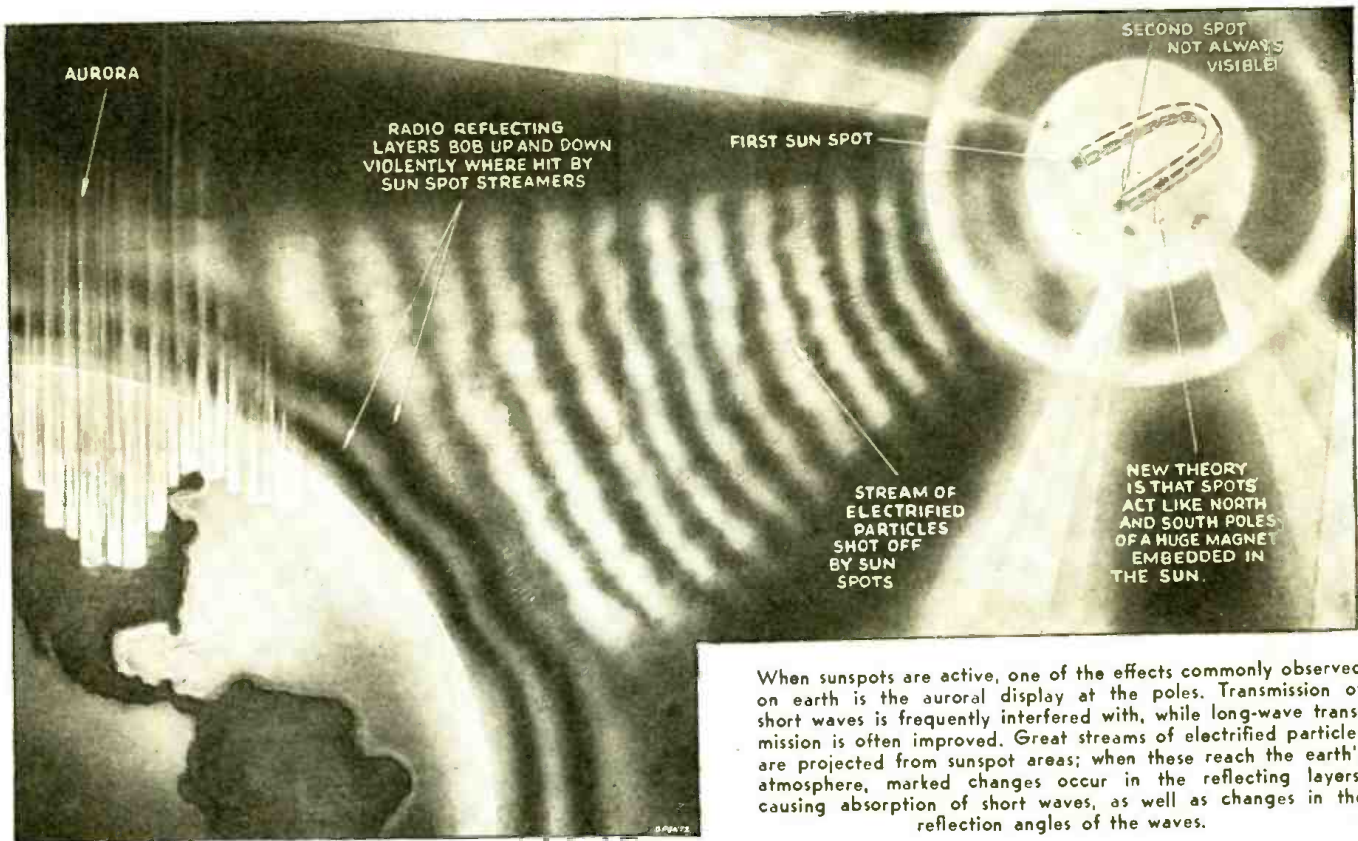
Another example: *"With Ford motors running on ground at various speeds, voltage measurements taken with cathode-ray oscillograph on primary ignition circuits for interference-filter design data. UHF transmission from Fairchild to Deal: route . . . degrees from Deal . . . Miles. Altitude 3500 feet both directions. Two-way, station W2X1Z (Hadley), 4797.5 kes. and 3415 kes.; and W2X1Z (Newark) 3105 kes."*

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.



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

● 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

R. W. Hallows, M. A.

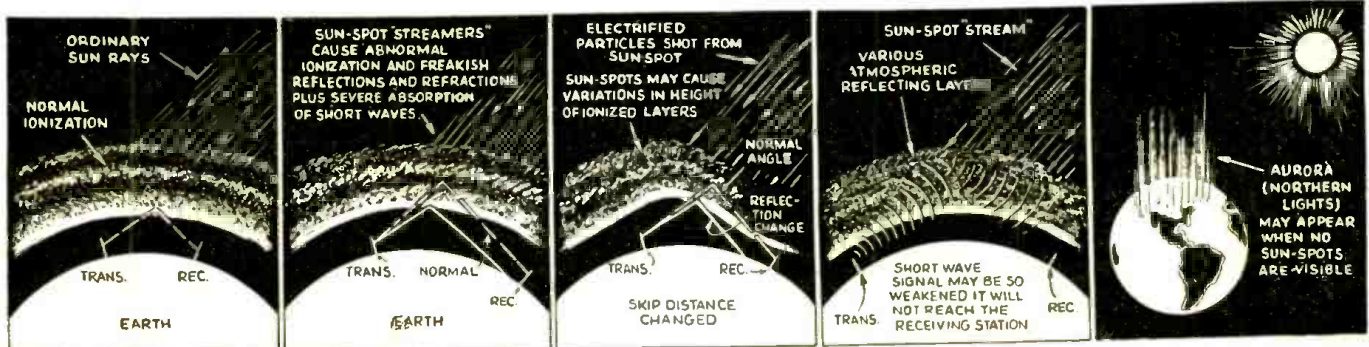
display a few of these, though it is only the larger ones, visible to the naked eye, that are brought to the knowledge of most of us by the newspapers. What may be called the average or common sunspot comes to the attention of none save astronomers, since it is a telescopic and not a naked-eye object.

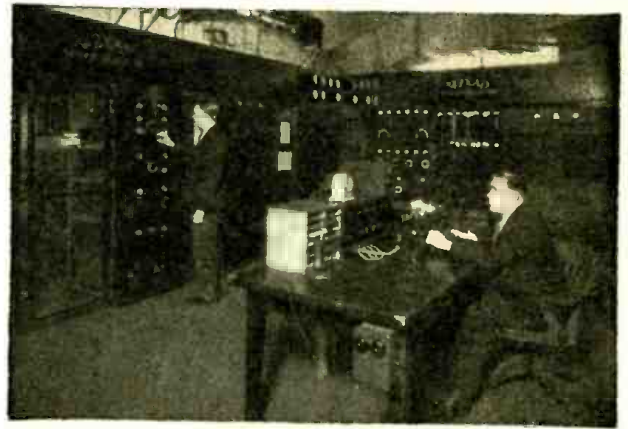
Not every sunspot, then, gives rise to magnetic storms, to violent atmospherics on various wavelengths, or to poor reception or "fade-outs" on the short waves. We may,

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)





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

18 Years of s. w.

● 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.

▲ C. D. Wagoner who spoke around the world over W2XAD in 1930. His voice returned in $\frac{1}{8}$ of a second.

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

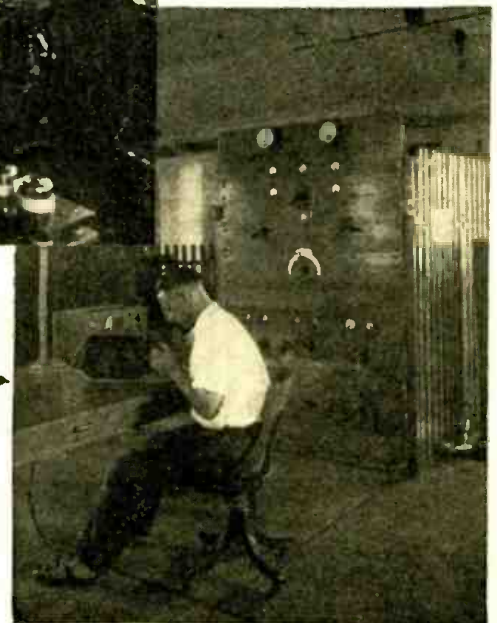


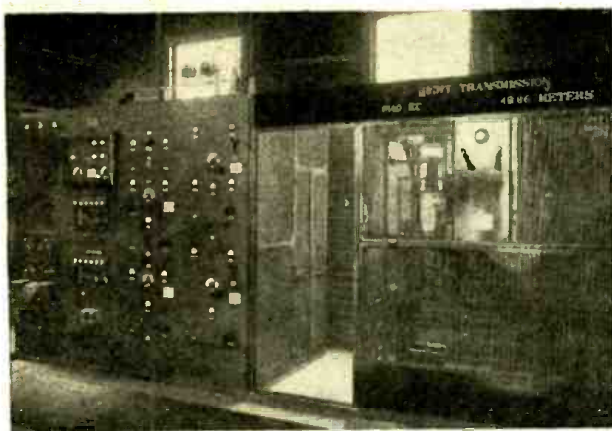
▲ Interior of 2XI, G.E. station on Van Slyck Island early in 1924. Signals went out on 100 meters.



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.



Westinghouse Station W8XK, Saxonburg, Pa., today. Engineer is announcing call.

Broadcasting!

M. Harvey Gernsback

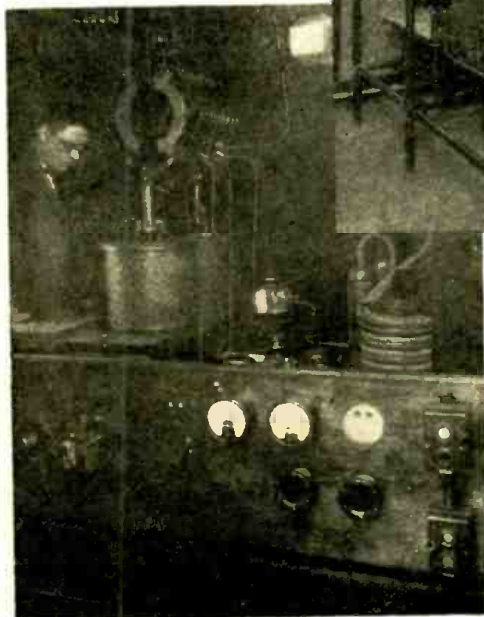
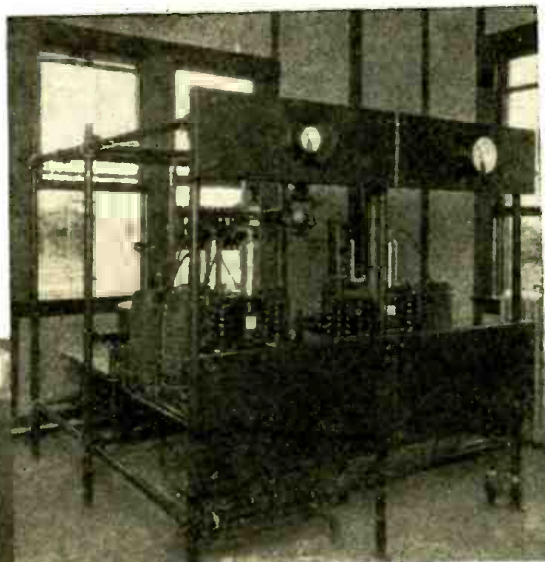
With the passage of time expansion made larger quarters necessary and 8XS was moved to the Hill Station near Pittsburgh in 1924. Eventually even these quarters were outgrown and the station again moved, this time to Saxonburg, where it is now located. Until 1929 most broadcasting activity of 8XS was 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 W1KK, Westinghouse station at Millis, Massachusetts.

Schenectady on the Map

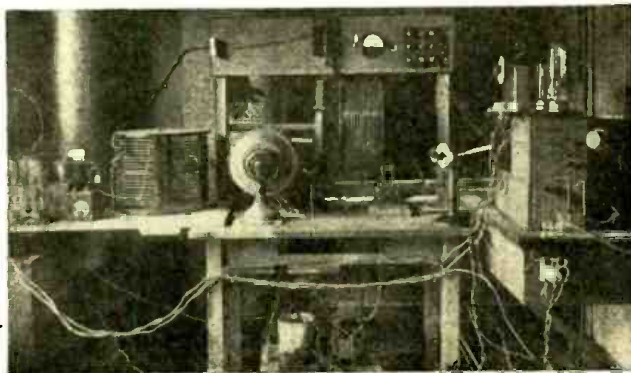
In the meantime the General Electric Company at Schenectady, N. Y., had started experimenting with short waves. In 1923 a transmitter operating around 100 meters went on the air. It was used in connection with development of the then new 20 kw. water-cooled transmitting tube. The engineers had not reckoned 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)

Improved transmitter at Westinghouse Hill Station → 8XS in 1924.



← 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.

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

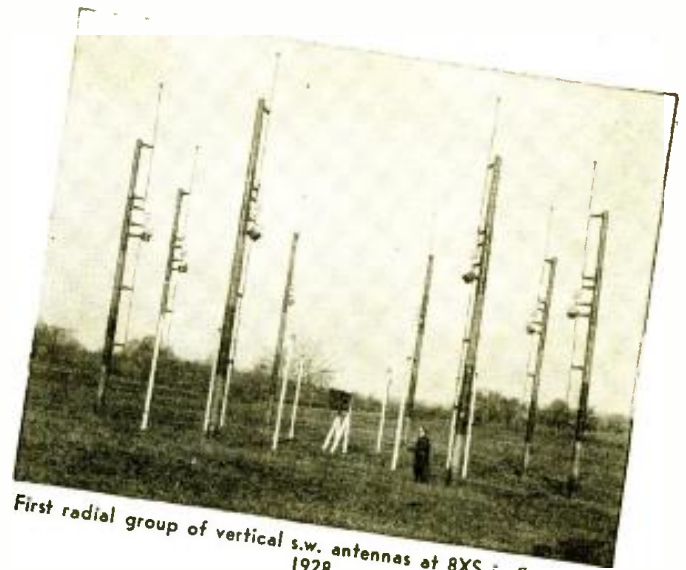
mc. until 1931 or 1932, and a W2XK on 17.3 mc. was used irregularly till the same time. W2XAD now operates on 21.5 and 9.55 mc. as well as on 15.33 mc.

The first, and until recently, only short-wave station on the Pacific Coast was W6XX at Oakland, California, also operated by G.E. W6XX 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 W6XX 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 W6XX.

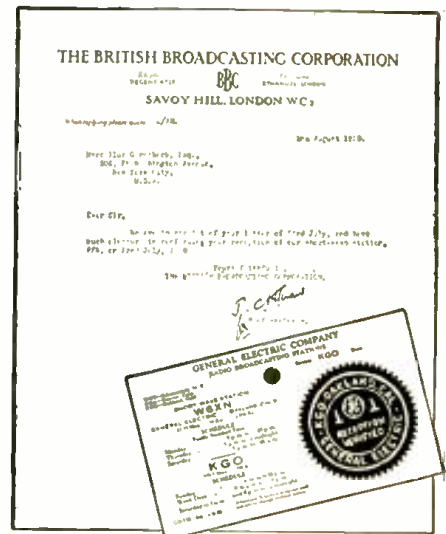
In the early days little use was made of directional transmitting aerials as the main idea was to see how far away signals could be heard. Contrast this with modern stations using elaborate directional arrays for spraying signals at any point on the globe.

Foreign Stations

By 1926 other parts of the world were
(Continued on page 246)



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



A veri from 5SW, Chelmsford, England, July, 1928. The card is a veri from W6XX, Oakland, Cal., in 1929. W6XX is no longer active.



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

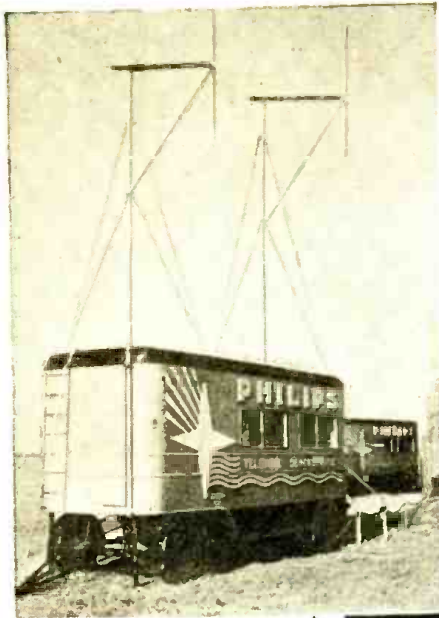


WGY's portable s.w. transmitting set in 1923. The forerunner of modern mobile stations.



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

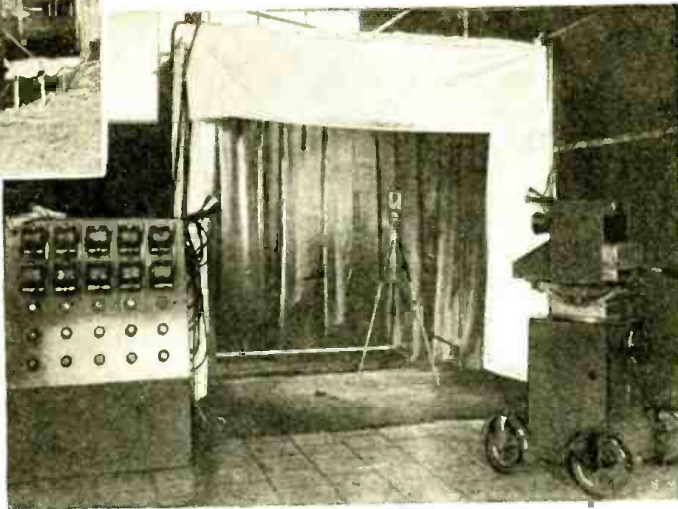
WHEN Holland Televises



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.

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.



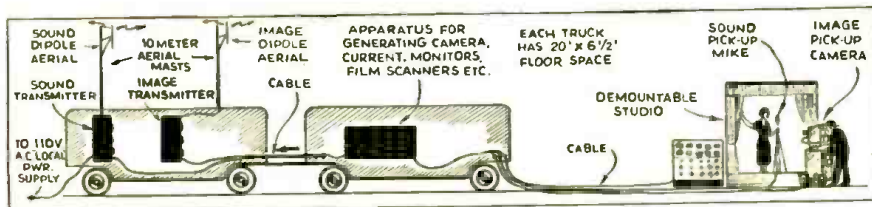
● IN order to be able to give demonstrations of television at any desired place, the Philips Laboratory has built a portable apparatus, some particulars of which are

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

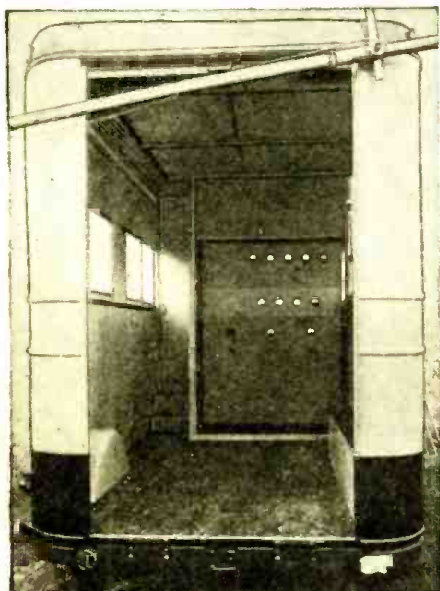
studio is also carried, which consists of an easily demountable framework of steel tubing, upon which five water-cooled super
(Continued on page 238)

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 focusses lens.



