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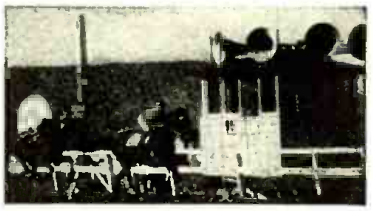

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The Popular Radio Magazine

HUGO GERNSBACK, Editor
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MARCH — 1939
Vol. IX No. 11

FLASH!

Electronics Television Course

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Antenna Systems for HAMS—Herman Yellin, W2AJL — The Half-Wave Hertz type

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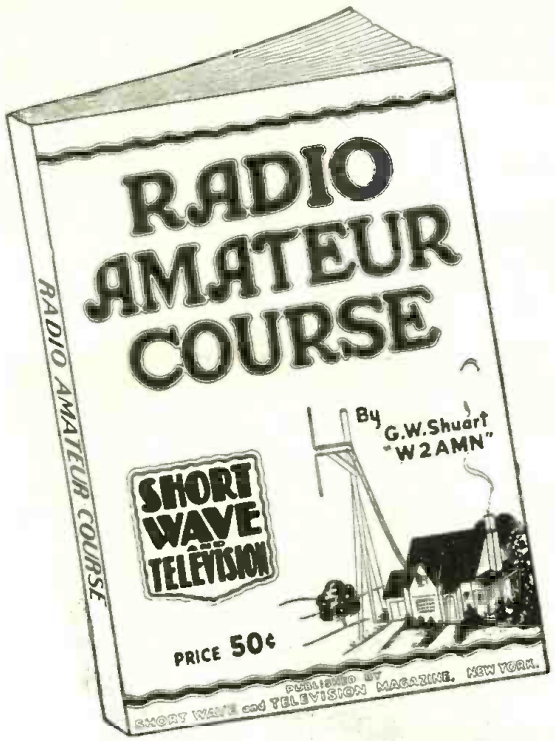

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The SUN's Effect on the Propagation of SHORT WAVES

Emile Girardeau

General Director,
de la Compagnie Générale de Télégraphie Sans Fil,
Paris, France.

Emile Girardeau

● THE study of the propagation of short waves has definitely proven that there exists a certain relation between the varying conditions in the activities of these waves and the changes in the Sun's radiations.

The constant observation of these phenomena, during the last ten years, in the most important centers of radio transmission and reception in France, has made possible the compilation of technical data of unquestionable value from which it is now possible to draw certain conclusions.

It is known that the Sun exerts a normal and regular influence upon the propagation of short waves; another well-known fact is that the length of the wave used for communication between two given points needs to be shorter during the day than at night, and also shorter in Summer than in Winter at the same time of the day.

For example, in 1937 a day wave of 15 meters for trans-Atlantic communication was efficient in Summer, while a wavelength of 22 meters had to be used in Winter. At night, a 30 meter wave was used in Summer and a 40 meter wave in Winter.

Another example: the 22 meter wave successfully linking Paris to New York, five hours a day in January, 1935, was used for progressively longer periods, being efficient ten hours a day in March, and used continually throughout a twenty-four hour day in June.

The efficiency of this wavelength decreased from June to December, from twenty-four hours a day in June to only five hours a day in December.

The influence of the Sun's altitude upon the propagation of short waves along various lines of Radio communications has been determined accurately.

It has been observed that, over a path uniting two points situated on widely different longitudes, such as Paris and Tokio, where the respective altitudes of the Sun vary greatly at the same instant, the efficiency of a given wavelength is reduced much more than over our almost North-and-South connections, such as Paris to Buenos Aires.

Another difficulty observed is that it is almost impossible to find a short wave capable of maintaining satisfactory communications between Paris and Tokio on certain Winter days, between the hours of three and six o'clock in the morning. In this case *long* wave transmitters, utilizing high-frequency alternators, are operated to assure permanent connections.

There are also the variations in atmospheric conductivity, changing from year to year, which have been observed to follow the variations in the Sun's activity.

In Figure 1 is shown a graph of the annual solar activities according to the sunspot numbers used by astronomical observatories. The curves are plotted to indicate the average number of hours when wavelengths of 14 to 18 meters were used successfully.

One will notice that the variations in the Sun's activity are nearly identical with variations in wave efficiency. However, for wavelengths of 37 to 50 meters the variations are opposite and almost inversely proportional.

* * *

From the practical viewpoint of commercially exploiting radio communications, the record of these continuous observations is of great value, since it enables us to foretell the most practical wavelength to use, on a particular day, at a certain hour.

Nearly eleven years have passed since these records of short wave propagations were written, and eleven years is the approximate duration of a cycle in the variations of the Sun's activities, which is graphically shown in Figure 2.

Referring to these observations, it is now possible to foretell which will be the best wave to use at a given hour of a certain day, of any month of any year.

Uncertainties and inconveniences can be thus eliminated by avoiding the use of a wavelength unsuitable for communications affected by the varying conditions so far outlined.

There are also other consequences of Solar phenomena, the study of which is of great interest because of the occasional troubles in propagation known as *fading.*

Fading, or the attenuation of a signal being received, may be intermittent, or more or less slow, or at times quite sudden. Nevertheless, the comparison of these effects with the records of astronomical observatories on disturbances in the earth's magnetic field (which invariably follow changes in the Sun's activity) indicate the Sun as the original source of these disturbances.

The power and the influence of the Sun over all things on earth is again reasserted by science, after having been forgotten during the centuries that followed the fall of the ancient gods, such as Amen of the Egyptians.

We can again say, like Phaedra: *"Sun, divine Sun from thou I came,"* or like the Pharaoh's prayer say: *"Thou Sun who created the world according to Thy desire."*

Solar phenomena are revealed either by *spots* of varied appearance, or by immense flames pouring out of the brilliant disc.

The *spots* form dark areas of various shades and changing dimensions. Taking as an example a recent occurrence from the 30th of September to the 10th of October, 1937, one could observe on the

(Continued on page 682)

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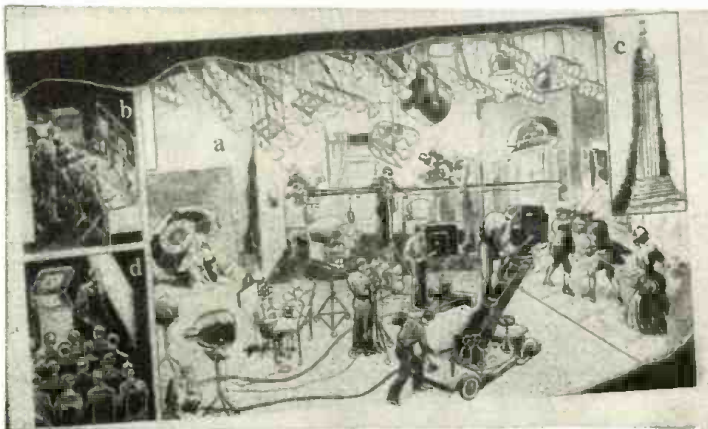
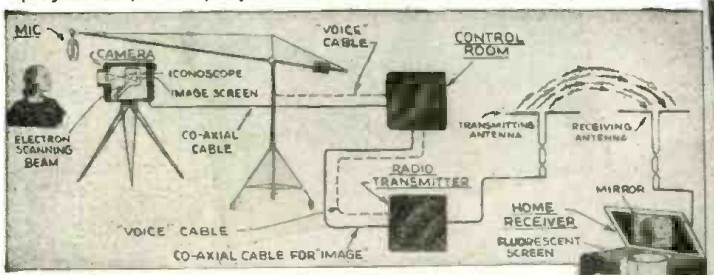
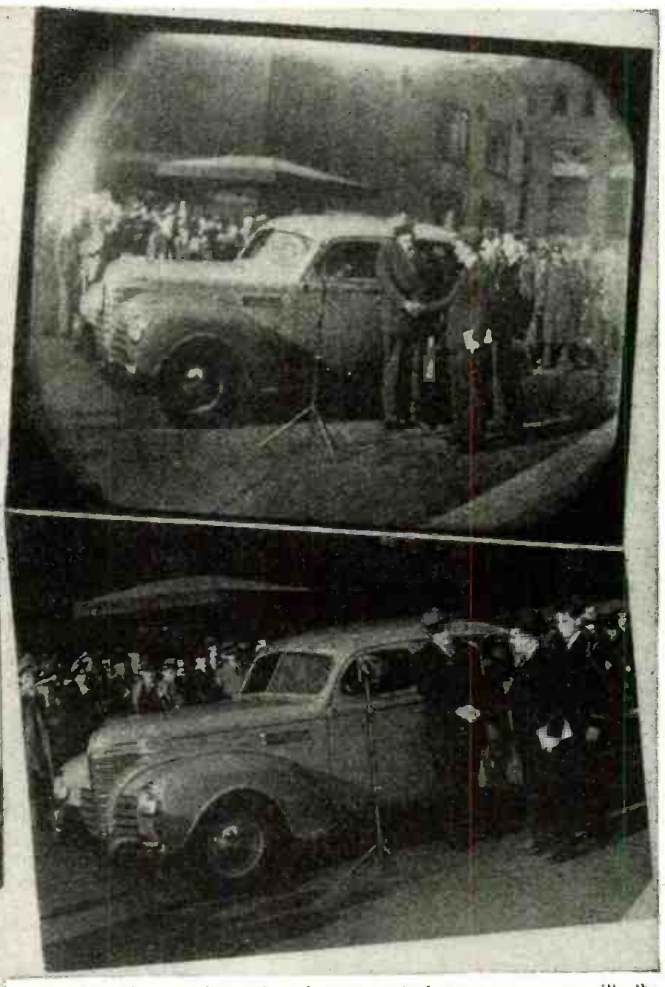
Television Prepares for Debut



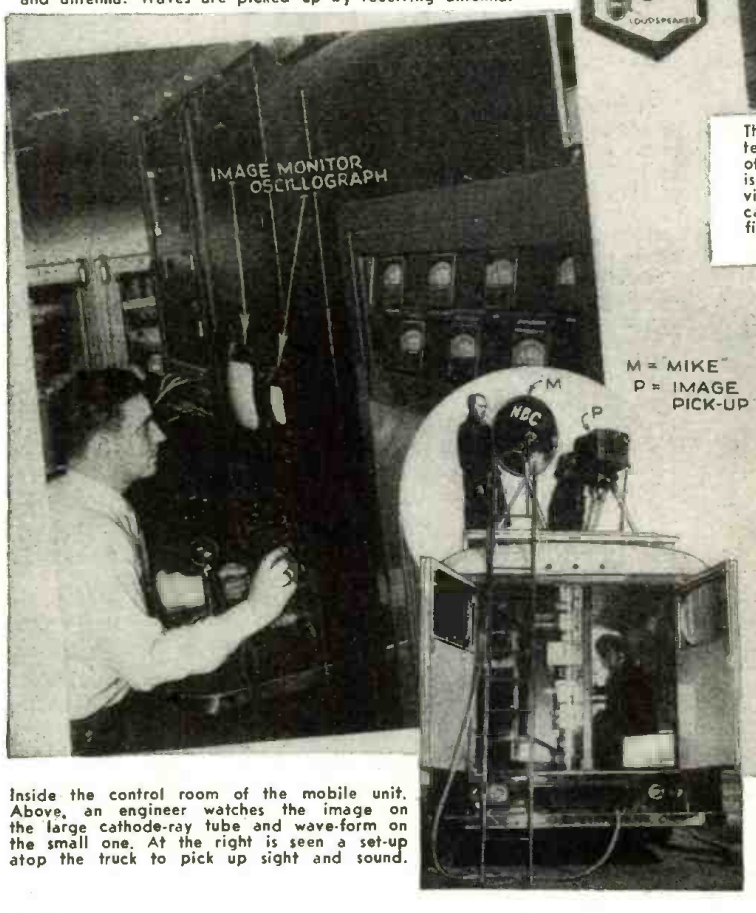
Above—"A" represents a studio set up for three scenes: Left—a beach scene; center—a drawing room; and, at right, a scene where action is taking place for a period play. "b" shows the control room; "c," the antenna atop the Empire State Building; "d," a number of persons watching a program as picked up by a television receiver. Photos courtesy N.B.C.



Block diagram of television transmission and reception. Image of girl at extreme left is picked up by iconoscope; her voice caught by mike. Resulting electrical impulses of sight and sound pass through control room and thence to transmitter and antenna. Waves are picked up by receiving antenna.



The two pictures above show how an actual scene compares with the television image it produces. Lower picture is an ordinary photo of one of the new model cars being inspected by interested crowd. Above it is actual photo of the image of this occurrence, as received via television. The top picture was taken of the screen at the end of the cathode-ray tube. Notice that while most of the detail is held, the finer detail (such as that of the radiator grille on the car, and the eye shadows of the man in the right foreground) is lost.



Inside the control room of the mobile unit. Above, an engineer watches the image on the large cathode-ray tube and wave-form on the small one. At the right is seen a set-up atop the truck to pick up sight and sound.

The television camera makes a pick-up of the skaters at the rink in the Sunken Gardens at Radio City. Notice the man in the foreground wearing a light gray felt hat. He is the announcer. You can see the microphone cable running back over his right shoulder.

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STATIC-FREE RADIO

Invented by Armstrong

New frequency-modulated wave points the way to a new era in broadcasting. Among other features it provides high-fidelity and multiplex operation.

Static-less radio programs will be broadcast next Spring from this 400-foot tower, when station W2XMN begins operating on the new Armstrong type of ultra short radio wave, which wipes out tube noises, fading and interference. W2XMN, located atop the Palisades near George Washington Bridge (N.Y.), will be the first high-powered frequency-modulated radio station in the world. The tower, with its 150-foot cross-arms, can be plainly seen from Riverside Drive, N. Y. City.

●

● MAJOR EDWIN H. ARMSTRONG, Professor of Electrical Engineering at Columbia University, has devised a new method of radio transmission known as *frequency modulation*.

In the present form of wave used for broadcasting, the carrier wave is amplitude modulated; that is, the strength of the wave varies as the voice modulates it. With frequency modulation, the frequency of the wave is changed for each variation in the voice, the amplitude remaining constant. Due to the wide band used for this new system and the special receiver employed for its reception, very high-fidelity reception, free from static and other noises, results.

Not only is *static-free* transmission achieved by this newest invention, but tube noises and other interfering disturbances are eliminated.

Professor Armstrong has built a powerful transmitting station for his new frequency-modulated system at Alpine, N. J., near New York City. This station (W2XMN) has been picked up as far distant as 300 miles at a special receiving station erected atop Mt. Washington in New Hampshire. (Mt. Washington is 6000 feet high.)

At present the Alpine station is operating on a wavelength of 7.5 meters, and while some experimenters and Hams have heard the wave broadcast by this station by listening in with super-regenerative receivers tuned to the edge of the band, considerable distortion occurs; to realize the full benefit of the new type of frequency-modulated wave and the high fidelity afforded, a special receiver has to be used.

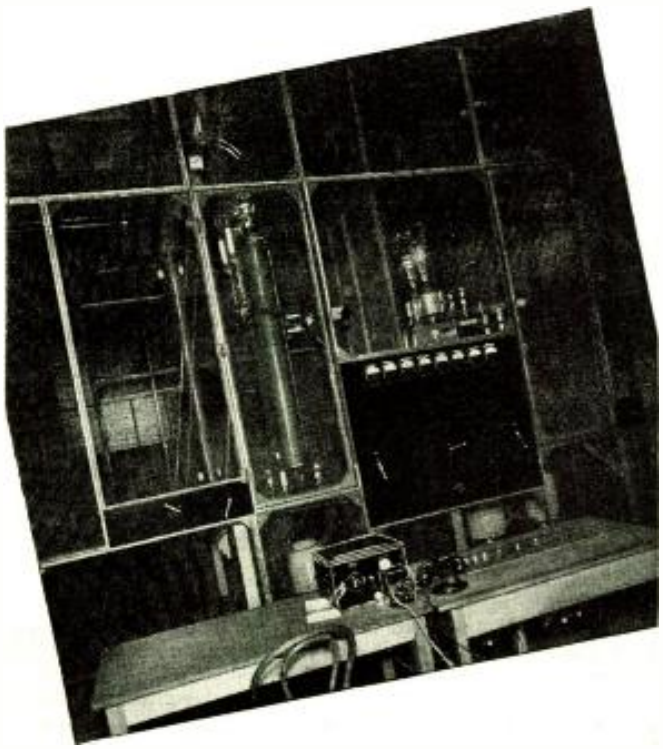
The General Electric Company is building some of these receivers and a short time ago a demonstration was carried out between Alpine, N. J., and the G.E. laboratories in Bridgeport, Conn.

In the future, when this frequency-modulated system is extended, receivers will be made available to the public which will incorporate a receiver for the reception of the regular broadcast waves now in use, and a short-wave receiver capable of tuning in the special frequency-modulated waves.

Other experimental transmitting stations using the Armstrong frequency-modulated system have been erected at Yonkers, N. Y., Albany, N. Y., and Storrs, Conn.

The width of the wave channel radiated by the Alpine station is twenty times the width of the ten kc. wave sent out by the modern broadcast station. In other words, the width of the Armstrong frequency-modulated wave is 200 kc. In the wavelengths between one and ten meters, there is room for 1350 stations using the 200 kc. wide "f.-m." wave. In other words, there is opened up a brand new frequency spectrum for broadcast stations, in fact, more stations than we probably have immediate need for.

The new Armstrong static-free transmission system should prove very useful in the future for relaying television programs between cities, as it will undoubtedly prove far cheaper than would the use of coaxial cables between cities.



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Noise-free radio programs will be broadcast next Spring through the amplifier shown, when station W2XMN begins operating on the new Armstrong type of radio wave. The station is located atop the Palisades near New York City, and will have a service area of 100 miles. A table has been made into a control desk, as shown in the foreground.

Range of Station

The average range (radius) of one of these new "f.-m." stations will be about 100 miles, and if in the future our broadcasting system should be converted to this method of radiating waves, we would need many more stations than we have at present to serve the same communities with broadcast programs, owing to the smaller range of the ultra-short wave "f.-m." stations. With the higher power now being used by many

(Continued on page 697)

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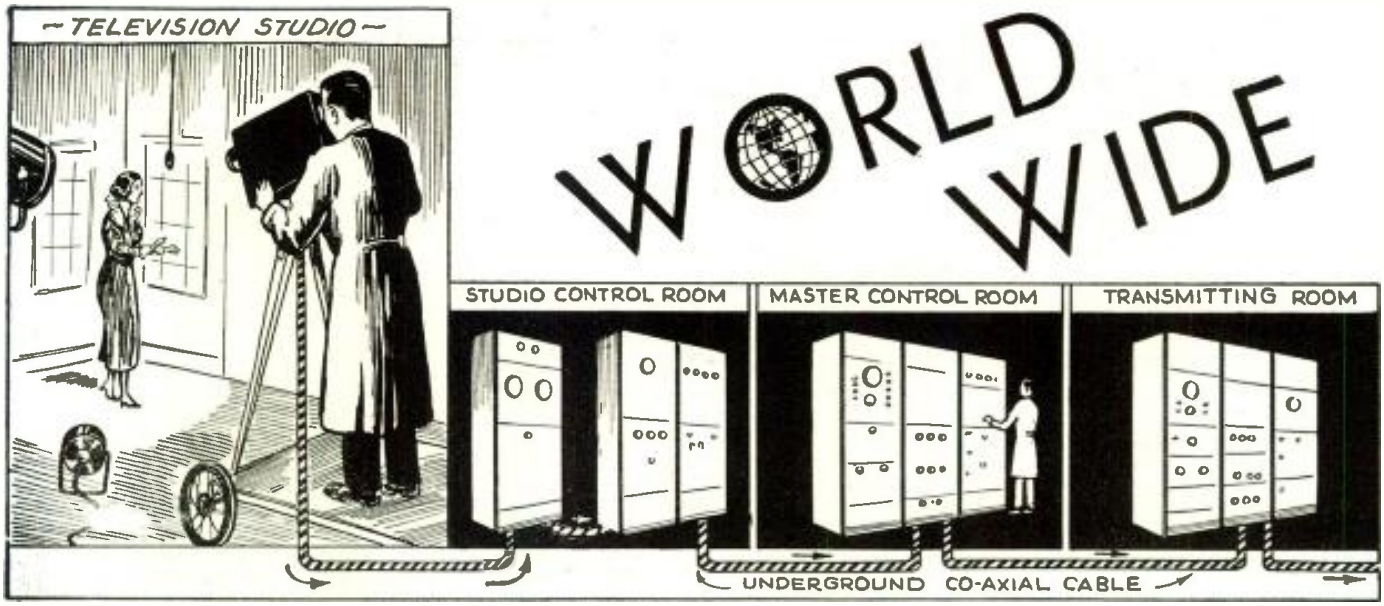


WORLD WIDE

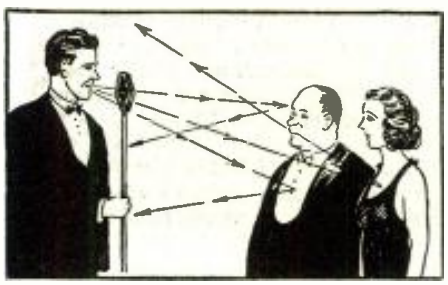
View of the Future "Broadcasting House"

THE London Broadcasting House will look like this in 1940. The entire plant is being remodeled and will be extended to more than twice its present size. Excavation and the erection of retaining walls around the site should be completed about the middle of this year.

The building is expected to be finished by the end of 1940. There will be five underground studios to eliminate all outside noise (bombs?). The main studio will be 80 feet x 54 feet x 30 feet tall; there are also to be three dramatic studios, a sound effects room and a number of rehearsal rooms. Above the ground level will be a number of floors of offices. The control room will be on the 7th floor and a restaurant on the 8th or top floor.

Audiences Cause Distortion

THAT the clothing (or lack of it) in a studio may wreak havoc with the acoustics was discovered at a recent Toscanini broadcast. When it was noticed that tone values, especially in the higher



frequencies, were registering with unusual sharpness, an investigation was started. The cause of the trouble was found to lie in the fact that a large number of men in the audience were wearing stiff dress shirts, and many of the feminine visitors to the studio had large expanses of backs and bosoms uncovered and thus reflecting.

Soft cloth absorbs sound far better than stiff materials. such as a boiled shirt or a sharp shoulder blade. Therefore, the woe!

Well—Could You?

THE *Malayan Radio Times* included in its last issue a questionnaire measuring 8½" x 22", asking listeners a number of questions under the heading of "Could *YOU* Improve the Singapore Programs?" Some of the questions include "What type of programs do you prefer?"; "Do you prefer 'live' or recorded programs?", etc. Questions Nos. 8 and 10, which particularly appealed to the world-wide radio review editor, are printed verbatim: "Do you enjoy Chinese Music? If so, which do you prefer: Teochew, Cantonese, Hokien-Amoy, Mandarin, Teochew Gua-Kang, Peiping, Sze Shuan"; "Which of the following Malay programs do you most enjoy? Put numbers against the items to show the order of your preference: Kronchongs, Lagu Malayu, Lagu Extras, Lagu Nasib & Sair, Dramas."

Eiffel Tower Television Station

AN interesting article on the construction of the television station installed in the Eiffel Tower, Paris, France, appears in a recent issue of *Radio Revista*. As the picture above shows, the video equipment, terminal studio equipment, and transmitter apparatus are linked to each other and to the Eiffel Tower radiator by means of a buried co-axial cable. Thirty kilowatts are used to put the signal on the air and to insure its covering the Parisian area with adequate strength.

Orkney Amateur

MR. J. C. Graham, traffic control officer of the British Air Ministry at Kirkwall Airport on the Orkney Islands, has erected an amateur transmitting station at that point, according to *Practical and Amateur Wireless*. If you should hear GM3TR, you will be tuned in on Mr. Graham.

Trailer Displays Television

NOW Midland Television, Inc., of Kansas City, Mo., has equipped a Covered Wagon display coach with portable television demonstration equipment. Special racks were mounted in the trailer to hold the power supplies, amplifiers and a 9-inch cathode-ray monitor tube. Both

the pickup and the monitor are permanently mounted in the trailer. In addition to this equipment, two television receivers are carried, to be taken out and set up in the auditorium or other place where the demonstration is to be made. The definition achieved by this system is 90 lines.

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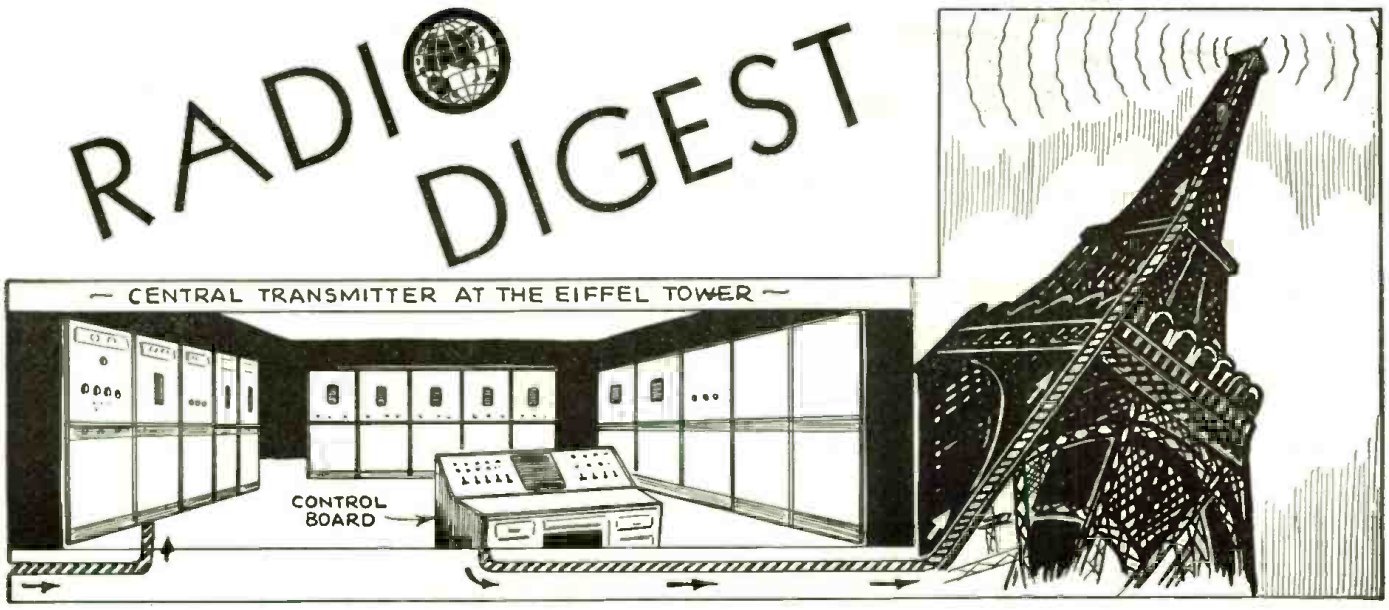
RADIO DIGEST



Radio Aids Skiers

A NEW radio telephone circuit has been set up to enable the hostess at Sunshine Lodge, which is 8,000 feet above sea level, to send a daily message to skiers in various parts of the Canadian Rockies. The photograph shows Miss

Ina May Hummon, hostess at the Lodge, seated at the microphone at the transmitter, which is near Banff.

Television Transmitter

BAIRD of Boston is on the air with a 441-line television signal sent at 30 double interlaced frames per second. While the station has no regular schedule

at the present time, it averaged almost one hour a day during the past year. Programs consist of both direct pickup and motion picture film. The station, W1XG, is sending out the video signals on 46.5 megacycles at 500 watts. There is no audio portion of the program broadcast at the present time.

New N.B.C. Short Wave Antennas

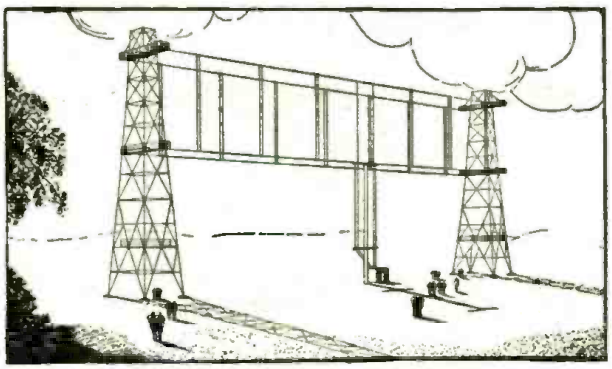
A NEW type of directive short-wave antenna has been installed for N.B.C. short-wave stations, W3XL and W3XAL, which will beam signals from 25,000 watt transmitters directly on Latin America, with effective strength equivalent to 600,000 watts! The frequencies used will be 21.63 and 9.67 mc. The antennas are of the broadside type, consisting of two 150-foot towers 350 feet apart. There are five panels in the radiator and five in the reflector. The beams are directed at Buenos Aires and Rio de Janeiro. The design of the aerials is such that the center of the beam can be changed through an angle of 20 degrees to cover various other areas of the South American continent. By means of a method of phasing the antenna elements, the beam may be swung through this angle simply by pushing a button located on the transmitter control panel. The antennas will be fed through co-axial cables with an outer diameter of 3½ inches. The space between the center conductor and the outer tube is to be filled with nitrogen gas under pressure to keep out moisture.

Channel, Channel, Who's Got the Channel?

WHEN the Germans took over the Czech Moravska-Ostrava transmitter installed at Soinov (a part of the Sudeten lands ceded to Germany by Czechoslovakia), the Nazis inherited a problem in addition to some equipment. The studio is at Moravska-Ostrava and the Czechs are eager to use it but they can't find a frequency to operate on, the Germans claiming that the 1.204 mc. channel is part of the transmitter. Just to make things simpler, most of the programs now being sent over this outfit are relayed from Breslau.

Television Goes to War

OUR America, always in the foreground in invention, is developing television equipment for defensive warfare. Television pick-ups will be sent aloft in planes or balloons, transmitting images of enemy terrain to American staff headquarters and to gun emplacements which may be located several miles back.



View of the Past

DO you recognize the weird object on the table? In case you can't, it is a *loose-coupler* radio set of the vintage of 1910. J. S. Dobbins, an amateur of that

vintage, is seen enthralled by the "magnificent" programs which were on the air in those days. Mr. Dobbins' call was WNU and his station was located in New Orleans, La.

In those days "fans" listened in for waves several thousand meters long. Loading coils as big as the operator were common, the sections being switched in as required.

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WHAT INVENTIONS ARE HEARD OF BUT NEVER SEEN?

RADIO TEST-QUIZ

Meet Your Professor ROBERT EICHBERG

● **THIS month a new method of scoring is used in the R. & T. Radio Test Quiz. For each question you answer fully, credit yourself with 10 points; for each you get half right, take five points; etc. A perfect score is 180; a very good score is 136; a good score is 110; fair is 90—and if your score is below 60, you'd better read a lot of books. Harry Winfield Secor, Managing Editor of this publication, won 142 points in 10½ minutes.**

1. Every year brings the story of some great invention—which no one actually ever sees. Of the following, which is (or are) as yet unproven?

a. The death-ray, which will kill at distances of several miles.
b. The destruction ray, which will stop the motors of airplanes and automobiles at a distance.
c. The television kit, which converts any broadcast receiver for sight-and-sound.
d. A means of transmission so broad that it can be received without tuning.

—

2. Under the International Telegraph Regulations, as revised by the Cairo conference in 1938, a period is sent as

a. didit didit didit
b. didah didah didah
c. didahdidahdidah
d. dadah dadah dadah

—

3. And under the same rulings, the comma sign is now

a. didahdidahdidah
b. dahdahdididahdah
c. dididahdahdidit
d. dahdit dahdit dahdit

—

4. The greatest advance in radio in 1938 was said to be

a. "Wireless" remote control automatic tuning for receivers.
b. Preparations for the release of television.
c. The beam power oscilloscope.
d. The use of ultra-short waves for trans-Atlantic communications.

—

5. In the "Schmidts at Home" dramatic broadcasts from the Deutscher Kurzwellensender, the American character, *Billy Smith*, is

a. the love interest
b. an admirer of business man Germany
c. a nice nitwit
d. a hardboiled
e. an anti-Nazi
f. a shrewd Yankee farmer

—

6. If you are fortunate enough to have a facsimile receiver in your home,

a. it will typewrite printed matter received via radio.
b. it will reproduce both type and pictorial matter received via radio.
c. it will make a permanent readable record of broadcast talks and music.
d. it will show moving images of broadcast scenes and programs.

WHAT COULD YOU EXPECT FROM YOUR FACSIMILE SET?

7. "You're crazy! That magazine isn't published any more!" exclaimed the newsdealer, when the customer asked him for a copy of

a. Radioland
b. All-Wave Radio
c. Radio Stars
d. Tower Radio
e. Wireless Age
f. Popular Radio

—

8. The various station selector circuits in a set using push-button tuning are aligned

a. by means of a movable iron core in each of a number of coils.
b. by means of trimmer condensers in parallel with various coils.
c. through the use of an RF signal generator.
d. by unwinding a number of turns from each of various coils.

—

9. In Spain, both the Nationalists and the Loyalists refer to short waves as

a. chicos ricos
b. poco dinero
c. bobinas rojas
d. ondas cortas
e. gallinas gordas
f. ojos azules

—

10. Radio has been credited with much valuable work in advancing the development of

a. burglar alarms
b. motion pictures
c. aviation
d. hearing aids
e. automobile design
f. weather forecasting

—

11. Can you match the following broadcasters with the types of characters they portray? Well, try your hand at it, anyway.

a. Jack Benny	*A. Grouchy*
b. Gertrude Berg	*B. Silly*
c. Jane Ace	*C. Penurious*
d. Frank Morgan	*D. Timid*
e. Ned Sparks	*E. Boastful*
f. Kenny Baker	*F. Philosophical*

—

12. Marconi first sent his famous three dots flashing across the Atlantic ocean approximately

a. 30 years ago
b. 40 years ago
c. 50 years ago
d. 60 years ago
e. 70 years ago
f. 80 years ago

DO YOU REMEMBER THE TALKING TAPE WAS?

13. Perhaps you don't remember, but "talking tape" is or was

a. steel ribbon on which sounds have been magnetically recorded.
b. a form of indoor antenna, made of flat tinsel.
c. talking movie film.
d. similar to talking movie film, but carrying sound only—without pictures.

—

14. In broadcasting parlance, "live shows" are broadcasts which

a. include risque jokes.
b. do not originate from phonograph records.
c. include hot dance music.
d. are to continue for a series, as compared with those which are only "one-time shots."

—

15. Newspapers have a very strong feeling about radio because

a. radio set manufacturers spend lots of money advertising in the papers.
b. radio stations sometimes compete with the papers by broadcasting news.
c. advertisers spend money for sponsored programs which might otherwise be spent on newspaper advertising.
d. publishing the programs of radio stations attracts more readers to the papers.

—

16. Ultra-short radio waves are said to travel much like

a. sound waves
b. ocean waves
c. permanent waves
d. light waves
e. crime waves
f. Longmayshiwaves

—

17. Frequency modulation transmissions

a. travel farther than other types.
b. pick up less static than others.
c. afford higher fidelity than others.
d. merely evade older patents.

—

18. If you were running a radio receiver and the line cord got hot, you would know that

a. there was a burned out primary on the power transformer.
b. that it was an AC/DC receiver, working as intended.
c. that there was a short-circuit in the set.
d. that it was merely due to overloading because of excessively strong signals.

(Cont. on page 698)


WHAT MAKES IT HOT?

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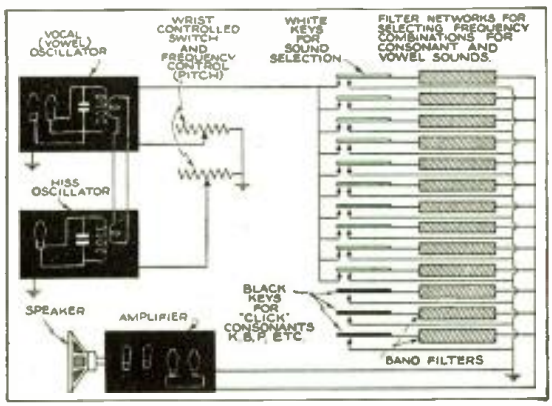
How the VODER Creates Human Speech!

Cover Feature

● AN electrical device, based on radio principles, under control of an operator at a keyboard, actually talks — emitting words and sentences! Known as the Voder, it was developed by Bell Telephone Laboratories as a scientific novelty to make an interesting educational exhibit for the company's displays at the San Francisco Exposition and at the New York World's Fair. It is built, except for its keys, entirely of apparatus used in everyday telephone service.

The Voder is the first machine in the world to create speech. Individual vowels and consonants have been made by a variety of instruments, but they have never before been linked into connected speech. Seated at a keyboard something like that of the old-fashioned parlor organ, an operator can carry on a conversation simply by pressing keys, singly or in combination. It takes a good deal of practice and some time to learn—not as much time as it takes the human to learn the mechanisms he is born with, but still quite a while. And it talks with what might be called a slight electrical accent. Nevertheless, a skilled operator can make it say what she wants.

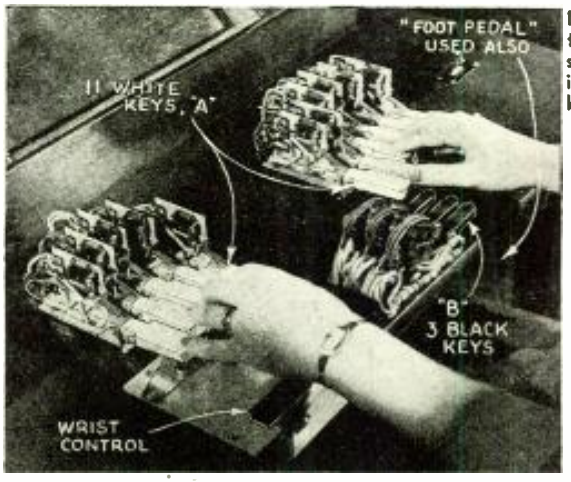


Above: Simplified diagram of the "Voder," showing how radio circuits create the human voice.

The designers of the Voder provided it with electrical equipment corresponding to the two kinds of speech sounds. One kind of sound is made by forcing the breath through the mouth, past tongue, teeth and lips. Turbulence in the air-stream sets up a hissing sound which contains a great many audio frequencies. Some of these are reinforced by resonances in the mouth cavity; that is the way in which are made all the sounds of speech when one whispers, and such sounds as s, th and f. In the Voder there is an electrical hiss, and with

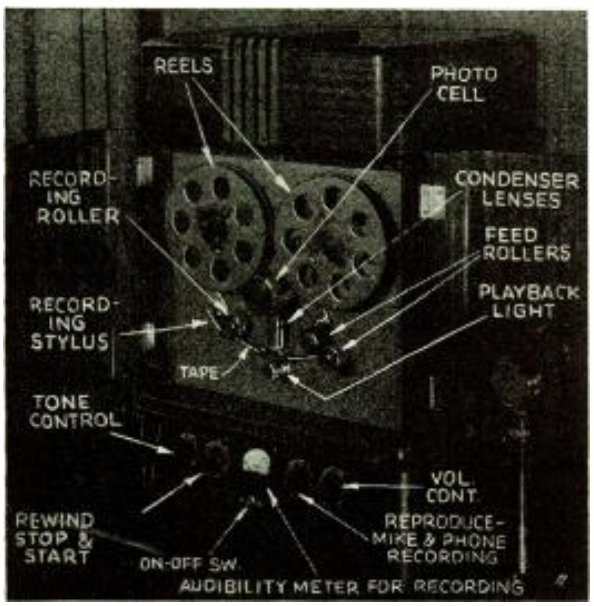
(Continued on page 701)

Above: Seated at the keyboard, this young lady can carry on a conversation by pressing keys. A foot pedal changes inflections. The "voice" comes through the loud speaker.



Left: A close-up. Ten of the white keys control speech sounds; the 11th is a volume control. Black keys make "stop" consonants.

●



Records on Paper Tape

from Mike or Phone

● A NEW type of voice recorder, invented by Merle Duston, veteran radio engineer, affords instantaneous playback of sound-on-tape without need of processing.

In the new apparatus, cellophane or glassine tape is treated with a secret chemical process. This tape is then placed on reels in the machine, as shown in the accompanying illustration. When words are spoken into the microphone, current passes through the tape from the stylus, recording by discoloring the tape as it goes through.

To reproduce the sound, the tape is rewound and fed through again in the same direction. The discolorations in the tape intercept a light beam which travels from a small bulb on the panel of the receiver through a condensing lens system and to a photo cell, the output of which is amplified and reproduced in the usual way.

When 6-inch rolls of tape are used, the apparatus will record for approximately 20 minutes without a change; if 7½-inch rolls are used, one hour's recording can be had. A single track is used on the tape so that lengths may be cut out and filed, much as a letter would be. The inventor envisions use of the apparatus in business offices.

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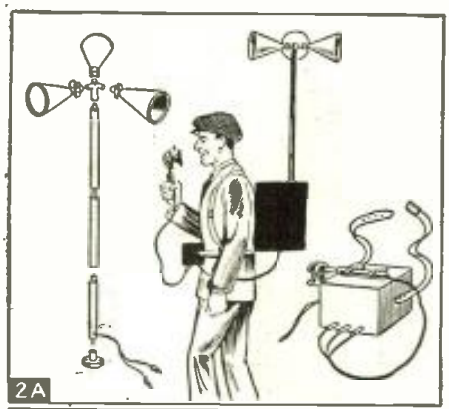
New Facsimile Station

1 FACSIMILE stations are breaking out all over the United States. One of the most recent of these is that installed by Station WBEN of the *Buffalo Evening News*. At one o'clock every morning, this station (shown in Fig. 1) transmits an hour's program, producing a miniature 3-page newspaper. The transmissions are on 900 kc. with 1000 watts of power. Picture shows the transmitter.

gram of which is shown in Fig. 3, is extremely simple to construct. The coils are wound on one-inch forms of No. 22 d.c.c. wire. Coil A consists of 50 turns; coil B, 30 turns; and coil C, 60 turns. These are the short-wave coils. The long-wave coils are D, 250 turns; E, 150 turns; F, 300 turns. The variable condenser has a capacity of .0005 mf., and the fixed condenser, .002 mf.

The designer of the apparatus suggests



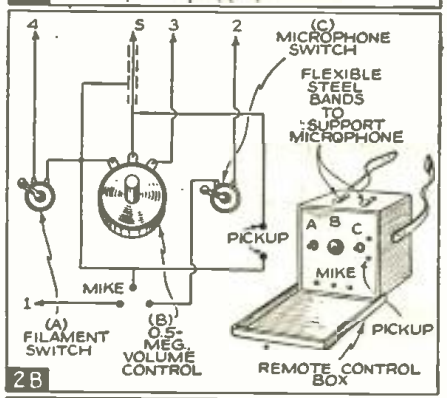
Public Address Pack

2 A PORTABLE public address system that, together with microphone and loud speakers, may be carried on the back of one operator, is described in *Radio Revista*.

Fig. 2A shows the pack as it appears in use. The microphone may be carried inside the case or strapped to the top, while the loud speakers are supported on a collapsible aluminum or bamboo pole.

Fig. 2B gives the detail of the panel, and the switching system which permits a microphone and pick-up to be used and to be faded in and out by means of a volume control.

Fig. 2C illustrates the balance of the wiring diagram to which the numbered terminals in 2B connect. Power for the complete apparatus is supplied by dry cell batteries. The miniature type may be used, as the plate current drawn is relatively low and can be still further reduced by using C bias on the push-pull stage, although this will result in some loss of volume or quality. Standard transformers are used throughout, and values of all fixed condensers are given. Meter may be omitted.



All-Wave Crystal Receiver

3 A CRYSTAL receiver employing band-switching has been described in *Radio Revista*. This receiver, a circuit dia-

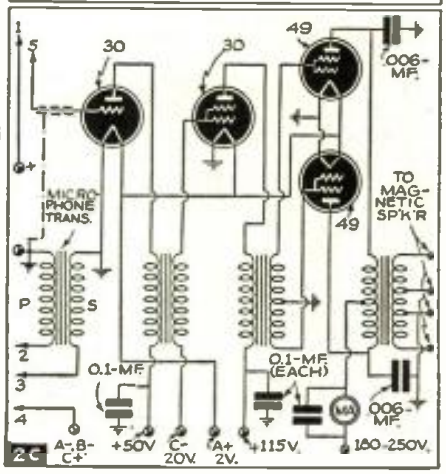
that a single phone of no more than 500 ohms be used. If aerial is more than 60 feet long, insert a .005 mf. condenser in series.

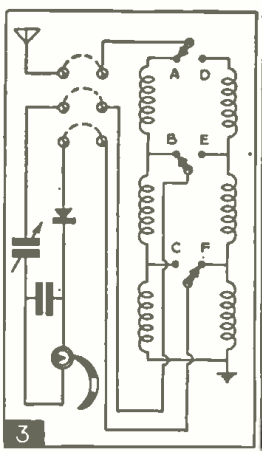
A.C. Resistance, Capacity Mu Bridge

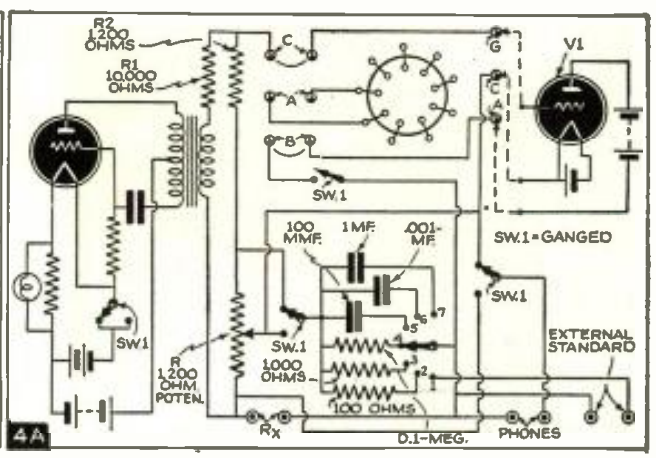
4 L. FRATER (2AZR), writing in Great Britain's *Radio and Television Bulletin*, describes a simple and easily constructed A.C. bridge for measuring resistance, capacity and mutual conductance.

The apparatus diagrammed in Fig. 4A may be broken down into three basic circuits. These are shown in Figs. 4B, 4C and 4D. The fundamental circuit used in the bridge which measures resistance is shown in Fig. 4B. The circuit for measurement of capacities is seen in Fig. 4C, while that used to test mutual conductance is given in Fig. 4D. In Fig. 4B, the network consists of the potentiometer R, the two legs of which are R1 and R2, a known resistance, R3, and the resistance to be measured, RX. Alternating current of a low voltage at about 1000 cycles is applied across the potentiometer, and the point S, where no sound is heard in the phones connected as shown, is determined by experiment. As the bridge is then balanced, the formula is

$$\frac{R_1}{R_2} = \frac{R_3}{R_x} \text{ or}$$







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where the equation is simplified,

$$Rx = R_3 \times \frac{R_2}{R_1}$$

The ratio of R1 to R2 may be easily determined by using a calibrated potentiometer.

To test a capacity, a known condenser, C1, is inserted in place of R3 and the condenser under test, CX, is put in the position of RX. Fig. 4C illustrates this. The same procedure is followed in making this measurement as in measuring resistance. The adjustment is somewhat more critical because no point of absolute silence may be found, in which case the operator must determine the point of minimum sound.

Inductances may be measured in much the same way, substituting the known and unknown inductances at the points R3 and RX or C1 and CX. Terminals are provided for the installation of a standard inductance, although this apparatus is not installed in the equipment in order to economize on space.

The mutual conductance tests are made with the portion of the circuit shown in Fig. 4D. A point on the potentiometer R is found where no sound is heard, whereupon the formula

$$\text{Mutual Conductance } Gm = \frac{R_2}{R_1 \times R_3}$$

is used. In this case, the resistance R3 must be low in comparison with the anode impedance of the tube under test.

When making resistance and capacity tests, all batteries used in Gm measurements must be completely disconnected from the circuit. The oscillator may be a 2-volt power tube.

Mobile Unit Generates Own Power

5 THE mobile unit of Station KDJB (seen in Fig. 5) has traveled some 3500 miles, broadcasting 60-odd programs on 2790 kc. to KGLO where it was retransmitted on 1210 kc. Five hundred feet of cable are used for line or mike, and when necessary to cover longer distances, a portable unit, W9XRS on 31.1 mc., broadcasts to the truck, which rebroadcasts. The unit's Kato power plant is inset.

1

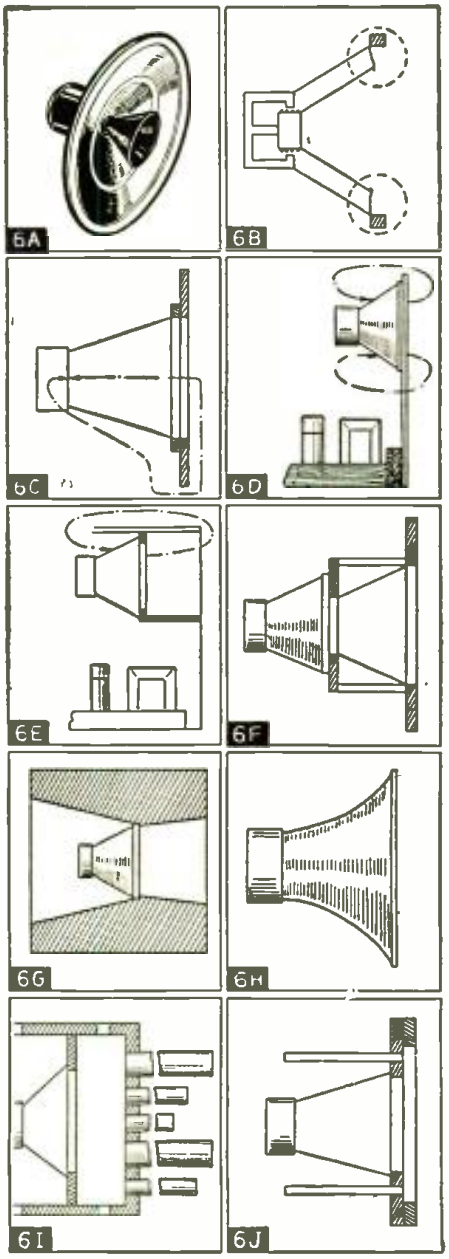
Loud Speaker Design

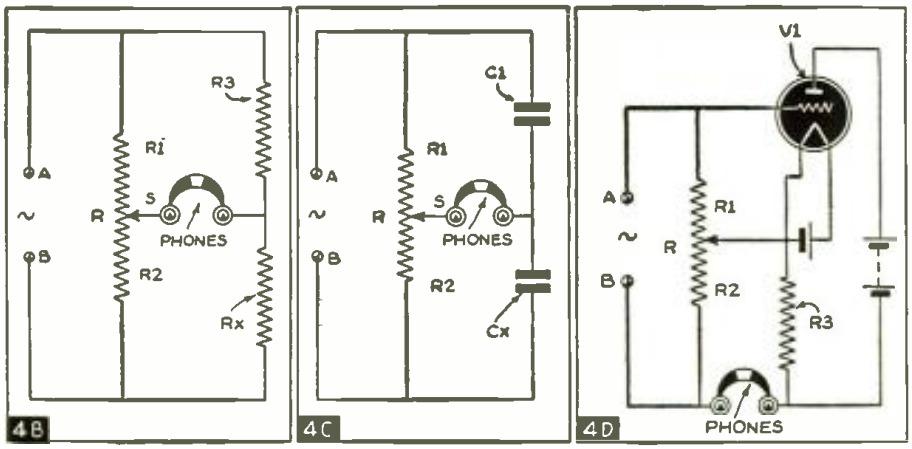
6 A LOUD SPEAKER which includes a "tweeter" for the highs and a large diaphragm for the lower frequencies, is described in the German publication *Rundfunk* and pictured herewith in Fig. 6A.

A Russian publication *Radio* devotes a large section of its latest issue to *baffle* design. Fig. 6B indicates a speaker employing no baffle. Notice the short path which the sound waves may follow from the front to the back of the diaphragm. A far longer path is found when the speaker employs even a small baffle, as shown in Fig. 6C.

6D shows an application where the speaker must be mounted near the edge of a cabinet. The comparatively short baffle area which would be possible above it is compensated for by extending the baffle toward the rear, thus lengthening the path. A resonating chamber is added to this in Fig. 6E. This is shown in greater detail, and with the addition of a horn, in 6F.

6G shows another method of providing directive properties to a speaker. In this design, the speaker is bi-directional, having two radiating surfaces. The sound is projected both through the smaller horn at the front of the speaker and the larger one at the speaker's rear. A standard American system employing a horn, is shown in Fig. 6H.





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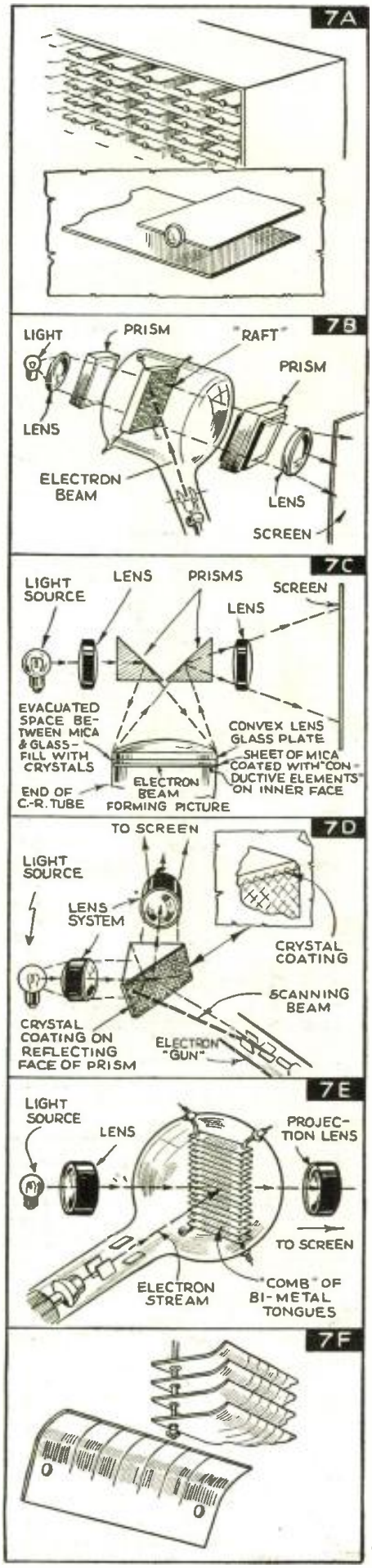
INTERNATIONAL



6I shows a further modification of speaker control. In this particular design, the sound is brought out through tubes designed to resonate at given frequencies. The bass notes are "boosted" by the larger tubes and the trebles by the smaller tubes.

More nearly approximating an American method of some years ago is the design shown in Fig. 6J, in which the feed-back of the speaker is controlled by the use of tuned tubes at the speaker's rear.

New Electron Tubes Designed for Projection Television

7 SOME radically new ideas for the projection of large screen television images by electronic means is found in the latest issue of *Television and Short-Wave World*, a British publication. In one scheme, illustrated in Figs. 7A and 7B, an electro-optical matrix would consist of a number of parallel strips of an optical medium, such as *glass*, Rochelle salts and the like, which become birefrigent (doubly refractive) under electric stress. These strips would be arranged in the form of a rectangular plate, in alternate interstices of which would be inserted thin strips of metal foil to form an edge-on grille. In the other interstices would be arranged small electrodes, each having a small button lying flush with the surface.

The mozaic would be mounted within an evacuated bulb provided with an electron gun and deflector plates in order to produce scanning by an electron beam. The beam of polarized light would be passed through the mozaic and through a second polarizing prism from which it would be projected to the screen. As the beam struck each of the buttons, it would change the electrical potential with respect to the strips on either side of it, thus causing stress on the optical medium between and in this manner modulating the light. This idea, suggested by the Baird Company, was tried some years ago without much success.

Marconi's Wireless Telegraph Company, Ltd., and L. M. Myers suggest the idea illustrated in Fig. 7C. In theory, a layer of asymmetrical crystals would disperse the light unless they were struck by an electron beam to "line them up" so that they would pass light to the mirror's surface. This system, however, is still in the theoretical stage.

The not entirely dissimilar system, shown in Fig. 7D, utilizes a cathode-ray tube with an optically polished end-wall, to which is attached the totally reflecting face of a prism. On the inside of the tube's end plates are carbon particles which are given a positive charge. The electron beam causes the carbon particles to move away from the end wall of the tube, thus changing the reflective factor.

Another idea is to use a very thin metal plate in place of the usual fluorescent screen and to cause the picture element areas of the metal to become incandescent by means of the heat generated by the electron bombardment.

Still another proposed method, shown in Fig. 7E, uses a number of bi-metallic elements which in their cool position block the beam from the light source and then, when heated, bend to permit the beam to pass. Fig. 7F shows detail of the bi-metallic strips. This method, originating in Germany, has not as yet been successful, due probably to thermal lag, though its proponents claim that the use of thin metal with large surface area will speed up the response.

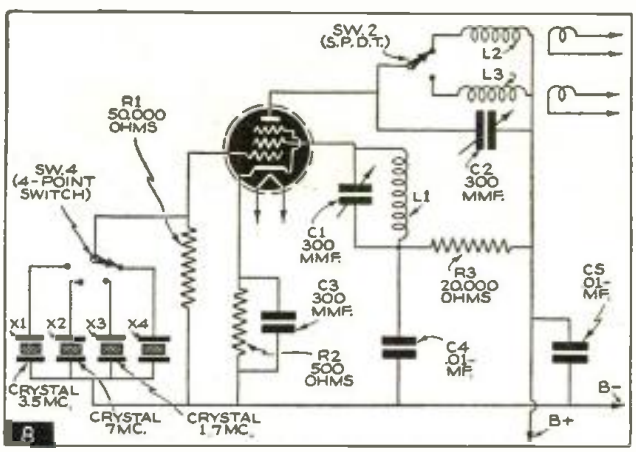
Simple Exciter Unit

8 A SIMPLE one-tube exciter unit (Fig. 8) is described by W. H. Allen (G2UJ) in the *T. & R. Bulletin* of Britain. According to the author, the apparatus has been in use successfully for about two years by GW6YQ.

When an output is required at crystal frequency, C1 is tuned to a point where L1 is out of resonance with the crystal in use.

The output may be adjusted to the required frequency by means of a 4-point switch. S2 selects the plate coils L2 or L3, each of which tunes to two amateur bands. L3 is the 1.7 and 3.5 mc. coil. L2 takes effect with switch SW2 in the other position, when 7 mc. is found at about the center of the condenser.

In order to secure doubling, L1, C1 should be tuned to crystal frequency and the anode circuit to twice that frequency.



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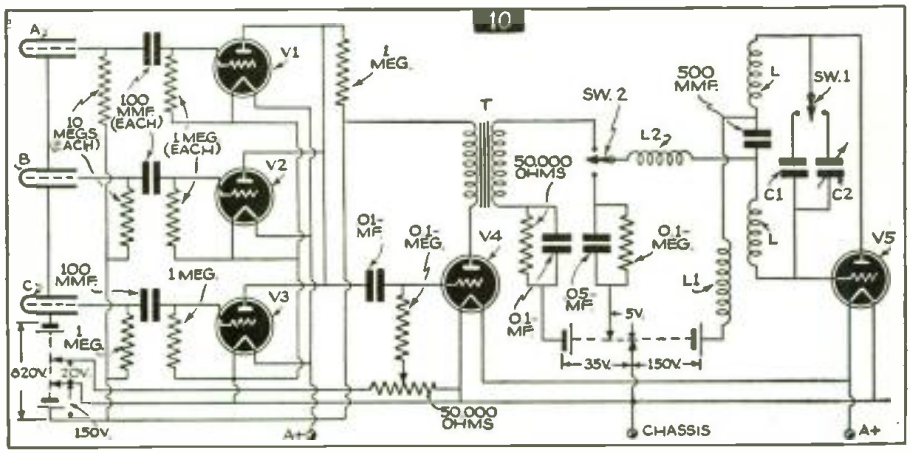
RADIO REVIEW



Simple Output Meter

9 A HIGHLY simplified output meter which uses a crystal to rectify the current for an 0-1 milliammeter, is described in *Practical and Amateur Wireless* of England.

The circuit shown in Fig. 9 makes use only of a one-to-one ratio output transformer, a carborundum crystal detector, and an 0-1 milliammeter. It is, of course, necessary that D.C. be kept out of the meter, and for this purpose the transformer is used.

If the set under test does not already incorporate an output transformer the terminals AA in Fig. 9 are connected to the output of the set. If, on the other hand, the set has a built-in output transformer, the terminals BB are connected across the secondary of the transformer already in the receiver.

The particular type of milliammeter used in the outfit shown had 100 ohms internal resistance.

While this is the apparatus as described in the British magazine, the editors of RADIO & TELEVISION believe that it would be wise to put a variable resistance of 0-1000 ohms in series with crystal and meter.

Measuring Cosmic Rays

10 MUCH mystery has always surrounded the type of apparatus used for measuring cosmic ray discharges. Now *Wireless World*, a British publication, reveals the workings of the transmitters which are sent up in balloons to count cosmic ray emanations, and signal automatically the altitude at which the observations are made.

The 40 mc. apparatus shown in Fig. 10 was used in the Wordie Expedition to West Greenland and worked satisfactorily at altitudes up to 12 miles.

The ray counter consists of two electrodes in vacuum tubes containing small quantities of certain gases. The electrodes are a straight wire and a metal cylinder surrounding it, a potential of about 800 volts positive being kept on the wire. The circuit is completed through 10-megohm resistors, as shown in the diagram. Charges passing through the counters ionize the gas and cause current to flow.

Triples Facsimile Speed

11 A NEW type of scanner, upon which U. S. patents have just been granted to W. G. H. Finch, triples the speed at which a facsimile image may be scanned and reproduced.

Fig. 11 illustrates the new device, which employs an endless chain upon which are mounted three styli at regular intervals. The chain travels continuously in one direction and at the same time the platen, carrying the paper upon which the image is to be reproduced, slowly rotates. As one stylus passes off the paper at the right, a second commences its line at the left and as this one travels off at the right, the third is caused to begin the next line. When this stylus has passed across the paper, No. 1 is again ready to start.

The new design simplifies the mechanism greatly, as a reciprocal motion is no longer needed, a continuous motion taking its place.

Rails provided in front of the platen guide the styli accurately along their path.

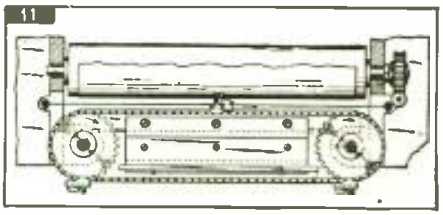
Curing Television's Ills

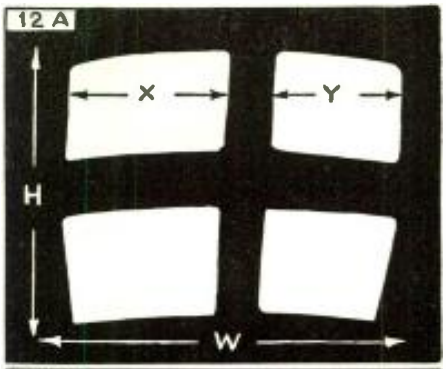
12 ONE of the most frequent troubles with the television image is due to non-linear scanning in either the vertical or horizontal sweep. Figs. 12A, 12B and 12C show the familiar cruciform pattern sent out by many television stations for test. In Fig. 12A you will notice that the distance X is greater than the distance Y. This is caused by a non-linear sweep voltage from the line time base. In other words, the saw-tooth oscillation has the wrong form. The discharge of the condenser used in the circuit takes place too late. It may be caused by incorrect voltage or by a change in the value due to overload or deterioration, and is usually cured by reducing the value of the cathode resistance or increasing the value of the charge resistance.

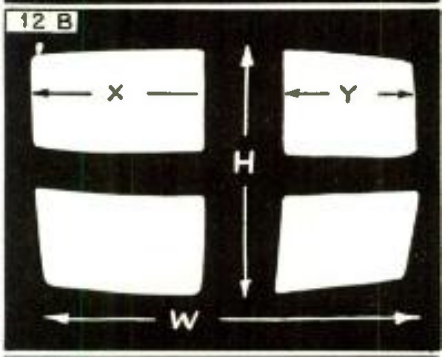
In Fig. 12B, the pattern has its height-to-width ratio out of proportion. The amplitude of the oscillation in the gas relay tube is at fault.

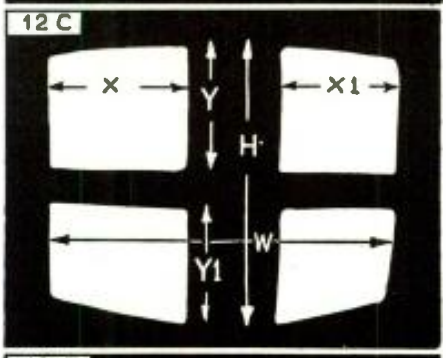
Fig. 12C shows the pattern again, this time as it should be received, although the distance X is slightly greater than X1

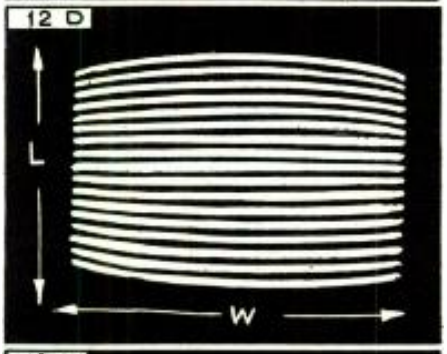
(Continued on page 698)

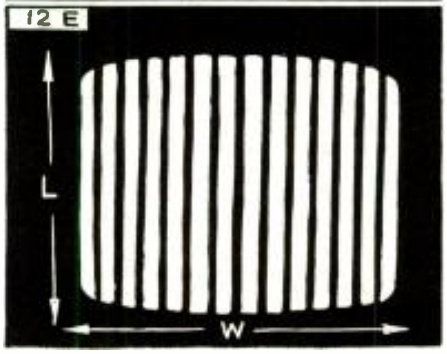












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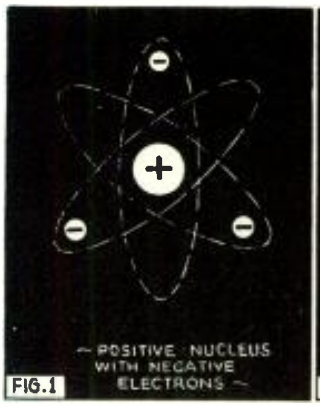
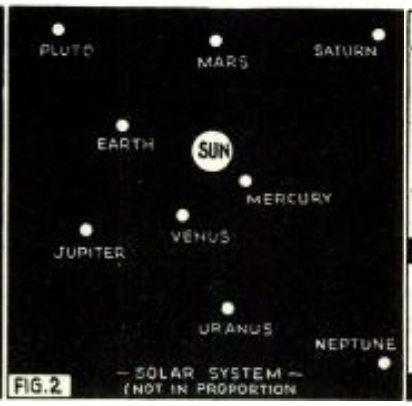
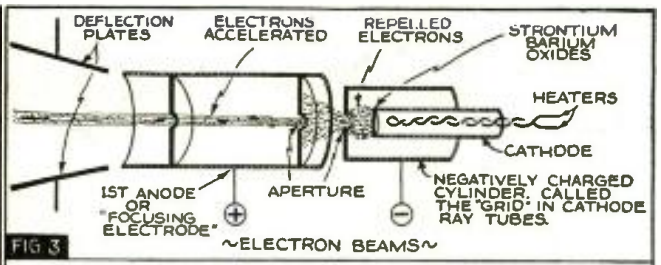
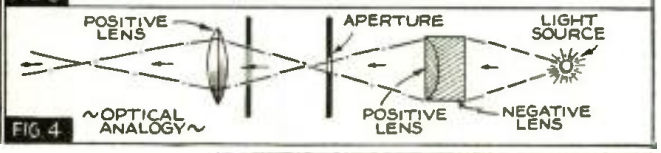








ELECTRONIC TELEVISION COURSE

Henry Townsend

Lesson I—Fundamentals

This series of lessons on television has been prepared by a practical television expert and will cover such vital subjects as photo electrics, cathode-ray tubes and how they work, sweep circuits, receiving systems for image and sound, etc.

● ACCORDING to the accepted classical theories, an *electron* may be defined as *a negative particle of electricity.* An atom consists of a positive *nucleus* with one or more electrons revolving in their respective orbits around this positive nucleus. (See Fig. 1.) The Solar System may be compared to an atom, the sun being the positive center with the planets in their respective orbits revolving around it representing the electrons.

These electrons, as has been stated before, behave exactly as do the planets in the solar system, describing their orbits around the positive nucleus without variations, when the atom is at rest. However, if energy is applied to this atom it begins to move in a given direction and with a speed commensurate with the energy applied. In its travel in a given direction, one or more electrons may strike an adjacent electron of a second atom and dislodge it from its orbit, thus *ionizing* this second atom. A physical manifestation of this phenomena may be observed when we apply energy to a vacuum tube filled with a rare gas, such as neon, and apply a potential to the electrodes. This potential is the necessary energy to cause these atoms of neon gas to travel at speeds sufficient to cause collisions of electrons, making the gas glow with its familiar red luminescence.

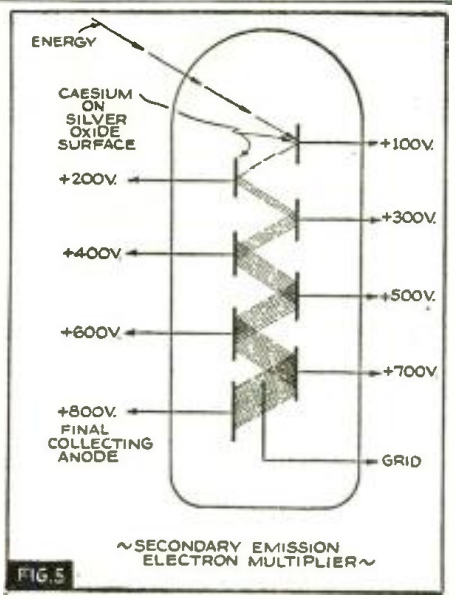
How Electrons Are Emitted

All substances will emit electrons when energy is applied, to a greater or lesser degree, the degree depending upon the substance. The elements that emit copious quantities of electrons as used in modern day vacuum tubes and with which we are familiar are tungsten, thoriated tungsten and oxides of strontium and barium on metal. Each of these substances has its particular use in the field of electronics, but because of the lower energy necessary to emit a certain quantity of electrons, the strontium or barium oxide coated filaments or cathodes are used in the majority as electron emitting surfaces. Due to the low operating temperatures (from 1100 to 1170 degrees Kelvin), these oxide coated cathodes are particularly suited to various applications in electronic tubes suitable for television, because at this temperature they emit very little visible light.