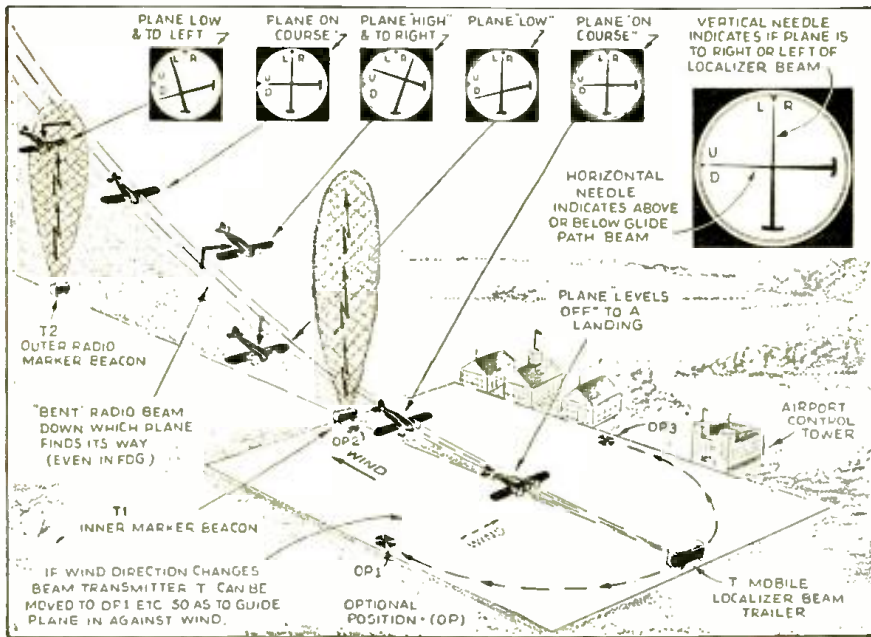
automobile trailers, each one having a floor surface of about 20 x 6½ ft. In the first is found the apparatus for the generation of the auxiliary signals and direct voltages necessary for the working of the iconoscope of the recording camera. In addition we find apparatus for the conversion of the picture 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 fire-proof 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 broad-



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.

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)

- 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

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.



W2XDV
EXPERIMENTAL
HIGH-FREQ. STATION.

(CBS - 485 MADISON AVE., N.Y. CITY)

W2XDV Located Atop Skyscraper

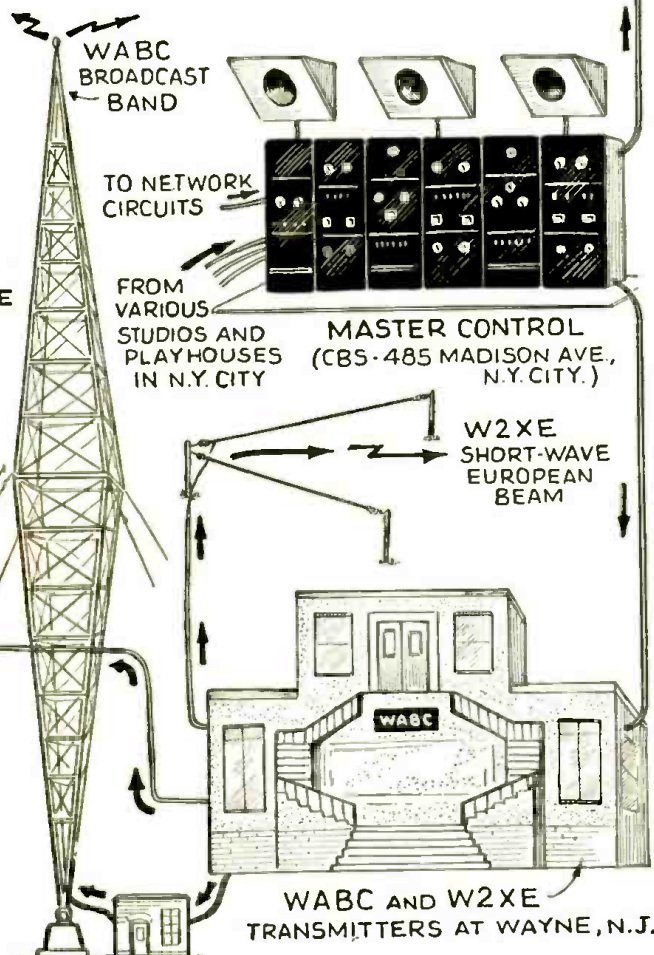
W2XDV, owned and operated by the Columbia Broadcasting System, was first licensed as a *general experimental* station on February 6, 1932. For several years under this classification, it conducted an active program of experimentation and scheduled broadcast transmissions. Then on November 5, 1935, W2XDV 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.

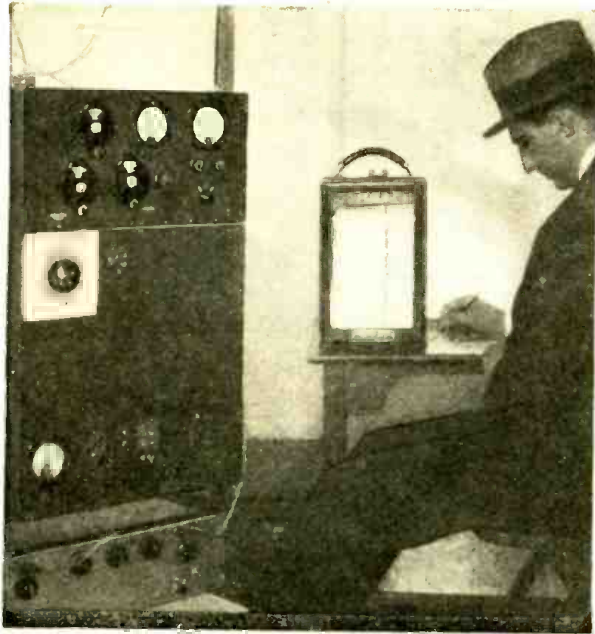
Half-Wave "Vertical" Antenna Used

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)

W2XE SHORT-WAVE
BEAM TO SOUTH
AMERICA

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.





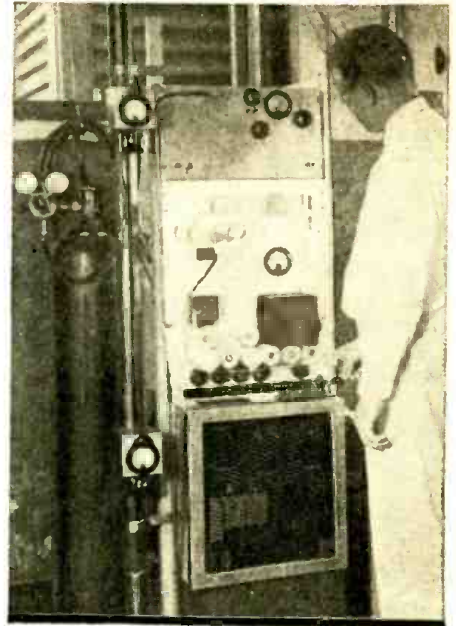
Reception on 2-Meter Wavelength

waves are bent back to earth by the reflecting property of the lower at-

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

mosphere. 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)

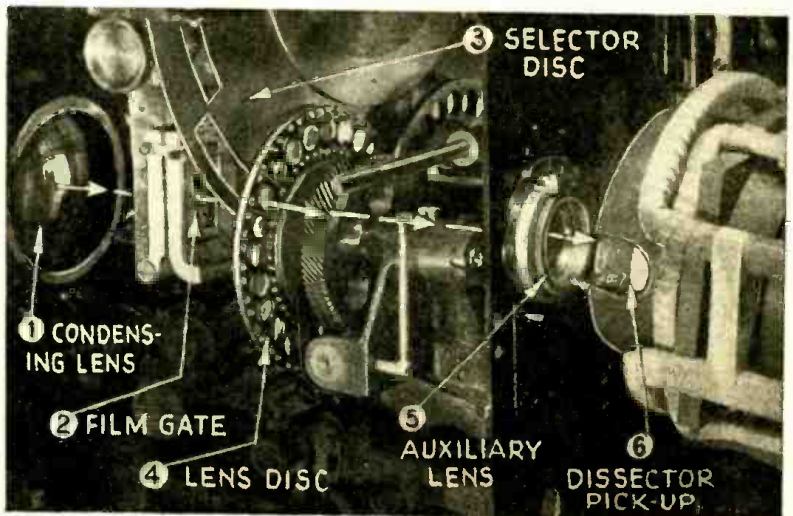
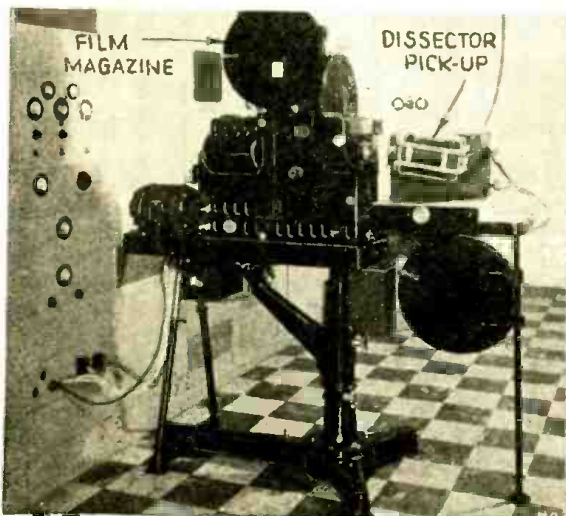


● ULTRA-short waves which are transmitted to points well beyond the optical horizon undergo variations in the received field intensity which are usually not observed over the shorter distances.

This fading, as pointed out by Mr. Decino in the *Bell Laboratories Record*, is attributed to variations in the amount the

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

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

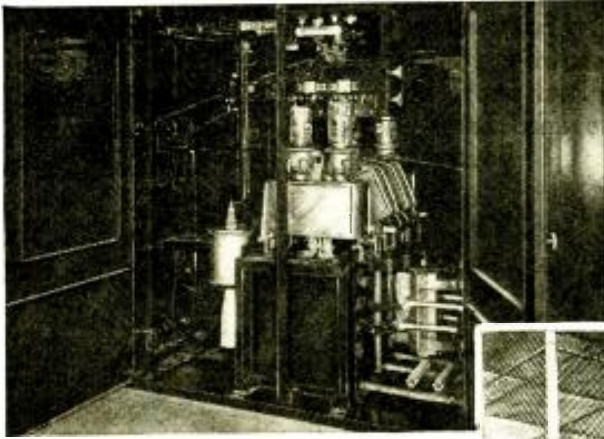
has been appreciably enhanced by the excellent adaptability of the high fidelity dissector tube for this phase of the art.

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

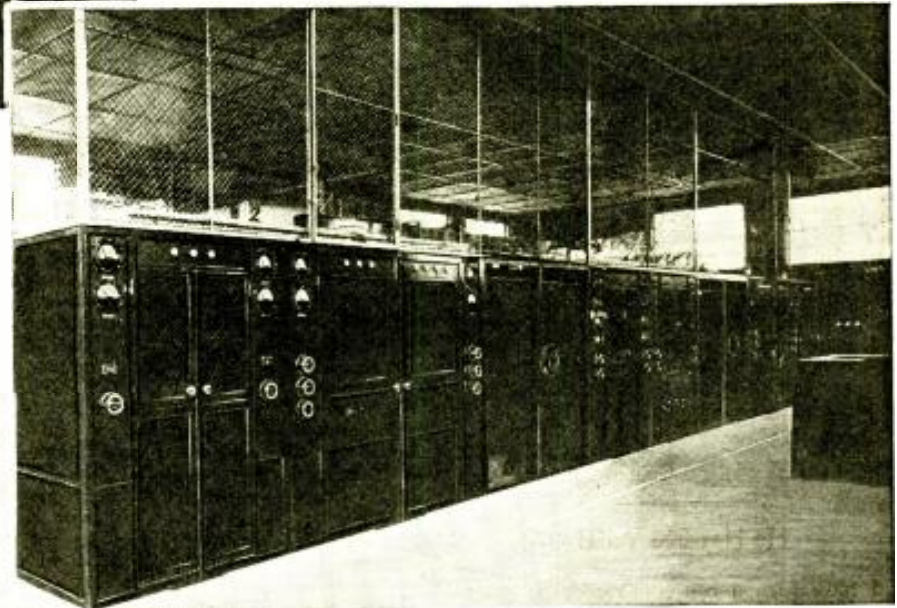
(Continued on page 252)

"Içi 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

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 foreigners, here's a few of them: KTO, JYK, JYT, TPA2, JZK, GSF, LSN, TPA3, 2RO, DJD, GSP, TPA4, COCX, LSN, COCQ, LRX, RAN, GSG, DJA, GSB, PRF5, COCH, KKH, HC2BI, 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.

JEL Y MUGROVE,
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

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



DO YOU

THINK?

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. Head-phones 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.

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. I.,
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, WHED, W1AXA, W1CGY, W1GEX, W1COI, W1CND, W1JFG, W2AZ, W2UK, W2IUV, W2GIZ, W3PC, W3CHF, W3CHE, W3FEMM, 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 pigeon 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.

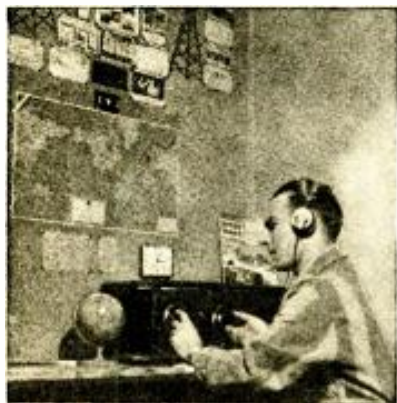
He Logged 29 Countries!

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. Lindenmayer, 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 gen-



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

erator, 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.

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, W8XX, W2XAD, W3XAL, W2XAF, W1XX, 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 I-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.

Send that PHOTO! It May Win

One Year's Subscription to
SHORT WAVE & TELEVISION
FREE

for Best "Listening Post" Photo

Closing date for each contest—75 days preceding date of issue; Aug. 15 for Nov. issue, etc. The editors will act as judges and their opinions will be final. In the event of a tie a subscription will be given to each contestant so tying.

Short Wave League

HONORARY MEMBERS



Dr. Lee de Forest
D. E. Replogle
John L. Reinartz
Hugo Gernsback, Executive Secretary

Manfred von Ardenne
E. T. Somerset
Hollis Baird

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 watt relay of WOR, Newark, from 8 a.m. to 1 a.m.

RANCHO GRANDE Enrique Ziegler, Caliao, 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

tory form and assume the stature of a public service.

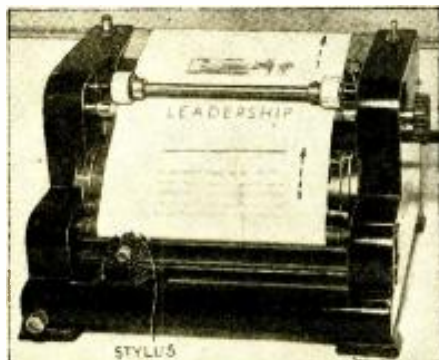
Mr. Hogan feels that *facsimile* is a more useful and important service than television, for the following reasons: (1) Facsimile apparatus much less expensive than television apparatus; (2) Programs much less costly; (3) Text and pictures can now be acceptably reproduced by facsimile, whereas the best 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.

Photographic System Discarded

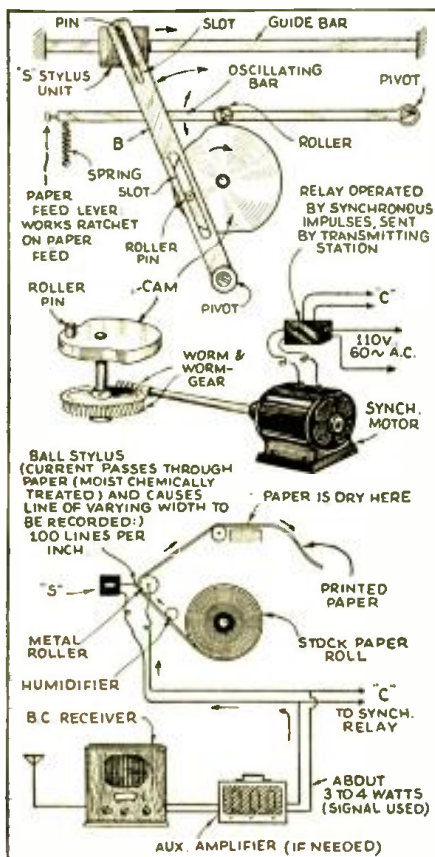
In the studies leading to the design of a suitable recorder for *home* use, Mr. Hogan discarded photographic methods because of the processing and skill required; he set up as his first requirement that the recording should be visible and instantaneous, so that the user could see what was going on at 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 should be *continuous*, i.e., that the recording should be *continuous*. (Continued on page 242)

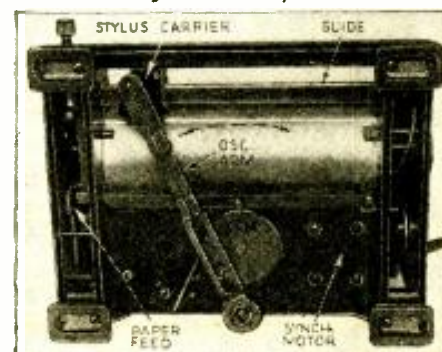


Front view of the Hogan Facsimile Receiver

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.



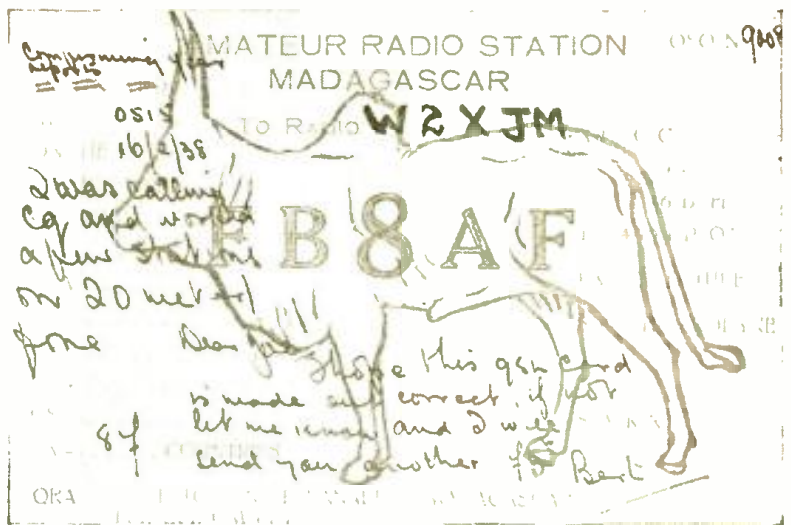
Bottom view of the receiver, showing the oscillating arm and stylus carrier.



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 labora-



← 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:

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

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



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 Gaborones, 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 106, Mafeking, Bechuanaland Protectorate.

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 as-

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



signed 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

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.

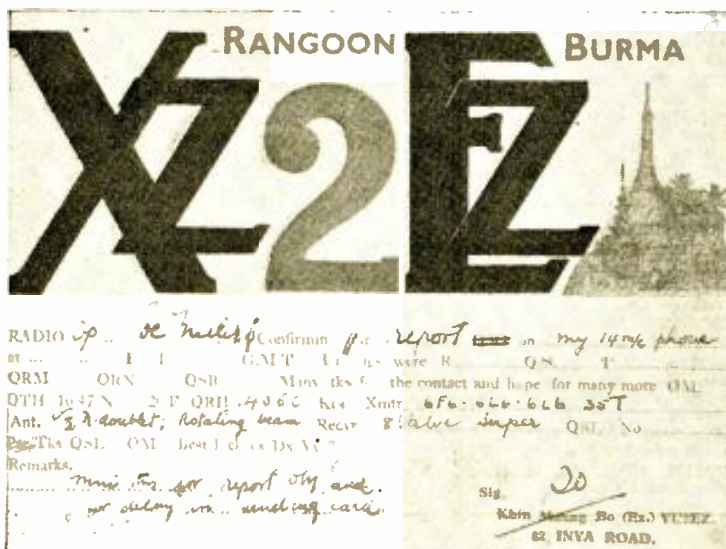
INDO-CHINA

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)



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

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.



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	Mc.	Call	Mc.	Call
31.600	WIXKA	BOSTON, MASS., 9.494 m., Addr. Westinghouse Co. Daily 5 am.-12 m., Sun. 7 am.-12 m. Relays WBZ.	20.700	LSY	BUENOS AIRES, ARG. , 14.49 m., Addr. Transradio Internatl. Tests irregularly.
31.600	WIXKB	SPRINGFIELD, MASS., 9.494 m., Addr. Westinghouse Co. Daily 5 am.-12 m., Sun. 7 am.-12 m. Relays WBZ.	20.380	GAA	RUGBY, ENG. , 14.72 m. Calls Arg., Brazil mornings.
31.600	W3XEY	BALTIMORE, MD., 9.494 m., Relays WFBR 4 pm.-12 m.	20.040	OPL	LEOPOLDVILLE, BELGIAN CONGO , 14.97 m. Works ORG morn.
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.	20.020	DHO	NAUEN, GERMANY , 14.99 m., Addr. Reichspostzentramt. Works S. Am. mornings.
31.600	W9XHW	MINNEAPOLIS, MINN., 9.494 m., Relays WCCO 9 am.-12 m.	19.900	LSG	BUENOS AIRES, ARG. , 15.08 m., Addr. (See 20.700 mc.) Tests irregularly.
31.600	W3XKA	PHILADELPHIA, PA., 9.494 m., Addr. NBC. Relays KYW 9 am.-10 pm.	19.820	WKN	LAWRENCEVILLE, N. J. , 15.14 m., Addr. A. T. & T. Co. Calls England daytime.
31.600	W5XAU	OKLAHOMA CITY, 9.494 m., Sun 12 n.-1 pm., 6-7 pm. Irregular other times.	19.680	CEC	SANTIAGO, CHILE , 15.24 m., Addr. Cia. Internacional de Radio. Calls Col. and Arg. daytime.
31.600	W4XCA	MEMPHIS, TENN., 9.494 m. Addr. Memphis Commercial Appeal. Relays WMC.	19.650	LSNS	BUENOS AIRES, ARG. , 15.27 m., Addr. (See 21.020 mc.) Calls Europe daytime.
31.600	W8XAI	ROCHESTER, N. Y., 9.494 m., Addr. Stromberg Carlson Co. Relays WHAM 7.30-12.05 am.	19.620	VQG4	NAIROBI, KENYA , 15.28 m. Addr. Cable and Wireless, Ltd. Calls London 7-8.30 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.	19.600	LSF	BUENOS AIRES, ARG. , 15.31 m., Addr. (See 20.700 mc.) Tests irregularly.
31.600	W9XPD	ST. LOUIS, MO., 9.494 m., Addr. Pulitzer Pub. Co. Relays KSD.	19.480	GAD	RUGBY, ENG. , 15.4 m. Calls VQG4 7.30-8 am.
26.450	W9XA	KANSAS CITY, MO., 11.33 m., Addr. Commercial Radio Eqpt. Co. Testing after August 1st.	19.355	FTM	ST. ASSISE, FRANCE , 15.5 m. Calls S. America mornings.
26.400	W9XAZ	MILWAUKEE, WIS., 11.36 m., Addr. The Journal Co. Relays WTMJ from 1 pm.	19.345	PMA	BANDOENG, JAVA , 15.51 m. Works Holland 5.30-11 am.
26.300	W2XJI	NEW YORK, N. Y., 11.4 m., Addr. Bamberger Broad. Service, 1440 Broadway. Relays WOR 8 am.-1 am.	19.260	PPU	RIO DE JANEIRO, BRAZ. , 15.58 m., Addr. Cia. Radiotel. Brasileira. Works France mornings.
26.100	W9XJL	SUPERIOR, WIS., 11.49 m. Relays WEBC daily.	19.220	WKF	LAWRENCEVILLE, N. J. , 15.6 m., Addr. A.T.&T. Co. Calls London and Paris daytime.
26.100	GSK	DAVENTRY, ENG., 11.49 m., Addr. B.B.C., London. Operates irregularly.	19.200	ORG	RUYSSELEDE, BELGIUM , 15.62 m. Calls OPL mornings.
25.950	W6XKG	LOS ANGELES, CAL., 11.56 m., Addr. B. S. McGlashan, Wash. Blvd. at Oak St. Relays KGFJ 24 hours daily.	19.160	GAP	RUGBY, ENG. , 15.66 m. Calls Australia 1-8 am.
21.550	GST	DAVENTRY, ENG., 13.92 m., Addr. (See 26.100 mc.) Irregular at present.	19.020	HSBPJ	BANGKOK, SIAM , 15.77 m. Mondays 8-10 am.
21.540	W8XK	PITTSBURGH, PA., 13.93 m., Addr. Grant Bldg. Relays KDKA 6.45-9 am. Exc. Sun.	18.970	GAQ	RUGBY, ENG. , 15.81 m. Calls S. Africa mornings.
21.530	GSJ	DAVENTRY, ENG., 13.93 m., Addr. (See 26.100 mc.) 5.45 am.-12 n.	18.890	ZSS	KLIPHEUVEL, S. AFRICA , 15.88 m., Addr. Overseas Comm. of S. Africa, Ltd. Calls GAU 6.30-7 am.
21.520	W2XE	NEW YORK CITY, 13.94 m., Addr. Col. Broad. Syst., 485 Madison Ave. Sun. 7 am.-12 n.	18.830	PLE	BANDOENG, JAVA , 15.93 m. Calls Holland 6-11 am.
21.500	W2XAD	SCHENECTADY, N. Y., 13.95 m., General Electric Co., 7 11 am.	18.680	OCI	LIMA, PERU , 16.06 m. Tests with Bogota, Col.
21.470	GSH	DAVENTRY, ENG., 13.97 m. (See 26.100 mc.), 5.45 am.-12 n.	18.620	GAU	RUGBY, ENG. , 16.11 m. Calls N. Y. daytime. Calls ZSS 6.30-7 am.
21.450	DJS	BERLIN, GERMANY, 13.99 m., Addr., Broadcasting House. 12.05-11 am.	18.480	HBH	GENEVA, SWITZERLAND , 16.26 m., Addr. Radio Nations. Sun., 10.45-11.30 am.
21.420	WKK	LAWRENCEVILLE, N. J., 14.01 m., Addr. Amer. Tel. & Tel. Co. Calls S. Amer. 7 am.-7 pm.	18.345	FZS	SAIGON, INDO-CHINA , 16.35 m. Works Paris early morning.
21.080	PSA	RIO DE JANEIRO, BRAZ., 14.23 m., Calls WKK daytime.	18.340	WLA	LAWRENCEVILLE, N. J. , 16.36 m., Addr. A.T.&T. Co. Calls England daytime.
21.060	WKA	LAWRENCEVILLE, N. J., 14.25 m., Addr. (See 21.420 mc.) Calls England morning and afternoon.	18.310	GAS	RUGBY, ENG. , 16.38 m. Calls N.Y. daytime.
21.020	LSN6	BUENOS AIRES, ARG., 14.27 m., Addr. Cia. Internacional de Radio. Works N.Y.C. 7 am.-7 pm.	18.299	YVR	MARACAY, VENEZ. , 16.39 m. Works Germany mornings.
20.860	EHY-EDM	MADRID, SPAIN, 14.38 m., Addr. Cia Tel. Nacional de Espana. Works S. Amer. 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	Mc.	Call
17.810	—	17.810	ROME, ITALY, 16.84 m., Addr. (See 2RO, 11.81 mc.) Relays 2RO to 6 pm. irregularly.
17.800	TGWA	17.800	GUATEMALA CITY, GUAT. , 16.84 m., Addr. Ministre De Fomento. Irregular.
17.790	GSG	17.790	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	17.785	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	17.780	BOUND BROOK, N. J. , 16.87 m., Addr. Natl. Broad. Co. 8 am.-8 pm.
17.770	PHI2	17.770	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	17.765	PARIS, FRANCE , 16.88 m. Addr. (See 15.245 mc.) 8.30-10 am.
17.760	DJE	17.760	BERLIN, GERMANY , 16.89 m., Addr. Broadcasting House. 12.05-10 am.; also Sun. 11.10 am.-12.25 pm.
17.760	W2XE	17.760	NEW YORK, N. Y. , 16.89 m., Addr. Col. Broad. System, 485 Madison Ave. Daily exc. Sun. 6.30-9 am.
17.755	ZBWS	17.755	HONGKONG, CHINA , 16.9 m., Addr. P.O. Box 200. 4-10 am. Irregular.

End of Broadcast Band

17.741	HSP	17.741	BANGKOK, SIAM , 16.91 m. Works Germany 6-7 am., 8-9 pm. Works JVE 11 pm.-6 am.
17.650	XGM	17.650	SHANGHAI, CHINA , 17 m. Works London 7-9 am.
17.520	DFB	17.520	NAUEN, GERMANY , 17.12 m. Works S. America, near 9.15 am. Works Siam 6-7 am., 8-9 pm.
17.480	VWY2	17.480	KIRKEE, INDIA , 17.16 m. Works London 7.30-8.30 am.
17.310	W2XGB	17.310	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	FZEB	17.280	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	17.120	OCEAN GATE, N. J. , 17.52 m., Addr. A.T.&T.Co. Works ships irregularly.
17.080	GBC	17.080	RUGBY, ENG. , 17.56 m. Works ships irregularly.
16.835	ITK	16.835	MOGADISCIO, ITAL. SOMALILAND , 18.32 m. Calls IAC around 9.30 am.
16.270	WLK	16.270	LAWRENCEVILLE, N. J. , 18.44 m., Addr. A.T.&T. Co. Works S. Amer. daytime.
16.270	WOG	16.270	OCEAN GATE, N. J. , 18.44 m., Addr. A.T.&T. Co. Works England late afternoon.
16.240	KTO	16.240	MANILA, P. I. , 18.47 m., Addr. RCA Comm. Works Japan and U. S. 5-9 pm. and early am. irreg.
16.233	FZR3	16.233	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	15.880	ST. ASSISE, FRANCE , 18.9 m. Works Saigon 6-9 am.
15.865	CEC	15.865	SANTIAGO, CHILE , 18.91 m. Calls Peru daytime irregular.
15.810	LSL	15.810	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

Goes to

Albert C. Uthe

W2JZO, New York, N. Y.

For best HAM STATION

Photo of the Month



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

● 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.

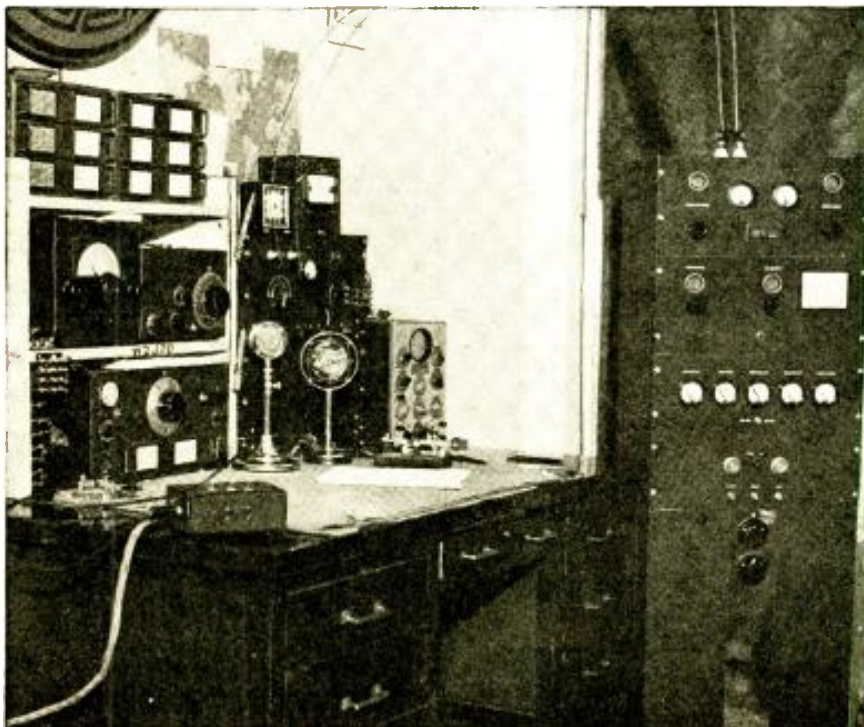
Although the station is rarely on the air more than three or four hours each week, yet, during the first year his log indicated over 750 contacts on five meters alone. During the year just ending, he has made

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.



This beautiful silver trophy stands 11 $\frac{3}{4}$ " 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.

A Triplet 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	Mc.	Call	Mc.	Call
15.660	JVE	NAZAKI, JAPAN, 19.16 m. Works Java and Siam early am.	15.160	YUD3	DELHI, INDIA, 19.79 m., Addr. All India Radio. 1.30-3.30 am., 8.30-10.30 pm.
15.620	JVF	NAZAKI, JAPAN, 19.2 m. Works Cal. near 5 am. and 8 pm.	15.155	SM5SX	STOCKHOLM, SWEDEN, 19.79 m., Daily 11 am.-5 pm., Sun. 9 am.-5 pm.
15.550	CO9XX	TUINICU, ORIENTE, CUBA, 19.29 m., Addr. Frank Jones, Central Tuinicu, Tuinicu, Santa Clara. Broadcasts irregularly evenings.	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.
15.450	IUG	ADDIS ABABA, ETHIOPIA, 19.44 m., Works Rome 9-10.30 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.
15.415	KWO	DIXON, CALIF., 19.46 m., Addr. A. T. & T. Co. Works Hawaii 2-7 pm.	15.130	TPB6	PARIS, FRANCE, 19.83 m., Addr. "Paris Mondial," 98 Bis Blvd. Haussmann. 6-8.15 pm.
15.370	HAS3	BUDAPEST, HUNGARY, 19.52 m., Addr. Radiolabor, Gyali Ut 22. Sun. 9-10 am.	15.130	WIXAL	BOSTON, MASS., 19.83 m., Addr. World-Wide 'B'cast'g Foundation. University Club. 10-11 am., Mon.-Fri.
15.360	DZG	ZEESEN, GERMANY, 19.53 m., Addr. Reichspostzentralamt. Tests irregularly.	15.120	HVJ	VATICAN CITY, 19.83 m., 10.30-10.45 am., except Sun., Sat. 10-10.45 am.
15.355	KWU	DIXON, CALIF., 19.53 m., Addr. A.T.&T. Co. Phones Pacific Isles and Japan.	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.
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.	15.080	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.
15.330	W2XAD	SCHENECTADY, N. Y., 19.56 m., Addr. General Electric Co. Relays WGY 11.30 am.-6 pm.	End of Broadcast Band		
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.	15.055	WNC	HIALEAH, FLORIDA, 19.92 m., Addr. A.T.&T. Co. Calls Central America daytime.
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.	14.980	KAY	MANILA, P. I., 20.03 m., Addr. RCA Comm. Works Pacific Is. Mornings.
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.	14.960	PSF	RIO DE JANEIRO, BRAZIL, 20.05 m., Works with Buenos Aires daytime.
15.300	—	ROME, ITALY, 19.61 m., Addr. (See 2RO, 11.81 mc.) Relays 2RO to 9 pm. irregularly.	14.950	HJB	BOGOTA, COL., 20.07 m. Calls WNC daytime.
15.290	LRU	BUENOS AIRES, ARG., 19.62 m., Addr. El Mundo. Relays LRI, 7-9 am.	14.940	PSE	RIO DE JANEIRO, BRAZIL, 20.08 m., Broadcasts Wed. 3.45-4.15 pm.
15.280	HIX3	CIUDAD TRUJILLO, D. R., 19.63 m., Relays HIX Sun. 7.40-10.40 am. Weekdays 12.10-1.10 pm.	14.940	HII	CIUDAD TRUJILLO, D. R., 20.08 m. Phones WNC daytime.
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.	14.940	HJA3	BARRANQUILLA, COL., 20.08 m. Works WNC daytime.
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.	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.
15.260	GSI	DAVENTRY, ENG., 19.66 m., Addr. (See 26.100 mc.) 12.17-4, 9.17-11.20 pm.	14.845	OCJ2	LIMA, PERU, 20.21 m. Works South America stations daytime.
15.252	RIM	TASHKENT, U.S.S.R., 19.67 m. Works RKI near 7 am.	14.790	ROU	OMSK, SIBERIA, U.S.S.R., 20.28 m. Works Moscow irregularly 7-9 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.	14.730	IQA	ROME, ITALY, 20.37 m. Broadcasts 6-9 pm. irregular.
15.245	TPA2	PARIS, FRANCE, 19.68 m., Addr. 98 Bis Blvd. Haussmann. "Paris Mondial" 5-10 am.	14.653	GBL	RUGBY, ITALY, 20.47 m. Works JVH 1-7 am.
15.230	HS8PJ	BANGKOK, SIAM, 19.7 m. Irregularly Mon. 8-10 am.	14.640	TYF	PARIS, FRANCE, 20.49 m. Works Saigon and Cairo 3-7 am, 12 n.-2.30 pm.
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.	14.600	JVH	NAZAKI, JAPAN, 20.55 m. Broadcasts irregularly 5-11.30 pm. Works Europe 4-8 am.
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.	14.590	WMN	LAWRENCEVILLE, N. J., 20.56 m., Addr. A.T.&T. Co. Works England morning and afternoon.
15.210	W8XK	PITTSBURGH, PA., 19.72 m., Addr. (See 21.540 mc.) 9 am.-7 pm.	14.535	HBJ	GENEVA, SWITZERLAND, 20.64 m., Addr. Radio Nations. Broadcasts Sun. 1.45-2.30 pm., Mon. 1.30-1.45 am.
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.	14.530	LSN	BUENOS AIRES, ARG., 20.65 m., Addr. (See 20.020 mc.) Works N. Y. C. afternoons.
15.190	ZBW4	HONGKONG, CHINA, 19.75 m., Addr. P. O. Box 200. Irregular. 11.30 pm. to 1.15 am., 3-10 am., 4.15-6, 6.17-9 pm.	14.500	LSM2	BUENOS AIRES, ARG., 20.69 m., Addr. (See 21.020 mc.) Works Rio and Europe daytime.
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.	14.485	TIR	CARTAGO, COSTA RICA, 20.71 m. Works Central America and U. S. A. daytime.
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.	14.485	YSL	SAN SALVADOR, SALVADOR, 20.71 m. Irregular.
15.160	XEWW	MEXICO CITY, MEXICO, 19.79 m., 12 n.-12 m., irregular.	14.485	HPF	PANAMA CITY, PANAMA, 20.71 m. Works WNC daytime.
15.160	JZK	TOKYO, JAPAN, 19.79 m. 12.30-1.30 am., 4.30-5.30, 6-6.30 pm.	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.	14.460	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.
14.440	PIIJ	DORDRECHT, HOLLAND, 21.15 m., Addr. (See 7.088 mc.) Sat. 12 n.-12.30 pm.	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.	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.	13.990	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.	13.820	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.	13.690	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.	13.635	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.	13.630	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.	13.585	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.	13.415	GCJ	RUGBY, ENG., 22.36 m. Works Japan and China early morning.
13.410	YSJ	SAN SALVADOR, SALVADOR, 22.37 m. Works WNC daytime.	13.410	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.	13.390	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.	13.380	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.	13.350	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.	13.345	YVQ	MARACAY, VENEZUELA, 22.48 m. Works WNC daytime.
13.285	CGA3	DRUMMONDVILLE, QUE., CAN., 22.58 m. Works London and ships afternoons.	13.285	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.	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.	12.870	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.	12.862	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.	12.840	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.	12.830	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.	12.800	IAC	PISA, ITALY, 23.45 m. Works Italian ships mornings.
12.780	GBC	RUGBY, ENG., 23.47. Works ships irregularly.	12.780	GBC	RUGBY, ENG., 23.47. Works ships irregularly.
12.325	DAF	NORDDEICH, GERMANY, 24.34 m. Works German ships daytime.	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.	12.290	GBU	RUGBY, ENG., 24.41 m. Works N. Y. C. evenings.
12.250	TYB	PARIS, FRANCE, 24.49 m. Irregular.	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.	12.235	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.	12.215	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.	12.200	—	TRUJILLO, PERU, 24.58 m., "Rancho Grande." Address Hacienda Chiclin. Irregular.
12.150	GBS	RUGBY, ENG., 24.69 m. Works N. Y. C. evenings.	12.150	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.	12.130	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.	12.120	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	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.	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.	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.