Electron Optics

When a number of electrons are emitted, their paths are indefinite but as these electrons are negative particles of electricity, their paths can be made to follow a given direction by attraction to a positively charged electrode: or we can form beams of these electrons by surrounding the electron-emitting cathode by a negatively charged electrode, thus repelling these electrons to form a narrow beam and then attracting this beam by the positively charged electrode mentioned previously. By suitably arranging negatively and positively charged electrodes of proper shapes and sizes we can make these electron beams behave similarly to visible light. This art is often referred to as *electron optics.*

Certain chemical substances, when exposed to a bombardment of an electronic stream begin to *fluoresce* (emit visible light). This phenomenon is taken advantage of in cathode-ray tubes for the interpretation of electrical energy back into light, so that our eyes may perceive and our brains interpret this phenomena into images. Many chemical substances exhibit this property. The most commonly used are zinc sulphide, zinc silicate-manganese, and cadmium tungstate. These substances fluoresce in visible light, ranging from blue for zinc sulphide to the red end of the spectrum for a combination of zinc-cadmium-silver compounds. These chemicals, in certain proportions, are used in present day television receiving tubes which fluoresce with an almost pure white light.



1—Fig. 1 shows positive nucleus with negative electrons; 2—Analogy, the Solar system; 3—How electrons are beamed; 4—Analogy for 3; 5—Illustrating the fundamental action taking place by secondary emission in the Zworykin electron multiplier.

Electron Multipliers

Another phenomenon of the electronic art, that has brought television to its high present-day status, is known as *secondary electronic multiplication.* All of the alkali metals emit copious quantities of electrons when extremely small amounts of energy are applied to them. In a device called *The Electron Multiplier,* a number of electrodes are coated with these alkali metals, usually caesium. An electron emitted from the first electrode is caused to strike the second electrode with sufficient force to dislodge five or more electrons from its surface and these five or more electrons are in turn attracted by a positive charge

(Continued on page 698)

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LATEST INTER-PLANET NEWS

The Martian Flash

MARS-EARTH SPACE TRANSMISSION: COSMICLEAR

No. 2 MARCH, 1939 Price: None

The Martian Flash

An Inter-Stellar Magazine for all Radio Enthusiasts.

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Martian Office—
698743209 K K K 9 Street,
Martolus, Mars.

Fips, the Office Boy, who tells us the latest happenings on Mars.

March, 1939

EDITORIAL

● FIRST of all, thanks, boys, men, and all others, for the lovely roses and cobblestones which you were good enough to shower upon me. To say that I am overwhelmed is to put it lightly; flabbergasted would be a much better term—although the Martians would not understand it. Indeed, you cannot flabbergast a Martian, much less surprise him. A civilization with fifty million years of experience behind it cannot very well be expected to be surprised even at the most extra—super—ultra—colossal. While I have been here only a few years, I am getting so now, that I am quite immune to surprises myself. So I hope you will bear with me when I relay to you, from month to month, conditions on Mars as they exist nowadays.

Of course, I know some of you are still incredulous of all the wonders of Mars. As I unfold all the technical wonders every month, you will soon appreciate and understand that they are not half as far-fetched as you may imagine.

Just imagine, what even such a reputed wise-guy, as King Solomon with his A number one wisdom, would think if he were suddenly to come to life again on your good old earth now? And remember that only a few paltry thousand years have intervened between Solomon and you. Then consider that the Martians have been civilized and up to date in all technical wonders for over fifty million years!

I will leave you with that thought till next time.

THE AUTO-TRIBUNAL

By *Ulysses Mohammed Fips*
* * Martian Star Reporter * *

LAST month (of course, I refer to Earthian months—the Martian month being sixty of your Earth days) I spoke about the Auto-Science-Mech-Ultra-Tribunal. The Editors of your magazine reported several thousand letters of you readers who wanted to know what this fearful thing is all about.

The answer is simple. Always remember that Martian Civilization is fifty million years ahead of your own. In such a civilization you naturally do not expect cops, detectives, judges, juries, and similar Earthian kindergarten stuff. The Martians haven't had any policemen for twenty million years, and such a thing as juries and judges and courts can be found only in the oldest-recorded early history of the planet Mars.

On Mars everything is geared in such a manner that no Martian can do anything out of the ordinary without its being known immediately. Thought recorders, naturally, are old-time stuff here. Originally, they were used to register all thoughts radio-mechanically,

In a few minutes I was apprehended by an automatic guard . . . .

whereby the recorded thoughts came out on a moving tape. This tape in turn was fed through a second machine which either worked like a typewriter or could set up type automatically. Thus, when an Editor wanted to put his thoughts down, he no longer did so by writing or dictating. He simply *thought* them and when he was finished thinking, he had the whole piece either typed out or printed on a sheet.

There was a terrible commotion. . . . Tubes blew out, sparks played all about and general pandemonium broke loose.

After a while, sensitive registering apparatus were designed whereby any extraordinary emotion of a Martian could be recorded, even at a great distance. From this development, it did not take very long, by utilizing other necessary refinements, to reach the stage whereby, if any extraordinary emotion took place in any one of the inhabitants, it was immediately recorded at a central recording office. The idea was not to spy on the thinking processes of the population, but rather as a sort of police duty. Suppose one Martian murdered another fellow being. The accompanying emotion would set loose a veritable tornado of radiation to be instantly recorded at the Radio-Emo Centre. By simple triangulation, the person was instantly spotted, and within ten seconds, the police had the culprit. This was of course, millions of years ago. Nowadays infinite refinements have been made and instead of a man being arrested for any wrong-doing, a sort of hypnotizing-paralyzing beam is directed on him. The culprit then becomes nothing but an automaton with no free will. Nowadays when we no longer have any policemen or judges, everything works automatically. This is how it works:

Let us say someone has committed a theft. The emotion let loose is instantly recorded at Headquarters. Headquarters then sends out its hypnotizing-paralyzing beam, and the culprit is directed to appear at the Auto-tribunal of his district. There are many of such Auto-tribunals throughout the planet. As the subject no longer has any free will of his own, but still can react to everything that is going

(Continued on page 695)

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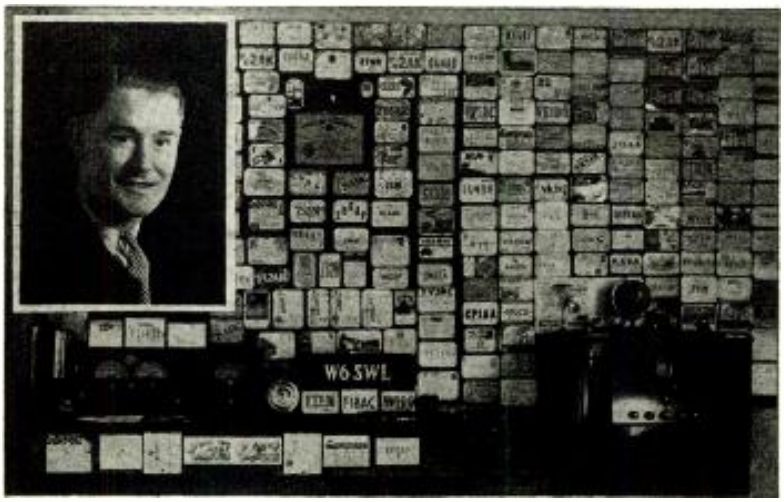
What Do You Think?

He Wants "Trophy" for "SWL" Shacks!

Editor, I have just recently become a reader of RADIO & TELEVISION and I find it is a very constructive publication, just chock full of valuable and interesting information. Of course, being an SWL, I am most interested in Joe Miller's column, and find it both accurate and up-to-the-minute. I am also interested in the Silver Trophy Award for the best amateur station photo of the month. It would be greatly appreciated by the SWL's if they were given a chance, say every other month, to compete with the amateurs for the trophy. I am sure there are many fine looking "SWL Shacks" that would look good in print. What do you say to that?



This month's Prize Winner—1 yr.'s subscription to "R. & T.", goes to James E. Moore, Jr., San Francisco, Calif. His receivers are RME-69, DB-20 Pre-selector; 11-tube Philco. Verified 74 countries.

I have been DXing for a good many years, but I have collected QSL's for only three years. My VAC or HAC is: Africa, 28; Asia, 35; Europe, 42; South America, 40; Oceania, 16, and North America, uncounted. My verified individual countries are 74; I have verified all continents on 20, electrically recorded all continents on 20, as well as the other short-wave bands. Recorded list is as follows: VK4VD, VK3ME, VR6AY, HH2X, SM5SD, KA1ZL, J2MI, ZU6P, YV1AP, ZBW3, JZJ, RV15, GSB, ZRK, ZRH, TGWA, KKH, DJB, DJQ, CEC, PRF5, Radio Mondial. The recordings of ZRK-ZRH were so well liked by the SABC they were played back to me on three transmissions.

New cards received here since this photo was taken are: ES5D, G8QX, G5BW, G5LJ, G6NF, G6WX, G5BJ, G2TR, G3DO, CT1QG, SPD, SM5SD, HB9J, HB9CL, IRF, OE1CM, VR6AY, VK2VV, VK5FL, VK3WA, VK2OG, J7CR, XU8RB, KA4LH, KA1FH, J2KG, XZ2EZ, VS6AG, VS4CS, YDB, YDC, PK3GD, PK1JR, ZS5AW, ZS2AF, ZS1AX, ZT6Y, ZRD, ZRJ, ZRK (6 meg.), ZRH (6 meg.), HH2S, Radio Martinique.

In my three years of reporting for QSL's, I have had excellent luck with the exception of the Australians, who I believe it is almost impossible to please. It seems there are only a few who will QSL. They have received IRC, American Dimes, Australian Stamps, and I have even gone so far as to send them actual "recordings" of their signals. After three years I have been able to obtain only 16 cards from Australia and the nearby islands.

JAMES E. MOORE, JR., 3551—18 St.,
Business Manager, I.D.A., San Francisco,
Golden Gate Chapter, California.

He Thinks "R. & T." OK as Is

Editor,

What's the matter with these fellows who are throwing "bricks" at recent RADIO & TELEVISION issues? One fellow doesn't like the cover, another does not want television articles. I do not agree with these readers. I think that the latest issues of RADIO & TELEVISION have been more interesting, and contained more news than ever before.

Dr. R. Essinger, as far as I can see, does not seem interested in learning anything about television; he seems more interested in general radio subjects. Yes, I am broadly interested in radio too, but I would like to read and study progress in television. Then Dr. Essinger also says he wants more radio circuits to be published in R. & T. Each month I find the newest and most modern radio circuits. How about conducting a vote on whether to have television articles?

Joe Miller's column is very FB and is up to the minute each month. The new VAC certificate is very handsome and I am going after mine soon. Please mention in your "mag" that I would like to correspond with listeners in Ontario, Cuba, Argentina and Mexico. All in all R. & T. is the perfect radio and television magazine. This is all for now, but what about this television topic? How about it fellows?

MEREDITH M. STROH, Kitchener, Ont.,
172 Queen St., N., Canada.

Spiral Scanning

Editor,

Upon close study of the methods of television now in practice, namely mechanical and cathode ray types, both have faults that must be corrected before either is successful.

The scanning in both systems has followed the time worn path to form a rectangular picture. Both methods have tried interlacing the scanning lines to eliminate distortion and shadow.

I am of the opinion that right here we should try something else in scanning. What would be wrong with a round picture? Why doesn't someone try experimenting with a spiral scan, by some simple rotational cam or other method? Spiral scanning would do away with returning the beam to one side each time to scan the next line, etc. This method applied by some ingenious method to the cathode ray would eliminate the negative return for each succeeding line.

Before the cathode ray tube was ever used as it is now in the Iconoscope, Dissector and other tubes of this type I mentioned to many of my acquaintances that the disc method was out of the picture, as some means must be found to scan the image as it appeared on the glass negative in a photographer's camera which is exactly what the cathode ray tube now does. However, I do not believe this the ultimate procedure, as probably some system combining the two (mechanical and electronic) methods will eventually answer the purpose.

You might outline spiral scanning in your magazine so that some more fortunate than I can take it up and do something with it. I am sure someone will find a way. Probably a simple mechanical means will be best since the intensity of light in mechanical systems seems greater and its adaptability to color enlargement and stereoptical methods at least practical, with less coverage of the wave band.

DARREL F. WOLFE,
1821 Thompson St.,
Harrisburg, Pa.,

Constructive Criticism

Editor,

I haven't commented on RADIO & TELEVISION for quite some time, so here goes.

Where could a man find a better magazine consisting of non-boring technical articles, inside information concerning radio stations, a complete station list and etc.? Again I ask—WHERE??!!? I think the new make-up is very ultra modern—FB—no disappointments whatsoever in the new changes here at this shack.

May I suggest that you put an asterisk after the author's name and a footnote at the bottom of page, giving his mailing address, so that should a reader wish to correspond with him he may do so? There have been plenty of times I would have given a lot to write to certain authors in order to obtain a little more information.

But after all—you still have a "FB" magazine and I shall continue to buy and save them. I wish you continued success.

JOE HESTER,
1430 South College,
Tulsa, Oklahoma.

(Thanks for the suggestions, Joe, and we're working on some of the ideas. Glad you like the new make-up.—Editor.)

A "Reference Library"

Editor:

We SWL's ought to stick together as far as these Hams are concerned. I am open to any argument from the Hams and will answer all letters promptly, whether from South Africa or the Bronx. I would like to correspond with any SWL in this small world.

I have been in this short-wave game for about two years and still learn of new stations, every day. I use your magazine as

(Continued on page 684)

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Getting Started in AMATEUR RADIO

C. W. Palmer, E.E., Ex.-W2BV

Second of o new series

How To Build a Beginner's Transmitter

● HAVE you started in earnest to learn to "copy" code signals in preparation for getting your Operator's license? If so, you are probably anxious to get started making your first transmitter, so that you will be ready on that eventful day when the "tickets" arrive from the radio inspector's office to "get on the air" immediately.

The importance of sticking seriously to the job of learning the code cannot be stressed too much. This is the stumbling block of many embryo Hams, but if you are *really serious*, there is no reason why it should stop you from enjoying the thrills of "contacts" with other amateurs all over the world. Stick to the job!

As we promised last month, we will start right in with the construction of a 'phone and C.W. (code) transmitter which will meet the government's regulations and will be a good stepping stone toward the "rig" that every Ham dreams about.

Our transmitter delivers about 10 watts of power as a phone rig and up to about 20 watts for code. The units as shown in the photos compose a complete C.W. code transmitter, complete with power supply and all ready to go on the air except for a suitable antenna and antenna tuning and coupling arrangement. When this is completed we will build a modulator to permit it to be used for phone work. You will notice that the parts on the power supply are all at one end of the chassis—this is to leave room for the power supply of the *modulator*.

The circuit shows that the rig is quartz crystal controlled and with the coils described later and two quartz crystals it can be used on three bands—the 3.5 megacycle band for either phone or C.W., the 7 megacycle band for C.W. and the 14 megacycle band for either phone or code.

The type 59 tube is a "tri-tet" (triode-tetrode) oscillator and the 46 is a power amplifier. On the 7 and 14 megacycle bands, the oscillator is used as an "electron-coupled" device, simply by shorting out the coil L1. It can be seen that with plug-in coils and the flexibility offered by the circuit arrangement, it is an easy matter to change from one band to another.

The model shown in the photos is mounted on two bakelite panels—one for the transmitter and the other for the power supply. It is not necessary to use the bakelite panels—dry wood which has been shellacked to keep out moisture is just as good and is a lot cheaper.

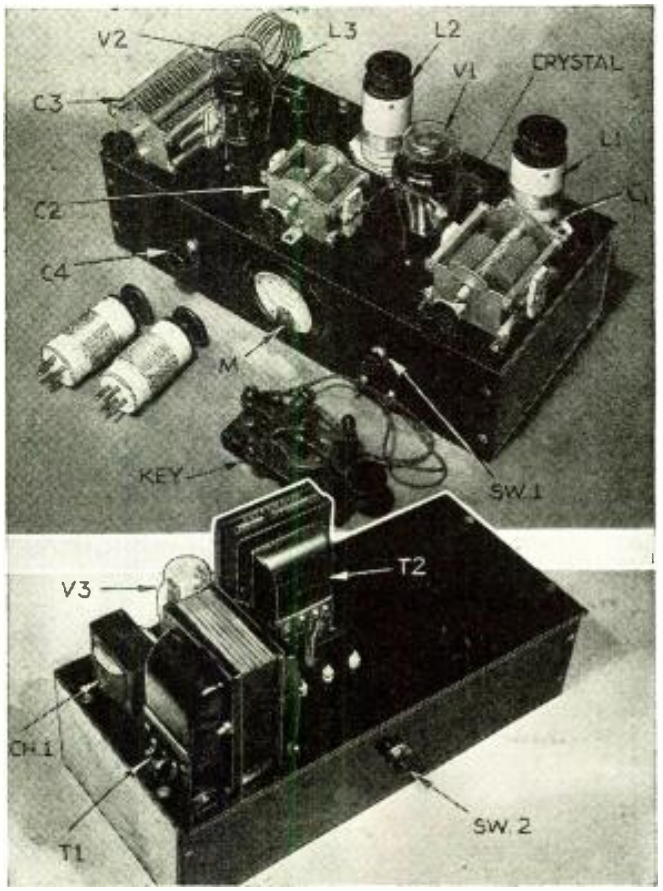
It is advisable to use the best of parts where coils and condensers are concerned, as these parts will greatly affect the operation of the unit. All the sockets are isolantite wafer types—two 4-prong sockets being required for the oscillator grid and plate coils, two 5-prong sockets for the 59 tube and the quartz crystals and a 7-prong one for the 46 amplifier tube.

On 3.5 megacycles and 7 megacycles, the oscillator is used as a straight pentode, the coil L1 being shorted out of the circuit by means of a short length of wire, or by bending one of the end plates of C1 so that at maximum position the plates touch.

On the 14 megacycle band, quite a different mode of operation is required. Here the oscillator is a "tri-tet" unit, the cathode coil L1 being tuned to 7 megacycles or higher and the plate coil L2 being tuned to 14 megacycles. Thus, the oscillator serves the double purpose of generating the oscillations and doubling their frequency. This eliminates the need for more than 2 quartz crystals and also increases the stability of operation on the 14 megacycle band.

Mount the parts in the positions shown in the photographs, as this will prevent undesired couplings and will keep leads short. Keep all grid and plate leads as short and direct as possible and twist the filament leads to prevent a modulation hum being picked up.

No exact details for wiring the units will be given, as the wiring is quite simple and the positions of the parts can be readily seen in the photographs.



Top Photo—The Beginner's Transmitter here described. Lower photo—Power supply unit.

Coil Winding

The coils are an important part of the transmitter construction and care should be used to make them as neat and strong as possible. For the oscillator grid and plate coils, isolantite plug-in forms are used which make the winding job a relatively simple matter. For the amplifier tank coil (output coil) a different mode of construction is employed. Number 12 wire is used for these two coils and they are made self-supporting by cementing strips of celluloid across the turns at three or four points around the circumference. The wire is wound on a form slightly smaller than that desired for the finished coil—about 2¼ inches in our case, to make 2½ inch diameter coils. The desired number of turns are wound on and then narrow strips of celluloid are slid under the wire. Next, the turns are spaced to the desired amount with string, to make the over-all coil the desired length and to keep the turns from short-circuiting.

Next Duco cement is run between the turns onto the celluloid strips. After about an hour, the string spacers are removed and a second layer of cement is run between the turns on to the strips. After about a day, this hardens and makes the coil quite firm.

(Continued on page 681)

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Waves and Harmonics

The Radio Beginner—Lesson 5

Martin Clifford, W2CDV

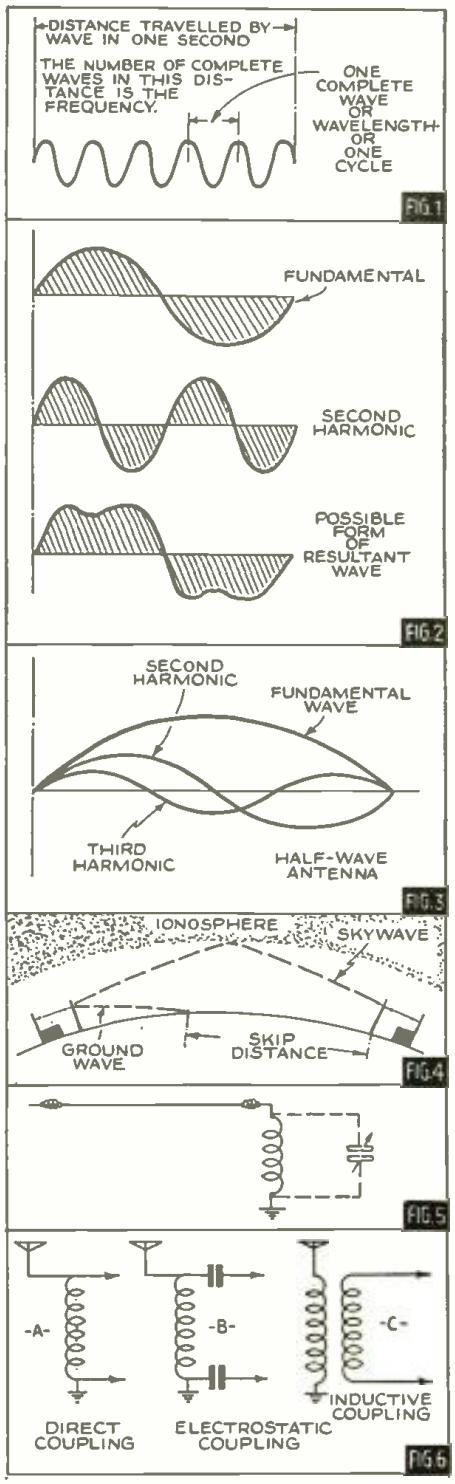
● IF we were to take a piece of thin steel wire, stretch it between two points, and then pluck it, we would hear a noise of a certain pitch that we would call a sound wave. This sound wave would be due to the vibration back and forth of the wire. If we were to shorten the wire, or make it tighter, the wire would vibrate over a smaller distance, giving us an increase in pitch, due, of course, to the fact that there would be more vibrations per second. Speaking in terms of radio we would say that we have increased the number of cycles of sound waves in a given unit of time. Thus, when tightening our steel wire, we could increase the frequency, or speed of vibration, from a thousand cycles per second to ten thousand cycles per second, and we would notice the sound getting higher and higher.

Sound, Light and Radio Waves Similar.

Let us assume that we can make the wire vibrate as rapidly as we wish. The pitch would increase more and more, and then we would no longer *hear* the sound waves, but we would begin to *feel* them. By placing our hand on the wire we would get the sensation of warmth, or heat waves. Increasing the frequency, the wire would get warmer until we could *see* a dull red color—a light wave. Thus we see that the only difference between sound waves and light waves is one of frequency of vibration, and this difference extends itself also to radio waves. The type of wave that we would get, whether radio wave, sound wave, or heat wave, would depend upon the frequency of the vibrations. With more rapid vibrations we would go from heat waves to light waves, then to ultra violet light, to X-rays, and then to gamma rays. There is no sharp dividing line between the waves of various frequencies, since the division of these waves into radio waves, light waves, sound waves, etc., is merely a matter of convenience. All the waves actually belong to one unbroken series, although they may not all be perceived or observed in the same manner, since the identifying characteristics of the waves vary as the frequency is changed. In connection with radio waves we hear the term *cycle* or *kilocycles* (thousands of cycles) and the term *wavelength*. Figure 1 shows the relationship between wavelength and frequency.

What Are Harmonics?

Referring once again to our analogy of the steel wire, we know that we can make it vibrate and produce a wave that we can identify by sound. The sound wave thus produced is not a pure wave—that is, it does not consist of just one wave, but several waves. The wave having the lowest or principal frequency is called the *fundamental* wave. The other waves may be double, triple, or even four times the fundamental frequency, and are called *harmonics*. We might very well ask why we do not hear sounds of several different pitches at the same time, when we vibrate the wire, since we produce waves of a number of different frequencies. The answer is that the fundamental frequency and its harmonics combine to form a single wave, as shown in Figure 2. Harmonics are of importance in radio since they have a very valuable application in the field of transmitter and transmitting antenna design. It is by means of harmonics that an antenna, whether used for receiving or transmitting, is able to resonate at more than one frequency. Use of harmonics has a practical application where antenna space limitations exist. For example, an antenna to resonate at a wavelength of 40 meters should be about 132 feet (i.e., 40 meters) long, in which case it would be known as a *full wave* antenna. The same antenna could be used for operation even if reduced to 66 feet, or half the length, in which case it would operate as a *half-wave* antenna. The term is used to indicate that the antenna is resonant at one half the fundamental frequency. Note in Figure 3 that the second harmonic exists as a full wave, since it is double the frequency and that the third harmonic is a wave and a half, or three half-waves long.



1—Illustrating wavelength. 2—Fundamental, second harmonic and resultant wave. 3—2nd and 3rd harmonics relation to fundamental. 4—Sky and ground waves, also "skip distance." 5—Loading aerial circuit with inductance. 6—Various forms of coupling.

Ground Waves and Sky Waves

Radio waves follow the curvature of the earth, in which case they are called *ground waves*, and travel outward into space, this latter component being called the *sky wave*. The sky wave would be useless for radio transmission were it not for the fact that about fifty miles above the earth's surface there is an ionized layer, called the Kennelly-Heaviside layer, that bends the radio waves back to earth. This layer, called also the *ionosphere*, is a region in which the air molecules have been ionized by radiation from the sun and presumably by radiation coming from outside our own particular solar system.

Ionization simply means that the molecules or particles of matter that constitute air have received an electric charge. This does not imply that the molecules of air retain their electric charge permanently, but that they are constantly being re-ionized. At night, absence of radiation from the sun causes a sharp decrease in the amount of ionization, with the result that a variation in transmission and reception is usually experienced. The point at which the wave is returned to earth depends on the wavelength of transmission. For example, waves in the broadcast band (of several hundred meters) are generally directed back to the area around the transmitter. However, as we get down to short waves, the sky wave will not return to the

(Continued on page 701)

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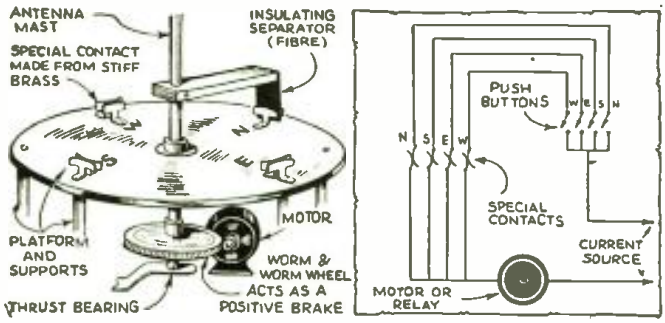
Radio Kinks

Each month the Editor will award a 2 year subscription for the best kink submitted. All other kinks published will be awarded eight months' subscriptions to RADIO & 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.

First Prize Winner



Motor-Driven Rotating Antenna

This is a means for electrically controlling the direction of a beam or loop antenna which is mounted at a point remote from the control panels. Parts needed are: 8 specially made contacts, 4 switch buttons, a motor with a worm drive, and the usual mast which is mounted on a thrust bearing. as the accompanying sketch shows.

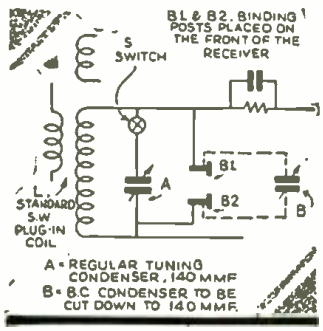
The worm drive acts as a brake, eliminating back-lash and making the antenna stop positively in the correct position. The only detail which must be given special care is to make sure that the contacts are perfectly aligned and that the arm which breaks the contacts is accurately positioned.

As a reference to the illustration shows, each circuit is completed by pressing the corresponding button (West, East, South or North), and is broken only when the insulating separator gets between the two contacts as the antenna is rotated. All the other circuits may be completed, despite the fact that one pair of contacts is open. The antenna automatically stops in the desired position. Pressing the same button twice will not change the antenna's position but pressing any of the other buttons will cause it to rotate until it reaches the new position which is wanted.

Pilot lights may be arranged to show the position of the antenna but these are omitted for the sake of simplicity in the drawings.—*William L. Teter.*

Cutting Condensers

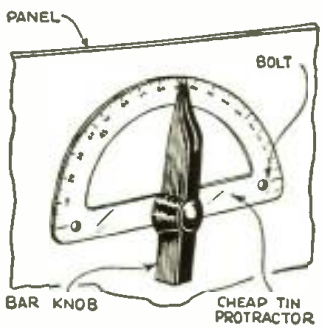
When broadcast condensers must have their capacity decreased for short wave use, it is always hard to tell when enough plates have been removed to make them of 140 mmf. capacity for use with standard short wave coils. In the accompanying sketch, you will see how the condenser under test is connected to a pair of binding posts across a short wave tuning condenser which is in series with a switch. The



process is to tune in the station with the regular short wave condenser, then to open the switch so that the broadcast condenser is in the circuit until the station is again heard with the plates of both condensers about equally meshed. Tuning is accomplished first with one condenser and then the other, until the condenser being rebuilt covers the same frequency range as the standard. If the plates are removed by being bent back and forth until they break off, instead of by unscrewing the condensers and nuts, the job can be quickly and easily performed. —*Eldon Meredith.*

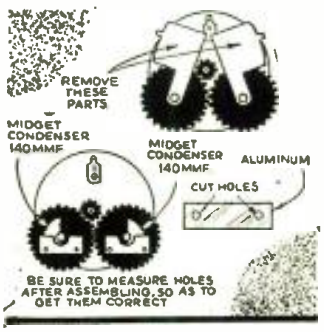
180-Degree Dial Scales for 10c.

Small protractors, such as are sold in the ten-cent store, make excellent scales for radio dials. A protractor is mounted on the panel with the shaft of the control at its center point. A bar knob slipped onto the shaft enables the user to read the control setting on the scale of the protractor. — *Louis Mazzagetti.*

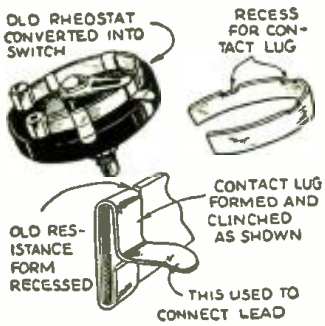


Ganging Trimmers

If one of the old Remler condensers is in the odd parts box



it may be rebuilt into a vernier gang control for two midget condensers. The sleeves on which the Remler plates are mounted are sawed off, leaving about 1" remaining. Then the posts on which these sleeves turn are cut to about ½" in length. The shafts of the midget condensers are slipped into the sleeves. The midget condensers themselves are mounted to a piece of sheet aluminum, much as they would normally be mounted on a panel. Finally, the sleeves are soldered to the rotor shafts of the midget condensers. —*W. F. Rouse.*

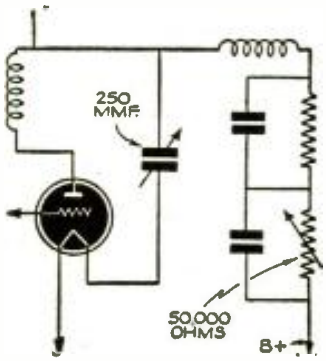


Multi-pole Switch

A simple multi-pole switch can be made from an old rheostat at no cost whatsoever. The resistance element is removed from the rheostat and brass strips are positioned over the insulating material which formerly formed a core for the resistance wire. If this insulating material is notched to take the strips of brass, the arm will fall into position and thus enable the operator to feel when each contact is being made. — *Einar Nelson.*

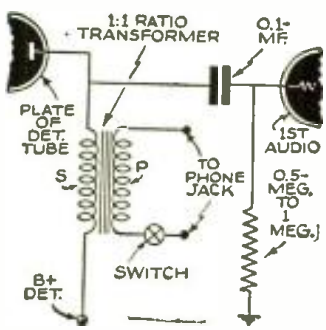
Double Regeneration Control

Regeneration is usually controlled by connecting a potentiometer to the plate of the detector, or by using a variable condenser between the tickler and ground. Better results, however, are obtained by coupling both condenser and potentiometer in the detector circuit. Regeneration is very smooth and easy to control, and is especially suitable for s.w. receivers because of the system's wide applicability to the different coils. The condenser is first adjusted to produce regeneration, and then the potentiometer, as usual.—*Han Pao Hsuan.*



Transformer for Phones

When connecting phones in the detector output stage of a resistance-coupled receiver, there is danger of burning them out when they are simply broken into the circuit. This is particularly true when crystal phones are used. However, by substituting the primary of a one-to-one ratio transformer for the coupled resistor in the detector plate circuit and connecting the phones across the secondary, this is prevented.—*D. Grossenbacher.*



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World Short Wave Stations

Revised Monthly

Complete List of SW Broadcast Stations

Reports on station changes are appreciated.