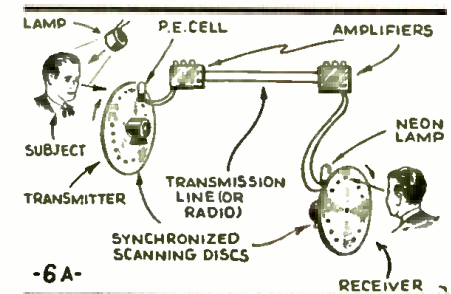
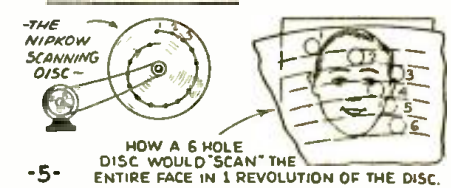
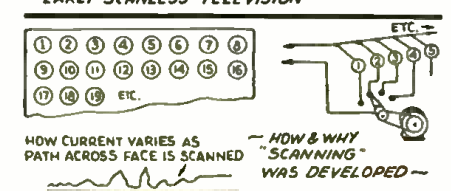
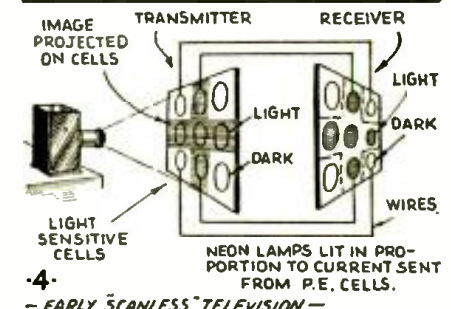
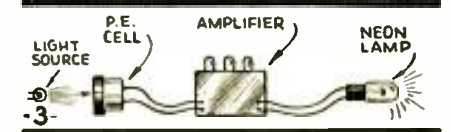
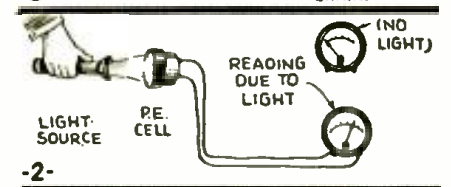
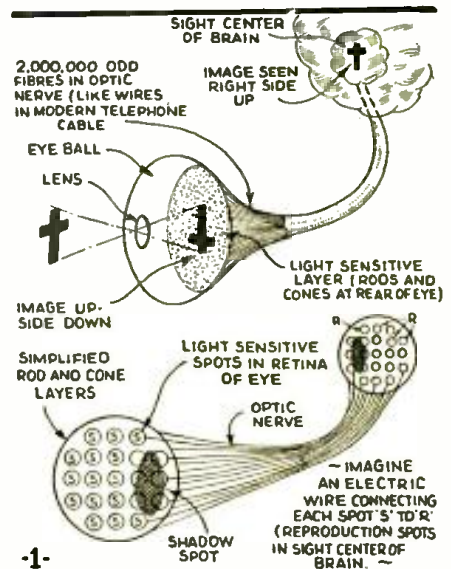
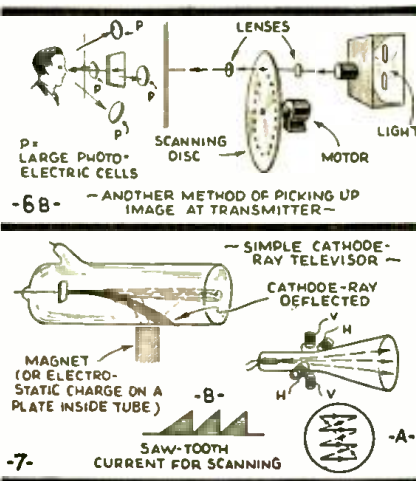
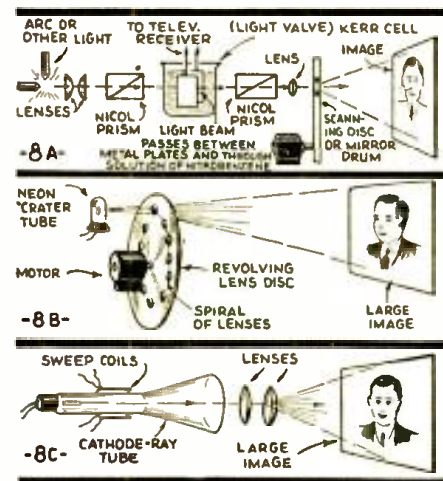
The optic nerve carries the image flashed on the retina to the sight-center in the brain, at which point we mentally perceive

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		Mc.	Call		Mc.	Call	
11.970	H12X	CIUDAD TRUJILLO, D. R., 25.07 m., Addr. La Voz de Hispanioia. Relays HIX Tue. and Fri. 8-10-10.10 pm.	11.740	COCX	HAYANA, CUBA, 25.55 m., P. O. Box 32. 6.55 am.-1 am. Sun. till 12 m. Relays CMX.	10.550	WOK	LAWRENCEVILLE, N. J., 28.44 m., Addr. A.T.&T. Co. Works S. A. nights.
11.955	IUC	ADDIS ABABA, ETHIOPIA, 25.09 m. Works IAC around 12 m.	11.740	HVJ	VATICAN CITY, 25.55 m. Testing irregular.	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.
11.950	KKQ	BOLINAS, CALIF., 25.1 m. Tests irregularly evenings.	11.730	XETA	MONTEREY, MEX. 25.57 m., Addr. Box 203. Relays XET, 12 n.-2 pm.	10.520	VLK	SYDNEY, AUSTRALIA, 28.51 m., Addr. Amalgamated Wireless of Australasia Ltd. Works England 1-6 am.
11.940	FTA	STE. ASSISE, FRANCE, 25.13 m. Works Morocco mornings and Argentina late afternoon.	11.730	PHI	HUIZEN, HOLLAND, 25.57 m., Addr. N. V. Philips' Radio.	10.430	YBG	MEDAN, SUMATRA, 28.76 m. Calls Java 5.30-6.30 am.
25 Met. Broadcast Band			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.	10.410	PKD	KOOTWIJK, HOLLAND, 28.8 m. Works Java 7.30-9.40 am.
11.910	CDI190	VALDIVIA, CHILE, 25.2 m., P. O. Box 642. Relays CB69 10 am.-1 pm., 11 am.-10 pm.	11.720	CJRX	WINNIPEG, CANADA, 25.6 m., Addr. James Richardson & Sons, Ltd. Daily 6 pm.-12 m., Sun. 5-10 pm.	10.410	KES	BOLINAS, CALIF., 28.8 m., Addr. RCA Communications. Irregular.
11.900	TPA3	PARIS, FRANCE, 25.21 m., Addr. (See 15.245 mc.) 1-4 am., 10.15 am.-5 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.	10.370	JVO	NAZAKI, JAPAN, 28.93 m. Works TDE 3-8 am.
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.	11.715	TPA4	PARIS, FRANCE, 25.61 m., (See 15.245 mc.) 6-8.15 pm., 8.30-11 pm.	10.370	EAJ43	TENERIFFE, CANARY ISLANDS, 28.93 m. Relays Salamanca, Spain, 2-4, 5-9.45 pm.
11.895	HP51	AGUADULCE, PANAMA, 25.22 m. Addr. La Voz del Interior. 7.30-9.30 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.	10.350	LSX	BUENOS AIRES, ARG., 28.98 m., Addr. Transradio International. Tests irregularly.
11.885	TPB7	PARIS, FRANCE, 25.24 m. (See 15.245 mc.) 8.30-11 pm.	11.710	YSM	SAN SALVADOR, EL SALVADOR, 25.63 m., Addr. (See 7.894 mc.) Irregular 1.30-2.30 pm.	10.330	ORK	RUYSSELEDE, BELGIUM, 29.04 m. Broadcasts 1.30-3 pm. Works OPM 1-3 am., 3-5 pm.
11.870	W8XK	PITTSBURGH, PA., 25.26 m., Addr. (See 21.540 mc.) 7-11 pm.	11.700	HP5A	PANAMA CITY, PAN., 25.65 m. Addr. Radio Teatro, Apartado 954. 10 am.-10 pm.	10.300	LSL2	BUENOS AIRES, ARG., 29.13 m., Addr. Cia. Internacional de Radio. Works Europe evenings.
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.	11.700	CB1170	SANTIAGO, CHILE, 25.65 m. Addr. P.O. Box 706. Relays CB89 6 pm.-12 m.	10.290	DZC	ZEESEN, GERMANY, 29.16 m., Addr. (See 15.360 mc.) Irregular.
11.860	GSE	DAVENTRY, ENG., 25.29 m., Addr. (See 26.100 mc.) Irregular.	End of Broadcast Band			10.260	PMN	BANDOENG, JAVA, 29.24 m. Relays YDB 5.30-10.30 or 11 am., Sat to 11.30 am.
11.855	DJP	BERLIN, GERMANY, 25.31 m., Addr. (See 15.280 mc.) Irregular 11.35 am.-4, 7-10.45 pm.	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.	10.250	LSK3	BUENOS AIRES, ARG., 29.27 m., Addr. (See 10.310 mc.) Works Europe and U.S.A. afternoons and evenings.
11.840	KZRM	MANILA, P. I., 25.35 m. Addr. Erlanger & Gallinger, Box 283. 9 pm.-10 am. Irregular.	11.680	KIO	KAHUKU, HAWAII, 25.68 m., Addr. RCA Comm. Irregularly.	10.230	CED	ANTOFAGASTAN, CHILE, 29.33 m. Tests 7-9.30 pm.
11.840	CSW	LISBON, PORT., 25.35 m. Nat'l Broad. Station. 11.30 am.-1.30 pm. Irregular.	11.595	VRR4	STONY HILL, JAMAICA, B. W. I., 25.87 m. Works WNC daytime.	10.220	PSH	RIO DE JANEIRO, BRAZIL, 29.35 m., Addr. Box 709. Broadcasts 6-9 pm.
11.840	OLR4A	PRAGUE, CZECHOSLOVAKIA, 25.35 m., Addr. Czech Shortwave Sta., Praha XII, Fochova 16. Daily 1.55-4.40 pm.	11.560	VIZ3	FISKDALE, AUSTRALIA, 25.95 m., Addr. Amalgamated Wireless of Australasia Ltd. Tests irregularly.	10.160	RIO	BAKOU, U.S.S.R., 29.5 m. Works Moscow 10 pm.-7.30 am.
11.830	W9XAA	CHICAGO, ILL., 25.36 m., Addr. Chicago Federation of Labor. Irregular 7 am.-6 pm.	11.530	SPD	WARSAW, POLAND, 26 m., Addr. 5 Mazowiecka St. 6-8 pm., Sat. & Sun. 6-9 pm.	10.140	OPM	LEOPOLDVILLE, BELGIAN CONGO, 29.59 m. Works Belgium 1-3 am. and 3-5 pm.
11.830	W2XE	NEW YORK CITY, 25.36 m., Addr. Col. Broad. System, 485 Madison Av., N.Y.C. 5.30-10 pm.	11.500	XAM	MERIDA, YUCATAN, 26.09 m. Irregular 1-7.30 pm.	10.080	RIR	TIFLIS, U.S.S.R., 29.76 m. Works Moscow 12 m.-8 am.
11.826	XEBR	HERMOSILLA, SON., MEX., 25.37 m., Addr. Box 68, Relays XE8H. 1-4 pm., 9 pm.-12 m.	11.500	PMK	BANDOENG, JAVA, 26.09 m. Tests irregularly.	10.065	TDE	SHINKYO, MANCHUKUO, 29.81 m. Works JVO 3-8 am.
11.820	GSN	DAVENTRY, ENG., 25.38 m., Addr. (See 26.100 mc.) Irregular.	11.413	CJA4	DRUMMONDVILLE, QUE., CAN., 26.28 m. Tests irregularly.	10.055	ZFB	HAMILTON, BERMUDA, 29.84 m. Works N.Y.C. irregular.
11.810	ZRO	ROME, ITALY, 25.4 m., Addr. E.I.A.R., Via Montello 5. Daily 5-8.45 am., 10 am.-9 pm.	11.402	HBO	GENEVA, SWITZERLAND, 26.31 m., Addr. Radio Nations. Sun. 7-7.45 pm., Mon. 1-1.15 am.	10.055	SUV	ABOU ZABAL, EGYPT, 29.84 m. Works Europe 1-6 pm.
11.805	COGF	MATANZAS, CUBA, 25.41 m., Addr. Gen. Betancourt 51. Relays CMGF. 2-3, 4-5, 6-11 pm.	11.050	ZLT4	WELLINGTON, NEW ZEALAND, 27.15 m. Works Australia and England early morning.	10.042	DZB	ZEESEN, GERMANY, 29.87 m., Addr. Reichspostzentralamt. Irregular.
11.805	OZG	SKAMLEBOAEG, DENMARK, 25.41 m., Addr. Statsradionien. Irreg.	11.040	CSW	LISBON, PORTUGAL, 27.17 m., Addr. Nat. Broad. Sta. 1.30-5 pm.	9.990	KAZ	MANILA, P. I., 30.03 m., Addr. RCA Communications. Works Java early morning.
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.	11.000	PLP	BANDOENG, JAVA, 27.27 m. Relays YDB. 6-7.30 p.m., 5.30-10.30 or 11 am. Sat. until 11.30 am.	9.980	COBC	HAYANA, CUBA, 30.04 m., Addr. P. O. Box 132. Relays CMBC 6:55 a.m.-12:30 a.m.
11.795	DJO	BERLIN, GERMANY, 25.43 m., Addr. (See 15.280 mc.) 7.15-11 pm.	10.970	OCI	LIMA, PERU, 27.35 m. Works Bogota, Col., evenings.	9.950	GCU	RUGBY, ENGLAND, 30.15 m. Works N.Y.C. night time.
11.790	—	VIENNA, AUSTRIA, 25.45 m. Irreg.	10.960	—	TANANARIVE, MADAGASCAR, 27.36 m., Addr. (See 9.53 mc.) 12.30-45, 3.30-4.30, 10-11 am.	9.940	JDY	DAIREN, MANCHUKUO, 30.18 m. Relays JOAK daily 7-8 am. Works Tokyo occasionally in early am.
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.	10.910	KTR	MANILA, P. I. 27.41 m. Phones ships 6-10 am.	9.930	HKB	BOGOTA, COL., 30.21 m. Works Rio evenings.
11.780	HP5G	PANAMA CITY, PAN., 25.47 m., Addr. Box 1121. Heard till 12 m.	10.840	KWV	DIXON, CALIF., 27.68 m., Addr. A.T.&T. Co. Works with Hawaii evenings.	9.890	LSN	BUENOS AIRES, ARG., 30.33 m., Addr. (See 10.300 mc.) Works N.Y.C. evenings.
11.770	DJD	BERLIN, GERMANY, 25.49 m., Addr. (See 15.280 mc.) 10.40 am.-4.30 pm., 4.50-11 pm.	10.770	GBP	RUGBY, ENGLAND, 27.85 m. Works Australia early morning.	9.870	WON	LAWRENCEVILLE, N. J., 30.4 m., Addr. A.T.&T. Co. Works England nights.
11.760	TGWA	GUATEMALA CITY, GUAT., 25.51 m. (See 17.8 mc.) Sun., Tues. and Thurs. 8 pm.-12 m.	10.740	JVM	NAZAKI, JAPAN, 27.93 m. Works U.S.A. 2-7 am.	9.865	COCM	HAYANA, CUBA, 30.41 m., Addr. Transradio Columbia, P. O. Box 33. 7 am.-12 m. Relays CMCM.
11.760	OLR4B	PRAGUE, CZECHOSLOVAKIA, 25.51 m., Addr. (See 11.840 mc.) Irregular.	10.680	PLQ	BANDOENG, JAVA, 28.09 m. Works Javanese Isles and other Asiatic phones 6-8.30 am.	9.860	EAQ	MADRID, SPAIN, 30.43 m., Addr. Post Office Box 951. 7.30-8, 8.40-9 pm.
11.750	GSD	DAVENTRY, ENG., 25.53 m., Addr. B.8.C., London. 12 m.-2.15 am., 12.17-4.00 pm., 6.17-8.30, 9.17-11.20 pm.	10.675	WNB	LAWRENCEVILLE, N. J., 28.1 m., Addr. A.T.&T. Co. Works with Bermuda irregularly.	9.830	IRF	ROME, ITALY, 30.52 m. Works Egypt afternoons. Relays ZRO, 6-9 pm.
			10.670	CEC	SANTIAGO, CHILE, 28.12 m. Irregular.	9.800	LSI	BUENOS AIRES, ARG., 30.61 m., Addr. (See 10.350 mc.) Tests irregularly.
			10.660	JVN	NAZAKI, JAPAN, 28.14 m. Broadcasts daily 2.8 am. Works Europe irregularly at other times.	9.790	GCW	RUGBY, ENGLAND, 30.64 m., Works N.Y.C. evenings.
			10.600	ZIK2	BELIZE, BRIT. HONDURAS, 28.25 m., Tues., Thurs., Sat. 7.30-7.45 pm.	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.