Mc.	Call	
31.600	WIXKA	BOSTON, MASS., 9.494 m., Addr. Westinghouse Co. Daily 6 am.-1 am., Sun. 8 am.-1 am. Relays WBZ.
31.600	WIXKB	SPRINGFIELD, MASS., 9.494 m., Addr. Westinghouse Co. Daily 6 am.-1 am., Sun. 8 am.-1 am. Relays WBZ.
31.600	W3XEY	BALTIMORE, MD., 9.494 m., Relays WFBR 4 pm-12 m.
31.600	W2XDV	NEW YORK CITY, 9.494 m., Addr. Col. Broad. System, 485 Madison Ave. Daily 6-11 pm.; Sat. and Sun. 1.30-6, 7-10 pm.
31.600	W9XHW	MINNEAPOLIS, MINN., 9.494 m. Relays WCCO 9 am.-12 m.
31.600	W3XKA	PHILADELPHIA, PA., 9.494 m., Addr, NBC. Relays KYW 9 am.-10 pm.
31.600	W5XAU	OKLAHOMA CITY, 9.494 m., Sun. 12 n-1 pm., 6-7 pm. Irregular other times.
31.600	W4XCA	MEMPHIS, TENN., 9.494 m. Addr. Memphis Commercial Appeal. Relays WMC.
31.600	W8XAI	ROCHESTER, N. Y., 9.494 m., Addr. Stromberg Carlson Co. Relays WHAM 7.30-12.05 am.
31.600	W8XWJ	DETROIT, MICH., 9.494 m., Addr. Evening News Ass'n. Relays WWJ 6-12.30 am., Sun. 8 am-12 m.
31.600	W9XPD	ST. LOUIS, MO., 9.494 m., Addr. Pulitzer Pub. Co. Relays KSD.
26.550	W2XGU	NEW YORK CITY, 11.3 m. Relays WMCA.
26.450	W9XA	KANSAS CITY, MO., 11.33 m., Addr. Commercial Radio Eqpt. Co. Testing
26.400	W9XAZ	MILWAUKEE, WIS., 11.36 m., Addr. The Journal Co. Relays WTMJ from 1 pm.
26.300	W2XJI	NEW YORK, N. Y., 11.4 m., Addr. Bamberger Broad. Service, 1440 Broadway. Relays WOR 12 n.-6 pm.
26.100	W9XJL	SUPERIOR, WIS., 11.49 m. Relays WEBC daily.
26.050	W9XTC	MINNEAPOLIS, MINN., 11.51 m. Relays WCTN 9 am.-1 pm., 7 pm.-12 m.
26.050	W9XH	SOUTH BEND, IND., 11.51 m. Addr. South Bend Tribune. Relays WSBT-WFAM 2.30-6.30 pm., exc. Sat. and Sun.
25.950	W6XKG	LOS ANGELES, CAL., 11.56 m., Addr. B. S. McGlashan, Wash. Blvd. at Oak St. Relays KGFJ 24 hours daily.
25.950	W9XUP	ST. PAUL, MINNESOTA. 11.56 m. Relays KSTP evenings.
21.630	W3XAL	BOUND BROOK, N. J., 13.8 m. Addr. N.B.C., N. Y. C. 9 am.-4 pm.
21.570	W2XE	NEW YORK CITY, 13.91 m. (Addr. CBS, 485 Madison Ave., N. Y. C. Daily 7.30-10 am. Sat., Sun. 8 am.-1 pm.
21.565	DJJ	BERLIN, GERMANY, 13.92 m., Addr. Broadcasting House, 6-7.50 am.
21.550	GST	DAVENTRY, ENG., 13.92 m., Addr. (B.B.C., London) Irregular at present.
21.540	W8XK	PITTSBURGH, PA., 13.93 m., Addr. Grant Bldg. Relays KDKA 6.45-9 am. Also Sunday. 6 pm.
21.530	GSJ	DAVENTRY, ENG., 13.93 m., Addr. (See 21.550 mc.) 5.45-8.50 am.
21.520	W3XAU	PHILA., PA., 13.94 m., Addr. Col. Broad. Syst., 485 Madison Ave., N. Y. C. 1-2.30 pm.
21.500	W2XAD	SCHENECTADY, N. Y., 13.95 m., General Electric Co., 8 am.-12 n.
21.470	GSH	DAVENTRY, ENG., 13.97 m. (See 21.550 mc.), 5.45 am.-12 n.
21.450	DJS	BERLIN, GERMANY, 13.99 m., Addr., Broadcasting House. 12.05-5.30 am.
19.020	HS6PJ	BANGKOK, SIAM, 15.77 m. Mondays 8-10 am. See 15.23 mc.
18.480	HBH	GENEVA, SWITZERLAND, 16.23 m., Addr. Radio Nations. Sun., 10.45-11.30 am.

16 Met. Broadcast Band

17.845	HVJ	VATICAN CITY, 16.81 m. Heard 12 n. on Wednesday.
17.840	DJG	BERLIN, GERMANY, 16.82 m., 10.35 am.-1 pm.
17.820	—	ROME, ITALY. 16.84 m., Addr. (See 2RO, 11.81 mc.) Relays 2RO to 6 pm. irregularly.
17.810	GSV	DAVENTRY, ENGLAND, 16.84 m., 5.45-8.50 am., 12.20-4 pm.
17.810	TPB3	PARIS, FRANCE, 16.84 m. Addr. (See 15.245 mc.) 9.30-11 am.
17.800	TGWA	GUATEMALA CITY, GUAT., 16.84 m., Addr. Ministre De Fomento. Irregular.
17.790	GSG	DAVENTRY, ENG., 16.86 m., Addr. B.B.C., London. 5.45 am.-10.15 am., 12.20-4 pm.
17.785	JZL	TOKYO, JAPAN, 16.87 m. 8-8.30 pm.
17.780	W3XL	BOUND BROOK, N. J., 16.87 m., Addr. Natl. Broad. Co., 9 am.-5 pm. to Europe, 5-11 pm. to So. Amer.
17.770	PHI2	HUIZEN, HOLLAND, 16.88 m., Addr. (See PHI, 11.730 mc.) Daily 7.25-8.25 am. Tues. and Thurs., 7.25-8.40 am., Sun. 6.25-9.40 am.
17.760	DJE	BERLIN, GERMANY, 16.89 m., Addr, Broadcasting House. 12.05-5.50, 6-7.50 am.
17.755	ZBW5	HONGKONG, CHINA, 16.9 m., Addr. P.O. Box 200. Dly. 11.30 pm.-1.15 am., 5-10 am., Sun. 9 pm. (Sat.)-1.30 am., 5-9.30 am. Operates irreg.

End of Broadcast Band

17.310	W2XGB	HICKSVILLE, L. I., N. Y., 17.33 m., Addr. Press Wireless, Box 296. Tests 9.30-11.30 am. except Sat. and Sun.
17.280	FZE8	DJIBOUTI, FRENCH SOMALILAND, 17.36 m. Test XMSN 1st Thurs. each month 8-8.30 am. Next B.C. Feb. 2.
15.550	CO9XX	TUINICU, ORIENTE, CUBA, 19.29 m., Addr. Frank Jones, Central Tuinicu, Tuinicu, Santa Clara. Broadcasts irregularly evenings.
15.510	XOZ	CHENGTU, CHINA, 19.34 m. Daily 9.45-10.30 am.
15.370	HAS3	BUDAPEST, HUNGARY, 19.52 m., Addr. Radiolabor, Gyali Ut 22. Sun. 9-10 am.
15.360	DZG	ZEESEN, GERMANY, 19.53 m., Addr. Reichspostzenstralamt. Tests irregularly.
15.360	—	BERNE, SWITZERLAND. 19.53 m. Irreg. 6.45-7.45 pm.

19 Met. Broadcast Band

15,340	DJR	BERLIN, GERMANY, 19.56 m., Addr. Br'dcast'g House, 12.05-11 am.
15.330	W2XAD	SCHENECTADY, N. Y., 19.56 m., Addr. General Electric Co. Relays WGY, 12.15-7 pm.
15.320	OLR5B	PRAGUE, CZECHOSLOVAKIA. 19.58 m. Addr. (See 11.840 mc.) Sun., Wed., Sat. 5-5.10 pm.: Mon., Tues., Thurs., Fri. 6.55-9.55 pm.
15.310	GSP	DAVENTRY, ENG., 19.6 m., Addr. (See 17.79 mc.) 3-5.15 am., 1.45-4 pm.
15.300	YDB	SOERABAJA, JAVA, N. E. I. 19.61 m. Addr. NIROM, 7.30 pm.-2 am.
15.300	XEBM	MAZATLAN, SIN., MEX., 19.61 m., Addr. Box 78, "El Pregonero del Pacifico." Irregularly 9-10 am., 1-2, 8-10 pm.
15.300	2RO5	ROME, ITALY. 19.61 m., Addr. (See 2RO, 11.81 mc.) 11:15 am.-12.15, 2-4 pm.
15.290	LRU	BUENOS AIRES, ARG., 19.62 m., Addr. El Mundo. Relays LRI, 7-9 am.
15.280	DJQ	BERLIN, GERMANY, 19.63 m., Addr. Broadcasting House. 12.05-11 am., 4.50-10.50 pm. Also Sun. 11.10 am.-12.25 pm.
15.270	HI3X	CIUDAD TRUJILLO, D. R., 19.65 m. Relays HIX Sun. 7.40-10.40 am, Tues. and Fri. 8.10-10.10 pm.
15.270	W3XAU	PHILA., PA., 19.65 m. (Addr. See 21.52 mc.) 3-7 pm.
15.270	W2XE	NEW YORK CITY, 19.65 m., Addr. (See 21.570 mc.) 1-3 pm. Sat. & Sun 1.30-2.30 pm.
15.260	GSI	DAVENTRY, ENG., 19.66 m., Addr. (See 17.79 mc.) 3-5.15 am., 12.20-1.30 pm.
15.250	W1XAL	BOSTON, MASS., 19.67 m., Addr. University Club. Tues., Thurs. 4.30-6.30 pm.
15.245	TPA2	PARIS, FRANCE, 19.68 m., Addr. 98 Bis. Blvd. Haussmann. "Paris Mondial" 6-11 am.
15.230	HS6PJ	BANGKOK, SIAM, 19.7 m. Irregularly Mon. 8-10 am.
15.230	OLR5A	PRAGUE, CZECHOSLOVAKIA, 19.7 m. Addr. (See OLR4A, 11.84) Mon.-Fri. 7.50-10.55 pm. Sat., and Sun. 5-5.15 pm., Sun. 5.55-8.55 pm., Tues. 4.40-5.15 pm.
15.220	PCJ2	HUIZEN, HOLLAND, 19.71 m., Addr. N. V. Philips' Radio Hilversum. Tues. 2-3.30 am., Wed. 9.30-11.30 am. Daily 7.25-8.25 am.
15.210	W8XK	PITTSBURGH, PA., 19.72 m., Addr. (See 21.540 mc.) 9 am.-1 pm.
15.200	DJB	BERLIN, GERMANY, 19.74 m., Addr. (See 15.280 mc.) 8-9 am., 4.50-10.50 pm. Also Sun. 11.10 am.-12.25 pm.
15.195	TAQ	ANKARA, TURKEY, 19.74 m., 5.30-7 am., 9.30-11 am., Relays 2RO irregularly Afts.
15.190	—	ROME, ITALY. 19.75 m. Relays 2RO till 6 pm., irreg.
15.190	OFO	LAHTI, FINLAND. 19.75 m. Addr. (See OFO, 9.5 mc.) 1-3 am., 9 am.-n., 12.15-5 pm. Irreg.
15.190	ZBW4	HONGKONG, CHINA, 19.75 m., Addr. P. O. Box 200. Irregular. 11.30 pm. to 1.15 am., 3-10 am.
15.180	GSO	DAVENTRY, ENG., 19.76 m., Addr. (See 17.79 mc.) 4.15-6, 6.20-8.30 p.m.; 3-5.15 am.
15.175	RW96	MOSCOW, U.S.S.R., 19.76 m. Mon., Tues., Fri., Sat. 2.30-3.30 pm. Daily 3-4 am. Mon., Wed., Thurs. 7-9.15 pm.
15.170	TGWA	GUATEMALA CITY, GUAT., 19.77 m., Addr. (See 17.8 mc.) Daily 12.15-1.45 pm.; Sun. 12.45-5.15 pm.
15.165	OZH	SKAMLEBAK, DENMARK, 19.78 m., Sun. 8 am.-1.30 pm.
15.160	XEWW	MEXICO CITY, MEXICO, 19.79 m., 12 n.-12 m., irregular.
15.160	JZK	TOKYO, JAPAN, 19.79 m. 12.30-1.30 am., 2.30-4, 4.30-5.30, 8-8.30 pm.
15.160	VUD3	DELHI, INDIA, 19.79 m., Addr. All India Radio. 1.30-3.30 am., 9.30-11.30 pm.

(Continued on page 664)

All Schedules Eastern Standard Time

www.americanradiohistory.com

TO RADIO W2-XJM H. YONEDA 652/2 1-CHOME DAITA SETAGAYA-KU TOKIO JAPAN

MR. JOSEPH H. MILLER

YOUR REPORT

THIS CONFIRMS ~~OUR QSO~~ OF 3RD. APRIL 1938 AT 0858 G.M.T.

~~UR~~ 20M ~~MG~~ PHONE SIGS ~~RST~~ CONDX

W A C JARL **J 2 N G** ARRL W A C

XMTR: XTAL CONT. WTS INPUT FINAL

MOD: CLASS B 'S. RCVR:

ANT:

TKS FER FB QSO OM! HPE TO CUAGN! ~~PSE~~ TNX QSL!

73'S ES DX!

J2NG—A plain but valued veri of a 20 meter Japanese amateur phone.

J2NG — In person. "OM" Harry shows his DX layout, which "push out" those FB phone sigs all over the world.

Let's Listen In with Joe Miller

● CERTAINLY there is no other time of year when background noise is so lacking in evidence, and with many distant signals coming in as never before, combined with a lack of noise, well—what more could anyone ask? Commercial fones, SWBcers, and our ever-reliable amateurs are a pleasure to log, especially the latter ever-growing class of transmitters, whose stations are being heard in this country from all parts of the world, even New Zealand hams on 80 meter fone have been logged on the West Coast! This season was always *the* DX season, even in the old days of '24-'25, when the famous trans-Atlantic BCB tests were successfully concluded, and with what fond memories do we hark back to those days.

When this issue is published, Spring will not be far off and that is the season when the experienced SW DXer knows he will "clean up" on amateur DX, especially, if not mainly, on 20 meters. So, fellow DXers, look for our DX "dope" in the next issue, which will show you how to get the most from your tuning time during March and April on the ham bands.

Incidentally, and quite an incident, we sez, we have been assured that the new Hallicrafters Dual Diversity will be delivered to us for a two months' DX test, beginning March 1, so you can be sure we look forward to a lively time in DXing this Spring! Thanks to Mr. Durst of Hallicrafters, Inc., for this FB courtesy, and we will consider it a privilege to be able to report to you the expected superlative performance of this receiver.

Now for DX:

IRAQ

YIJG, 7.20 mc., at Baghdad, mentioned here last month as a difficult DX catch for U. S. tuners, was "dug out" from the 40 meter amateur band QRM one recent afternoon, just before their 3 p.m. sign-off, and luckily, sufficient program was heard to permit writing for a confirmation. Erroneously, we stated Iraq as former Persia, when Persia is now known as Iran, a rather similar name! Iraq was formerly called Mesopotamia.

YIJG may still be heard up to as late as mid-April, providing the noise-level and QRM conditions in the 40 meter band permit. Full details in last issue.

FRENCH INDO-CHINA

Radio Hanoi II, 11.90 mc., located at Hanoi, with a power of 100 watts, has already QSL'd Murray Buitekant's report with a letter and gave our W2 friend DXer some FB data, via a native radio magazine published by the Radio Club D'Indo-Chine, which they sent to Murray.

There are 3 transmitters operating in Hanoi at present: Radio Hanoi I, 9.51 mc., with 15 watts; Radio Hanoi II, 11.90 mc., with 100 watts; and Radio-Volonté, on 7.10 mc., no power listed.

Schedules are as follows: Radio Hanoi I, daily 11 p.m.-2:30 a.m. and 6-9:30 a.m., Sundays, when it starts at 7:30 p.m. to 10:30 p.m. Sat. night, and from 11 p.m. Sat. to 9:30 a.m. Sun. a.m.

Radio Hanoi II, daily 12 mid.-2:30 a.m. and 6-9:30 a.m. and Sundays, when it also starts Sat. night 8:30-10:30 p.m., then midnight-5 a.m., then 6-9:30 a.m.

Radio Volonté operates every day from midnight to 2 a.m., not very promising.

QRA's for these stations follow: R.H.I, 82 Rue Jules Ferry, Hanoi. R.H. II, 32 Rue de la Pepiniere, Hanoi. Radio Volonté: 15 Bd. Hollandes, Hanoi.

Radio Hanoi II may be heard fairly well on good days, for East Coast, on their last transmission after 6 a.m. when they came in rather well last month. The famous French amateur, Rene Lebon, FI8AC, whose nice QSL appeared here recently, is the constructor of both Radio Hanoi transmitters and deserves a big hand for his fine encouragement of short wave radio in the Far East. Thanks to Murray Buitekant for his FB help.

Bob Sawada, W6, reports a veri of Boy-Landry, 9.76 mc., adding that QRA given here was OK. FB, Bob!

CHINA

XPSA is the correct call of that Chinese station located at Kweiyang, mentioned last month, and frequency is given as 7.14 mc., though heard on 7.00 mc., according to a dispatch relayed here from Han Pao Hsuan, of China, tnx, OM!

The schedule given by Mr. Hsuan for XPSA is as follows: 9-10 p.m., 2:30-3:30 a.m., 9:50-11:50 a.m., which, however, does not check with previous listed schedules. As every schedule we get lists XPSA differently, we believe the I.D.A. schedule here last month is most likely to be correct.

G. C. Gallagher, W6, hears XPSA on 6.98-7.00 mc. around 9 a.m. This station desires reports on reception, addressed to Kweiyang, Kweichow Province, China.

XGRV, 11.40 mc., approximate, at the war-time capital, Chungking, is being heard 1-1:35 and 8-8:35 a.m. daily, when news is given, at 1 a.m. in Japanese and Chinese, and at 8 a.m. in French and English. Jack Wells, W4, has received a letter from Hollington K. Tong, Chairman of China Information Committee, Hankow, with this data, also mentioning that XTJ has been moved into the interior to avoid the bombing of the enemy. Don Williams, W6, reports XGSA.

INDIA

The Indian BC transmitters on or near 5.00 mc., have astonished the SW world by their amazing signal strength daily, being heard throughout the U. S. with always easily logged signals, during mornings.

One may hear all of these 10 kw. transmitters within a short span on the dial, from 4.88 to 4.995 mc., and, when this news is read, it will still be possible, we hope, to be able to get a log on these real DX catches, on such an unusual low frequency.

VUC2, 4.88; VUB2, 4.905; VUM2, 4.95; and VUD2, 4.995 mc., are logged in that order, from 7 a.m. on through the a.m.'s. The last letter of each call indicates the city, as VUC2, Calcutta. Other cities are Bombay, Madras and Delhi. Address reports to Station Director, All India Radio, and then whatever station and city heard, India.

VWY2, 17.48 mc. Poona, was recently logged at 7:30 a.m., with a FB signal, foning Rugby, England. Inverted speech used on both stations.

ASIATIC REVIEW

TAIWAN—(Formosa) JIB, 10.53 mc., Taihoku, reported by G. C. Gallagher, W6, at 2 and 10 a.m., also here at 3:20 a.m.

PHILIPPINE ISL.—KZIB, 9.503 mc., is a new Manila station, daily from 6-9:05 a.m. (I.D.A.) Has chimes similar to NBC.

FED. MALAY STATES—ZGE, 6.24 mc., Kuala Lumpur, reported off the air, has been taken over by the Govt., and is relaying the programs of ZHP, at Singapore.

U.S.S.R.—RV15, Khabarovsk, reported last month on 6.045 mc., has again returned to their ol' reliable 4.275 mc. spot on the dial.

OTHER DX

TAHITI—FO8AA, 7.10 mc., Papeete, in the South Seas, is beginning to be well heard on their usual

(Continued on page 697)

ZL3KZ — This outstanding card, in orange-yellow, with red letters, confirms 10 meter phone reception.

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Mc.	Call	
15.155	SM5SX	STOCKHOLM, SWEDEN, 19.79 m., Daily 11 am.-5 pm., Sun. 9 am.-5 pm.
15.150	YDC	BANDOENG, JAVA, 19.8 m., Addr. N. I. R. O. M. 6-7.30 pm., 10.30 pm.-2 am., Sat. 7.30 pm.-2 am., daily 4.30-10.30 am.
15.140	GSF	DAVENTRY, ENG., 19.82 m., Addr. (See 17.79 mc.) 3-5.15 am., 5.45 am.-12 n.
15.130	TPB6	PARIS, FRANCE. 19.83 m., Addr. "Paris Mondial," 98 Bis Blvd. Haussmann, 7-9.15 pm.
15.130	WIXAL	BOSTON, MASS., 19.83 m., Addr. World-Wide B'cast'g Foundation. University Club. 10-11 am., Mon.-Fri. Sun. 10 am.-1 pm.
15.120	SPI9	WARSAW, POLAND, 19.84 m., 6-9 pm.
15.120	HVJ	VATICAN CITY, 19.83 m., 10.30-10.45 am., Tues only. Suns. 1-1.30 pm.
15.110	DJL	BERLIN, GERMANY, 19.85 m., Addr. (See 15.280 mc.) 12.05-2, 8-9 am., 10.35 am.-4.25 pm., Sun., also 6-8 am.
15.080	RKI	MOSCOW, U.S.S.R., 19.87 m. Works Tashkent near 7 am. Broadcasts Sun. 12.15-2.30 pm. Daily 7-9.15 pm.

End of Broadcast Band

14.960	—	MOSCOW U.S.S.R., 20.25 m., 1st of month, 6 pm. Dutch program.
14.940	PSE	RIO DE JANEIRO, BRAZIL. 20.08 m., Broadcasts Wed. 3.45-4.15 pm.
14.600	JVH	NAZAKI, JAPAN, 20.55 m. Broadcasts irregularly 5-11.30 pm. Works Europe 4-8 am.
14.535	HBJ	GENEVA, SWITZERLAND, 20.64 m., Addr. Radio Nations. Broadcasts Sun. 1.45-2.30 pm., Mon. 1.30-1.45 pm.
14.440	—	RADIO MALAGA, SPAIN, 20.78 m. Relays Salamanca 5.40-8.40 am. Sometimes 2-4 pm.
14.430	HCJB	QUITO, ECUADOR, 20.79 m. Sun. 9-9.30 pm. and irreg.
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. Apartado 124. News at 4.30 and 7.15 pm. Relays Salamanca from 5.40 pm.
13.635	SPW	WARSAW, POLAND, 22 m. Daily 6-8 pm, Sat. & Sun. 6-9 pm.
12.862	W9XDH	ELGIN, ILL., 23.32 m. Press Wireless, Tests 2-5 pm.
12.460	HC2JB	QUITO, ECUADOR, 24.08 m. Daily exc. Mon. 8-10.30 pm.
12.235	TFJ	REYKJAVIK, ICELAND, 24.52 m. Works Europe mornings. Broadcasts Sun. 1.40-2.30 pm.
12.200	——	TRUJILLO, PERU, 24.58 m., "Rancho Grande." Address Hacienda Chiclin. Irregular.
12.060	RNE	MOSCOW, U.S.S.R., 24.88 m. Daily 6-7 am., 12 n.-2 pm., 3-6, 10.15-11 pm., also Tues., Thurs. 8.30-9 pm., also Sun. 6-10.30 am., 12 n.-5 pm., 6-6.30, 8.30-9, 10.15-11 pm.
11.970	HI2X	CIUDAD TRUJILLO, D. R., 25.07 m., Addr. La Voz de Hispaniola. Relays HIX Tue. and Fri. 8.10-10.10 pm.

25 Met. Broadcast Band

11.928	TI2XD	SAN JOSE, COSTA RICA. 25.15 m. La Voz del Pilot. Apartado 1729. 10 am.-n., 4-10 pm.
11.910	CD1190	VALDIVIA, CHILE, 25.2 m. P. O. Box 642. Relays CB69 10 am.-1 pm., 7-10 pm.
11.900	—	HANOI, FRENCH INDO-CHINA. 25.21 m. "Radio Hanoi", Addr. Radio Club de l'Indochine. 12 m.-2 am., 6-10 am., 150 watts.
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., Sun. 12.30-2 pm.
11.885	TPA3	PARIS, FRANCE, 25.24 m., Addr. (See 15.245 mc.) 2-5 am., 11.15 am.-6 pm., 7-9.15 pm.
11.885	TPB7	PARIS, FRANCE, 25.24 m. (See 15.245 mc.) 9.30 pm.-mid., 12.15-2 am. Irregular.
11.880	VLR3	MELBOURNE, AUST., 25.25 m., 3.30-7.15 pm., 9 pm.-3 am. weekdays.
11.870	W8XK	PITTSBURGH, PA., 25.26 m., Addr. (See 21.540 mc.) 1-11 pm.
11.865	——	BERNE, SWITZERLAND. 25.28 m. Irreg. 8-9 pm. to No. Amer.
11.860	GSE	DAVENTRY, ENG., 25.29 m., Addr. (See 11.75 mc.) 3-5.15, 5.45 am.-10.30 am.
11.855	DJP	BERLIN, GERMANY, 25.31 m., Addr. (See 15.280 mc.) Irregular. 7.15-10.50 pm. for No. Amer.
11.840	KZRM	MANILA, P. I., 25.35 m. Addr. Erlanger & Gallinger, Box 283. 9 pm.-10 am. Irregular.
11.840	CSW	LISBON, PORT., 25.35 m. Nat'l Broad. Station. 11.30 am.-1.30 pm. Irregular.
11.840	OLR4A	PRAGUE, CZECHOSLOVAKIA, 25.34 m., Addr. Czech Shortwave Sta., Praha XII, Fochova 16. Daily 1.55-4.30 pm. Mon. to Fri. 7.55-10.55 pm., Sun. 5.55-8.55 pm.
11.830	W9XAA	CHICAGO, ILL., 25.36 m., Addr. Chicago Federation of Labor. Irregular 7 am.-6 pm.
11.830	W2XE	NEW YORK CITY, 25.36 m., Addr. Col. Broad. System, 485 Madison Av., N.Y.C. Mon.-Fri. 3.30-6, 6.30-10 pm. Sat., Sun. 3-6, 6.30-11 pm.
11.826	XEBR	HERMOSILLA, SON., MEX., 25.37 m., Addr. Box 68. Relays XEBH. 9.30-11 am., 1-4 pm., 9 pm.-12 m.
11.820	GSN	DAVENTRY, ENG., 25.38 m., Addr. (See 11.75 mc.) Irregular.
11.810	2RO4	ROME, ITALY, 25.4 m., Addr. E.I.A.R., Via Montello 5. Daily 4.40-8.45 am., 10 am.-12 n.
11.805	COGF	MATANZAS, CUBA, 25.41 m., Addr. Gen. Betancourt 51. Relays CMGF. 2-3, 4-5, 6-11 pm.
11.805	OZG	SKAMLEBOAEK, DENMARK, 25.41 m. Addr. Statsradiofonien. Irreg.
11.801	DJZ	BERLIN, GERMANY, 25.42 m. 4.50-10.50 pm.
11.800	JZJ	TOKYO, JAPAN, 25.42 m., Addr. Broadcasting Co. of Japan, Overseas Division. 7-7.30, 8-9.30 am., 2.30-4, 4.30-5.30, 8-8.30 pm., 12.30-1.30 am.
11.795	DJO	BERLIN, GERMANY, 25.42 m. 4.50- Addr. (See 15.280 mc.) 11.30 am.-4.25 pm., 4.50-10.50 pm. Irregular.
11.790	WIXAL	BOSTON, MASS., 25.45 m., Addr. (See 15.250 mc.) Daily 4.55-6.30 pm., Tues., Thur., 4.40-6.30 pm., Sat. 1.45-6 pm., Sun. 5-6.30 pm.
11.780	HP5G	PANAMA CITY, PAN., 25.47 m., Addr. Box 1121. 8-11 pm.
11.780	OFE	LAHTI, FINLAND. 25.47 m. Addr. (See OFE, 9.5 mc.) 1.05-3 am., 5-6.20, 10 am.-12.30 pm.
11.770	DJD	BERLIN, GERMANY, 25.49 m., Addr. (See 15.280 mc.) 11.30 am.-4.25 pm., 4.50-11 pm.
11.760	TGWA	GUATEMALA CITY, GUAT., 25.51 m. (See 17.8 mc.) Irregular 10-11.30 pm. Sun. 6-11.30 pm., irregular.
11.760	XETA	MONTEREY, MEX. 25.51 m., Addr. Box 203. Relays XET, n.-3.30 pm. and evenings.
11.760	OLR4B	PRAGUE, CZECHOSLOVAKIA, 25.51 m., Addr. (See 11.840 mc.) Irregular.
11.750	GSD	DAVENTRY, ENG., 25.53 m., Addr. B.B.C., London. 3-5.15 am., 9 am.-noon. 12.30-6 pm., 6.20-8.30 pm., 9.20-11.20 pm.
11.740	SP25	WARSAW, POLAND, 25.55 m., 6-9 pm.
11.740	COCX	HAVANA, CUBA. 25.55 m. P. O. Box 32. Daily 8 am.-1 am. Sun. 8 am.-12 m. Relays CMX.
11.740	HVJ	VATICAN CITY, 25.55 m. Testing irregular.
11.730	PHI	HUIZEN, HOLLAND, 25.57 m., Addr. N. V. Philips' Radio. Daily 6.15-6.45 pm. Sat. 7.15-7.45 pm.
11.730	WIXAL	BOSTON, MASS., 25.57 m., Addr. World-Wide B'cast'g Foundation. University Club. Daily exc. Sat. and Sun. 9-11 pm.
11.720	CJRX	WINNIPEG, CANADA, 25.6 m., Addr. James Richardson & Sons, Ltd. Daily 6 pm.-12 m., Sun. 5-10 pm.
11.718	CR7BH	LAURENCO MARQUES, PORTUGUESE E. AFRICA, 25.6 m. Daily 12.05-1, 4.30-6.30, 9.30-11 am., 12.05-4 pm., Sun. 5-7 am., 10 am.-2 pm.
11.715	TPA4	PARIS, FRANCE, 25.61 m., (See 15.245 mc.) 7-9.15 pm., 9.30 pm.-12 m. to No. America.
11.710	YSM	SAN SALVADOR, EL SALVADOR, 25.63 m., Addr. (See 7.894 mc.) 1-2.30 pm.
11.710	—	SAIGON, FRENCH INDO-CHINA. 25.62 m., Addr. Boy-Landry, 17 Place A' Foray. 7.30-9.15 am.
11.705	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. Wed. and Sat. 8-9 pm.
11.700	HP5A	PANAMA CITY, PAN., 25.65 m. Addr. Radio Teatro, Apartado 954. 10 am.-1 pm., 5-10 pm. Sun. 6-10 pm.
11.700	CB1170	SANTIAGO, CHILE, 25.65 m. Addr. P.O. Box 706. Relays CB89 10 am.-2 pm., 3.30-11 pm.

End of Broadcast Band

11.676	IQY	ROME, ITALY. 25.7 m. Relays 2RO 1.35-2.25, 6-9 pm.
11.535	SPD	WARSAW, POLAND, 26.01 m., Addr. 5 Mazowiecka St. 6-9 pm.
11.402	HBO	GENEVA, SWITZERLAND, 26.31 m., Addr. Radio Nations. Sun. 7-7.45 pm., Mon. 1-1.15 am., 7-8.30 pm.
11.040	CSW2	LISBON, PORTUGAL, 27.17 m., Addr. Nat. Broad. Sta. 9.30 am.-Noon. 2-5.30 pm.
11.000	PLP	BANDOENG, JAVA, 27.27 m. Relays YDB. 6-7.30 pm., 10.30 pm.-2 am., 4.30-10.30 or 11 am. Sat. until 11.30 am.
10.950	——	TANANARIVE, MADAGASCAR, 27.40 m., Addr. (See 9.38 mc.) 12.30-45, 10-11 am., 2.30-4 am., exc. Sun.
10.670	CEC	SANTIAGO, CHILE, 28.12 m. Irregular.
10.660	JVN	NAZAKI, JAPAN, 28.14 m. Broadcasts daily 1.50-7.40 am. Works Europe irregularly at other times.
10.600	ZIK2	BELIZE, BRIT. HONDURAS, 28.30 m., Tue., Thurs., Sat. 1.30-2, 8.30-9 pm.
10.535	JIB	TAIHOKU, TAIWAN, 28.48 m. Works Japan around 6.25 am. Broadcasts, relaying JFAK 9.05-10 am., 1-2.30 am. Sun. to 10.15 am.
10.400	YSP	SAN SALVADOR, EL SALVADOR, 28.85 m., 1-3, 6.30-11 pm.
10.360	LSX	BUENOS AIRES, ARG., 28.98 m., Addr. Transradio International. Tests irregularly.
10.330	ORK	RUYSSELEDE, BELGIUM, 29.04 m. Broadcasts 12.30-2 pm. Works OPM 1-3 am., 3-5 pm.
10.290	TIEMT	SAN JOSE, COSTA RICA, 29.15 m., 4.30-8 pm.
10.290	DZC	ZEESEN, GERMANY, 29.16 m., Addr. (See 15.360 mc.) Irregular.
10.260	PMN	BANDOENG, JAVA, 29.24 m. Relays YDB 6-7.30 pm., 10.30 pm.-2 am., 4.30-10.30 or 11 am., Sat. to 11.30 am.
10.220	PSH	RIO DE JANEIRO, BRAZIL, 29.35 m., Addr. Box 709. Broadcasts 6-7 pm., Mon. 8-8.30 pm.
10.042	DZB	ZEESEN, GERMANY, 29.87 m., Addr. Reichspostzenstralamt. Irregular.
10.100	——	DEUTSCHE FREIHEITS SENDER, 29.70 m., loc. in Germany, undercover. 4-5 pm.
9.995	COBC	HAVANA, CUBA, 30.02 m., Addr. P. O. Box 132. Relays CMBC 6.55 am.-1 am.
9.920	JDY	DAIREN, MANCHUKUO, 30.24 m. Relays JQAK daily 7-8 am. Works Tokyo occasionally in early am.
9.892	CP1	SUCRE, BOLIVIA, 30.33 m., 11 am.-n., 7-9 pm.
9.860	EAQ	MADRID, SPAIN, 30.43 m., Addr. Post Office Box 951. 7.30-8, 8.40-9 pm.

(Continued on page 666)

All Schedules Eastern Standard Time

www.americanradiohistory.com

The Short Wave League

On the Ham Bands

(with the "Listening Post" Observers)

Edited by Elmer R. Fuller

HONORARY MEMBERS

Dr. Lee de Forest — Manfred von Ardenne
D. E. Replogle — E. T. Somerset
John L. Reinartz — Hollis Baird

Hugo Gernsback, Executive Secretary

● CONDITIONS during the month of December have been very bad, and the reports received certainly show it. However, they are on the mend.

A few new observers were appointed during the past month, as follows:

Robert Parker ..... Utah
Edward Lendzioszek ..... Massachusetts
Maurice P. Wynne ..... Louisiana
Charles Le Ralle ..... France

L. F. Gallagher, formerly Observer for New York, has asked to notify, via this department, his SWL friends that his new QRA (address) is P. O. Box 419, Osborn, Ohio. He has been transferred to Patterson Field, and is now Aircraft Radio Mechanic.

Reports for the past month were received from the following observers:

Carling, Len M. ..... Illinois
Clarke, Stanley ..... Canada
Fitzpatrick, John ..... New Jersey
Fuller, Charles H. ..... Special Observer for the editor (N. Y.)
Fuller, Lester ..... Arizona
Halliday, Ray ..... South Carolina
Hegler, Burns E. ..... Kansas
Henderson, Bill ..... Arkansas
Jordan, Tom ..... Pennsylvania
Kemp, Howard G. ..... Connecticut
Lang, Ernest W. ..... Washington
Lendzioszek, Edward ..... Massachusetts
Noyes, William Dean ..... Nebraska
Parker, Robert ..... Utah
Slaughter, Edward C. ..... Texas
Taglauer, Robert ..... Kentucky
Wallen, Dan T. ..... Colorado
Sibbin, J. C. ..... New Zealand
Akhtar, Masud ..... India
Wells, Jack ..... Alabama
Wood, James R. ..... Minnesota

And now for the reports on the various continents. As usual, we will start off with Asia, and only a few are reported. This seems to be the rarest of the continents heard.