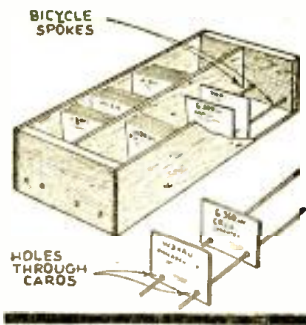
(Continued on page 220)

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

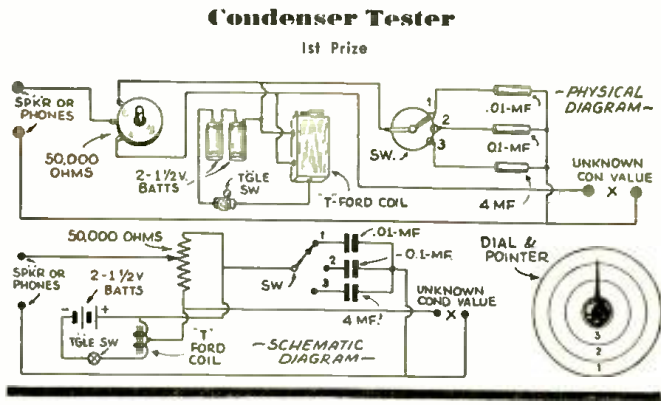
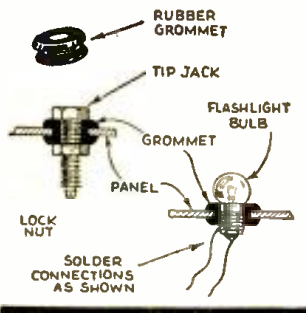


A very neat filing arrangement for QSL cards may be constructed from a few pieces of wood and four bicycle spokes. As shown in the sketch, each of the cards has two holes punched into it and is then slipped over the bicycle spokes. The bicycle spokes may easily be removed for adding new cards through 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 Tetrault.*

Grommets

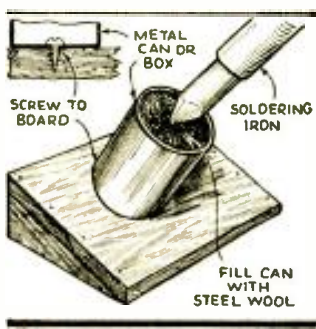
A simple rubber grommet can be used for a variety of purposes, a few of which are sketched. Insulating tip-jacks from metal panels is a simple matter, even if the fibre insulating washers have been lost. Secure a grommet through which the tip-jack will snugly pass, then drill a hole in the panel which 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, W8D1V.*



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.*

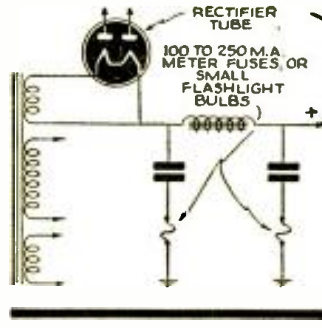


Iron Cleaner

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.*

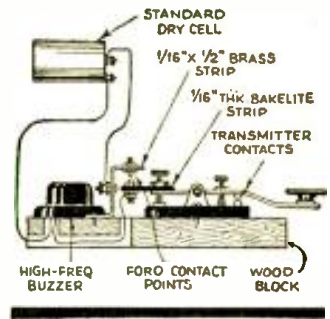
Cheap Insurance

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.*

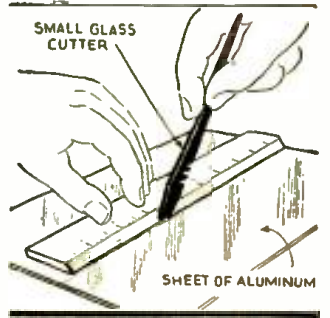


Monitor Key

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.*



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.*

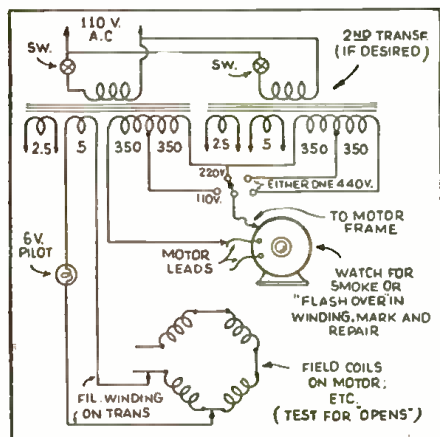
New Experiments with Radio Apparatus

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.

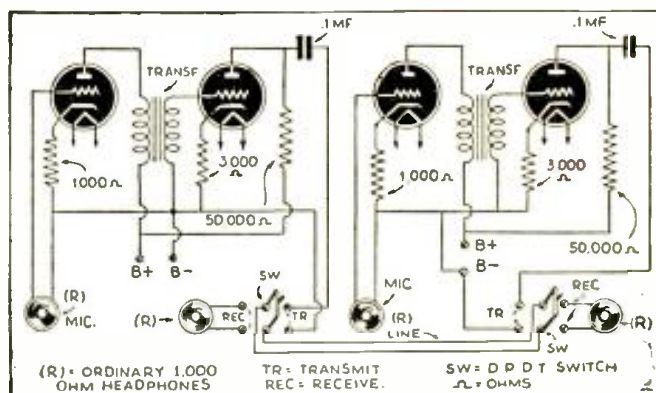
I might mention that it is possible to add a 6 volt pilot light in series with a 5 or 6 volt filament winding; this can be used to check coil sections, etc.—KENNETH GRAY.

Second Prize -- \$5.00

2-Way Phone

● A 2-WAY phone for office or home use can be readily constructed by fol-

lowing 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 resistor. The tubes should be biased, as indicated, in order to keep the plate current down to an economical limit.—HAYWOOD E. WEBB.



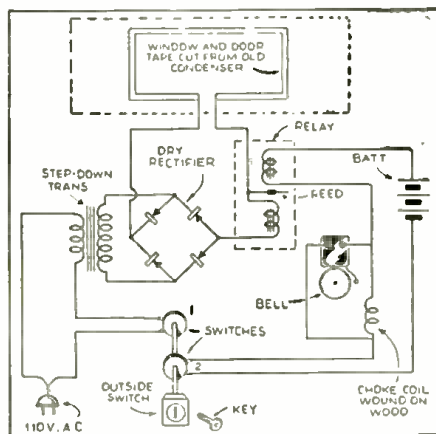
Simple 2-way phone made from radio parts.

tinuously 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 STEMPER.

Burglar Alarm



Burglar alarm useful for store, garage or home protection.

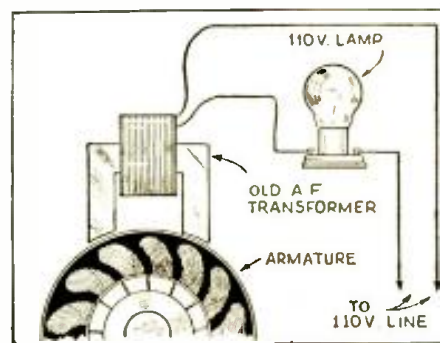
● HERE is a burglar alarm system that is quite effective.

- 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 con-

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. Genl. 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, CALIF., 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, CALIF., 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 PIJ1 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. Emisoría Diaria de Comercio. 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.

Mc. Call
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 YERA 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 Tenorio, "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 OAXIA 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.

Mc. Call
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 HI1A 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 H15N 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 ZP14 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 CX44 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)

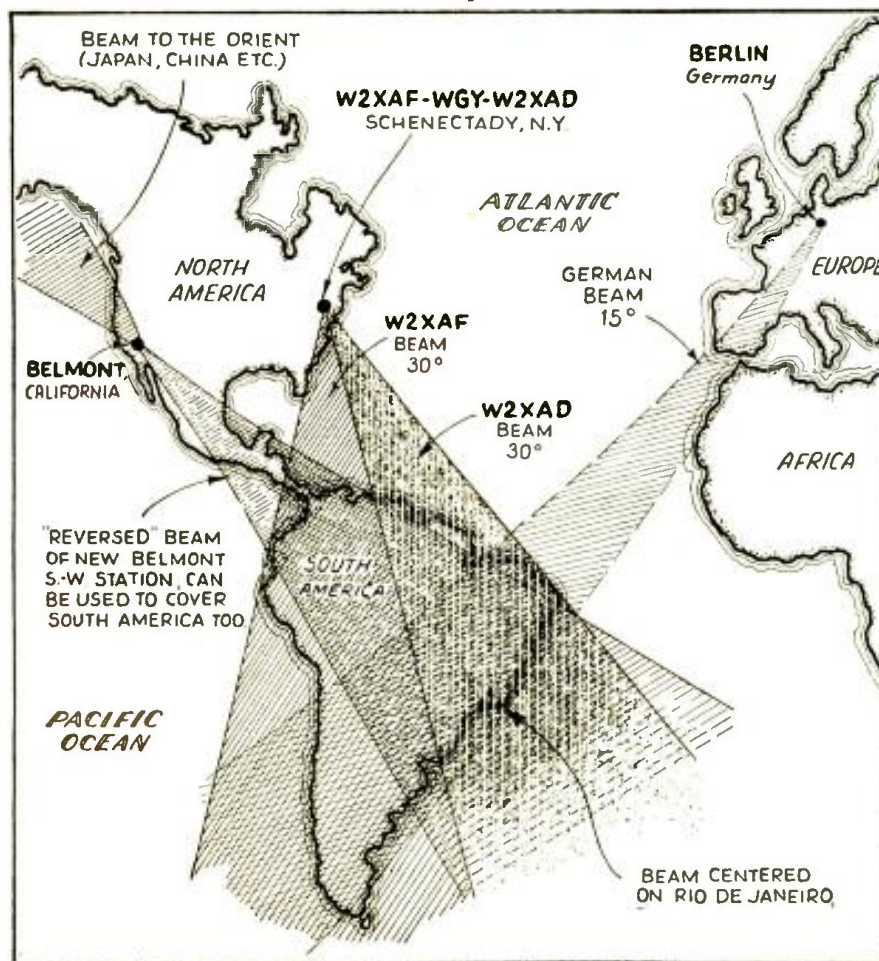
The Signal MUST Be Good!

Boyd W. Bullock

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.

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.



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

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.

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)

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.

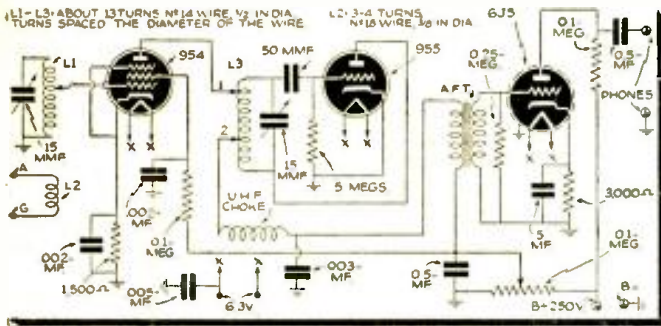
choke shown in series with the primary of the power transformer should be wound with wire capable of passing at least 2 amperes. There are commercial chokes of this type available, but they may be home-made, if desired, by winding 50 to 100 turns of No. 16 d.c.c. wire on a form about 1/2" in diameter.

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 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



5-Meter Acorn Tube Receiver—1143

and a 955 triode as a self-quenched super-regenerative detector. A 6K5 is used as a.f. amplifier.

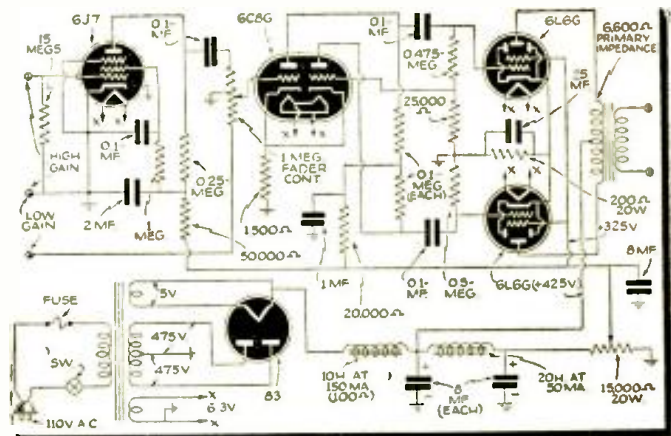
The tap on coil L1 should be adjusted for best results. Generally, the best position will be somewhere near the top end of the coil. Tap No. 1 on coil L3 should be located close to the grid end of the coil while tap 2 must be carefully adjusted to give best results. Ordinarily, it will be somewhere near 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 1/4" 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 Eleton, Bloomington, Ill.

It is not practical to increase the power output of the amplifier shown in the May, 1937, issue, without extensive rebuilding,



Beam Power A.F. Amplifier—1144

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 push-pull. 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.

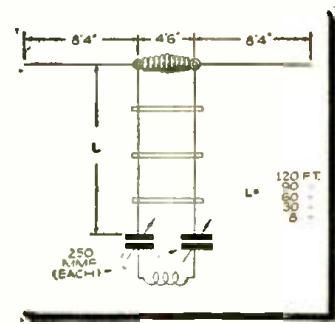
To realize the maximum output of this amplifier, it is essential that the regulation of the power transformer be very good. A small cheap transformer will reduce the undistorted power of the amplifier very considerably. It is also essential that the 10-henry choke coil have a resistance no greater than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

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.

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.



Antenna Tuner—1145

An Alignment Oscillator

for "Single-Sig." Receivers

Herman Yellin, W2AJL

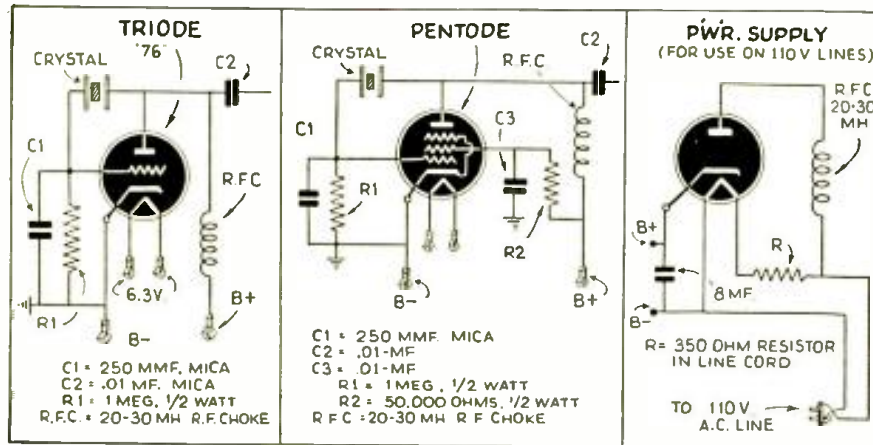
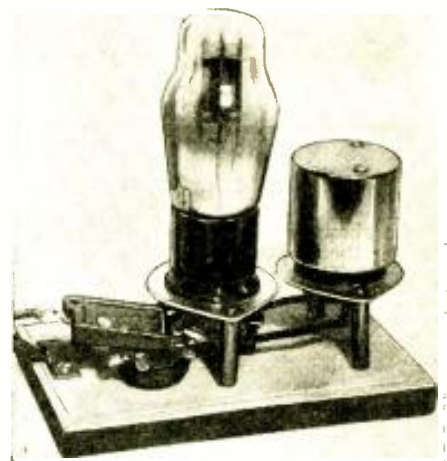


Diagram for triode and pentode oscillators with crystal and also hook-up of optional power-supply.



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

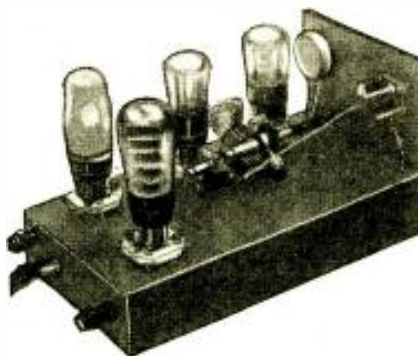
● IN one of the recent issues of *Television and Short-Wave World* (London) a small 4 tube receiver for the reception of ultra-high frequencies—especially the sounds which accompany the television broadcasts was shown.

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.

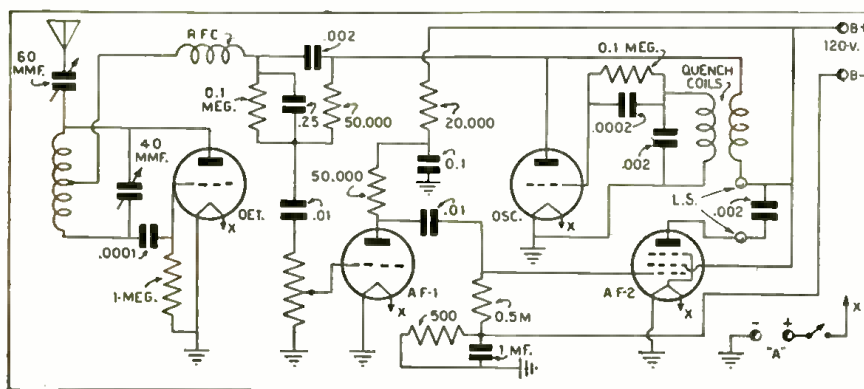
The tuning coil contains 6 turns of No. 14 bare copper wire wound to a diameter of 1 inch and tapped at the 4th turn from the grid end. The quench oscillator coils are the usual low-frequency type. Suitable coils for this purpose can be obtained from a number of makers of radio coils.