Call	*Frcq. mc.*	*R*	*S*	*Observer*
VU2COO	14.	4	7	Wood
VU2CQ	14.12	3	6	Wells
F18AC	14.26	5	6	Akhtar
J2KG	14.	3	4	Akhtar

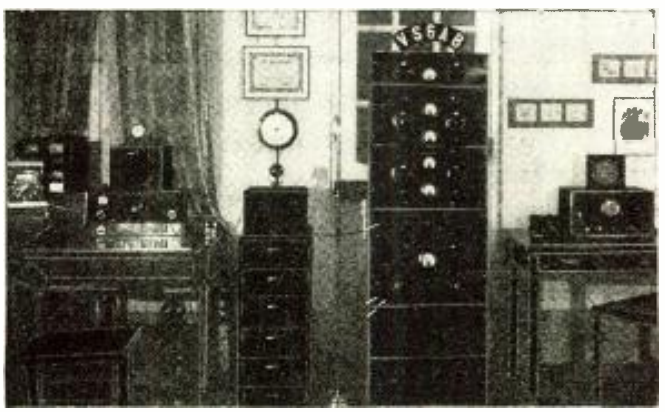
From Africa, several were reported, but not nearly as many as in the previous month.

ZS1AX	14.075	5	8	Noyes
ZS1BV	14.085	5	7	Noyes
ZS1CF	14.05	3	4	Akhtar
ZS1DB	14.	3	3	Akhtar
ZS2AN	14.06	5	5	Akhtar
ZS2G	14.30	5	5	Akhtar
ZS2X	14.043	5	8	Noyes
ZS2N	14.020	4	9	Fitzpatrick
ZS2AF	14.025	4	7	Fitzpatrick, Akhtar
ZS4H	14.170	5	7-9	Jordan, Noyes, Fitzpatrick, Slaughter, Clarke
ZS5CL	14.280	5	8	Akhtar, Taglauer, Henderson
ZS5CO	14.140	5	7	Taglauer, Akhtar, Noyes
ZS5J	14.030	5	9	Fitzpatrick
ZS5CA	14.165	4	7	Fitzpatrick
ZS5C	14.015	3	8	Fitzpatrick
ZS5T	14.015	5	8	Noyes
	14.040			
ZS5BZ	14.15	5	6	Akhtar
ZS6BR	14.027	4	5	Wood, Slaughter, Noyes
ZS6EJ	14.135	5	3-7	Hegler, Akhtar, C. Fuller, Taglauer
ZS6DY	14.210	4	7	L. Fuller, Slaughter, Akhtar
ZS6A	14.120	4	6	L. Fuller, Slaughter, Fitzpatrick
ZS6BE	14.095	4	6	L. Fuller
ZS6EF	14.080	5	7	Taglauer
ZS6BY	14.060	5	8	Taglauer, Noyes
ZS6BW	14.040	5	9	Taglauer
ZS6N	14.040	5	7	Taglauer
ZS6AJ	14.	5	6	Slaughter
ZS6AU	14.	5	6	Slaughter
ZS6DW	14.060	3-5	4-8	Carling, Wells, Fitzpatrick, Slaughter, Clarke, Henderson
ZS6BD	14.070	5	8	Fitzpatrick
ZS6S	14.120	5	8	Fitzpatrick, Noyes
ZS6DR	14.10	3	6	Akhtar
ZS6EJ	14.	5	6	Akhtar
CN1AF	14.110	4-5	5-7	Noyes, Wood, Fitzpatrick, Clarke, Wells
CN8AW	14.010	5	7	Fitzpatrick
CN8BA	28.425	3	5	Halliday
CN8AU	14.050	5	6	Clarke
ZE1JJ	14.11	5	6	Akhtar
ZE1JM	14.26	3	3	Akhtar
ZE1JT	14.	5	6	Akhtar
ZE1JX	14.013	5	7	Noyes
VQ2HC	14.29	5	8	Akhtar
VQ4KTB	14.080	5	8	Clarke
VQ4ECJ	14.005	3	5	Fitzpatrick
FB8AH	14.340	5	8	Jordan
SU5NK	14.11	3	4	Yours truly

Because of the poor conditions during the past month, and the consequent dearth of DX, we will include South America in our department for this month.

LU1QA	14.	4	5	Wood
LU1DA	14.090	5	5-8	Carling, Akhtar, C. Fuller, Hegler, Wallen
	28.215	5	8	Fitzpatrick
LU2BJ	14.060	4	7	Hegler
LU4BK	14.095	5	8	Noyes
LU4BC	14.230	4	6	Fitzpatrick, Akhtar
LU4ABG	14.250	5	9	Fitzpatrick
LU4CZ	14.060	5	7-8	Henderson, Carling
LU4DJ	14.100	4	7	Henderson
LU5CZ	14.075	5	7	Lang, Noyes
LU7BK	14.120	4	7	Wallen
HK1AH	14.075	5	9	Fitzpatrick
HK1AG	14.015	5	7	Clarke
HK1AA	14.020	5	8	Hegler
HK3CL	14.080	5	9	Jordan
HK3JA	14.08	5	8	Wells
HK3CI	14.160	5	7	Fitzpatrick
HK3LO	14.260	5	7-8	Hegler
HK3CG	14.282	5	5	C. Fuller
HK3CO	14.25	5	7	Wells
HK4DF	14.02	4	4	Yours truly
HK5EE	14.375	5	8-9	Fitzpatrick, Carling, Jordan
PY1HO	14.140	5	4	Lang
PY1FR	14.	5	8	Slaughter, Fitzpatrick, Lang
PY2HA	14.180	5	7	L. Fuller
PY2CK	14.130	5	8	Taglauer, Akhtar
PY2AK	14.100	5	7	Lang, Akhtar, Henderson, Slaughter
PY2DA	14.080	4	5	Lang, Akhtar
PY2IT	14.14	4	5	Akhtar
PY2MI	14.11	5	5	Akhtar
PY2AP	14.160	5	6	Jordan
PY4EJ	14.08	5	6	Akhtar
PY5AH	14.130	4	6	Lang
PY5AU	14.170	5	6	Jordan
PY7AI	14.29	5	6	Wells
PY7GA	14.	5	6	Slaugbter
PY8AG	14.310	5	8	Clarke
YV1AN	14.090	5	8	Carling
YV1AQ	14.030	5	4	Lang
YV4AM	14.175	4	7	Fitzpatrick
YV4AN	14.110	5	6	Wallen
YV4AE	14.075	4-5	7-9	Carling, Lang, Hegler, Wood, Wallen, Fitzpatrick
YV4AX	14.130	5	4	L. Fuller
YV5ABQ	14.075	4	6	Kemp, Wallen
YV5AG	14.215	5	9	Fitzpatrick
YV5ABY	14.225	5	8	Fitzpatrick
YV5ACA	14.135	5	7	Fitzpatrick
CX1AA	14.080	5	8	L. Fuller
CX2AK	14.	5	7	Wood
OA4AS	14.075	5	6	Henderson
HC1FG	14.150	5	8	Carling
HC1JW	14.080	5	5-8	Fitzpatrick, Wells
CE2BX	14.120	4	5	Wallen
CE2BR	14.095	5	7	Henderson
CE3BH	14.205	5	8	L. Fuller
CE3AT	14.075	5	8	L. Fuller
CE3BA	14.240	3	5	Wallen
CE3CH	14.110	5	8	Carling
CE3BK	14.040	4	7	Carling
CE4AI	14.085	5	9	L. Fuller, Jordan
W9AM	14.15	5	8	Wells
CT1AY	14.100	4	9	Fitzpatrick
CT1ZA	14.115	4	8	Fitzpatrick
CT1BP	14.075	3	5	Kemp
CT1PK	14.09	5	4	C. Fuller, Fitzpatrick
G2VG	28.580	5	7	Halliday, Henderson, Noyes, Hegler, Taglauer
G2MF	28.065	5	9	Taglauer, Fitzpatrick
G2IS	28.200	5	8	Taglauer
G2MS	28.105	5	7	Taglauer
G2MV	28.300	3	6	Fitzpatrick
G2XN	14.115	5	8	Fitzpatrick
G2AC	27.995	4	7	Noyes
G3FA	28.160	5	7	Fitzpatrick, Akhtar
G5ML	14.205	5	7-9	Fitzpatrick, Carling
G5JO	14.050	5	6	Clarke
G5LC	28.400	4-5	6-7	Halliday, Jordan
G5BY	28.158	5	8	Noyes
G5GJ	14.08	5	5	Akhtar
G6WZ	14.09	5	5	Akhtar
G6GX	28.387	5	9	Noyes
G6GW	28.135	5	7	Noyes
G6QX	28.350	3	5	Halliday
G6GF	28.375	3	7	Halliday
G6LL	28.400	3	6	Halliday
G6WS	28.370	3	4	Halliday
G6NF	14.025	5	7	Clarke
G6LA	14.300	3	7	Fitzpatrick
G6LK	28.105	4	8	Fitzpatrick, Noyes
G6LW	28.245	5	7	Fitzpatrick
G6WT	28.110	5	9	Fitzpatrick

Europe came through again last month, but not so strongly as it did in the month before. Several, however, were heard with good signal strength. A glance at the following will prove this.



Ham station VS6AB, Hongkong, China. Operated by J. W. M. Brown, c/o Import & Export Office, Kowloon, Hongkong. Photo courtesy of Joe Miller. See veri card in January issue.

(Continued on page 703)

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Mc.	Call	
7.854	HC2JSB	GUAYAQUIL, ECUADOR, 38.2 m. Evenings to 11 pm.
7.797	HBP	GENEVA, SWITZERLAND, 38.48 m., Addr. Radio-Nations.
7.614	CR6AA	LOBITO, ANGOLA, 39.39 m., Mon., Wed., Sats. 2.45-4.30 pm. Also 7.177.
7.510	JVP	NAZAKI, JAPAN, 39.95 m., 8-9.30 am.
7.450	TI2R3	SAN JOSE, COSTA RICA. 40.27 m. "Radioemisora Athena". 9.30-11 pm., exc. Sun.
7.410	HCJB4	QUITO, ECUADOR, 40.46 m., 7-9.30 pm. irregularly.
7.410	YDA	TANDJONGPRIOK, JAVA. 40.46 m., Addr. N.I.R.O.M., Batavia, 10.30 pm.-2 am.; Sat. 7.30 pm.-2 am.
7.380	XECR	MEXICO CITY, MEX., 40.65 m., Addr. Foreign Office. Sun. 7-8 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., Mon., Wed., and Sats. 2.45-4.30 pm. Also see 7.614 mc.
7.100	FO8AA	PAPEETE, TAHITI, 42.25 m., Addr. Radio Club Oceanien. Tues. and Fri. 11 pm.-12.30 am.
7.088	PI1J	DORDRECHT, HOLLAND, 42.3 m., Addr. Dr. M. Hellingman, Technical College. Sat. 11.10-11.50 am.
7.050	FG8AA	POINT-A-PITRE GUADELOUPE, F.W.I., 42.55 m., 6-7 pm., also 9-10.30 pm. Irregular. P.O. Box 125.
6.990	XEME	MERIDA, YUCATAN, 42.89 m., Addr. Calle 59, No. 517, "La Voz de Yucatan desde Merida." Irregular.
6.977	XBA	TACUBAYA, D. F., MEX., 43 m. 9.30 am.-1 pm., 7-8.30 pm.
6.805	HI7P	CIUDAD TRUJILLO, DOM. REP., 44.06 m., Addr. Emisoria Diaria de Commercio. Daily exc. Sat. and Sun. 12.40-1.40, 6.40-8.40 pm. Sat. 12.40-1.40 pm. Sun. 10.40 am.-11.40 am.
6.790	PZH	PARAMIRABO, SURINAM. 44.16 m., Addr. P. O. Box 18. Daily 6.06-8.36 am., Sun. 9.36-11.36 am. Daily 5.36-8.36 pm.
6.775	HIH	SAN PEDRO DE MACORIS, DOM. REP., 44.26 m. 12.10-1.40 pm., 7:30-9 pm. Sun. 3-4 am., 4.15-6 pm., 4.40-7.40 pm.
6.750	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 N.I.R.O.M. programs. 4.30-11 or 11.30 am. Also Sat. 9.30 pm.-1.30 am.
6.690	TIEP	SAN JOSE, COSTA RICA, 44.82 m., Addr. Apartado 257, La Voz del Tropico. Daily 7-11 pm.
6.675	HBQ	GENEVA, SWITZERLAND, 44.94 m. Addr. Radio-Nations. Off the air at present.
6.672	—	—— 44.94 m., relays Salamanca, Spain, 7-9.45 pm.
6.672	YVQ	MARACAY, VENEZUELA, 44.95 m. Irregular.
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.
6.610	YNLG	MANAGUA, NICARAGUA. 45.39 m. Emisora Ruben Dario. 1.30-2.30, 6-10.15 pm.
6.558	HI4D	CIUDAD TRUJILLO, D. R., 45.74 m. Except Sun. 11.55 am.-1.40 pm.
6.550	XBC	VERA CRUZ, MEX., 45.8 m. 8.15-9 am.
6.550	TIRCC	SAN JOSE, COSTA RICA, 45.8 m., Addr. Radioemisora Catolica Costarricense. Sun. 11 am.-2 pm., 6-7, 8-9 pm. Daily 12 n.-2 pm., 6-7 pm., Thurs. 6-11 pm.
6.545	YV6RB	BOLIVAR, VENEZUELA, 45.84 m., Addr. "Ecos de Orinoco." 6-10.30 pm.
6.520	YV4RB	VALENCIA, VENEZUELA, 45.98 m. 11 am.-2 pm., 5-10 pm.
6.516	YNIGG	MANAGUA, NICARAGUA, 46.02 m., Addr. "La Voz de las Lagos." 1-2.20, 8-10 pm. Except Sundays.
6.500	HIL	CIUDAD TRUJILLO, D. R., 46.13 m. Addr. Apartado 623. 12.10-1.40 pm., 5.40-7.40 pm.
6.480	HIIL	SANTIAGO DE LOS CABALLEROS, D. R., 46.28 m., Addr. Box 356. 9.40-11.40 am., 7.40-9.40 pm.
6.470	YNLAT	GRANADA, NICARAGUA, 46.36 m., Addr. Leonidas Tenoria, "La Voz del Mombacho." Irregular.
6.465	YV3RD	BARQUISIMETO, VENEZUELA, 46.37 m. Radio Barquisimeto, irregular.
6.450	HI4V	SAN FRANCISCO DE MACORIS, D. R., 46.48 m. 11.40 am.-1.40 pm., 5.10-9.40 pm.
6.400	TGQA	QUEZALTENANGO, GUATEMALA, 46.88 m., Mon.-Fri. 9-11 pm. Sat. 10 pm.-1 am. Sun. 1-3 pm.
6.384	ZIZ	BASSETERRE, ST. KITTS, W. INDIES, 46.99 m. 4-4.45 pm. Wed. 7-7.30 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.
6.336	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 del Radio Philco, P. O. Box 130. 6.55 am.-12 m. Sun. 9.55 am.-10 pm.
6.310	HIZ	CIUDAD TRUJILLO, D. R., 47.52 m. Daily except Sat. and Sun. 11.10 am.-2.25 pm., 5.10-8.40 pm. Sat. 5.10-11.10 pm. Sun. 11.40 am.-1.40 pm.
6.300	YV4RD	MARACAY, VENEZUELA, 47.62 m. 6.30-9.30 pm. exc. Sun.
6.295	OAX4G	LIMA, PERU, 47.63 m., Addr. Apartado 1242. Daily 7-10.30 pm.
6.280	HIG	TRUJILLO CITY, D. R., 47.77 m. 7.10-9.40 am., 11.40 am.-2.10 pm., 3.40-9.40 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. 5.30-8 pm.
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.
6.205	YV5RI	CORO, VENEZUELA, 48.32 m., Addr. Roger Leybe, care A. Urbina y Cia. Irregular.
6.200	HI8Q	CIUDAD TRUJILLO, D. R., 48.36 m. Irregular.
6.190	TG2	GUATEMALA CITY, GUAT., 48.4 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.
6.185	HIIA	SANTIAGO, D. R., 48.5 m., Addr. P. O. Box 423. 7 am.-5 pm.
6.170	W2XE	NEW YORK CITY, 48.62 m., Addr. Col. B'cast System, 485 Madison Ave. Mon., Fri. 12 m.-1 am. Sat. & Sun. 11.30 pm., 1 am.

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6.156	YV5RD	CARACAS, VENEZUELA, 48.71 m. 11 am.-2 pm., 4-10.40 pm.
6.153	HI5N	MOCA CITY, D. R., 48.75 m. 6.40-9.10 pm.
6.150	VPB	COLOMBO, CEYLON, 48.78 m., 7-11 am.
6.150	CJRO	WINNIPEG, MAN., CANADA, 48.78 m., Addr. (See 11.720 mc.) Daily 6 pm.-12 m., Sun. 5-10 pm.
6.150	ZPI4	VILLARRICA, PARAGUAY, 48.78 m. 4-6 pm.
6.147	ZE8	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	HJ4ABG	MEDELLIN, COL., 48.79 m. 11 am.-12 n., 6-10.30 pm.
6.140	W8XK	PITTSBURGH, PA., 48.83 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.
6.133	XEXA	MEXICO CITY, MEX., 48.93 m., Addr. Dept of Education. Daily 8-11 am., 2.30-4 pm., 7.30 pm.-12.45 am. Sun. 1.30 pm.-12.45 am.
6.130	VP3BG	GEORGETOWN, BRIT. GUIANA. 48.94 m. 9-10 am., 2.15-6.30 pm., Sun. 5.30-11.30 am., 3-5 pm.
6.130	TIEM	SAN JOSE, COSTA RICA. 48.94 m. "El Mundo", Apartado 1049. 11 am.-11 pm., Sun. 10 am.-6 pm.
6.130	CHNX	HALIFAX, N. S., CAN., 48.94 m., Addr. P. O. Box 998. Mon.-Fri. 7 am.-11.15 pm., Sat. 11 am.-11 pm., Sun. 12 n.-11.15 pm. Relays CHNS.
6.130	LKL	JELOY, NORWAY, 48.94 m. 11 am.-6 pm.
6.125	CXA4	MONTEVIDEO, URUGUAY, 48.98 m., Addr. Radio Electrico de Montevideo, Mercedes 823. 8 am.-Noon. 2-10 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.
6.122	FK8AA	NOUMEA, NEW CALEDONIA, 49.00 m., Radio Noumea, Addr. Charles Gaveau, 44 Rue de l'Alma., Wed. & Sats. 2.30-3.30 am.
6.117	XEUZ	MEXICO CITY, MEX., 49.03 m., Addr. 5 de Mayo 21. Relays XEFO 9 am.-1 pm., 7 pm.-2 am.
6.115	OLR2C	PRAGUE, CZECHOSLOVAKIA, 49.05 m. (See 11.40 mc.)
6.110	GSL	DAVENTRY, ENGLAND, 49.1 m., 6.20-8.30, 9.20-11.20 pm.
6.110	XEGW	MEXICO CITY, MEX., 49.1 m., Addr. La Voz de Aguila Azteca desde Mex., Apartado 8403. Relays XEJW 11 pm.-1 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. 1-3, 6.30-8.30 am., Noon-6.30 pm.
6.100	W3XAL	BOUND BROOK, N. J., 49.18 m., Addr. Natl. Broad. Co.
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., 5.30-7, 9-11.30 am.
6.096	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.
6.083	VQ7LO	NAIROBI, KENYA, AFRICA, 49.31 m., Addr. Cable and Wireless, Ltd. Mon., Fri. 5.30-6 am., 11.15 am.-2.15 pm., also Tues. and Thurs. 8.15-9.15 am.; Sat. 11.15 am.-3.15 pm.; Sun. 10.45 am.-1.45 pm.
6.081	YVIRD	MARACAIBO, VEN., 49.32 m. 6-11 pm.
6.080	W9XAA	CHICAGO, ILL., 49.34 m., Addr. Chicago Fed. of Labor. Relays WCFL irregular.

(Continued on page 699)

All Schedules Eastern Standard Time

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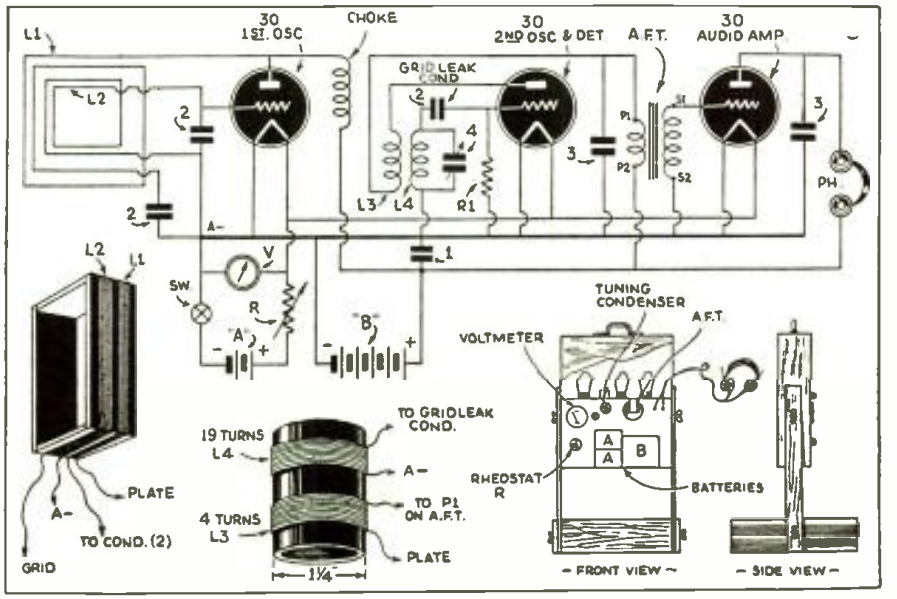
A Radio Ore-Locator

Operates with 3 Tubes

Charles E. Chapel
1st Lieut., U.S. Marine Corps, Retired

Left — Finished 3-tube ore-locator in use.

Right — Diagram of 3-tube treasure-locator



● RADIO enthusiasts are all familiar with the fact that radio can be used to locate buried treasure and mineral deposits, but in the past the practical instruments for this purpose have been both difficult to build and complicated to operate. Dr. Gerhard R. Fisher, of Palo Alto, California, who developed the radio direction finders on the ill-fated *U. S. S. Macon*, and who invented the radio "homing-devices" for airplanes, has perfected a simple treasure-hunter within the building and operating range of any amateur. The construction details of this instrument are released for the first time in this magazine.

In appearance, the device resembles a simple box which can be carried by the operator. Using three type-30 tubes, it has two oscillators, one of which acts as an oscillating detector. Both oscillating circuits are so adjusted as to produce a beat note. Metal, whether magnetic or not, in the field of the Loop Antenna will change its inductance and produce a change in the beat note. The audible beat note is in turn amplified by the third tube and can be heard in the headphones. By noting the change in the pitch of the headphone noise, the operator can tell when he is passing over buried treasure or minerals, and plot a simple chart that will reveal the spot to start digging.

The materials needed for building the Fisher T-Scope are few in number and comparatively inexpensive. No special equipment is needed. All parts are standard, and can be purchased from any dealer in radio and electrical supplies.

The Loop Antenna is 16 by 14 inches, and has two windings, as shown in the diagram. "L-1" has 7 turns of No. 32 D.C.C. wire, and "L-2" has 9 turns of No. 32 D.C.C. wire. Both are wound in the same direction, with ½ inch space between the windings. The holder for the Loop Antenna is made of any lightweight wood, 2½ inches wide and ¼ inch thick, these being the dimensions of each of the four sides of the Loop Frame.

The Loop Frame, as can be seen in the photograph of the complete set, is rectangular, with each corner braced by a cleat, the sides being joined at the corners with brass screws.

Two oak uprights, 1½ inches wide, ¾ inch thick, and 18 inches long, are fastened on opposite sides of the Loop Frame, with brass screws. These uprights support the instrument case when the Loop Frame is

(Continued on page 679)

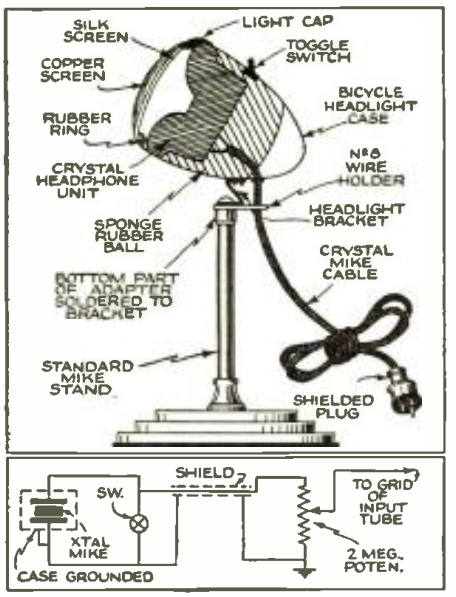
An Inexpensive Mike

Above—Finished "mike." Right—Sectional view of mike stand and suggested hook-up.

● HAVING need for an inexpensive mike, primarily for application in a ham rig, then later for P.A. purposes and certain types of remote broadcasts, we developed a combination of inexpensive parts that makes a very presentable appearance and does the job admirably. The level of this improvised mike is several db.'s higher than the ordinary crystal mike, although the quality will not permit high fidelity music reproduction. However, it was found to be ideal for communication work and voice reproduction, especially for the ham rig in view of the surprisingly low cost for the quality attained.

The mike proper is a crystal headphone unit, mounted in a half of a sponge rubber ball, purchased at the five and dime store. The case is that of a small bicycle headlamp, with bracket, that sold retail for 80 cents. The glass is removed and ordinary copper screening or tea strainer screen soldered into the cap. The screening is

(Continued on page 688)



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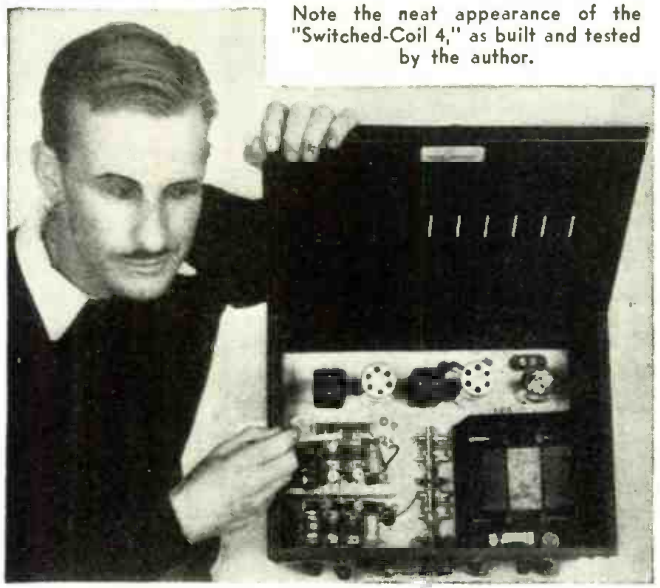
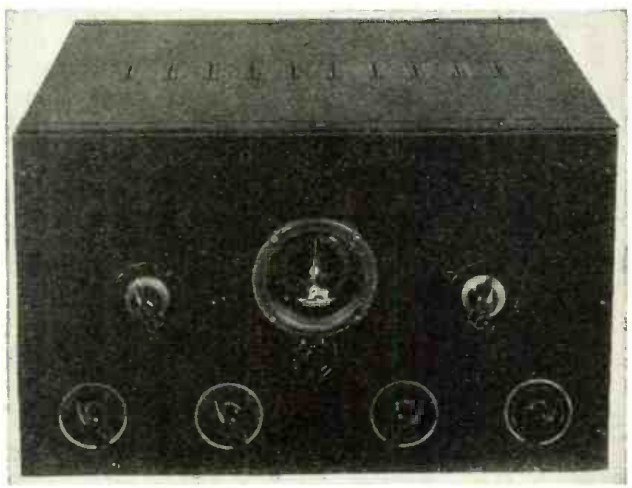
The "Switched-Coil 4"—

for Mobile, Marine

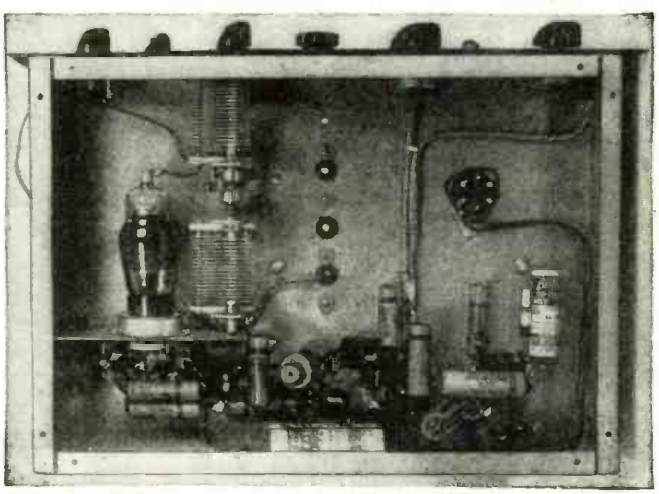
Raymond P. Adams



Note the neat appearance of the "Switched-Coil 4," as built and tested by the author.



Another view of the 4-tube receiver which should make many friends.



Bottom view of the "Switched-Coil 4."

● THIS new mobile-farm (and emergency) super is compact, all-wave, sensitive and economical to operate. Only four tubes are employed; a 6J8G high efficiency mixer; a 6K7G I.F. amplifier; a 6C8G combination grid-leak second detector and first audio amplifier; and a 6V6G A.F. output amplifier. A Genemotor power unit, self-filtered, is featured, mixer and HFO stage coils are *switch selected*, and both the *tank* and the *bandspread* condensers are ganged to facilitate tuning.

No R.F. stage is used. High efficiency coils, mounted right on the selector switch, the 6J8G tube, and careful layout and front-end circuit design all make for unusually good input sensitivity, however.

Coverage is from 530 kc. to 32.4 mc. (9.25 to 565 meters). Four sets of coils are used for these general or band-set ranges: Band 1—530-1575 kc.; Band 2—1.5-4.6 mc.; Band 3, 4.18-12.5 mc.; Band 4—11.2-32.4 mc.

General coverage is provided by the 2-gang 260 mmf. per section tank condenser, and a very practical bandspread is effected by the 20 mmf. per section 2-gang spreader condenser. In the laboratory model the bandspread gang is mounted above chassis and is controlled by the main dial, and the bandset components are arranged below for knob adjustment. This positioning may be reversed by the individual builder who is primarily interested in receiving standard broadcast or 160 meter Ham transmissions.

A jack is provided for headphone reception, and the second detector circuit may be made regenerative to increase the I.F. selectivity, or made to oscillate to facilitate copying C.W. Audio frequency output is entirely ample for loudspeaker reproduction.

Circuit Notes: The mixer and HFO tuned circuits are both related to the self-excited 6J8G, which provides for good conversion even down through the 10-meter band. This tube is simply a 6L7 and a triode in one envelope—the triode's grid tied within the envelope to the mixer section's injector.

Bandspread and band-set condensers are connected in parallel. All coils are Alignaire trimmed, all oscillator circuits padded. A manual trimmer across the tuned mixer circuit is an optional refinement—particularly useful when the receiver is used under various conditions in the field and varying antenna loading effects must be quickly compensated for.

The front-end circuit is familiar to all readers acquainted with similar and common-run 6L7-6C5 Mixer-HFO layouts.

A single I.F. stage affords excellent selectivity and gain (at 456 kc.) in itself, due to its use of Ferrocart iron core transformers in both input and output positions. Additional effective I.F. efficiency is, however, made possible by the use of the second detector regeneration, which peaks the circuit to almost a single-signal condition. The scheme for obtaining this regeneration—and oscillation for C.W. reception, if we like—is an old and practical one involving the incorporation of a broadcast coil in the detector's cathode circuit and of a rheostat control bridged across this coil for feedback adjustment. The I.F. output transformer's peak-tone setting is, of course, affected in a minor degree by any variation of the control resistance, but so long as the initial peaking is made with the rheostat *wide open* for maximum regeneration (just below the point of circuit oscillation), the effect is acceptable, as detuning will then only be introduced as the sensitivity is backed off.

A single tube serves as both second detector and first audio amplifier. This tube, a 6C8G, is much better to use than a 6N7 or 6A6, as it has a separate cathode for each triode section and so eliminates the possibility of annoying inter-circuit coupling—something which even a well by-passed common cathode may effect.

The tube's A.F. section drives the 6V6G to speaker output and provides directly for *headphone* output. Note that the coupling condenser has .25 mf. value, necessary when crystal headphones are employed. (It should be stressed that crystal phones must not, under *any* circumstances, be connected directly into any D.C. circuit, such as the plate circuit of a tube. The phones *must* be isolated properly or they will be irreparably ruined.)

Increased A.F. gain may be brought about through the use of an audio transformer replacing the coupling network. The circuit,

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A Practical Superhet

or Farm Application

A useful 6-volt receiver using but four tubes—a mixer, an I.F. amplifier, a combination second detector and first audio stage, and a power output amplifier. A genemotor power unit supplies the plate voltage, and the coils for the various bands are switch-selected. Wavelength coverage is 9.25 to 565 meters.

as given, will be satisfactory under most operating conditions—but if such a transformer is desired it can be added. Not only will the gain be increased, but better isolation between the 6C8G output plate and the 6V6G input grid circuits will be had.

The Genemotor power supply is a complete, *self-filtered* job. However, to improve performance and reduce supply interference a .25 mf. condenser has been connected from B plus to chassis and a 1 mf. capacitor between chassis and A "hot."

All No. 2 tube filament terminals are connected to chassis, all No. 7 terminals paralleled for common A "hot." The genemotor unit connects to chassis at *one point only!*

No speaker transformer is wired into the immediate circuit, as the receiver is designed for use with a P.M. reproducer equipped with such a component and designed to work out of the single Class A 6V6G, whose load resistance specification is 5,000 ohms.

Layout: Front panel layout centers the tuning dial for bandspread control (or bank control, if broadcast reception is of greater interest to the builder), with bandswitch knob to the left and 3-point "On-Off" knob (the extra point for standby—B circuit open only) to the right. Other knobs, from left to right, are for antenna load compensation, bandset (or bandspread, as the case may be), selectivity-sensitivity-BFO adjustment, and volume control.

The home-built coil assembly is mounted above the chassis. Immediately behind it is the input I.F. transformer, and across the rear length of the base are the other easily identified major transformer and tube components. The 6J8G mixer is mounted below the chassis horizontally, though it may go "upstairs" in conventional position if the builder so desires. The various condensers and resistors are positioned in circuit groupings close to associated sockets. Leads between front-panel controls and related circuit points, being rather long, run through low-capacity shield tubing—and both B plus and A "hot" leads are similarly shielded for as much of their length as possible and particularly near the receptacle for the genemotor can, though such shielding is not indicated in the under-chassis photograph.

The genemotor, installed in a small shield can provided with a chassis-type male plug in its base, plugs into the receptacle shown at center right to make B plus and A "hot" connection to circuit points and A minus-B minus connection to chassis right at the socket. The "On-Off-Standby" switch protrudes through the shield wall and receiver front panel for knob control. A receptacle, on the back of the box, is provided for connection to the energizing 6 volt storage battery.