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 accom-

panies 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.



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.

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

● 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.

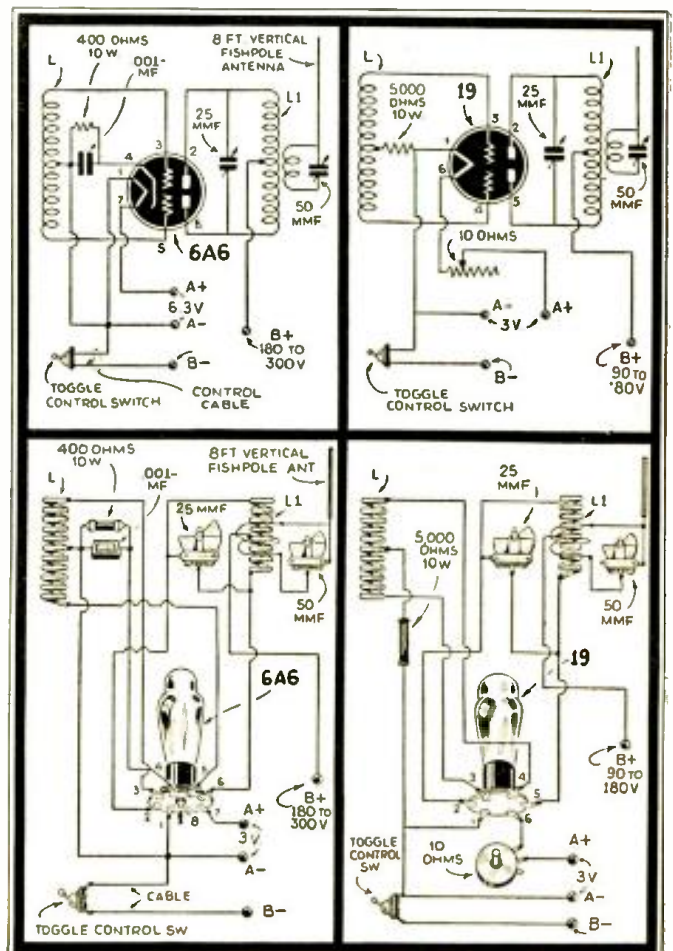
In the last few years tremendous interest has been aroused over the radio-controlling of working models of boats, autos and airplanes. These miniatures are prone to be tricky and get out of hand quite easily, especially when powered with small gas engines. Model boat builders usually tie their boats 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.

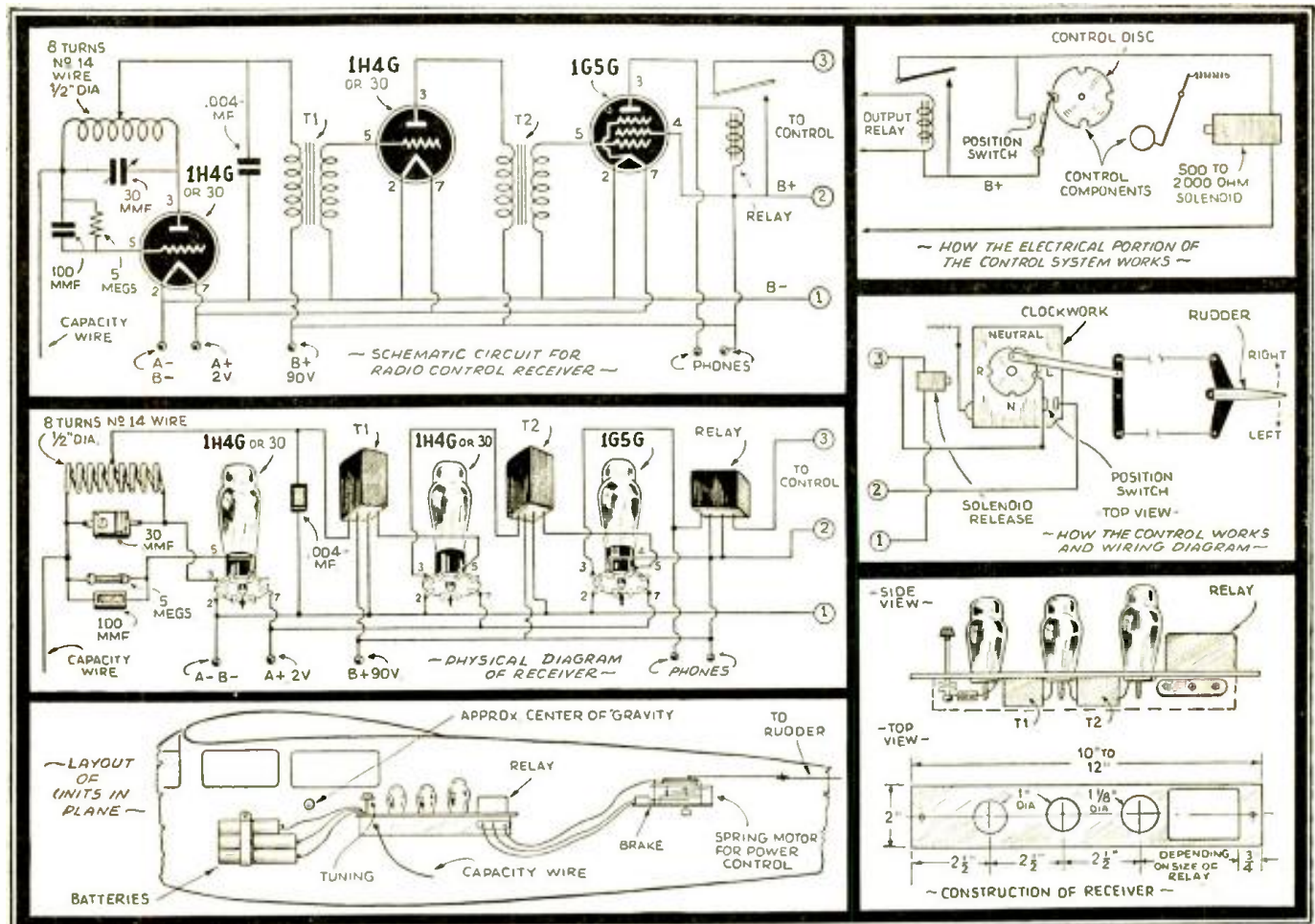
Every summer at Detroit there has been a *National Model Airplane Meet* in which contestants from all over the country compete for national honors. Not the least surprising in the contest of last year was the radio-control event, that stole the show and did so at every meet where it was shown.

The authors began and finished their entry in about a month,

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.

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.

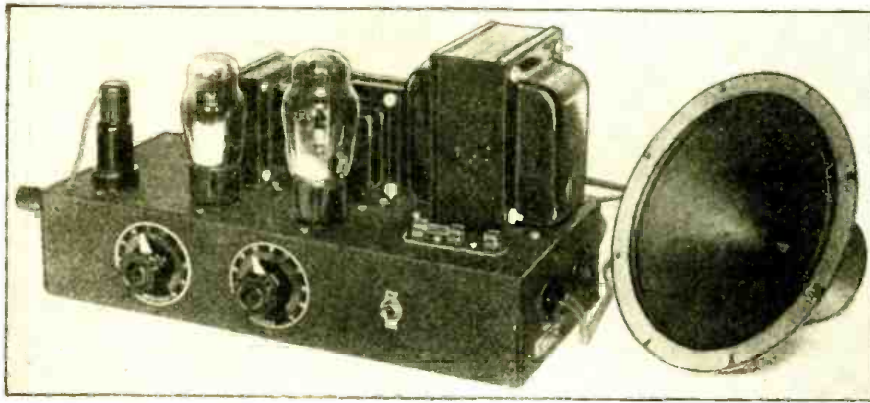
In this condition when no signal is applied to the grid, no change occurs in the plate voltage; and because it is drawing maximum current the relay should be closed. When operating normally the super-regeneration impressed on the grid as an a.c. voltage modulates the plate voltage, and there is less 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.

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.

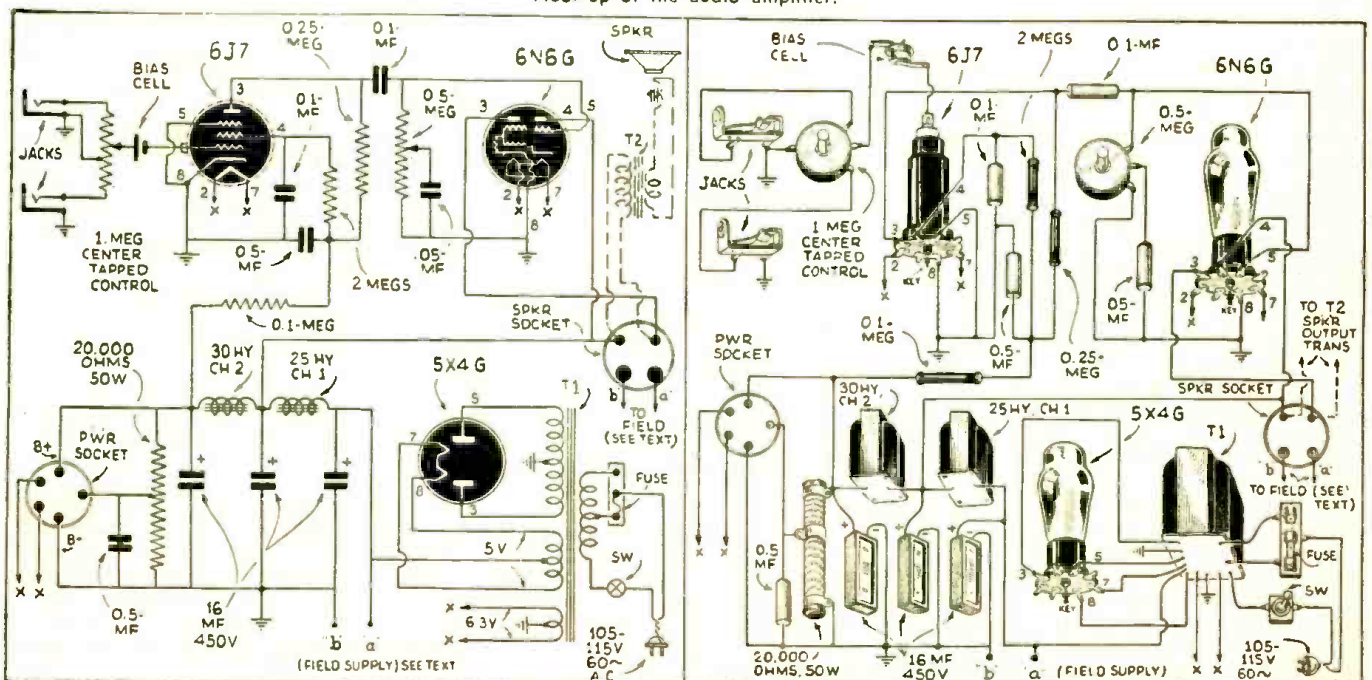
● THERE are many short-wave receivers in existence that have insufficient audio output to properly actuate a loud-speaker. Owners of such sets often desire to listen to dx stations on the speaker, not only for their own enjoyment but to enable their friends to enjoy their "catches." Most of these receivers 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

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.

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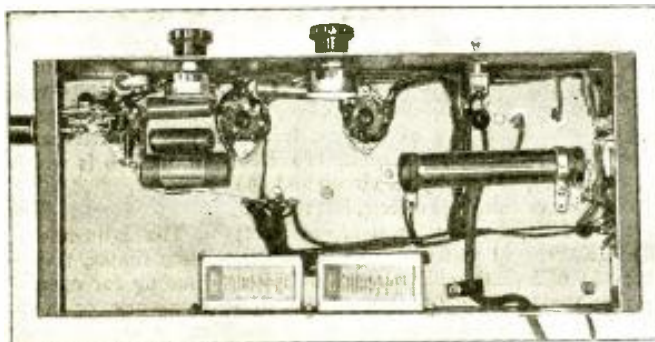
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Bottom view of Audio Frequency amplifier. The parts are mounted on a substantial chassis and the "fader" control enables the operator to use the amplifier for many different purposes.



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)



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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 8 3/4 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 re-

vamped, 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.

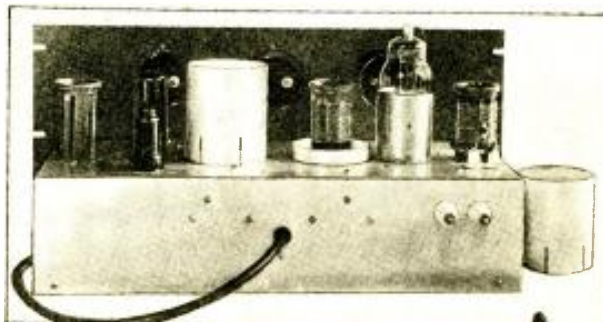
Construction Extremely Simple

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"

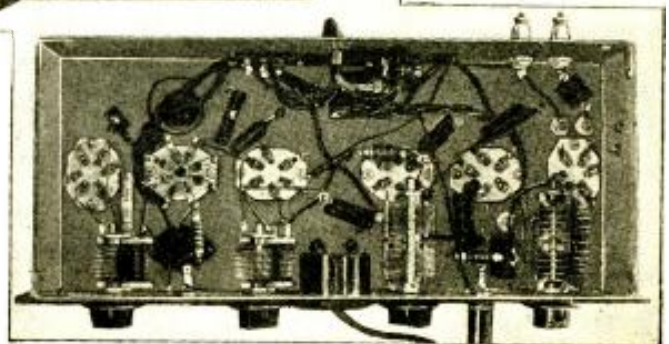
The adjustment of the transmitter is quite simple, taking only a few minutes to tune up for operation on either the crystal frequency or a harmonic. Using an 80 meter crystal, the tune-up procedure for 40 meter operation is as follows: Plug in the crystal and cathode coil and insert an open phone plug 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

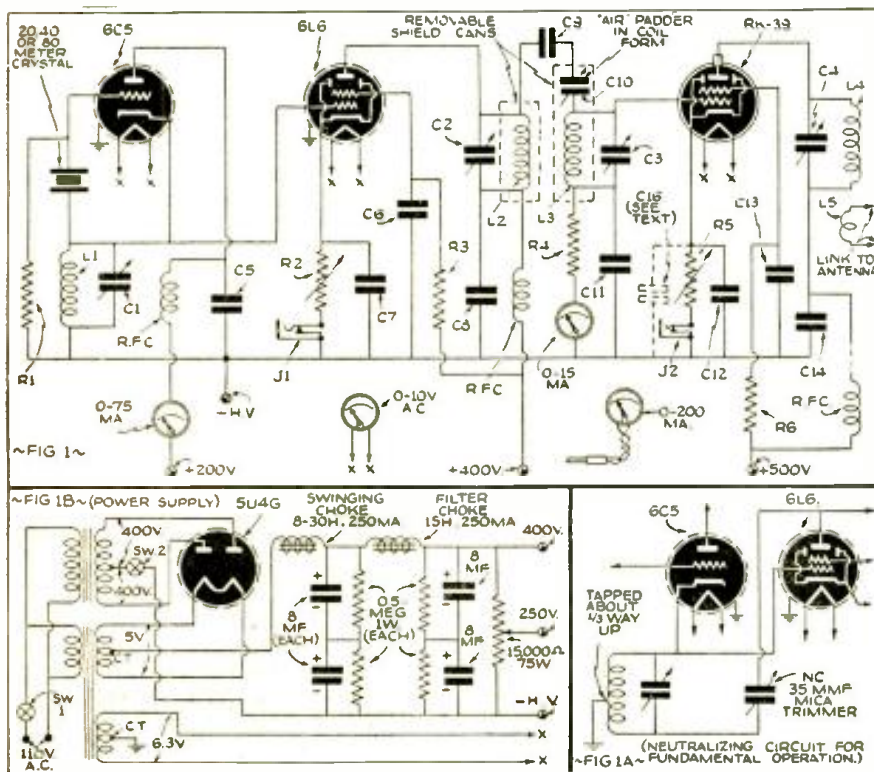
For 10 or 20 meter operation, the tune-up procedure is the same as outlined above, except that 10 or 20 meter coils would be used in the buffer-doubler and amplifier

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.



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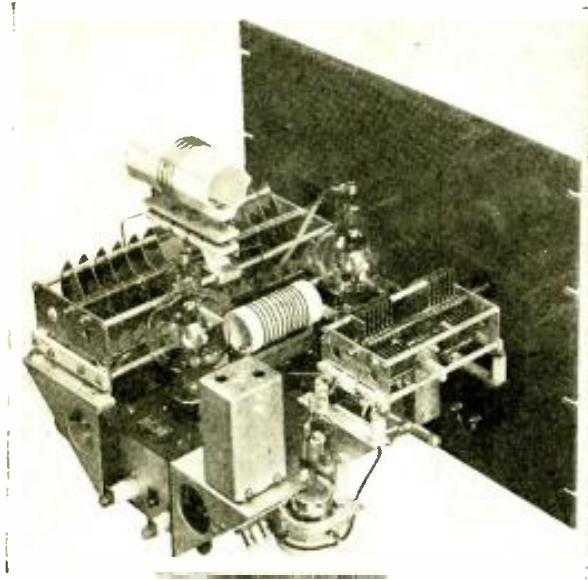
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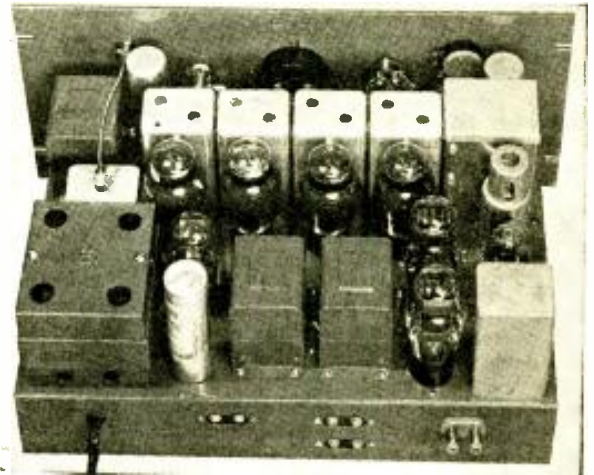
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What's New in S-W Apparatus

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)



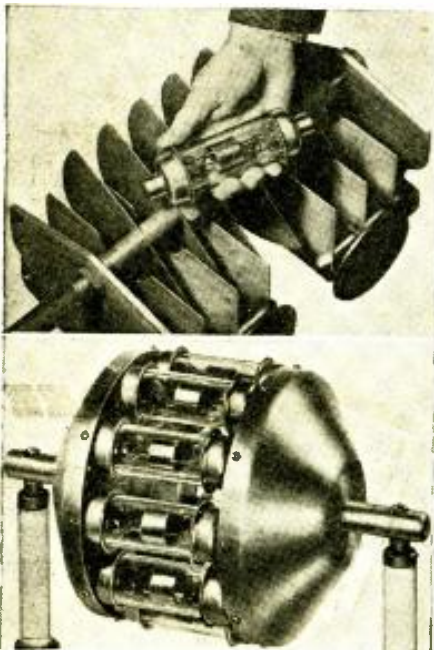
→ Right — New all-band crystal-controlled exciter, which comes complete with power supply and speech amplifier. (No. 720)

● 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 co-incident 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

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A 25z6g tube is used as the rectifier and is fully capable of supplying the power requirements of the set. A type k92a tube is used as the ballast to drop the filament supply to the proper voltage.