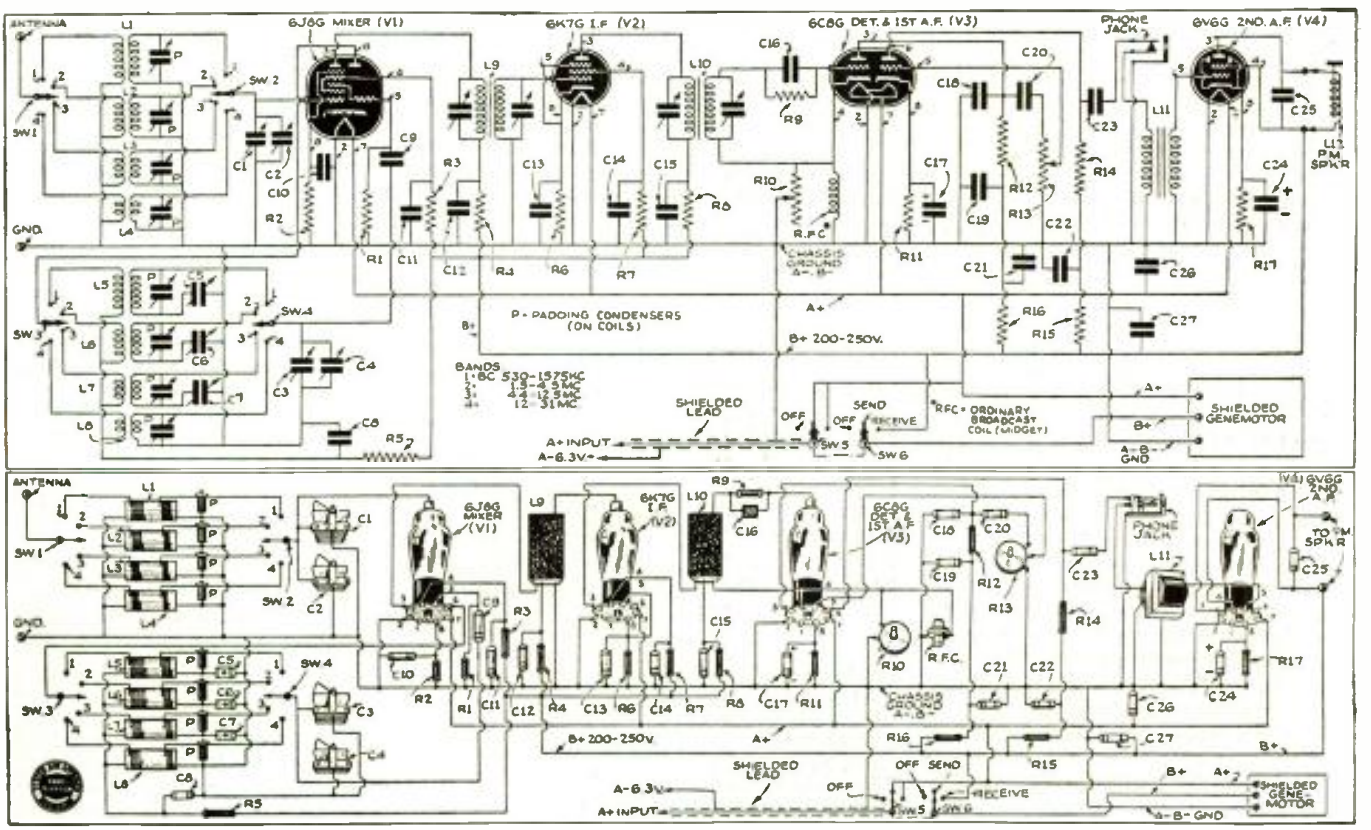
Construction Details

1. Drill the Par-Metal cabinet and chassis to exact layout specifications. Though a smaller assembly might seem possible, stick to recommended dimensions. Do not crowd the various components together, risking inadequate circuit isolation.

2. Build the switch assembly partitions. These should be large enough to amply shield the mixer from the HFO coils and to elevate the whole R.F. assembly far enough above the chassis so that when shields and selector switch are assembled together, its shaft will line up properly with the front panel switch hole. No exact size specification need be given here;

(Continued on page 685)

Wiring diagram of the four tube receiver.



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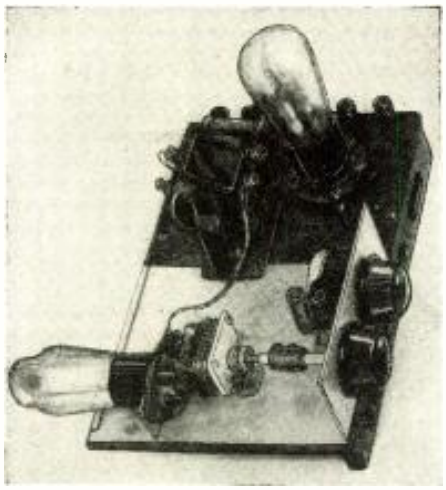
1-Meter WAVES with Ordinary Tubes

Nelson G. Haas and Carl A. Erbacher

Part 2—Conclusion



Here is the self-quenching one-meter receiver built by the authors; it uses ordinary tubes.

● TRANSFERRING the output of the one-meter transmitters previously described* to a radiating system or antenna employs the same basic theory used on the higher and more familiar wavelengths; the one *but* here is the need of placing the antenna system free and clear of surrounding objects. Fortunately, the dimensions of the antenna are so relatively small that no difficulty should normally be encountered.

The first antennas experimented with were simple vertical wires, either half- or quarter-waves long, clipped directly to the plate rods of the oscillators, either near the plate end for a half-wave antenna or near the plate-feed (cold) end for a quarter-wave radiator. Not much trouble was experienced in getting radiation from either of these two antennas, other than the necessity for cutting them very close to the proper length for maximum efficiency.

The quarter-wave antenna is clipped directly to the plate rod at a point an inch or so from the plate-feed end. Gradually slide it up toward the plate end of the rod, a fraction of an inch at a time, until maximum load is shown on the oscillator plate meter and maximum radiation, as determined by a field-strength meter placed a few feet away, is also had. A small flashlight bulb inserted in the antenna at the point where it clips onto the plate rod will light to indicate a considerable amount of antenna current.

If the half-wave antenna is used, it should be clipped onto the plate rod a few inches away from the plate end. It may be found that in coupling this type of antenna to the transmitter, the tube will stop oscillating unless the antenna is coupled to the plate end of the rod by means of a small variable condenser (a few microfarads is sufficient). A flashlight bulb inserted in the center of the half-wave antenna will show antenna current by lighting, and will very materially aid in making adjustments.

* Part 1, on Transmitters, appeared in the January issue.

More specific measurements as to the length of these antennas might be found useful. Supposing the Lecher Wires determine that the oscillator is on exactly one meter, a half-wave would necessarily have to be one-half such a length, or ½ meter—almost 19.7 inches (one meter equals 39.37 inches). At all times it is necessary to know the wavelength of the oscillator so as to cut the antenna for it to resonance.

An antenna clipped directly onto the transmitter is not as convenient as one fed from a distance. After much experimentation, and looking around to see what other experimenters were using for feeder systems, the *single-wire untuned transmission-line* was chosen. Not only does it offer a quick and practically foolproof method of exciting the antenna, but its use permits varying the load on the oscillator by the simple expedient of shifting the point at which the feeder is clipped to the plate circuit. Loading up, of course, is accomplished by moving the feeder closer to the plate of the oscillator.

In the previous article the design and construction of two transmitters using readily available tubes as the 56, 27, 76, 37, were covered, together with the method of using a simple Lecher Wire type wavemeter for determining the wavelength at which the transmitters were operating. This article describes the antenna systems for radiating the output of these transmitters and the construction of receivers for these wavelengths.

The optimum point on the half-wave antenna to clip the feeder to is best determined by trial and error; it is approximately 14% of a half-wave off the center of the antenna. For a one meter half-wave antenna this would be about 2¾ inches from the center.

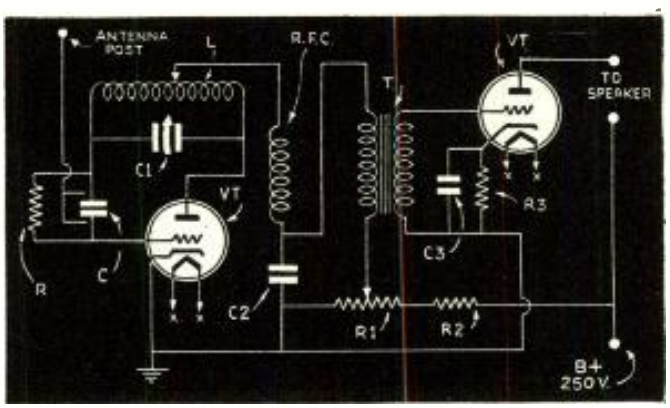
Directing Waves

Having gotten such a half-wave antenna properly excited by the single-wire feed described, the next step is to set up an array that will make the antenna *directional.* The first thought, and one that proved practical, was to set up a reflector. Such a rod, longer than the half-wave antenna by 2%, was spaced (¼) one-quarter wave behind it and immediately the radiation pattern changed. The field strength meter described in the previous article (it is a milliammeter placed in series with a fixed carborundum detector and tuned to one meter) soon indicated that behind the antenna the signal strength took a severe dip. The radiation pattern was strongly accentuated in a *forward direction.* This was checked by removing the reflector and placing it on another side of the antenna, only to have the same results.

Not completely satisfied, for we had visioned a more focused radiation, Mr. Haas suggested using a director as well as a reflector. After much experimentation with one it was found that a rod cut to about 87% of the half-wave, and spaced ⅜ of a wave in front of the antenna, produced a decided *beam* effect.

Playing with antennas proved so intriguing that for several weeks all other experimentation was put aside while the possibilities of squirting one meter signals was thoroughly explored. It was found that, within reason, a reflector or director could be spaced any odd quarter-wave away

(Continued on opposite page)



Hook-up of the one-meter receiver, as successfully built and tested by the authors. Tubes, such as the 56, 76 or 37 are satisfactory.

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METER

Amplifier "Built in"

Since the higher harmonics from the oscillator get pretty weak, it is desirable to have an amplifier which will amplify them, thereby facilitating their identification in the receiver. The 6L7 accomplishes this very nicely and at the same time mixes in the output of the 10 kc. multivibrator. The plate circuit of the 6L7 is tuned to the approximate frequency of the desired harmonic. If the harmonic is louder than desirable, the tuning condenser is merely detuned. Five coils mounted on a 2-pole rotary switch of the same type as that used in the oscillator cover the range of from 530 kc. to 100 mc. The four lower frequency coils are stock Meissner coils available with small 10 mmf. trimmers attached. Merely set these at their maximum capacity. The broadcast coil which has an L-5 section of 258 turns should be reduced to less than 50 turns. For the highest frequency band the coils are wound with No. 12 bus-bar.

Multivibrator

Essentially a *multivibrator* consists of a two-stage resistance-coupled amplifier with the output connected to the input; the resultant feed-back leads to oscillations, determined by the circuit constants. When a small amount of voltage is fed into the input from some standard frequency source, such as the 100 kc. oscillator, the frequency of operation of the multivibrator becomes stabilized at a harmonic (in this case the 10th, or 10 kc.) of the controlling voltage and will generate this signal even with minor changes in circuit constants. Thus, with the addition of the 10 kc. multivibrator, signals can be had not only at each 100 kc. throughout the radio spectrum, but also at each 10 kc. with a degree of accuracy limited practically only by the care used in setting the 100 kc. oscillator. The 6Z7G, a dual triode, combines the two-stage amplifier in one envelope. The 20,000-ohm control in the grid of the input section is used to change the frequency of oscillation. With the control set at about its center position, the multivibrator will "lock in step" at the 10th harmonic of the 100 kc. oscillator. Variation of the control to its extreme positions will result in generation of signals from the 8th to the 12th harmonics.

Only 1 Switch Used to Change Frequency

Only one switch is used to control the different stages of the frequency meter. This is a small Mallory 3-pole, 4-position rotary switch, labeled SW-3 (a, b, c) in the diagram. In the first position the unit

(Continued on page 689)

See Pages 686, 692 and 702 for Interesting Subscription Offers!

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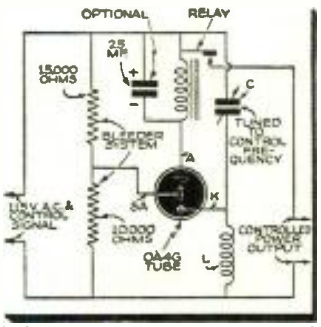
Question Box



Relay hook-up for remote control. No. 1170

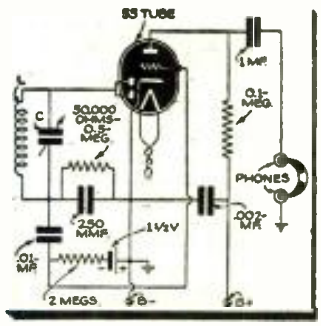
Remote Control Relay Circuit

I would like to obtain a circuit in which a remote control relay is employed to control the power output, and one using the new type 0A4G tube. The diagram should give exact details as to parts needed, together with an explanation of how the system functions.—Arthur Bellows, Cedar Rapids, Iowa.

A. The accompanying circuit shows a remote control relay using the 0A4G tube in A.C. service. Note that full line voltage is applied between the anode and cathode, and that a bleeder system is used to maintain a voltage on the starter-anode just below that required for breakdown. The capacity and inductance, C and L, is a high-Q tuned circuit for R.F. signals. When an R.F. signal is transmitted on the power line, a resonant signal appears across the inductance and capacity. The voltage across condenser C increases the negative potential peaks on the cathode and increases the potentials between the cathode and starter-anode. A discharge between the cathode and starter-anode is started by these peaks. This discharge produces free ions which enable the discharge to transfer to the anode when sufficient starter-anode current flows. After this transfer occurs, current flows through the relay.

Precautions should be taken in the application of this type tube so that at high line voltages the A.C. applied to the starter-anode will not be great enough to reach the breakdown point. Precautions should also be taken so that at low line voltages the carrier voltage will be high enough to make up for the lowest line voltage. Therefore a minimum R.F. starter-anode voltage of 55 volts should be provided.

Simple Phone Monitor



Phone Monitor. No. 1171

Will you kindly publish a diagram of a simple phone monitor using a 55 tube? Also will you kindly give the complete list of parts needed, etc? —Harry Roberts, Brooklyn, N. Y.

A. Most any type of simple detector circuit with a means for picking up a small amount of R.F. from the transmitter can be used as a phone monitor. The pickup coil need not even be tuned, although the monitor will be considerably more sensitive when tuned to the transmitter frequency.

Here is a satisfactory type of phone monitor using a 55 type tube as a diode detector and audio amplifier. The circuit LC is tuned to the transmitter frequency and a headset is connected to the output posts in series with the condenser and ground.

High Frequency Receiver

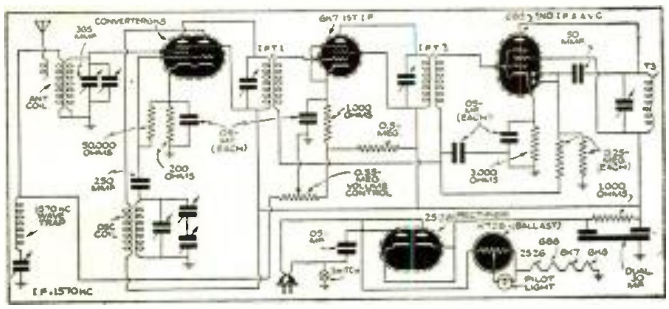
I contemplate building a high frequency receiver, to cover the bands from 10 to 40 meters. In this receiver I would like to make use of band-spread, a beat oscillator, crystal filter, an audio output meter and a built in monitor. In fact I would like to see published in the "Question Box," a diagram containing all these features and using about eight or nine of the most modern type tubes. Could you publish such a diagram?—Paul Cherosky, St. Louis, Mo.

A. A diagram of a high frequency receiver containing the features as mentioned above appeared in the October issue of R. & T.

Wireless Remote Tuner

I wish to construct a remote tuner, such as the Kadette "Tunemaster," for use with my radio receiver. Will you kindly print a diagram and any suggestions you can offer?—Asa Carney.

A. The *Tunemaster* diagram you request is published herewith. The coil used to radiate the signal, T3, consists of 35 turns of No. 28 D.C.C. wire wound on a 3¼-inch form. It can be tuned with a 30-300 mmf. condenser. Turn the volume of the remote unit on full, and tune the radio receiver until the hiss from the remote unit is heard through the loud speaker with the receiver's volume fully advanced. This will probably be near the high frequency (low wavelength) end of the receiver's scale. If the hiss is not heard, adjust the trimmer across T3 until the hiss is picked up on the receiver. Once this has been done, stations tuned-in on the remote unit will be heard through the receiver—the volume control of which, incidentally, should be kept well advanced, volume being controlled from the remote unit.



Remote "wireless" tuner for any receiver. No. 1172

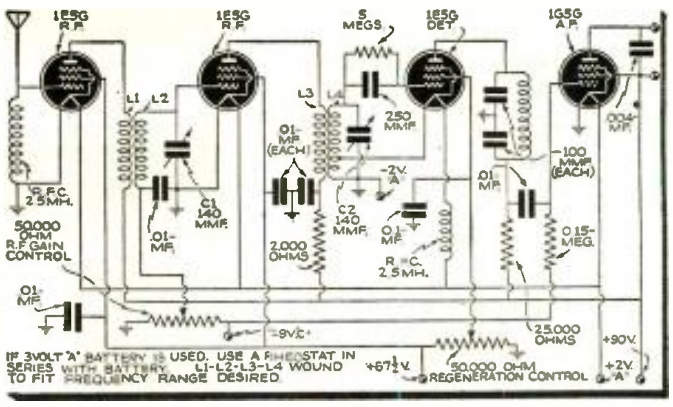
Regenerative Battery Receiver

Will you kindly publish a diagram of a battery-operated regenerative set using one stage of tuned and one stage of untuned R.F., regenerative detector, and one stage of audio amplification? All in all, I should like to use four tubes.—Horace Martin, Richmond, Va.

A. Herewith is a diagram using a 1E5G as an untuned R.F. stage and a 1E5G as tuned R.F. followed by another 1E5G as a regenerative detector feeding into a 1G5G audio. If care is used to make L-1, L-2 identical to L-3, L-4, the two tuning condensers can be ganged. Alternatively, small 10 mmf. trimmer condensers can be shunted across the secondaries of the coils.

Band	L-1	L-2	L-3	L-4	Tapped at Turn	L-2 L-4	
1750 Kc.	30	55	30	55	3rd	No. 28 DCC	Close Wound
3500 Kc.	20	28	20	28	1st	No. 20 DCC	Close Wound
7000 Kc.	9	11	9	11	½	No. 18 Enam.	Spaced to occupy 1"
14000 Kc.	5	5	5	5	¼	No. 18 Enam.	Spaced to occupy 1"

All L-1—L-2 No. 36 DSC Spacing between coil ⅛" Coil form 1½" diam.



Regenerative Battery Receiver. No. 1173

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.

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1-Meter WAVES with Ordinary Tubes

(Continued from page 673)

several pipes or wiring ran was a definite obstacle that the signals did not penetrate. Similarly, reinforced concrete walls, or those built on metal lath, would act as effective *shielding*.

On the other hand, the size of the antenna makes possible the setting up of the antenna array within such walls, provided the output is aimed out of a convenient window. Another characteristic that was revealed when checking performance was the unexpected reflection from such objects as a metal floor or table lamp or other household furnishings, having a serious effect on the radiation pattern.

A rod, cut slightly longer than a half-wave antenna, could be carried behind the field-strength meter, which would then show an altogether different reading. On the same principle, a rod experimentally placed in the vicinity of the receiver would, according to its position, increase or decrease the tuned-in signal. No two installations of either receiving or transmitting antenna worked alike, though a careful study soon showed the reason for the difference found.

One of the receivers was made portable by the addition of batteries used with a 37 type tube, and a circle of the house in which the transmitter was installed, was made. Here, too, the pattern was radically different than expected, due, without a doubt, to the variety of reflectors and shields naturally found on the immediate terrain. However, with the antenna array fairly well elevated, as in the second story window, and with no intervening objects to interrupt the light of sight, no difficulty should be had by the most casual experimenter in receiving a signal *several miles* away!

Apparently complete coverage of a given area is governed solely by the elevation of the transmitting antenna. At Alpine, N. J., commercial interests have erected a 450-foot steel framework atop the Palisades to support antennas for experimentation with Armstrong "frequency modulation" on about two meters, and it is reported, unofficially, that these signals have been picked up in most of the New York metropolitan area.

In working on *one meter*, many characteristics will be discovered that, at first glance, appear to be either freakish or just plain contrary to accepted practices. It will be seen, however, that once these characteristics are traced to their source, one meter transmissions follow a definite, and not too different pattern, as do transmissions on the lower frequencies.

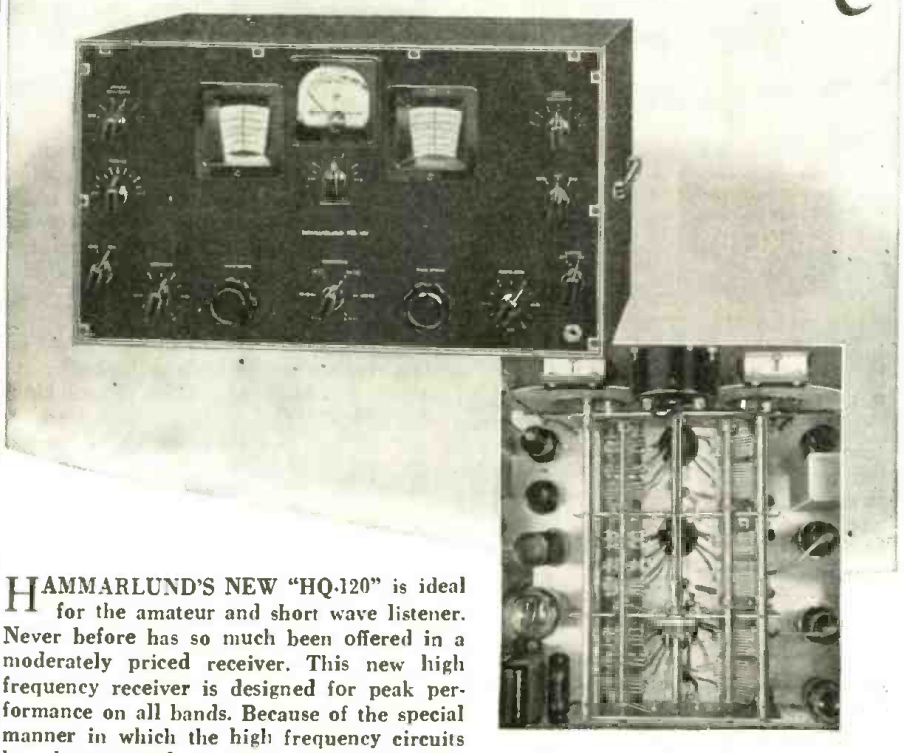
These ultra-high frequencies are the last unexplored frontier of radio and it is only a question of time before they, too, are put to work, possibly to carry *high-fidelity music* and, of course, *television!* The man who now becomes acquainted with them will, in the near future, be one stride ahead of his fellow experimenter who ignores their possibilities.

List of Parts

L—5 turns ¼-in. dia. No. 22 wire, ¼-inch long, soldered directly to condenser terminals
RFC—30 turns No. 28 wire, ¼-inch diameter
C—50 mmf. fixed mica midget condenser, with small strip ¼ x ¾ inch aluminum bent around it for coupling condenser for antenna
C1—Split stator condenser, as described in text
C2—By-pass condenser, .002 mf.
C3—By-pass condenser, 1 mf.
R—5 megohms
R1—50,000 ohm potentiometer
R2—50,000 ohm fixed 1 watt resistor
R3—2000 ohm, 1 watt resistor
T—Any 3 to 1 (or thereabouts) audio transformer
VT—Tubes of the 56, 76 or 37 type are satisfactory

9.7~555 METERS

High Performance ON ALL BANDS



HAMMARLUND'S NEW "HQ-120" is ideal for the amateur and short wave listener. Never before has so much been offered in a moderately priced receiver. This new high frequency receiver is designed for peak performance on all bands. Because of the special manner in which the high frequency circuits have been treated, the gain is uniform throughout the entire tuning range. This high uniform gain is always usable even in the most crowded bands because of the variable selectivity crystal filter. This filter is applicable to reception of voice and music as well as code. Weak stations can be tuned in clearly without interference by selecting the proper band width. Accurately calibrated dials and 310 degrees band-spread greatly simplify tuning.

SPECIAL FEATURES

★ Condenser assembly has 15 sections —9 for band-spread and 6 for main tuning. Permits uniform gain.

★ Accurate "S" meter calibrated in "S" units from 1 to 9 and up to 40 db. above "S-9." Accurate on all bands.

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New Tubes for *Television*

Black and white images can be reproduced in amateur television receiving stations, thanks to the new cathode-ray tubes now made available in 3, 5, 9 and 12 inch sizes.

New high-voltage half-wave rectifier for use in television power supply units—type 2V3-G. The peak inverse voltage of this tube is 16,500.

● RADIO CORPORATION of America has announced a new series of television tubes similar to the older style C-R tube, but a refinement of design makes it possible to build the tube *shorter* while affording the *same screen diameter*.

Type 1803-P4 is a 12-inch electromagnetic-deflection type with white phosphorus screen. This high vacuum tube, intended for television reception, will produce a black and white picture about 7½" x 10". It operates with a maximum Anode No. 2 voltage of 7000 volts and a grid No. 1 signal-swing voltage of approximately 25 volts for optimum image contrast. The bulb has been shaped to give minimum internal reflection and to provide maximum strength.

Type 1804-P4 is a 9" tube similar to the one previously described, but is smaller and provides a black and white picture measuring 5½" x 7½".

With both of these tubes, 1900 volts may be used on the No. 1 Anode or focusing electrode, and 250 volts on the accelerating electrode, Grid No. 2.

There is also the 1802-P4, a 5" electrostatic-deflection type tube, with white phosphorus screen, which requires a No. 2 Anode voltage of 2000 volts maximum.

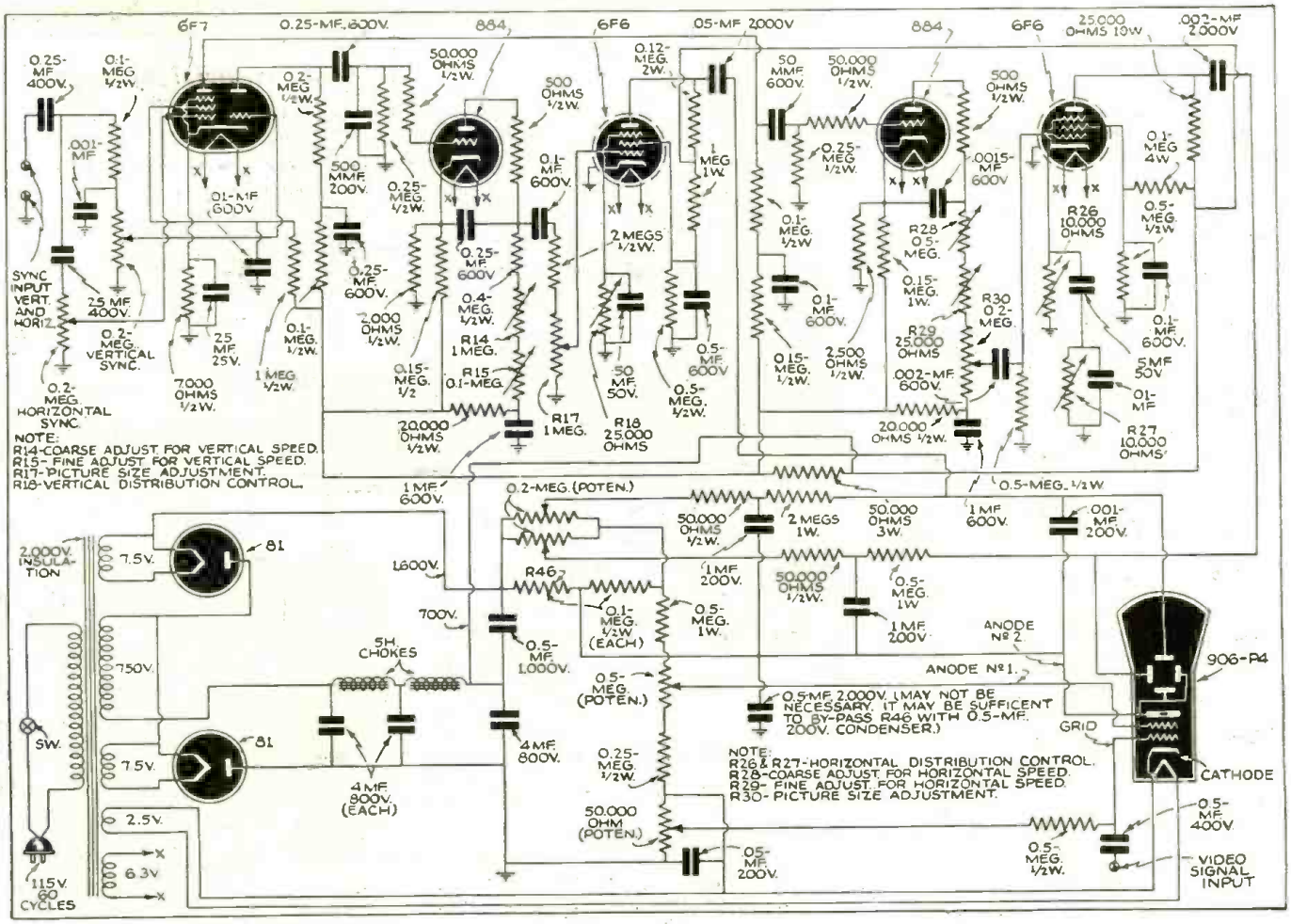
One of the new RCA short-stem television cathode-ray tubes. This is the 9" diameter model, No. 1804-P4.

The RCA 906-P4 is a 3" electrostatic deflection type with white phosphorus screen. It takes a maximum voltage of 1500 on the high voltage electrode, and is designed not only for experimental *television* work but for oscillograph use as well.

RCA has also announced a new high-voltage, half-wave rectifier, Type 2V3-G, which is a tungsten-filament tube for use in suitable rectifying devices to supply the high

(Continued on page 688)

Hook-up for new RCA television cathode-ray tubes: 3" diameter screen—No. 906-P4.



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A Radio Ore-Locator

(Continued from page 669)

lowered to the ground, but their real function is to keep a fixed distance between the Antenna and the instrument case. Where these uprights are joined to the instrument case, they are held in place with brass bolts and wingnuts, and are not anchored permanently to the case as they are to the Loop Frame, the reason for this being that the operator can loosen the wingnuts and rotate the case until he obtains the most efficient tuning for the device, in which case he tightens the wingnuts and notes this position.

The instrument case itself can be made with oak pieces, two being 16" x 3" x ⅜", and two being 14" x 3" x ⅜", joined together with brass screws, and reinforced with cleats at the corners. Inside this rectangular frame, 4 inches from the top, is mounted a chassis strip to hold the tubes, while the batteries are held in place at the bottom with wooden cleats. The front and back of this frame are faced with wallboard or light wooden pieces, one being permanently screwed to the frame with the other hinged and hooked so that it can be swung out for inspection and adjustment of the parts. In practice, these dimensions need not be followed exactly—they are only a guide, the principle being to construct a case which will hold all the parts without crowding. The carrying handle, though, must be made of leather or brass, since iron and steel should be kept to a minimum.

To operate, turn on the switch, and adjust the rheostat so that the voltmeter reads "2 volts." Then raise the instrument so that the loop-antenna (the base) is several inches above the ground. Turn the tuning knob until a good audible whistle is heard in the headphones. If the instrument is now carried over a metal object, the whistle will vary considerably in pitch.

You can adjust the tuning knob so that the pitch increases—that is, gets higher over the metal—or you may adjust it so that the pitch decreases. You will find, however, that the most practical adjustment is that in which the pitch decreases over metal.

The rheostat should never be adjusted so that the voltmeter reads more than 2 volts, but as the batteries lose their strength you will find that the rheostat must be turned higher.

To test your set, before going into the field in search of buried treasure, bury a small metal plate a few feet under the surface of the ground. This need not be iron or steel, since the set operates just as well over non-magnetic metals, such as brass and copper. Walk over ground at some distance from the buried plate, and then over the spot where the metal has been placed, and note the variation of pitch in the headphone sounds. With this established, you are now ready to actually hunt treasure or minerals.

The cross-sectional *area* of metal lying in a horizontal plane is more important than the size or weight. For this reason, a few dollars buried *flat* in the ground will give a stronger signal than a large number buried on their edges. This T-Scope, as Dr. Fisher calls it, is not designed to trace buried pipes, but it has been used successfully in searching for buried treasure. With a little care in building, and a lot of patience in operating, you, too, should have good luck with this instrument.

This apparatus is patented and the inventor gives permission for you to build this instrument for your *own* use, but not for re-sale or hire.

(First American Serial Rights)

Material List

RCA
3—Type-30 tubes

TRIMM
1—2000-ohm headphone set

TRIPLETT
1—0-3 D.C. Voltmeter, V.

CORNELL-DUBILIER
Condensers:
No. 1. .1 mf.
No. 2. .0001 mf. tubular fixed condensers
No. 3. .002 mf. tubular fixed condenser
No. 4. .0001 mf. variable condenser

BURGESS
2—1½-volt Burgess No. F4FH batteries. (Connected in series.) ("A" Batteries.)
1—45-volt "B" battery, No. 5308

MISCELLANEOUS
1—"On"-and-"Off" switch
Resistor (R-1)—1 megohm, ¼ watt resistor
Transformer—Any make of reliable audio transformer, ratio 3:1
R.F. Choke—25 turns, No. 33 D.C.C. wire, wound on ½ inch diameter coil form
1—30-ohm variable rheostat, R

Here's Your Button

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

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

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The NEW RME-70	$138.60	$27.72	$9.79
Howard 430	29.95	5.99	2.12
NC80X and NC81X	99.00	19.80	6.99
Improved NC101X	129.00	25.80	9.11
The NEW NC100A	120.00	24.00	8.48
Latest RME-69	152.88	30.57	10.80
Sky Champion & NC44	49.50	9.90	3.49
Breting 49 & S16	99.00	19.80	6.99

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$3.20 WITH PHONE Less Tubes Unwired

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MODEL 3A-E
Pat. No. 2,086,256

Following Auxiliary Parts are available: 9½ to 20 meter coil (foreign) 25c; 15 to 45 meter coil (foreign) 25c; 40 to 80 meter coil (foreign) 25c; 5" Find-all Loud Speaker $1.25; Complete Antenna Kit 50c; Wood Screw Kit 10c. Tubes for Model 3A-E each 40c. Long Wave Unit and coil $1. Double Earphones $1.30. Bandspread Attachment 75c. Air Scout Jr. model 3AE wired extra $1.00. NOTE: If you already have earphones, two extra foreign coils may be substituted in model 3AE.

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New HAM Licenses

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THERE are now approximately 50,000 licensed radio amateurs in this country. And hundreds of new amateurs are being licensed every month.

Heretofore no publication has listed the names and addresses of the new licensees as issued. RADIO & TELEVISION Magazine now provides this unique service, and publishes a list of newcomers in every issue. Check the names carefully so that you will be able to get in touch, not only with those amateurs in your neighborhood and vicinity, but also with those distant amateurs whom you wish to contact either by mail or by radio.

This list contains 100 names of newly licensed amateurs. YLs' names appear in blackface type.