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A headphone jack is incorporated to permit the use of phones when desired which automatically cuts off the speaker when phones are plugged in.

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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 "side-band" 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)

FREE

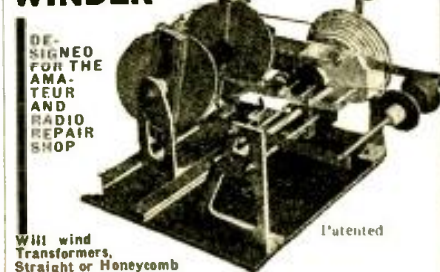
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One of these was a power increase to 100 kilowatts for both W2XAF and W2XAD. Another was for the use by W2XAD of two additional frequencies, 9550 kc. and 21,500 kc. Still a third was for permission to build an international broadcast station (the present 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 Alexander 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 W2NAF by Boyd W. Bullock, Assistant Manager of Broadcasting, General Electric Company, Schenectady, N. Y.)

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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.

Aurora, Sun-spots and Radio

(Continued from page 199)

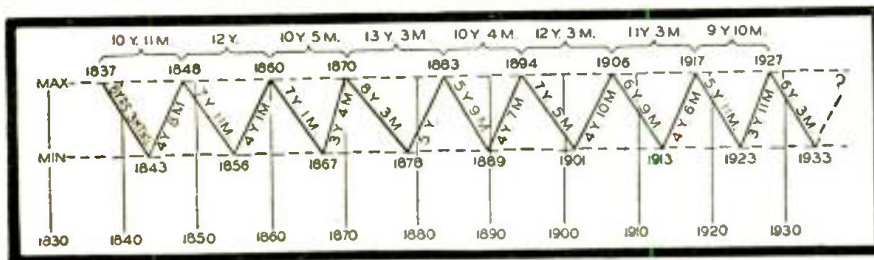
Radio Reception at Times of "Sunspot Minimum"

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 super-heterodyne 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.

usually 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.



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 un-

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. 87).

(Continued on page 238)

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Aurora, Sun-spots and Radio

(Continued from preceding page)

occurred 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) 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-

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.

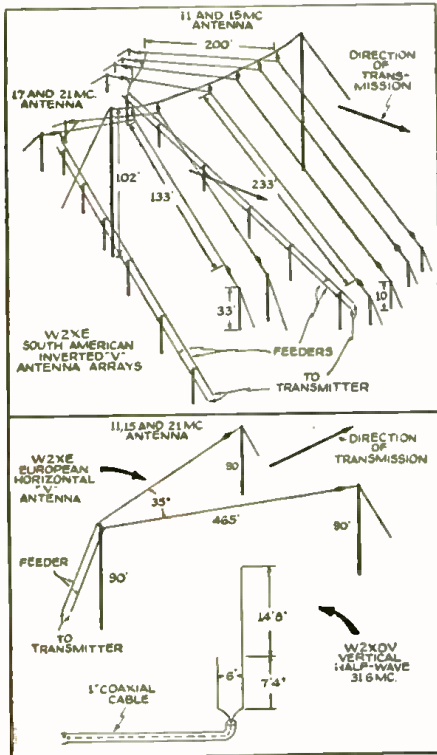
Since the received signal strength is directly proportional to the receiving antenna height for reception at these high frequencies, it should be evident that much more importance must be placed upon receiving antenna installations, if the full possibilities of reception at these frequencies are to be 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.



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

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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., 1/2 watt
- 1—0.25 meg., 1/2 watt
- 1—2 megohm, 1/2 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 wrinkle 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 3/4 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.

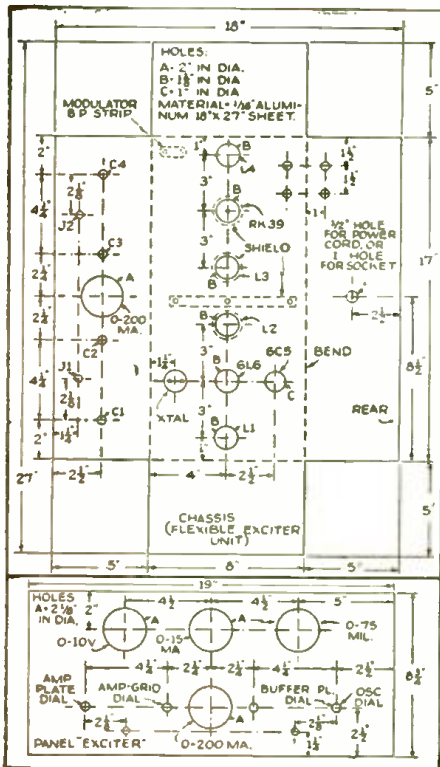
No provision has been made for antenna tuning. The author has been using a single-wire fed matched-impedance antenna for 20 meter C.W. work, the feeder being clipped directly to the amplifier tank coil as shown in the photograph. When using this type of antenna, always insert a good quality mica blocking 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-padded 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—Insulantite sockets, six-prong, S-6
- 1—Insulantite socket, eight-prong, octal, S-8
- 1—Insulantite socket, five-prong, S-5
- 1—Insulantite 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—1 5/8" dials

RAYTHEON

- RK-39, 6L6 and 6C5 tubes

MISCELLANEOUS

- 3—Feed-through insulators, 3/4" size
- 2—Feed-through insulators, 3/8" size
- 1—Power cable, heavy-duty, 5-wire
- 1—17 x 8 x 3 inch chassis and 8 3/4 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—Insulantite socket, four-prong, spring mounting type

I.R.C.

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

MISCELLANEOUS

- 1—Standard 8 3/4 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

Band Meters	(Hammarlund)			
	Turns on L1	L2	L3	L4
160	55 ²	55	55	55
80	28	28	28	28
40	28	18	18	18
20	28	6	6	6
10	15 ²	2 1/2	2 1/2	2 1/2

* (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 1/4 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.



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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 $8\frac{1}{2}$ 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.

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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)

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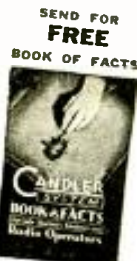


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Television for the Beginner

(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-benzene, 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 heat 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 toboggan 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)

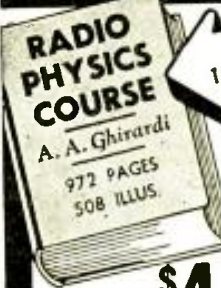
this method of landing a plane enables the pilot to judge his landing distance, after he has passed the second marker beacon, as his altitude when passing this beacon is predetermined.

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.

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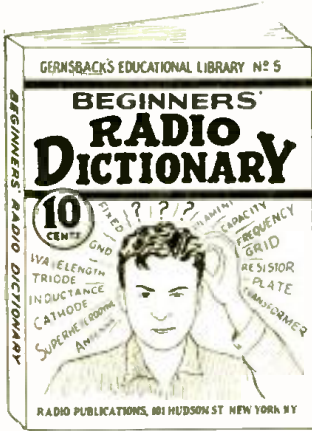
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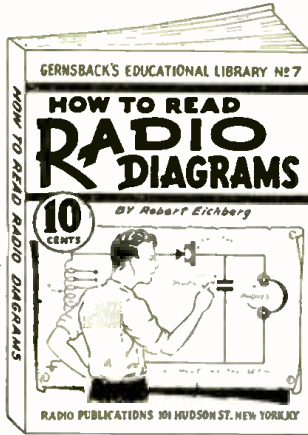
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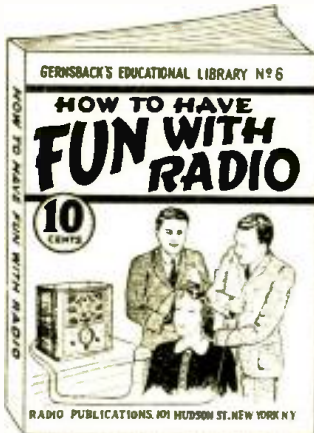


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18 Years of S-W Broadcasting

(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 debut 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.

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(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 sup-

ply 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 out-balance 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 horizontally or vertically. The antenna is an

(Continued on page 248)

DON'T LET IT HAPPEN TO YOU!



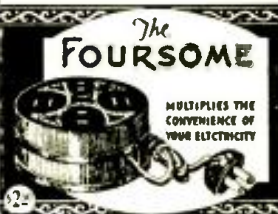
How much would you give for two gallons of gasoline when you suddenly find that your tank is empty and you are miles away from a filling station?

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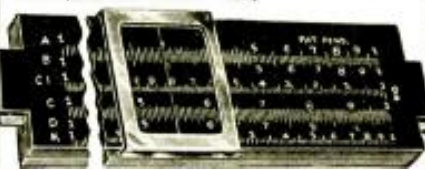
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Let's Listen In with Joe Miller

(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, 14.280, heard at 3:50 a.m., and J7CB, 14.060, approx., also heard at 3:50 a.m.

KA1CS, 14.146, Manila, sent us a radio message via WoDEP 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, 14.400; J7CR, 14.260; J7CB, 14.070, by Ashley Walcott, W6; J2LL, 14.000 and 14.090; J2NI, 14.000; J2MI, 14.090 and 14.290; J2NG, 14.320; J2NF, 14.320, by Harry Honda, W6, and also J7CB, 14.280; and J2KG, 14.050; J2KN, 14.400.

J5CC, 14.330, moves all over band; J2LL, 14.110, by Roy Myers, W6.

J2MI, 14.135; J7CB, 14.107; J2KG, 14.190; J2KN, 14.149, by Max Fisher, W6.

On the VS sigs, we have: VS1AI, 14.080, per Ashley and Roy, this one in Straits Settlements.

VS2AE, "America-England," 14.360, VS2AS, 14.310, from the Federated Malay States.

2AE by Harry Honda, and 2AS by OM Ashley, who also heard 2AR on 14.370.

VS6AG, 14.084; VS6AJ, 14.060, Hong Kong, reported by Harry Honda.

XU8DT, 14.130, China, by Roy Myers, also XU8RB, which is reported by many, including John De Myer, W8, and Ye Ed., on 14.080. XU8EF, 14.050, 14.128, by Ashley and Max Fisher, W6.

XZ2EZ, 14.350, Burma, which QSL is shown this month, a prize catch quite well heard, reported by Roy Myers, Harry Honda, Max Fisher, and XZ2DX, 14.060, 14.040, by Roy and Ashley.

A couple of late VS: Gail T. Beyer, W9, reports VS1AI on 14.040, and a prize catch, VS7RF, Ceylon, 14.330, 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)

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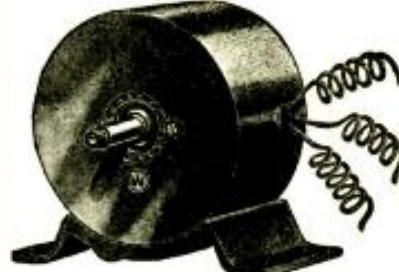


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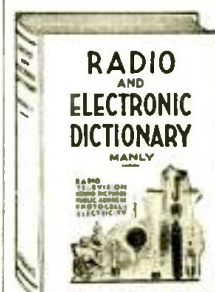
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Let's Listen In with Joe Miller

(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.

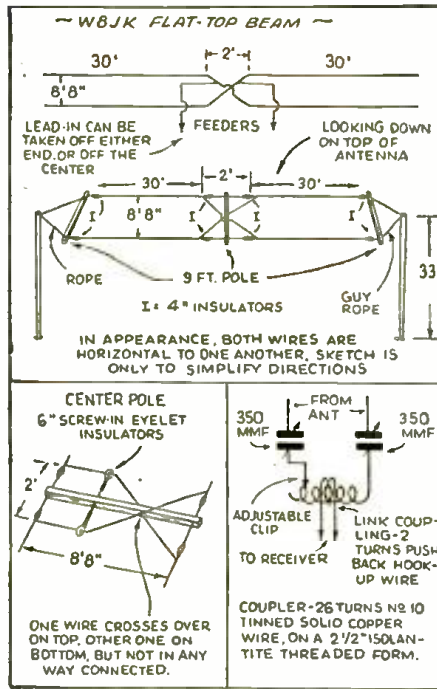
The other W6 OMs did not log their PKs and KAs; let's have all the dope, OMs, please.

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

An ace catch, CR7AU, 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.



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.

WBJK'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.

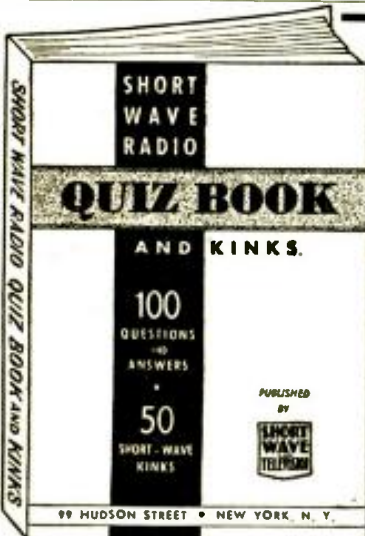
on West Coast.

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 look-out 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.



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SWT-838

Second Amateur Honored

(Continued from page 204)

ment 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.

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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 Sun-

days 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.

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"Rewinding" Armatures
Induction Balance
Telautograph
Einhoven String Galvanometer
Magnets and Solenoids—Get our list
Wheatstone Bridge
Induction Coils—1 to 12 inch Sp'k data
Electric Pipe Thawer

Any 5 prints \$1.50 or 10 for \$2.00

The DATAPRINT Co.

Lock Box 322

RAMSEY, N. J.

COMMERCIAL NOTICES 10¢ A WORD

Under this heading only advertisements of a commercial nature are accepted. Remittance of 10¢ 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 WHENEVER 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, 25¢ postpaid, R. Lauria, 67 Everett St., Everett, Mass.

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

COINS AND STAMPS

JOIN "THE EAGLE HOBBY EX-change." Exchange stamps, postcards, letters, etc. Your name, address and hobby listed free. Send only 10¢ and stamp for list of members who will exchange with you. C. Kurtz, 523 N. Elliker 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 BROAD-casting, 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. Licenses 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 10¢. Eskline Simmons, Rocky Hill, Conn.

MISCELLANEOUS

3/4 INCH TR. 0-125 V.T. A.C. Voltmeter, 0-10 A.C. Ammeter, \$2.75 each. Weston D.C. 0-7 and 0-140 Voltmeter, 2 1/2" with 9 pt. D.P. Switch \$2.75. Nat'l. MB27-4 Sig. T.R.F. chassis and Thord. 45 1-P. Pack. \$7.50. 10" MUTER DYN. SPRK. \$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 \$30,000 each. We sold all but a very few. We cannot obtain more to sell at these times at 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 SOME-thing you have! Particulars, 10¢ (refund). 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 25¢. Costs you only \$1 per dozen (8 1/4¢ each) postpaid, or \$10.40 per gross (7 1/4¢ each) postpaid. Sample knife 12¢ postpaid. A generous supply of illustrated, order-pulling 3x5 circulars with blank space for your name and address, furnished free with each order. Lortrac Products Co., Albany, N. Y.

HONEST PROPOSITION. REAL money makers. With unique sales plan, 50¢ postal money order brings pre-paid 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-MAK-ing opportunities. 10¢ list you—bring magazine, Mail Trade Guide, Arlington, Kentucky.

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

MUSIC

ORCHESTRAS — MUSICIANS — Attention. Orchestras 10—\$1. Sheet music 25—\$1. Silberman Music Mart, 3303 Lawrence, Chicago.

NOVELTIES

FREE—SURPRISE TRICK. JOKE novelties to everyone sending 10¢ 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. 20¢. B. Warn, 501 Broadway, Grand Rapids, Mich.

OFFERED FOR SALE

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

WATCH STRAPS MADE TO MEAS-ure for 50¢ and 75¢, our price only 25¢ coin. Warn, 501 Broadway, Grand Rapids, Mich.

NOVELTY ELEPHANT — G. O. P. 1940 model. Height 2 1/4 inches. 2¢ postpaid. F. C. Sehnitz, 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 CHI-cago, twenty for 1¢. Arnold, 103 S. Halsted, Chicago.

PRINTING

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

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

PUBLICATIONS

ADVERTISE IN TRADERS BUL-letin. Oldest monthly magazine for swappers and sellers. Lists over 1500 swap or sell offers. 10¢ copy. Ad 5¢ 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 15¢ word. Display \$6.58. (blum inch 48 words). Three times price two. Sample copy 10¢. A. Mirabile, Box 9238, Albany, N. Y.

50 DIFFERENT MAIL ORDER publications 10¢. 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 INT Chart for five cents in stamps. WIREP, 16 Stockbridge Ave., Lowell, Mass.

QSL SWL CARDS. NEAT. At-tractive, reasonably priced, samples free. Miller, Printer, Ambler, Pa.

RADIOS

HAVE LARGE LIST USED RA-dios 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 unrecirculated red condition, 1802 U. S. half dime 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 1¢ each for same. C. H. Kurtz, 523 N. Elliker, Allentown, Penna.

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 disector 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 "fly-back" 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 aeriels 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.

FOR SALE (NON COMMERCIAL) 3¢ A WORD

Under this heading we accept advertisements only when goods are offered for sale without profit. Remittance of 3¢ 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, 1/2 VP Casar f2.9 Comput. Dialyter lens f4.5 7.5 cm. in barrel with iris. Monel det. tank 127 to 116 incl. Sacrifice for

cash. Dale L. Cosper, Auburn, Indiana.

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

POSTPAID: 585 1937 SUPREME Diagonometer \$60. OS12 Hickok Oscillator \$20. Rider Manuals IV to VIII incl. \$20. Ray Terry, S/S Alabama, Ft. 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.

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 VP8 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. North 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 WCFI irregular.
- 6.079 DJM BERLIN, GERMANY, 49.34 m., Addr., Broadcasting House. Irregular.
- 6.077 OAX4Z LIMA, PERU, 49.35 m. Radio Nacional 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)

ADVERTISING 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 placed. Copy should reach us not later than the 10th of

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 Federal 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.