KB4FTU Otto Wilhelm Gomez, 13 Commandant Gade, Charlotte Amolie, St. Thomas, V.I.
W1CEV Lyman Hitchcock, 289 Walnut, Winsted, Conn.
W1HUL Harry Leighton, Leighton Ave., Limestone, Me.
W1LRT Carmine Ciarletto, Silvermine Ave., Norwalk, Conn.
W1LSG James F. Hennessey, 103 Dover Point Rd., Dover, N. H.
W2AY Melvin I. Grummet, 65 Mill, Middletown, N. Y.
W2FYL Robert A. Martiny, 4125 44th St., Sunnyside, L. I., N. Y.
W2LTP Alfred Greenberg, 401 Rahway Ave., Elizabeth, N. J.
W2LTQ Louis B. Pascal, 772 Forest Ave., New York, N. Y.
W2LTR Thomas J. Phelan, 96-23 45th St., Corona, N. Y.
W2LTS Aldro Lingard, Trustee, Fort Monmouth Radio Club, Building 271, Fort Monmouth, N. J.
W2LTT Harold Epand, 675 W. 160th St., New York, N. Y.
W2LTU Jay J. Chichon, 160 Vermilyea Ave., New York, N. Y.
W2LTV Eliot Lee Johnson, 160-22 84 Rd., Jamaica, N. Y.
W2LTX Leland J. Califano, 1033 Forest Rd., Schenectady, N. Y.
W2LTY Robert F. Cassidy, 1035 Woodycrest Ave., New York, N. Y.
W2LTZ Theodore Grasman, 1506 University, New York, N. Y.
W2LUA Fred Wm. Poppe, 615 Eagle Ave., New York, N. Y.
W2LUE Ann Hallinan, 41 3rd Ave., Hawthorne, N. J.
W3HWS Rudolph C. Koerner, Jr., 201 S. 35th St., Camden, N. J.
W3HWT Anthony J. Sivo, 54-56 Butler St., Trenton, N. J.
W3HWU Leroy M. Lewis, Jr., Curwen Rd., Rosemont, Pa.
W3HWV William Benner, 4722 Tampa St., Phila., Pa.
W3HWW Douglas M. Parr, 1511 Braddish Ave., Baltimore, Md.
W3HXC Saul Greenstein, 6522 N. Bouvier St., Phila., Pa.
W4AKC Joseph Abernethy, 404 W. Sixth, Gastonia, N. C.
W4AMF Cleveland Andrews, 1140 Belvidere Ave., Gastonia, N. C.
W4CCO Emmett B. Lewis, Jr., 213 S. Marietta St., Gastonia, N. C.
W4FTR Rollin M. Martin, R.F.D. No. 1, Lodge, S. C.
W4FTS Andrew C. Faire, 29 Baptist Hill, Greensboro, Ala.
W4FTV Charles E. O'Groynn, 416 High St., Montgomery, Ala.
W4FTX John M. Hammond, 2325 Cussetta Rd., Columbus, Ga.
W4FTZ Henry L. Cotton, 327 4th Ave., S. Jacksonville Beach, Fla.
W4FUA Samuel S. McNinch, Jr., R.F.D. No. 2, Sharon Lane, Charlotte, N. C.
W4FUT James J. Griffith, Jr., 1215 Watauga St., Kingsport, Tenn.
W4SH Jacob A. Maxwell, 212 W. Morgan St., Raleigh, N. C.
W5CKF John Henry Connell, Jal, N. Mex.
W5EMZ George S. Johnson, 317 S. Dartmouth, Albuquerque, N. Mex.
W5HPN Le Roy J. Langlois, 927 America St., Baton Rouge, La.
W5HPP Francisco Ortiz, 421 Pierce Ave., San Antonio, Tex.
W5HPR Jack Cecil, 715 W. Chambers St., Cleburne, Tex.
W5HPV Fred M. De Vorse, Valdez, N. Mex.
W5HPW Wm. R. Baker, Crowville, La.
W5HPX Thomas Atkinson, 530 West 17th St., Houston, Tex.
W5HQB Norman Kendale, 132 N. Santa Fe, Bartlesville, Okla.
W5HQC Warren M. Griffith, 203 Lexington, Jackson, Miss.
W5HQD Alfred A. Corcanges, lota 9&10, Block 3, Flaxton, N. Dak.
W6DKU Edwin Harper, 441 E. 1st Ave., Mesa, Ariz.
W6GDI Albert L. Hullin, 633 E. Inyo, Tulare, Calif.
W6MAI Masayoshi Harada, 1777 Euclid Ave., Berkeley, Calif.
W6QQC Harold Keto, 4216 Illinois Ave., San Diego, Calif.
W6QQE Joseph Fetzer, 303-E 5th South, Salt Lake City, Utah.
W6QQF Arthur J. Holton, 1446 Jones St., San Francisco, Calif.
W6QQG Albert Ezor, 1434 So. Crescent Heights Blvd., Los Angeles, Calif.
W6QQH Bob Cranston, 1929 5th Ave., Oakland, Calif.
W6QQI Justen L. Olsen, 87 W. 1st North, Ephraim, Utah.
W6QQK Royal G. Madsen, 1210 Crandall Ave., Salt Lake City, Utah.
W6QQS Wm. G. Gerlach, 2939 Best Ave., Oakland, Calif.
W6QQU Leslie L. Funston, 237 Grand Ave., South San Francisco, Calif.
W6QQW Morgan W. Hays, 719 Goshen Ave., Visalia, Calif.
W6QQZ John F. Schmieskors, 820 Gleen, Fresno, Calif.
W7ACU Frederick N. Frost, 4548 47th Ave., N.E. Seattle, Wash.
W7HFM Clarence E. Saunders, E. 2808 33rd Ave., Spokane, Wash.
W7HFN Glenn A. Cox, 646 Hemlock Ave., Marshfield, Ore.
W7HFO Earl F. Reilly, 1702 Rucker St., Everett, Wash.
W7HFP Malcolm J. McFarlane, 1907 Hoyt Ave., Everett, Wash.
W7HFR Dennis R. Fenno, Dillingham, Alaska.
W7HFS Dallas H. Lien, 617 N. 16th St., Boise, Idaho.
W7HFT Fred C. Alexander, 5046 So. K St., Tacoma, Wash.
W7HFU Howard V. Berg, 7558 Earl Ave., N.W. Seattle, Wash.
W7HFW Robert Wm. Sherman, 6808 30th N.E. Seattle, Wash.
W7HFX Harry E. Turner, Group 15, Belton, Montana.
W7HFY Raymond D. Kester, 1546 32nd, Milwaukie, Ore.
W8MPP Lorraine Swann, 274 E. Hancock St., Detroit, Mich.
W8SRR Richard M. Sweet, 11829 Franklin Blvd., Lakewood, Ohio.
W8SRY Robert T. Sxeer, 15998 Nelacrest Ave., East Cleveland, Ohio.
W8SRZ Alfred Schafer, 228 Fair St., Berea, Ohio.
W8SSA Jack Rockwell, 513 7th Ave., Williamsport, Pa.
W8SSC John Driscoll, 173 Florida, Buffalo, N. Y.
W8SSD Jack M. Gabert, 2134 Henry, Sheboygan, Wis.
W8SSF Arlynn C. Knapp, 414 Emmons Blvd., Wyandotte, Mich.
W8SSI Louis C. Barber, Jr., 203 Tinker Ave., Painesville, Ohio.
W8SSJ Bruce G. Born, 14809 Darwin Ave., Cleveland, Ohio.
W8SSK Bogan Burke, 351 Rockview Ave., Youngstown, Ohio.
W8SSL Wm. J. Clark, 705 Fairmont Ave., Youngstown, Chio.
W8SSO Howard H. Rausch, 315 Mackinaw, Sheboygan, Mich.
W8SSV Frank E. Bien, 9210 Plymouth, Garfield Heights, Ohio.
W9DUR Ransom V. De Faut, 3423 17th, Racine, Wis.
W9IFK Harold E. Coleman, 7 W. 9th St., McCook, Nebr.

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the motion of this cloudy medium are influenced by the Sun's radiations.

It is estimated that the stratosphere layer carrying a maximum ionization charge is approximately at an average height of 144 miles above the earth's surface. The high degree of ionization may be accounted for when one realizes the extremely low atmospheric pressure at such a high altitude.

The various problems involved led several authors to suppose the existence of several layers within the ionized stratosphere. I prefer to consider the hypothesis of a cloudy medium, in motion, of changing composition, and changing in altitude the same as the atmospheric medium does. Of course, in the case of the stratosphere regions, ionization is the main consideration, while the visible clouds are but accumulations of condensed humidity.

The state of the reflecting stratosphere region is influenced periodically by the Sun's radiations; this explains the periodical corelations between the Sun's activity and the propagation of short waves.

It is equally plausible to think that, between the earth's surface and the stratosphere region, at an altitude of 144 miles, the intervening space is far from being in a state of gradually decreasing ionization, as one approaches the earth.

There undoubtedly exist intermediate regions showing various degrees of ionization, much lower than the maximum of the higher region. The hypothesis of these secondary layers of ionization provide an explanation for the various changes in the propagation of wavelengths below 35 meters.

Referring to occasional troubles, such as sudden fadings occurring about 36 hours after solar eruptions, one may conclude that each eruption produces a violent electronic emission, reaching the earth at the observed time of 36 hours later.

These electrons, entering the earth's magnetic field are naturally deflected toward the poles, where they cause an intense bombardment, the first result of this being an extremely deep ionization of the stratosphere. It is then not surprising that the short waves reflected above the polar regions are much more affected than waves traveling along and reflected in regions remote from the poles.

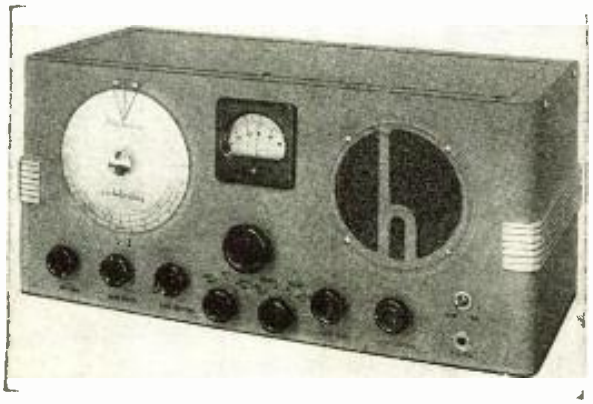
It is known that the Aurora Borealis is equally explained by the Sun's electronic emissions concentrating at the poles and producing the intense ionization, greatly modifying the stratospheric medium as well as the atmosphere itself, in such a manner that the propagation of all radiations, whether luminous or electro-magnetic, is seriously affected.

We cannot say much more now about the development of this hypothetical and perhaps too enthusiastic theory of the Sun's influence over everything happening on earth; it is an important subject which will, no doubt, receive considerable study and development in the near future. Several daring suppositions have been advanced to the effect that the Sun's electronic emissions actually influence not only the health but the mentality of men and other living creatures.

We can no longer laugh at such suppositions; we may now seriously dream of them, although it is difficult to employ reasoning profitably upon this subject, inasmuch as suitably long series of controlled observations do not yet exist.

A Receiver for the "Ultra Highs"

J. Gordon Taylor, W2JCR



Note the neat arrangement of the controls on the new Hallicrafter "Skyrider 5-10" receiver.

● IT is generally recognized that the design requirements for 10 meters and downward differ quite radically in some respects from those of standard receivers used on the lower frequencies but there seems to be considerable doubt as to just what these differences are. A brief discussion of a brand-new ultra-high frequency receiver which has just been made available to the public may therefore be of interest to many, particularly to Hams operating in the 5- and 10-meter bands.

This new receiver, the Hallicrafters "Skyrider 5-10," provides a range of 25 to 66 megacycles (12 to 4.5 meters), divided into two bands of 25-44 and 38-66 mc. with band-switching. The main dial is fully calibrated in megacycles. *Band-spreading* is ample to make tuning non-critical and for logging purposes has its own calibrated dial.

The circuit employs nine tubes and includes one R.F. stage, mixer, H.F. oscillator, two I.F. stages (the second I.F. tube also serving as the beat-frequency oscillator), second detector-first audio and A.V.C. all in one tube, 6H6 automatic noise-limiter, audio power stage, and rectifier.

One of the most important departures from previous practice is the use of an 1852 tube in the tuned R.F. stage. This is one of the new ultra-high frequency tubes which really provides respectable gain as contrasted with little more than unity gain, or even a loss sustained at these frequencies with conventional tubes such as the 6K7, etc. The mechanical and electrical layout of the R.F. circuits is unique in that the total separation between the coil, band-switch and tuning condenser of each R.F. circuit does not exceed one inch, the coils being mounted right at the switch; both of these immediately below the tuning condenser. Each of the three tuned stages is enclosed within

(Continued on following page)

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A Receiver for the "Ultra Highs"

(Continued from preceding page)

its own individual shielded compartment.

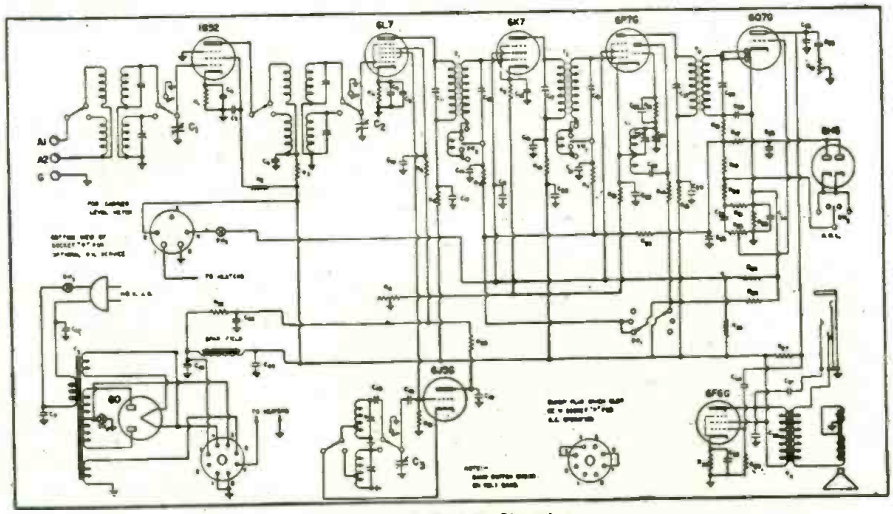
The intermediate frequency is 1600 kc., selected because it results in greatly improved image selectivity and widely separates any repeat points that may still remain. Broad and sharp selectivity is provided by means of variable I.F. interstage coupling, the selection being made by means of a switch on the front panel.

The completely automatic noise-limiter is especially important at these frequencies, where ignition noise is ordinarily most troublesome. This system cuts off all noise peaks above the signal level.

That this receiver has the same degree of flexibility as receivers for the lower range is indicated by a listing of the controls. Reading from left to right along the front panel they are: manual R.F. gain, bandswitch, tone control and A.C. line, A.V.C.-B.F.O.S.C., broad-sharp I.F. band width, audio gain, B.F.O. pitch control, stand-by switch and headphone jack. The single tuning control is in the center.

An extra refinement and a distinct novelty is the provision for operation either from the 110-volt A.C. line, or from a 6-volt storage battery for portable-mobile work. With special plug removed, the internal power supply is disconnected and by inserting another plug to which the storage battery and an external vibrator supply such as the Mallory VP-554 are connected, the receiver is ready for mobile operation.

In tests conducted at the home station and at those of other New York Hams equipped with outstandingly good 5- and 10-meter equipment, not one could beat out the DX ability of this little receiver on five and ten meters. The only installation to which it ran second was the rig at W2AMJ which consists of a Hallicrafters SX17, plus a 5-meter converter of 2AMJ's own design, in which two of the new ultra-high frequency tubes are used, making a total of 15 tubes in all. Every station picked up on the 15-tube equipment, including 1st, 2nd and 3rd district stations, was likewise heard with the "5-10," but greater volume was obtainable on the big rig.



Hook-up of "5-10" Skyrider

What Do You Think?

(Continued from page 658)

a sort of "reference library." I own a Sky Challenger which I wouldn't part with for any radio. Again may I offer my hearty congratulations on the R9+ S-W magazine, "R.&T."

RICHARD NOEL,
Gow School,
South Wales, N. Y.

A "Cover" Idea!

Editor,

I am writing mainly to congratulate you on the F.B. short-wave magazine of which I am an ardent reader. Joe Miller takes the cake, as far as DX is concerned. Here's more luck to you, Joe!

May I criticize one point, though—your cover? I think that pictures of S-W Listening Posts would be ideal. Each month print a picture of some notable S-W Post with its owner.

(Unsigned.)

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The "Switched Coil-4"—A Practical Superhet

(Continued from page 671)

simply use good judgment, fixing mounting feet on at least the back partition, providing in some convenient fashion for mounting the oscillator circuit padders, and drilling both plates so that they may replace wafer sections of the switch.

3. Disassemble the specified six wafer switch, then reassemble it, replacing the *third* and *sixth* (from the front or shaft end) wafers with the shield partitions. Mount the front-end coils right on wafer pairs, positioned as the photo indicates, with trimmer screws up for convenient adjustment. Connect the high (grid, plate, antenna, etc.) lead selector lugs to associated wafer shorting section terminals so that as the switching progresses from the No. 1 or broadcast position toward and through the higher frequency ranges, the unused coils will be shorted out. Wire in the variable padders for Band 1, 2 and 3 oscillator coils and the fixed padder for Band 4, then test the completed coil assembly for proper continuity, etc.

4. Mount the R.F. assembly, the I.F. transformers, tube sockets, headphone jack and speaker terminal unit on the chassis. Mount the two 2-gang condensers (ganging the individual capacitors conventionally with standard insulated couplings) with the bandset above the chassis for broadcast and 160-meter band work or below chassis if the receiver is to be used primarily for *short-wave* pickup and the bandset items need not be other than direct drive or knob controlled. Carefully cut off the frame extension of the dial assembly, so that with the control assembled on the above-chassis condenser shaft the unit slides tightly over the chassis. Tighten the hub's shaft screw when the inner edge of the dial glass is in approximately vertical line with the front chassis drop.

5. Mount the tanks below chassis (or ganged 20 mmf. units, as the case may be), also the additional antenna-load compensating trimmer if one is used. Mount the potentiometers, then assemble chassis and cabinet-panel together, using the securing nuts for all front drop controls as a means of such assembly, and placing washers (about 1/16 inch thick) between chassis and panel at each control-shaft point so that there will be sufficient clearance to permit the chassis-panel construction to fit properly into the cabinet.

6. Complete the general assembly, mounting the broadcast or regeneration coil as indicated at the 6C8G socket, and placing tie points here and there where necessary for rigid by-pass condenser and resistor support. Wire up the receiver, following the circuit diagram carefully and using shielded (low capacity) leads between front panel potentiometers and associated circuit items. The B plus and A "hot" leads may well be similarly shielded for as much of their length as possible.

7. The second detector plate circuit *must* be grounded at the intermediate frequency transformer. Use a mica condenser of from .002 to .005 mmf. value—logically the smallest value which will permit circuit feedback and oscillation.

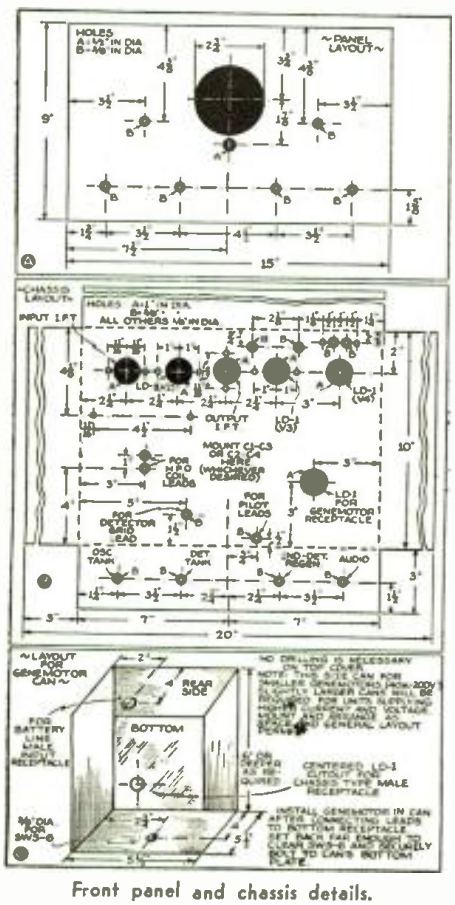
8. At this point check the operation of the set, using any available A.C. power supply which delivers 6.3 volts for the tube filaments and a well-filtered 200 to 250 volts of B. The power cable may be terminated in a plug designed for connection to the chassis receptacle for genemotor plug-in (i.e., the socket at center right immediately below the genemotor can). Align the I.F. circuits to 456 kc. peak with the regeneration control adjusted for maximum circuit gain (setting just below that for circuit oscillation). Then align the *front-end* coils at these trimming and padding frequencies:

Band 1—Align at 1400 kc.—Pad at 600 kc.
Band 2—Align at 4.0 mc.—Pad at 1.7 mc.
Band 3—Align at 10.0 mc.—Pad at 4.5 mc.
Band 4—Align at 29 mc.—Pad fixed.

9. With the layout properly adjusted and aligned under A.C. powering, proceed to the construction of the genemotor assembly. The genemotor itself is bolted down securely in the specified shield can for it—the can provided with a base mounted plug for receiver chassis connection, a rear wall receptacle (male) for storage battery line connection, and a front-wall mounted three-way switch (for "On-Off-Standby") supporting any necessary filtering items additional to those incorporated in the genemotor item proper, and positioned so that with the shield-can plug in, the switch shaft will line up with (and protrude through) the front-panel switch hole. The switch shaft, with genemotor assembly mounted on the main chassis, should clear this hole and the can should elsewhere be free of chassis and cabinet contact except at one point only—and that point logically near the A minus–B minus terminal of the chassis receptacle. (The grounding is then effected only with plug-in: genemotor can to chassis.) Use of the specified molded receptacle and plug units, by the way, will elevate the can above-chassis so that this single point grounding may be conveniently effected.

10. Connect the genemotor assembly to an energizing 6-volt storage cell, using

(Continued on page 687)



Front panel and chassis details.

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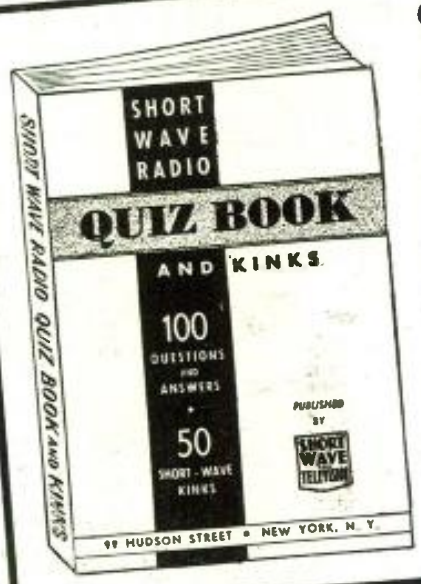

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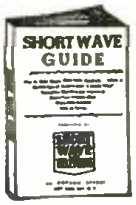

SHORT WAVE GUIDE

Covers hundreds of Short-Wave questions and answers; illustrates popular Short-Wave kinks; gives instructions for building simple Short-Wave receivers; instruction on the best type of antenna to use; diagram and construction details for building a simple "ham" transmitter; practical hints on Short-Wave tuning.

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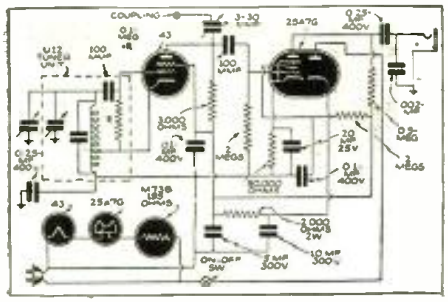
New Frequency Meter-Monitor

Fig. 1. Front view of instrument at left — Below, Fig. 2, rear view with cover removed.

Fig. 3. Diagram of the new Freq. Meter-Monitor.



● NOW that the Federal Communications Commission has ruled that stations must be accurately monitored, some means of checking frequency must be provided.

One such means, here illustrated, is the new Guthman U10 Frequency Meter-Monitor. This piece of apparatus can be checked to a very high order of accuracy upon nineteen broadcast band stations required by law to maintain frequency to plus or minus 50 cycles. Of course, it can also be checked with WWV, the standard frequency station. Such calibration is accurate to 6 parts in 850,000, according to the manufacturer's claim.

Fig. 1 illustrates the 7¾" accurately calibrated dial which is read against an anti-parallax indicator for the 160, 80, 40, 20, 10 and 5 meter amateur bands. Calibration covers 324 degrees out of a full 360 degree circle 7¾" diameter, with low frequency bands at inside and high frequency bands progressively toward the outside edge. This gives a maximum effective scale length of 21⅞" for the outer scale, which is devoted to a vernier scale of 500 divisions, readable to one-half division.

This dial may be rotated either directly or through a 12-to-1 vernier reduction knob. At lower right is the on-off switch and head-phone jack, with input coupling through the small jack at the upper right. The knob and dial at lower left are the zero-setter, or calibration setter. By first setting the main dial to any standard frequency station signal and then adjusting the zero-setter knob to zero beat, oscillation is automatically made accurate for the entire dial scale to closer than it can be read, the manufacturer claims.

Fig. 2 shows a means designed to attain stability. The frequency determining electron-coupled oscillator circuit comprises a very wide-spread, steatite-insulated, ball-bearing tuning condenser, high-Q 15/41 Litz inductance wound on low temperature-coefficient steatite form, and padding or "swamping" capacity of low-drift construction, completely ceramic-sealed. These units are housed in a tightly closed metal box, the back of which has been removed for visibility. A "dead air" mass around the frequency determining circuit, which resists temperature changes, is provided by this box, itself enclosed inside the outer cabinet. Stability is further assured by using the preferably continuously running tube heaters as heating elements to maintain temperature within a narrow and stable range, well above room temperature.

The fundamental range of the oscillator is 850 to 1030 kc. in order that it may be checked directly against the signals of broadcast stations tuned in on the receiver—or even directly upon the frequency meter in the case of "locals," for it is in itself a receiver. Harmonics of this range cover 1700 to 2060 kc., thus including both new and old 160 meter amateur bands. Through the use of a 43 power pentode as oscillator, it can be run in the frequency-stable range well below maximum rating, and at the same time put out strong harmonics down into the 5 meter band.

External coupling is to the plate of the 43 electron-coupled oscillator, in itself forming no part of the oscillator circuit, and additionally isolated by a small 3-30 mmf. adjustable coupling condenser. To be of maximum use both for measurement of transmitter frequency and for received signal frequency as well, a high-gain pentode functions as a beat-note detector-amplifier, coupled to the isolated oscillator plate circuit. This detector-amplifier is the pentode section of a 25A7G dual tube, its diode being the power-supply rectifier. A.C.-D.C. operation is provided, not for economy so much as to obtain the best possible supply voltage regulation. Omitting the usual power transformer, which always introduces some regulation problems, operation is direct from the power line, with only the "B" supply filter and rectifier tube as elements to affect regulation, which further increases flexibility besides improving regulation.

The manufacturer states that drift over 24-hour test periods has been unmeasureable—apparently less than 1 cycle in 1,000,000.

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The "Switched Coil-4"—A Practical Superhet

(Continued from page 685)

heavy leads, particularly if they must be overly long. (Voltage drop in the leads will materially affect genemotor output.) Check for *hash* with the receiver in operation. If it is bad with higher frequency front-end coils in circuit, check the shielding for A "hot" and B plus leads, increase that shielding as much as possible, check for single point genemotor chassis-contact, and if reception doesn't clear up install R.F. chokes in the B plus and A "hot" leads—chokes, by the way, designed for the frequencies over which the *hash* is really serious and with any A "hot" item of sufficient capacity to handle the genemotor drain on the battery.

Applications

This job makes a perfect receiver for the farm, summer camp, week-end cabin, and whether the user is an amateur, short-wave enthusiast or simply broadcast listener.

Secondly, it is entirely in line with general marine-service requirements, as it covers the important ship-to-ship, ship-to-shore and U. S. Coast Guard radiotelephone frequencies. It is well shielded, and its parts are amply protected against the severe atmospheric extremes which are encountered.

Third, it is just the thing for the truck or trailer or for general mobile application.

Finally, it is a logical design for emergency service—when A.C. power fails or when installations must be set up either at home or in temporary camps during flood and similar conditions.

NOTE: If this super is to be used in a car and if the vehicle is to be driven in areas affected hy municipal ordinances or state laws limiting auto set frequency coverage, some changes in front-end design will be necessary to prevent receiver tuning to and through the taboo wavelengths. The individual builder *must* observe whatever regulations are in effect in his driving area—and *should* find out from local authorities just what the restrictions are before purchasing the coils for his *front-end* assembly.

Parts List

PAR-METAL

1—Type HC-9151 steel cabinet (9x15x11 inches)
1—Type C-4524 chassis (10x14x3 inches)
1—Type UC-565 or larger shield cabinet

I.R.C.

Half-watt resistors: R2—400 ohms; R1—50,000; R3—50,000; R4—2,000 or 1,000; R5—30,000; R6—300; R7—100,000; R8—1,000; R9—10 megohms; R11—2,000; R12—50,000; R14—50,000; R15—20,000; R16—20,000; 2 watt: R17—400 ohms
Variable: R10—1,000 ohms; R13—500,000 ohms

AEROVOX

Type 484 400 volt tubular—C12; C15; C21; C22; all 0.1 mf.
Type 484—.05 mf.—C8; C20
Type 284—.1 mf.—C10, C11, C13, C14
Type 484—.25 mf.—C23
Type 484—.006 mf.—C25
Type PR25—25 mf.—C24, C17
Type 284—.25 mf. or larger—C26, C27
Type 1467 mica—C16—.001 mf.; C9—.0001 mf.; C18—.002 mf.

HAMMARLUND

C1—C3—both type MC-260
C2—C4—both type MC20
Antenna circuit trimmer, if required—type HF-15
2—APC couplings

CARTER (Gen-E-Motor)

1—Dynamotor for 6-volt operation; filtered for A.F. 40 ma., 200 V. or 50 ma., 200 V.

CROWE

1—type 124 dial
1—type 28 dial plate
1—type 27 dial plate
4—type 588 or 286 knobs

MEISSNER

1—24-8255 rotary switch—SW5-6
1—type 24-9204 six-gang coil shorting rotary switch
1—coil assembly rear shield partition, if available
1—coil assembly middle shield partition if available
Set of individual coils to include: 1—14-7921; 1—14-7942; 1—14-7990; 1—14-1018; 1—14-7922; 1—14-7938; 1—14-7954; 1—14-1020
Padding condensers: one each of types 22-7961; 22-7733; 22-7731; 22-4137
1—16-5740 input I.F. trans (456 kc.) and one 16-5742 output
1—small broadcast coil, HFO type 14-4034 for regen.

YAXLEY

1—double circuit phone jack

AMPHENOL

1—RSS8 steatite octal socket; three S8 moulded octal sockets; one PM 4 male receptacle; one PM 5 male receptacle; one S5 chassis receptacle or socket

NOTES:

1. Individual R.F. coil trimmers come wired to the coils.
2. C5, C6, C7 are the Osc. circuit padders.
3. Suggested tubes are RAYTHEON, one each of the following: 6J8G; 6K7G; 6C8G; 6V6G.
4. By substituting a type 6G6G output tube for the 6V6G, more economical operation will result. A 50 ma. Genemotor may be employed which will easily fit into the PAR-METAL shield box specified. A.F. output will be down to approximately 1.1 watts—entirely sufficient for mobile operation.

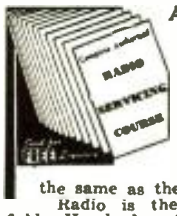
L1 through L8 are the R.F. coils.

Optional is L11—a shielded JEFFERSON 1-4 ratio interstage audio transformer, single plate to single grid.

Minimum range extension with the U.H.F. coils in connection (31 mc.) is not guaranteed. Every care must be used to keep leads short and direct in the "front end" if this possible extension is to be reached, with the paralleled tuning condenser arrangement recommended.

Complete RADIO TRAINING *for* $1.95

Regular $39.00 RADIO TECHNICAL INSTITUTE Course



AN UNUSUAL OFFER

A limited quantity of R.T.I. $39.00 radio servicing courses have been reprinted and are offered to you at only $1.95. These are the latest 1937 courses, complete in every detail with all supplementary material, and exactly the same as the originals.

Radio is the present-day opportunity field. Hundreds of men with no special talents have studied Radio Servicing for a short time and are now making twice and three times as much money. R.T.I. unique radio training brings rich rewards; you can get ready quickly, inexpensively, easily, and in your spare time for a good job in radio.

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Forty large radio manufacturers have helped to prepare the R.T.I. course. Just think what this backing by the radio industry means to you. R.T.I. practical training will give you facts and real data you will need on the job. Hundreds of diagrams and illustrations will help you. You will pass quickly from lesson to lesson and in a surprisingly short time will be ready to do real radio servicing.

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From the very start you are introduced to practical servicing equipment and practices. You are told how to open your own shop or radio store. Lesson 15, "The Radio Servicing Business," will give you many practical ideas and hints. The course is so planned that you will be able to earn spare-time money before you have reached your tenth lesson. The special $1.95 price of the complete course can be earned in a single evening's work.

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R.T.I. course is really three complete essential courses combined. You get training in (1) Practical and Applied Radio; (2) Fundamentals of Radio Principles; and (3) Advanced Specialized Training. This is the training that will place you above the average radio servicemen—and you get this training for only $1.95.

There are over 32,000,000 radio sets in use. Over 4,500,000 auto radios alone. You should cash in on this gigantic money market. The R.T.I. easy practical course will pave the way to your success in Radio work.

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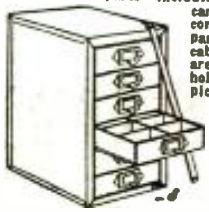
ALL METAL UTILITY CABINETS

Indispensable for keeping under lock and key all VALUABLE parts including your QSL or SWL cards. Top drawer has 10 compartments for small parts. In the 6 and 8 drawer cabinets, the two lower ones are made into one unit to hold tubes, crystals, meters, pick-ups, camera lenses, films, micrometers, slide rules, etc. In the smaller compartments you can keep resistors, condensers, bolts, nuts, washers, etc., from being "borrowed".