TRADE: \$21.00 NIFTY POWER Dauer telescope on tripod, tiny electric racer with track, \$5.00 magician's set, Morris \$4.50 coil winder set, used radio parts for 5 meter transceiver, 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 Lesman, R. 2, Wakefield, Neb.

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

WANTED JUNIOR CANDLE Course. Will buy or trade for Packard Lectro Electric Razor, Leslie Merg, 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-candle 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 scientific 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 THUNDER pipes, home cup wa wa etc. Also want good bur. Will trade Kodak 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, % Cavanaugh, Wallhalla, N. D.

WILL GIVE AN ATWATER KENT Generator, 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 voltm-ohm-ma meter. Have two good 1247 tubes, 2000 ohms phones, daisy air rifle, transformer, G. Chovnard, 4599 Papineau Ave., Montreal, Que.

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

SWAP U.S. STAMP COLLECTION, 330 diff. for a good used tube tester such as Millon or Superior make. Kenneth McLain, R. 3, Arcanum, 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. Kubik, 37 Pine Street, St. 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 Heasler, 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; or Weid camera case, or what have you in photographic supplies? N. H. 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 \$50.00. Will trade for SW3AC, 20 meter coil, power pack or Sargent 10, good condition. T. Marks, 10019 98th St., Ozone Park, L. I., N. Y.

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

WILL TRADE AMPERITE VERTICALLY Microphone-chromium plated. Also new, want PHA or X. Will make up difference. Nicholas Christ, 578 Third Street, Albany, New York.

TRADE ERECTOR SET, RADIODA 20 electrified, Stlenite A.C. 6, 100 back issues S.W.C. and other radio magazines. Want oscilloscope, service equipment, parts. S.W. super. Fred Humphrey, New Ealtz, N. Y.

TRADE COMPLETE SET OF lessons in Taxidermy from North Western school of Taxidermy (all rights 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 LATENT sheet music and folios for transmitting condensers or parts. All letters answered. E. Ward, P. O. Box 23, Granger, Wash.

HAVE ANTIQUE RCA IIA BATTERY receiver using 4 WD11 tubes. No tubes furnished, rest is original. Trade for camera or what sa? W. S. Crooks, W8LVG, Box 13, Stow, Ohio.

SWAP A BAIRD SHORTWAVE and television receiver and a set of (plug in Octo coils) 18 to 350 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 collector. Also want type 40 tube. Jim O'Rourke, 2019 So. Nicolett, Sioux City, Iowa.

HAVE IRWIN 16MM MOVIE camera, Wright & Ditson golf club, 3 irons, driver and bag, 36-KC crystal watch got? Bill Sampson, Jr., 2208 Floyd Ave., Richmond, Va.

WANTED: ONE USED LAFAYETTE Minute Man receiver (5 meter) also used Knight 3 watt utility power supply and amplifier. R. Hull, W1KTM, 883 Ridge Rd., Hamden, Conn.

WILL SWAP THREE EARLE Liederman physical culture books, \$30.00 for four Cadet System aviation books, cost \$12.00. Both complete sets, almost new. What am I offered in trade? Howard Marshall, 1300 Loul St., Syracuse, N. Y.

SHORT WAVE LISTENERS IN the United States and foreign countries who would like to exchange cards, books, or 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 4BT. 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 and 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. midket variable condenser. Harold Ellison, 913 State Street, Albion, Neb.

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. BABBLER 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. Zellaba, 314 Wright St., Washington, N. C.

HAVE ALADDIN NICKEL and copper portable detector in good condition. Also over 3000 different U. S. and foreign mixed. What have you to offer? Norman Hasden, 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 Szarucha, 1043 Lonfellow Ave., Bronx, N. Y.

TRADE-5 TUBE DUPLEX transceiver, never used, complete, tubes, mike, 2 antennae, speaker, cost \$53. Want good 10 watt P.A. system, with, without mike, speaker. Austin Swenson, 893 E. 42 St., Brooklyn, N. Y.

HAVE OLIVER No. 9 TYPE-writer, A-1 cond., earphones, new, other articles of value, send for list. Want SW3 or similar revr. 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, bank 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 Heardite 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, bando uke, typewriter. Want S.W. receiver or meters or what? Arthur Snape, 213 Milton Road, Lakewood, Rhode Island.

TRADE "ELEN 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 Fl., Pella, Penna.

EXCHANGE RACO 5 TUBE AC-DC 2-600 meters. Perfect condition. For SW3 or good T.R.F. revr. Schooner, Oakland, N. J.

CAMERA WANTED, 1-5/8x2 1/4 or 2 1/2x2 1/4 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 taking outfit, 300 pre-cancels, 200 post marks, 3 tube B.C. kit, several books, also 10 miniature books, bando-uke, punch boards field glasses, other items, want candle 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, 321 2nd, Peoria, Ill.

WILL SWAP A THOUSAND FOREIGN (a hundred and twenty) U. S. stamps mounted in neat album for any kind of camera or equipment. All letters answered. John Oster, 29 Bonnet St., Dayton, Ohio.

WANT BROWNING "35." SKY-Ruddy, Super-Tripper, Sky Chief, A.C.R. 136, "175," "153." Have All-Star Jr., complete, coils 13-565 meters, metal cabinet (16x12x8) lens 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 23 CAL repeating rifle (single shot) Junior Candler course, Charles A. Gansick, 412 N. "C" St., Stanfield, Iowa.

(Continued on page 254)

BARTER and EXCHANGE FREE ADS (continued)

World S-W Stations

(Continued from page 253)

COMPLETE KIT, 9 TUBE SET, 6D6, 6AF, 76, 7B, 7C, 6F6, 6N6, 5 band, select coils, iron core, I.F. Jensen speaker, instructions. Trade for smaller kit or receiver. Whitney Anderson, Quannah, 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. N.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 2300 stamps of highest grade. John McKenna, New Paltz, N. Y.

SWAP JEWELL EXTERNALLY TAPPED A.C. Voltmeter, 0-150-300-600, bakelite housing, newly calibrated. Want 0-1 volt ohmmeter, Harveyn UTX-10 with 5 meter coils. Carl Iloban, 710 Western, Joliet, Ill.

TRADE TWO TUBE KADETTE AC-DC Pocket (apart, with diagram) and ninety standard radio and mechanical magazines for small volt ohmmeter tester. All queries answered. Edgar Rice, Hatton, N. Dak.

TRADE 3 TUBE AC-DC SW set, described in April 1935 SWCT. Just built. Want class A or B p.d. transformers or test equipment. Lutz D. Minkace, 89 Elm Street, West Newton, Mass.

ATTENTION SWL'S, U. S. and foreign. Will correspond and swap SWL cards. QRA—Woodrow E. Metzger, 604 S. St., Bedford, Indiana. U. S. A.

SWAP: 100 MMF. SPLIT STATOR variable condenser, 1000-3000-6000, bakelite 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 air mail stamps, cameras, meters, scales, etc. Clocks or what have you? W3JAG, 2807 Clafin Ave., N. Y. C.

SHORT WAVE LISTENERS IN all countries. Would like to exchange SWL cards with anyone anywhere. QRA Jack DeMay, 635 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" game, 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 flasks and jars. Want five meter receiver or transmitter 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 3 1/2 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 Hlatt, Dryden, Wash.

WILL TRADE 11 TUBE, 2 BAND, Model F8-30, Lafayette radio for a Halliester'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, 836 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 Hallin, 40 East 66 St., New York, N. Y.

HAVE NUMEROUS AC-DC 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 Crum, Upper Sandusky, Ohio.

WANTED—USED SW3 OR HALLIESTER Sky Buddy, will trade Supreme model 85 tube checker or Automatic gender, cash extra if necessary, write for complete dope. J. Bradshaw, W9PDP, 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 Mechanik, Oct. 1935 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 Reischling, 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. H. 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 Bernshaw manuals, Readrite analyzer or others. G. H. Dufour, 51-Jeme, Rue, Quebec, 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 manufacturing bookends, statuettes, ash trays, 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., Benton, Washington.

WANTED: PHONE X-MITTER UP to 25 watt, must be in perfect order, and as new. Send full details of receiver, 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 FOR PERPETUAL calendars. Sold some for 35 cents each. Exchange for high power binoculars or high power microscope. Description, O. Dodge, Darlington, Mo.

WANTED: NATIONAL HALLIESTER set or receiver, candle camera, Massner Signal Shifter, Back combination McMurdo Silver communications superhet and Ultra Stratosphere "10" transceiver complete with matched speakers; "616" Xtal cut metal cabinet transmitter, W80Q1, Wellsville, N. Y.

WOULD LIKE TO SWAP 5 prong plug-in coils for .0014 condenser 9 1/2 to 600 meters for standard 4 prong coils for .0014 factory wound. Alex Radesky, CCC Co., 297-F-53, 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 handspread coils for A.C.S.W.3. Also short wave general coverage coils for same. State price and particulars. VEAFY, 441 McLeod Street, Ottawa, Ontario, Canada.

WOULD LIKE TO EXCHANGE cards with anyone. Jim Doyle, 819 East 2nd St., Florence, Colo.

WILL TRADE POST CARD PROJECTOR, Key 30, 98, 80 tubes for photographic equipment. David Herbert, Jr., Box 709, Lancaster, Calif.

WANTED: RCA-B.F. A C D I O Oscillator or other make. Will trade for meters, parts, books, etc. or for cash. Stanley J. Niciewicz, 79 Church St., Broad Brook, Conn.

WILL SWAP 6800 STAMPERS, electric phonograph motor, Supreme 801PL tube and condenser tester, Al condition. General Motors 6 tube 110V A.C. radio. Need Ham parts. Val say: Richard Dawson, 1308-F, The Dalles, Ore.

WANTED: ONE OR TWO TUBE receivers. Also want a J prong 10 meter coil. Will offer radio parts, radio magazines and tubes. Also want stamps. All correspondence answered. John H. Russell, Box 145, Colfax, Wisconsin.

SWAP COMMUNICATIONS SUPERHET, tuned 6-16-545 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 COMES RADIO News from first issue to May 1938, Radio-Craft, also other books for radio parts. O. E. Martens, Putney, Vermont.

HAVE IRWIN 8MM PROJECTOR and art films, Linotype keyboard and course, magazines, motor scooter, 1 tube Croyley radio, candle cameras. Want Keystone "8" onboard motor, model plane engine. Rosecoe, 1184 W. Broad St., Columbus, Ohio.

SEEKING: GEN. ELEC. EXPOSURE meter; Kalart synchronizer; 9 2 1/2 x 3 1/2" plate holders, slushers; current Pat. Off. Gazette; 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; microscope; 110V AC-DC revers. gen. mach. motor (minus treadle). Andrew Vena, 117 Edgecombe Ave., New York City.

TRADE FORTY RAILROAD ENGINE photos (2 1/2 x 3 1/2"). All different S. roads, for 81 mm. 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 coffee maker—new, etc. Want large size ruckoo 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. Typewriter, shotguns, Mondia pigeons or? Earl Hoefl, Brainerd, Minnesota.

SIX DOZEN NEW MAGICAL SETS retail 75c each, 18 1/4 x 14 1/4", 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 Plano acorillon. Have Royal portable 137cc, writer, 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 Latta, Lrain, Ohio.

FOR SWAP: I MODEL 28 BOSCH radio with 8" speaker in good condition. Model 1873 1/2 set. Winchester rifle in good condition, 1—410 double shot gun nearly new, Western Field, 1—Holt 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 FILMS USED U. S. stamps. Have \$60 Palmer Photoplay course; new \$2.95 Reelite cigarette lighter; new \$2.50 leather pocket letter case and matching bill fold. Palmer, 1101 Maple, Downers Grove, Illinois.

AMERICAN AND COLLIER'S magazines, Clipping Manual Encyclopedia, Clipping Manual Records, Falcon camera. Want radio books, parts, musical instrument or? Jerome Pieffer, 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 Rivine St., Munhall, Pa.

FOR SWAP—KRISS-KROSS Strapper for two-edge razor blades, good as new. Will accept razor 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 tubes for camera, gum, etc. Louis Zgola, 704 Glenwood, Ambridge, Pa.

- 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 HPSF 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 HPSB 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., 49.8 m., Addr. Av. Independencia 98. 8 pm.-12.30 am.
- 6.020 DJC BERLIN, GERMANY, 49.83 m., Addr. (See 6.079 mc.) 10.30 am.-4.30 pm.
- 6.017 H13U 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 PRAB 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 CJXC 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 HPSK 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 PJC1 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. BECHUANA-
LAND 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 4103. 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. Irreg-
ular 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.



Short Wave League

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

John F. Müller

a member of this League.

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

H. W. Fairfield
Gen. Secretary

This handsome certificate is presented FREE to all
members of the SHORT WAVE LEAGUE. The full
size is 7/8" x 9 1/2". See page 248.

- 5.853 WOB LAWRENCEVILLE, N. J., 51.26 m.,
Addr. A.T.&T. Co. Works Ber-
muda 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 TOD 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 TOD 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. 11-10 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 Elkin watch
needing overhaul, Durand Duplex and
Gem razors used once each, miscel-
laneous small-change coins of Balkans,
Turkey, Syria, Palestine, Egypt, In-
dia, books of many kinds, complete
file "Coronet." H. C. Rankin, 300
Fenway, Boston, Mass.

LOOK! COMPLETE INSTRU-
ctions for making Flexible Molds. Used
for casting imitation marble statues,
novelties, hoses, and others. A real
money making opportunity for enter-
prising people. What have you? Ace,
1017 North McBride, Syracuse, New
York.

WANT TO BUY OR SWAP FOR
old tooth puller. Known as Kant books,
turn keys, or cork screws, old hand
cuffs, or what have you? Write me
your wants, a collector and antique
dealer. A. H. Simonton, Wisconsin,
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 cent publications for con-
tenders, many other things to swap.
Write!—Box 87—R2, Alpha, Minne-
sota.

WILL SWAP STEREOSCOPE
with pictures; pair Klaxon horns;
miniature talking parrot, whistling
African Grey parrot; Remington hunt-
ing knife; books, old and new. Es-
quires; Univex movie camera; medical
journals; Brandes headset; steel bear-
trap. Want old prints, lithographs,
engravings in color; historical flasks,
bottles; music box. W. Gary Thomp-
son, 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, Tonawanda, Kansas.

WANTED! ELECTRIC DRILL OR
welder, tennis restraining equipment,
stamps, useful auto accessories, or?
Have Mimeograph, typewriter, miscel-
laneous articles, books, magazines,
Rudolph Zak, 2509 East 89th, Cleve-
land, Ohio.

WANTED. BOOKS, 15X TELE-
scope, piano accordion, candid camera.
Have Eb. clarinet, 22 repeating rifle,
reloading tool, Sinaplix typewriter,
radio parts, stereoscope—160 views,
Kodak, books, Sofus Andersen, Lan-
kin, N. J.

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 Saxara,
Cullman, Alabama.

FOR SWAP: JIFFY FOLDING
Eastman Kodak (new) Agfa, Royal
No. 1 same as new, ladies or gents
rebuild watch, Savake electric washer,
25/20 Martin repeater, Mark 1 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 \$4.50 Reming-
ton portable typewriter? Model No. 5
streamline. Never unboxed. Linking
Shop, Dept. S, Anna, Ill.

HAVE BASKETBALL SHOES—4 1/2
fielders glove, P. Z. player for guitar,
radio, radio parts, want radio tubes.
A.K. magnetic speaker, signal gen-
erator or make offer. All letters an-
swered. William Phillips, Gypsy,
W. Va.

- Mc. Call
5.735 HC1MP QUITO, ECUADOR, 52.28 m. Ir-
regular 10 pm.-12 m.
- 5.145 OK1MP 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 YUB2 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.

SWAP—NOVELTY AUTOMATIC
22 year calendar for two 3c unused
commemorative stamps. F. C. Schultz,
Noel, Mo.

WANT BENCH PAPER CUTTER.
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450 volt power pack, 2 tube Stewart
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Readrite 502 volt-ohm meter. Want
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British George V Jubilee stamps,
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and foreign countries. All cards an-
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HAVE 1 LIONEL O-GAUGE
train set, 1 American Flyer stream-
lined set, 1 scale model complete.
Complete tracks for all and D.C. re-
ducer, all working, for Hallcrafters
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Built on Pilot Super Wasp chassis.
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mechanical, engineering and archi-
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TRADE: POWER TRANSFORMERS;
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Institute Modern Business Executive
Course, cost \$210.00. Want 13 or 15
inch dynamic speaker, meters, etc.
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Super Skyrider in perfect condition.
Will swap for small metal working
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TRADE 6J5G-6P6 SUPER-RE-
generative receiver (verified reception
of W4EDD on 5 meters from Mt. Ver-
non, N. Y.) for 7 mc. xtal and key,
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post-card views and send to me. For
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No two cards alike, please. Harold
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tric train A-1 condition, good canal
and cash. Joseph Knerr, 196 First
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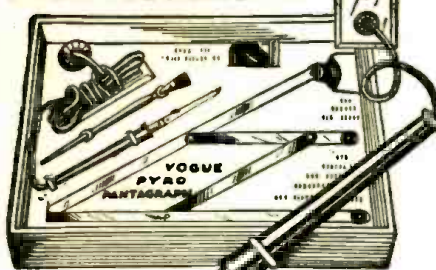
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Outfit will be forwarded by Express Collect if not sufficient postage included with your order.

WELLWORTH TRADING CO.
651 W. Washington Blvd. Dept. SWT-838 Chicago, Ill.

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 5 1/4" x 7 1/2", 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.

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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.

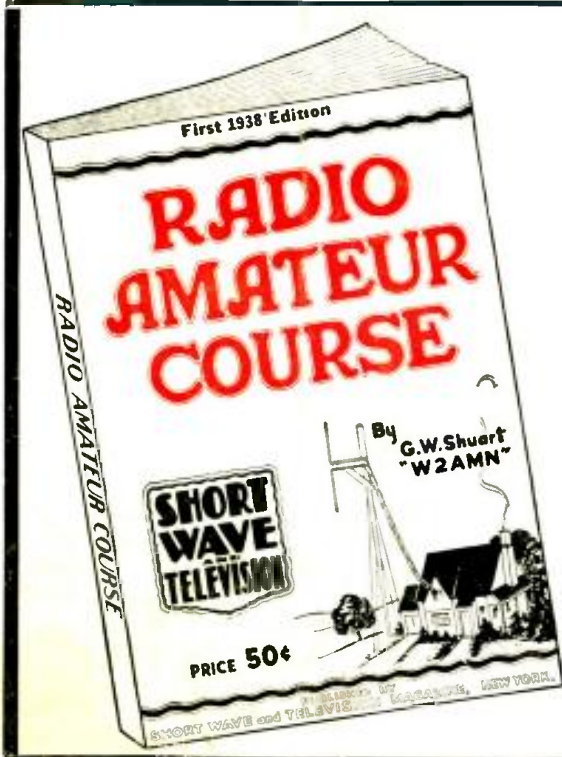
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