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Bar with lock and key ..... .50

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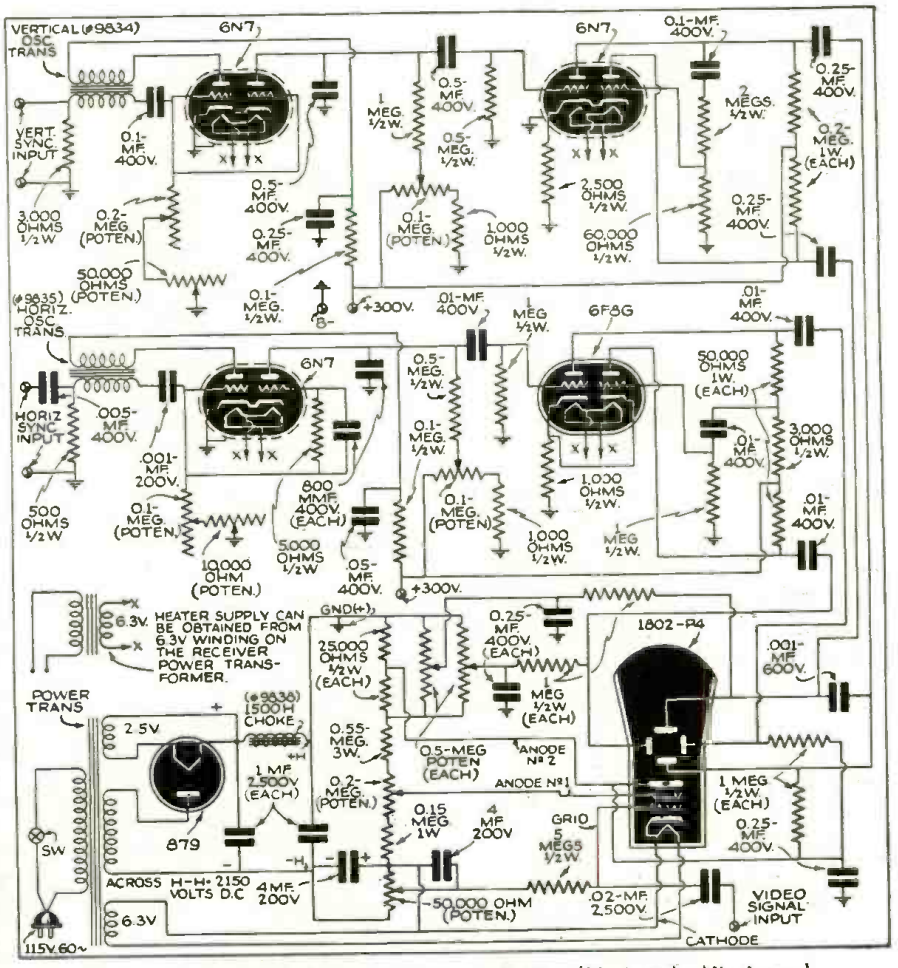
New Tubes for Television

(Continued from page 678)



Hook-up for new RCA 5" dia. Television C-R tube (black and white image) No. 1802-P4. Electrostatic Deflection Type.

D.C. voltages necessary for kinescopes and cathode-ray tubes. The peak, inverse voltage of the 2V3-G is 16,500 maximum, while the peak plate current is 12 ma. maximum.

* * *

New Acorn Tubes

A new series of Acorn tubes—types 957, 958 and 959—are also announced. These have low-current filaments of the coated type and are designed for amateur and experimental use in ultra-high frequencies. All operate on 1.25 filament voltage and a maximum plate voltage of 135.

The 957 is a triode, for use as detector, amplifier or oscillator. It has a moderately high amplification factor. The 958 is a triode, especially designed for use as oscillator or R.F. amplifier in a transmitter; it may also be used as an audio power output tube for phone or sensitive speaker. The 959 is a sharp cut-off pentode, to be used as R.F. amplifier, detector or moderate gain resistance-coupled A.F. amplifier.

An Inexpensive Mike

(Continued from page 669)

bulged slightly outward. The cable used was the regular standard crystal cable consisting of a single inner conductor with the shield used as the grounded conductor. The three-prong shielded Amphenol plug was used, as it fitted all of the station's equipment, and provided an ideal shielded installation. The mike unit itself is entirely shielded due to the case and screening. The mike stand is a cheap commercial stand costing around a dollar, but a stand can be built with the standard thread at the top very easily and inexpensively.

The general color scheme was crackle black and chrome, the headlamp being painted over.

The connection between the case and stand presented a rather knotty problem, but was finally solved with the use of a mike adapter cut off and soldered to the half of the bracket bolted to the bike light case and bent back. The cable leaving the case was secured to this with a light homemade clamp constructed of about No. 8 wire, soldered.

The sectional view drawing will be found self-explanatory and helpful in construction.

The complete mike cost less than six dollars.—*Philip Whitney, Engineer, WJEJ.*

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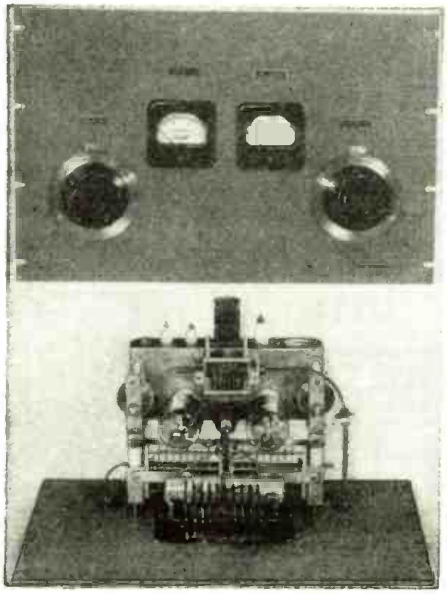
NEW RADIO APPARATUS

R.F. Amplifier Kit



New R.F. Amplifier Kit

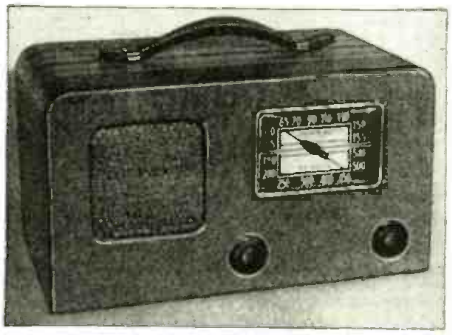
● HERE'S a new 500 watt Radio-Frequency Amplifier in kit form, announced by Bud Radio, Inc., which is to be the first of a series of knock-down units intended for amateur construction. It is designed primarily for operation on 5, 10, 20 and 40 meters.

There are no closed loops of any sort in either the tuning condenser or in the layout itself. This has been accomplished through utilizing a semi-skeleton type of construction.

The structure of this BPA-500 amplifier is such that it will accommodate any of the various low and medium power triodes in push-pull, and while it is conservatively rated at a maximum of 1750 volts and 500 watts plate input, it is equally efficient at inputs as low as 75 watts. This feature enables an amateur, wishing to start moderately, to utilize a pair of low-priced triodes at a low plate voltage; then, at any future date, a power increase is effected by merely substituting more rugged tubes and raising the plate voltage, no mechanical alterations being necessary.

The difficulties of good mechanical layout and machining are eliminated due to predetermined design. Each kit is supplied complete with wire, drilled and formed sheet metal, rack panel, hardware, etc., but less tubes and meters.

New Portable Receiver



● THIS RCA four-tube, single-band, battery-operated superheterodyne covers from 550 to 1560 kilocycles. Its tubes are: a 1A7G, first detector and oscillator; a 1N5G, intermediate frequency amplifier (455 kc.); a 1H5G, second detector, A.V.C. and A.F. stage; and a 1C5G, power output. The set requires 1½ volts of "A" battery and two 45-volt "B" batteries. It consumes but .24 ampere "A" and 9 milliamperes "B," providing an undistorted output of .1 watt or a maximum output of .21 watt. The cabinet is 14" long by 7¼" high by 8⅛" deep, and the set, complete with batteries, weighs 16 pounds. The antenna is a built-in loop but external antenna and ground posts are provided, when a permanent installation is made and greater sensitivity is required.

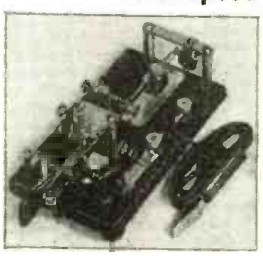
Wireless Record Player

● A PHONOGRAPH record player which operates through any radio set without any connection whatsoever between the two, has just been introduced by the Wholesale Radio Service Company. The new unit is plugged into any 110 volt A.C. outlet and produces a modulated carrier at a frequency of about 1200 kc. The instrument is provided with a jack into which a microphone may be plugged for announcing "home broadcasts"; a crystal pick-up and a turn-table which will accommodate all records up to 12 inches; and its own volume control.

New Hi-Capacity Low-Voltage Condensers

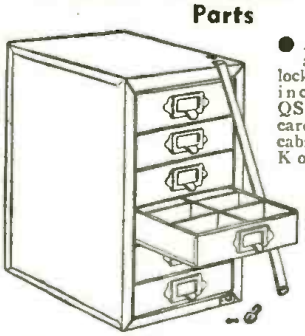
● NEW hi-capacity, low voltage dry electrolytic condensers in round aluminum cans for use with "A" eliminators, moving picture sound equipment and other similar circuits have been introduced by the Sprague Products Company. Seven units ranging from 500 mf. at 12 volts to 2,000 mf. at 25 volts are now available. These new condensers are known as Type HLV.

New Speed Key



● HERE is a new professional type speed key. This "hug" will send out a string of dot signals at a mere flip of a single lever horizontally. This is made possible by means of an accurately designed adjustable pendulum attached to the free end of the lever. The key is fitted with two pairs of large silver contact points, one for dots and the other for dashes. The key is equipped with a cord and jack plug and it is available in a black crackle finish; or at a slight additional charge, in a nickel plated finish. The Martin Flash Key is manufactured by the Martin Research & Manufacturing Corp.

All Metal Cabinet for Valuable Parts



● AN indispensable item for locking up parts, including your QSL or SWL cards is this neat cabinet made by Korrol Radio Products Co. The small size unit measures 9" x 8⅛" x 6" and has six drawers. the top drawer having ten compartments for small parts and the two lower drawers being made into one unit to hold tubes, crystals, meters, pick-ups, camera lenses, films, micrometers, slide rules, etc. Resistors, condensers, bolts, nuts, washers, etc., can be kept in the smaller compartments. It has an olive green wrinkle finish.

YOU NEED THIS FREE BOOK

It's a money saver!

Sound specialist, serviceman, experimenter, ham — whatever you are, this book is your "baby"! A radio catalog so packed with values, it takes 188 newsy pages to describe 'em! Here, for quick easy reference, arranged so you can compare brands, is every possible radio part and tool. Plus a P.A. section presenting LAFAYETTE'S big complete line for '39. Everything priced low in this great guide to thrifty buying. Send for your FREE copy of Catalog 73 today. Just mail the coupon.

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SHORT WAVE CONVERTERS FOR CAR RADIOS

MODEL 600

Can be attached to any car radio.

MODEL 600 covers 49-31-25-20-19 and 16 meter bands. Designed for American and Foreign short wave broadcast. Distance range 5000 to 10,000 miles. List Price $24.95

MODEL 700 long wave covers 135 to 410 kc. Receives gov. weather reports, etc. List Price $24.95

POLICE UNITS

MODEL 100 with fixed condensers, covers 1600 to 2600 kilocycles. List Price $11.95

MODEL 800 Super Sensitive police converter with fixed condenser. Covers 1500 to 2600 kc. Two metal tubes, exceptional distance range. List Price $15.95

MODEL 200 with variable condenser, covers 1550 to 6000 kilocycles. List Price $17.95

MODEL 500 with variable condenser and illuminated dial. Very sensitive, has two metal tubes. Exceptional distance range. List Price $21.95

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$2.55 110 Volts AC and DC

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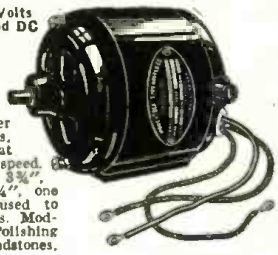

Specifications: 1/30 H.P. operates on either A.C. or D.C., 110 volts, 5000 R.P.M. Rheostat can be used to vary speed. Height 3¾", Length 3¾", Width 1¾", Shaft ¼", one inch long. Can be used to drive Sewing Machines, Models, Buffing Lathe, Polishing Head, Drills, Grindstones, etc., etc.

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MOTOR with Arbor and ¼" Chuck $3.55

Add 25c for special packing and mailing anywhere in U. S. A.

Westinghouse Power Generator

Manufactured for U. S. Signal Corps

200 Watt. 110 V. AC

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from a Windmill, from available Waterpower, from your Automobile, from your Motorcycle, from your Bicycle, Foot-pedals or Handcrank (for transportable Radio Transmitters, Strong Floodlights, Advertising Signs); do you want to operate AC Radio sets from 32 V. DC farm light systems; operate two generators in series to get 200 V. AC; obtain two phase and three phase AC, etc., etc.

There Are Over 25 Applications Some of which are:

A.C. Dynamo lighting from eight to ten 20 Watt 110 Volt lamps. Short Wave Transmitter supplying 110 Volts AC for operating "Ham" transmitter. Operating 110 V. AC 60 Cycle Radio Receiver in DC districts. Motor Generator. Public Address Systems. Electric Sirens on motor boats, yachts, etc. Camp Lighting. Short Wave artificial "fever" apparatus. Television. Pelton Waterwheel for lighting or other purposes. Airplane: for lighting strong searchlights or electric signs. Laboratory work, etc., etc. ¼ to ½ H.P. needed to run generator.

BLUE-PRINT 22 x 28 in. and Four-Page 8½ x 12 in. INSTRUCTION SHEETS FREE with Generator.

Generator, as described, including four replacement carbon brushes. Blue-print and instructions **$7.90**

Send $2.00 deposit, balance C.O.D.

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Radio Hams to represent us in the sale of shortwave diathermy units to physicians. Good territories open in Detroit, Minnesota, N. J., N. C., Ga., Fla., Ky., W. Va., Tex., and the Southwest. Liberal commission. Estab. 60 yrs. McINTOSH ELEC. CORP., 227 N. California Ave., Chicago.

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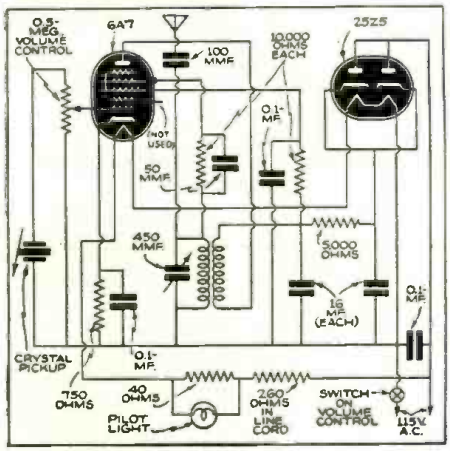
Your Bliley dealer will tell you how to build a simple, highly efficient 5 meter crystal controlled transmitter. Bliley Electric Co., Erie, Pa.

Bliley HF2-10 METER CRYSTAL

"Wireless Remote" Phone Pick-Up



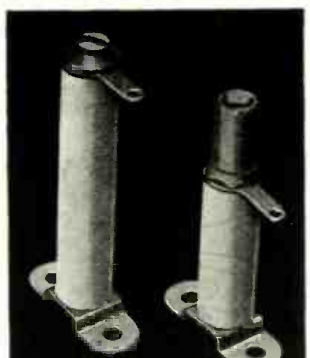
Appearance and Hook-Up of "Wireless" Record Player.

● THE advent of wireless remote control tuning for radio receivers has aroused a new interest in low-power transmitters used to link various adjuncts to the radio set. It permits a radio to be located in one portion of the room and to play, through its loud-speaker, recordings which are on the turntable in another part of the house and not connected to the radio by any physical means.

The Allied Radio Corporation is producing the two-tube "Magic Wireless" record player shown.

The antenna may be a metal plate inside the record player cabinet, or may be a short length of wire extending from the cabinet. If such wire is placed close to and parallel with the lead-in of the radio receiver, best results will be obtained. It will perform, however, up to twenty feet away from the set and may be operated from any 110 volt A.C. or D.C. power line.

New Stand-Off Insulators



● A COMPLETE line of stand-off insulators made of pure Isolantite has been announced by the Hammarlund Manufacturing Company. This material, according to the manufacturer, is less liable to breakage, chipping and stripped threads than the ordinary porcelains. The tips, provided in both plain and jack type, are heavy machined brass, cadmium plated. The base is constructed for two-hole mounting but is removable for single-hole mounting for which cork washers are furnished. The insulators are available in a variety of sizes from ¾" to 3½" in length, and ½" or ¾" in diameter.

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SOMETHING new for amateurs, fans, set builders—something which gives you the opportunity with which to experiment. Here's an ELECTROPLATING KIT amazingly simple to operate—you just Electroplate with a Brush! Requires only one single dry cell.

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NEW CATALOGS

New Condenser Catalog

● THE complete line of condensers offered by Sprague Products is described in a new 16-page catalog. Among the units featured are: the Atom midget dry electrolytics in both single and dual combinations; type HLV high capacity, low voltage aluminum can dry electrolytics; types DR and RP dielectric paper replacements for dry electrolytics; numerous new auto radio units; silvered mica condensers; type CR oil impregnated rectangular transmitting condensers with universal mounting brackets; type PC inverted screw can round condensers for P.A. and transmitter work, television and high gain amplifiers; universal replacement condensers and universal motor starting condensers. The new catalog also lists several hundred of the company's exact duplicate replacements for radio receivers and for motor starting.

Burstein-Applebee Catalog

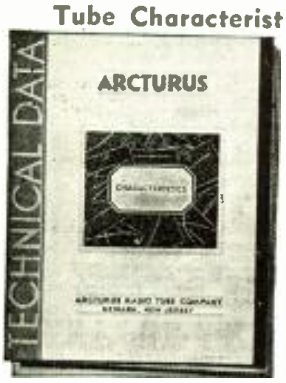
● THE new Burstein - Applebee Company catalog is a large 162-page issue devoted almost entirely to radio parts, sets, accessories and test equipment. There is an exceptionally wide choice of test units, for more than a dozen pages are devoted to this type of apparatus. The catalog also lists tubes, pick-ups, turn-tables, electric razors, electric flatiron heating units, tools, etc.

Net prices are given on all apparatus; and on the more expensive units, installment prices are also quoted.

Crystal Devices Catalog

● "BRUSH Crystal Products" is the title of a new catalog listing crystal microphones, headphones, pick-ups, and accessories, offered by the Brush Development Company. Among the many novel units shown is a combination unit microphone and desk stand. The stand is of the goose-neck type and may be bent into almost any position. Both diaphragm and sound cell microphones are listed in the catalog which also features a high fidelity mike with a response flat from 30 to 10,000 cycles, plus or minus 2 db. at an output level of minus 67 db.

Tube Characteristic Chart



● A NEW tube characteristic chart, just issued by the Arcturus Tube Company, gives complete ballast tube data, in addition to covering 179 different types of Arcturus tubes. The chart shows what tube type numbers are used in various radio sets and indicates what odd types the company's standard ballast tubes will replace. Formulas are included so that the serviceman may quickly ascertain just what standard RMA type number tube should be used in any set regardless of the original ballast units which may carry only private part numbers. The chart may be wall mounted or kept in a standard data file. Ask for No. 110A.

Meissner's New Catalog

● MEISSNER MFG. CO. has issued a new confidential net price catalog in which are inserted several late additional sheets, including one on 1-, 2- and 3-tube kits, and another on special export kits. Also featured are adapter kits, antenna and R.F. coils, beat frequency oscillator adapter kits, a wide selection of I.F. transformers and oscillator coils, remote control adapters, and eight kits for complete radio receivers. A number of other kits and their components are also described in this book, which has 44 large pages.

Cornell-Dubilier Catalog

● A NEW catalog, consolidating the capacitor listings and descriptions appearing in catalog No. 161, has been released by the Cornell-Dubilier Electric Corporation of South Plainfield, N. J. This catalog, their No. 165A, consists of 12 pages and is complete with concise information on their entire line. It is an ideal quick reference for required capacitors, for servicemen and engineers. Copy of this catalog sent free on request.

Mail Order Catalog

● THE 1939 Montgomery Ward radio catalog lists a wide variety of public address systems ranging from small 5-tube, 12-watt types to mammoth systems employing 16 tubes and providing output up to 100 watts and suitable for large auditoriums. Also included in the book are turn-tables and pickups, microphones and accessories, loud speakers, hearing aids, test instruments, tools and radio set components. A special line of amateur and S.W.L. receivers is also featured, as are a number of parts and units for use in transmitters.

The catalog is printed in rotogravure and has 56 large pages.

New Sears Catalog

● A 44-PAGE equipment catalog especially for radio "hams," servicemen and sound equipment men was recently issued by Sears, Roebuck and Co.

Because he is an old time "ham" operator, Parker Wiggin, head of their radio department, personally supervised the production of the book. As a result the quality requirements of amateur radio operators have formed the basis of the line presented.

Hammarlund Catalog

● HAMMARLUND'S 1939 catalog lists the "MC" midget condensers, the "MCD" split-stator condensers and the "X" type double-spaced condensers, as well as the "B" type band-spread condensers. There is also a large section on transmitting condensers and another on various types of "micro" condensers. Plug-in coil forms for receiving and transmitting purposes are also featured in various designs, as are Isolantite sockets for standard and Acorn tubes. Other items included in the book are coil and tube shields, flexible couplings, chokes for a number of purposes, intermediate transformers, and trimming and padding condensers. There is also a complete description and price list of the new "super-pro" receivers in models that will tune from 7½ to 240 meters or from 60 to 550 meters.

Taylor Tube Catalog

● 1939 CATALOG and Manual, 44 pages with index, illustrated. Published by Taylor Tubes, Inc., Chicago, Ill. The new Taylor Tube catalog contains 44 pages of information, including not only the company's various type of tubes but also several highly interesting circuit diagrams. One of the pieces of apparatus described in words, pictures and schematics is a De Luxe all-band transmitter which uses 275 watts plate modulated input. Another unit on which all data is given is a quick band-change 125 watt input transmitter, while another is a 450 watt phone and c.w. job. A 150 watt transmitter and an economical 100 watt grid modulated phone rig, complete with constructional details, are also covered.

As to tubes, many popular types are described, together with their complete characteristics and prices. There is also much general information on testing and selecting tubes and choosing the right tube for specific functions. Ask for No. 111A.

Sound Amplifier Guide

● BULLETIN No. 346-D just published by Thordarson Electric Mfg. Co., presents practical and theoretical information on amplifiers ranging from 8 to 120 watts output. Features of this 32-page book are a high quality phono-radio amplifier with volume expansion and tone controls, and a combination 6-volt—115-volt portable amplifier capable of delivering high undistorted output. Each circuit is complete with diagrams, parts lists, constructional data. Ask for No. 112A.

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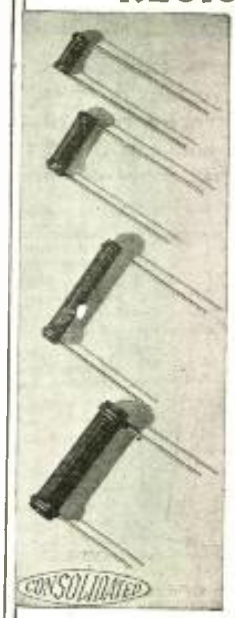

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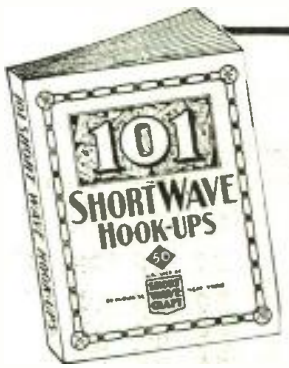

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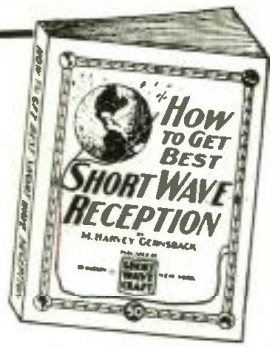

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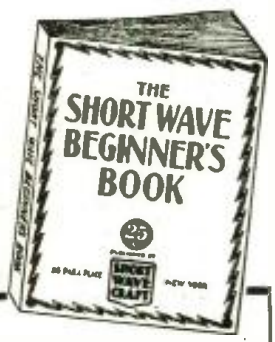

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The Martian Flash

(Continued from page 657)

on around him, he only knows one thing now, and that is to get to the Auto-tribunal as fast as possible. If he is near the Tribunal he will walk; if not, he will use the speediest conveyance to bring him there.

Now, the Tribunal itself, is a very strange affair, usually a great circular room. The most astonishing thing about the Automatic-Tribunal is that there is no living Martian in it except the culprit or culprits, in case there might be more than one, which seldom happens. The minute the culprit enters the Tribunal he is directed into a special chair mounted on wheels. He is then automatically guided past several hundred registering and recording apparatus. Questions are asked him at each stop which he is forced to answer. He cannot lie, of course, as apparatus similar to your old lie-detectors would immediately show up any deception. *What the authorities are interested in most is how he got that way.*

It should be obvious that, as every citizen on the planet knows in advance that he cannot commit even the slightest crime without instant apprehension, the authorities are always concerned with so-called *throw-backs,* who commit crimes simply because something went wrong with their mentality—the first stage of a break-down or something akin to what you would call insanity. For this reason, the Auto-tribunal's main duty is to examine the culprit's mind and after the reason has been found out, other machines, therapeutic and otherwise, which he will pass in due time, try to correct his deficiency.

Martian law is very stringent; so if it is found that there was no mental break-down, and that the reason for the crime may be, let us say, ennui or boredom—which is a terrible thing to commit a crime for in Martian eyes—then of course the victim is punished. If it is not his own fault, as for instance, approaching insanity or such, there will be no punishment but the chair on which the defendant is riding will be shunted into a laboratory where the patient is treated until restored. But let us say the offense was willful. Then there will be punishment, and as your old saying goes—"punishment to fit the crime." For slight cases, this may be nothing but disagreeable shocking, or the inhaling of disagreeable radio-atomic odors, which will make the victim retch for hours at a time. This in itself is a terrible punishment for most Martians.

There are a number of other *psychological punishments* even more severe which you could not possibly understand, as you do not comprehend Martian mentality. Thus for instance, the culprit may have to look at certain symbols engraved on a plate, staring at them fixedly for fifteen minutes. To you, this means nothing and would be considered a joke and no punishment at all. To a Martian, this is heart-rending and soul-racking. There are other punishments of which most are psychological in nature which you could not understand and frankly, I do not myself understand as yet. Finally, the extreme penalty, is death. Atomincing, as it is called here, whereby the condemned is led into a sort of electronic tube and placed between two electrodes which then blow the victim into atoms.

For a number of psychological reasons, the Martians do not wish to become contaminated with a fellow Martian who has thus been atominced, so the remains stay right in the electronic tube which is fired electro-magnetically out of the gravitational region of the planet. When the tube reaches about two hundred thousand miles above the surface of Mars, it explodes and the remaining atoms of the unlucky Martian are scattered through interstellar space.

I was living on the planet for about two months when I innocently enough touched a certain object—the likeness of a famous deceased Martian ruler—with my *bare* hands. This is a terrible offense on Mars. It is usually punished most severely. In my case this was of course, only pure curiosity, and no emotion stirred inside me. Nevertheless, an attendant saw me and the emotion set up in *his* mind immediately released the usual Martian Automatic Police. The Martian had no trouble in explaining that the emotion was not due to his doing anything wrong, but rather in seeing *me* commit a crime. In a few minutes I was apprehended by an Automatic guard of which they have a few for emergency cases, and in no time I was whisked to the Auto-tribunal. Not being a Martian, the hypnotizing-paralyzing ray did not work on me very well and I still had some of my faculties left, although I was pretty numb. Still, not numb enough to know that if something went wrong I would probably be atominced and blown into smithereens. *You see, Martian justice can never possibly go wrong.* That is, Martian justice for Martians. But I, not being a Martian, was in a terrible predicament, because it was quite possible that there might be, for the first time in millions of years, a miscarriage of justice on account of this.

Amongst some of the things which I had in my pocket, was an old fashioned Earthian menthol nasal inhaler and a piece of garlic, which I had carried with me by pure accident from the Earth. I quickly opened the inhaler and blew into it. Then I started to chew the garlic, figuring that perhaps the combination, totally unknown on Mars, would do something to the fearful, sensitive machinery. And that is exactly what happened. When I came to, one of the machines (which I found out later, recorded certain bodily odors and perspiration, to get an index on one's emotion), just blew up and *short-circuited!* Then there was a terrific commotion and the whole Auto-tribunal seemed to go "hay-wire" instantly. Tubes blew out, sparks played all about, lights flashed and general pandemonium broke loose! You have never seen such terrific displays of a technical fracas in all your born days. And all on account of a simple piece of garlic for which the Auto-tribunal was not prepared. In the ensuing confusion I made my way out of the Tribunal and had no trouble to find my Martian sponsor to whom I unfolded the foregoing events.

The sequel to the story is that I was instantly acclaimed a great hero, being the only living person who had in twenty million years upset the orderly working of the Auto-tribunal! This incident however, decided the Martians, that mere Earthlings could not be trusted alone on the planet, and now I am always accompanied by an automatic guard who calls back to Headquarters what is going on from instant to instant. It is therefore not very likely that I shall again upset an Auto-tribunal as long as I am here.

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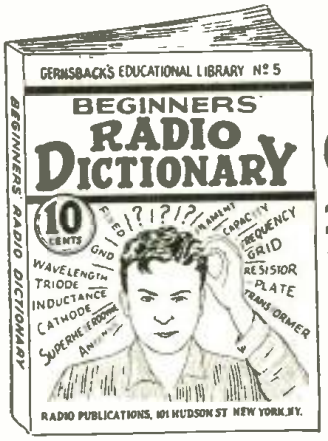

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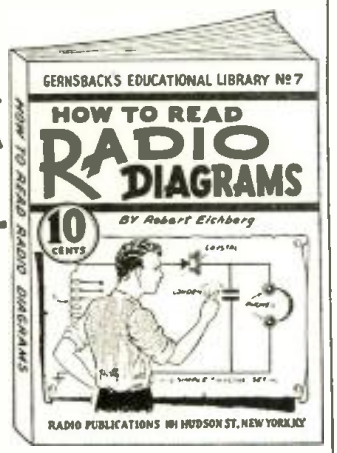

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NO. 7—HOW TO READ RADIO DIAGRAMS

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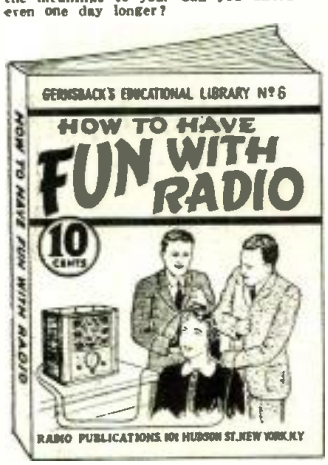

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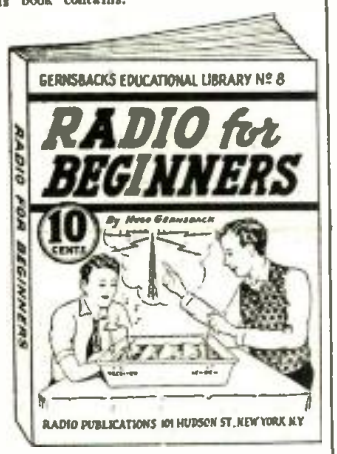

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Getting Started in Amateur Radio

(Continued from page 681)

coupling of the transmitter to an aerial. However, as we do not yet have a license, this will not be needed for some little time. Construction of the modulator and aerial coupling units will follow in succeeding parts of this series.

Parts List

HAMMARLUND

1—Type MTC-150-B tuning condenser, 150 mmf. double-spaced, C3
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4—4-prong isolantite plug-in coil forms
3—4-prong isolantite sockets
2—5-prong isolantite sockets
1—7-prong isclantite socket
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2—Type CH-X R.F. chokes, RFC1 and RFC2

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1—Type LD2 3.5 mc. crystal

TRIPLETT

1—Type 323 0-150 M.A. meter

SPRAGUE

1—.001 mf. mica condenser, C5
3—.002 mf. mica condensers, C6, C7, C8
2—Type EC-8 8-mf. electrolytic condensers, C9, C10

I.R.C.

1—50,000 ohm, 2 watt resistance, R1
1—15,000 ohm, 2 watt resistance, R2
1—15,000 ohm, type DHA wire-wound resistor with variable tap, R3

RCA RADIOTRON

1—Type 59 tube, V1
1—Type 46 tube, V2
1—Type 82 tube, V3

YAXLEY

1—Type 762 2-pole, 2-throw switch, SW1
1—Type 10 1-pole, 1-throw switch, SW2

JEFFERSON

1—Power transformer, type 465-151, T1
1—Filament transformer, type 464-191, T2
1—Filter choke, type 466-410, CH1

CORNISH WIRE

1—¼-lb. spool No. 22 D.C.C. wire
1—¼-lb. spool No. 18 bare tinned wire
1—½-lb. spool No. 12 bare tinned wire
1—Roll No. 18 hook-up wire

MISCELLANEOUS

2—Wooden or bakelite panels, 7 x 15 x 3/16" th.
2—Wooden or bakelite panels, 4 x 15 x 3/16" th.
4—Wooden panels, 4 x 6⅝ x ½" th.

BOOK REVIEW

RADIO TROUBLE-SHOOTER'S HANDBOOK, by Alfred A. Ghirardi, B.S., E.E. Stiff covers, size 9" x 11¼", 518 pages including index, illustrated. Published by Radio & Technical Publishing Co., New York City.

The first 275 pages of this book are allotted to a description of actual symptoms and remedies for common troubles for more than 3313 models of 177 different makes of radio receivers.

The center section is devoted to a line of intermediate peak frequencies of more than 15,000 models of superheterodynes. Other sections deal with a cross-index of model numbers of American RCA and RCA-Victors with those of corresponding American G.E., Westinghouse and Graybar sets and with those of corresponding Canadian sets of the same makes. This is followed by a "trouble-shooting" chart for radio receiver troubles, an auto-radio installation and car ignition system data chart, wiring diagrams of 107 different models of 27 makes of cars and much other material, including RMA standard color codes, a directory of radio manufacturers, and useful radio and servicing formulas.

The book will be a valuable addition to the library of any man who is engaged in the installation or servicing of radio receivers.

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BOOK REVIEW

THE RADIO AMATEUR'S HANDBOOK, by the Headquarters Staff of the A.R.R.L. 560 pages, illustrated, size 9¾" x 6½", paper bound. Published by the American Radio Relay League, West Hartford, Conn.

The 1939 edition of *The Radio Amateur's Handbook* contains over 300,000 words, as well as some 815 illustrations, 50 charts and tables, and 87 equations and formulas. The material has been thoroughly revised and more than thirty pieces of new equipment were designed, built and tested to furnish data for the text.

The equipment described is based on time-tried circuits and layouts, and features the dependable rather than the merely novel. Vacuum tube tables have been considerably expanded and data on more than 400 types of tubes is given. Among the additional material are tables for control and regulator tubes, and for cathode ray tubes. Treatment of fundamental antenna systems and other important phases of radio have been given a fresh approach and greatly enlarged.

The major chapters deal with receivers, transmitters and radio telephony; they contain the bulk of the new equipment.

This edition is dedicated to the late Ross A. Hull, distinguished amateur, who was accidentally killed while experimenting with his apparatus.

Let's Listen In with Joe Miller

(Continued from page 663)

winter peak, upon the regular Tues. and Fri. 11 p.m.-12:30 a.m. schedule. Reported by G. C. Gallagher, W6, also by Ye Ed. A catch well worth digging in the 40 meter ham band for, and FO8AA should peak in February.

BELGIAN CONGO—Radio Leopoldville, 6.14 mc., with a Sunday schedule of 5:35-7 a.m., reported by Nick Stahevitch, W6, at 6:50 a.m. FB! OPM. 10.14 mc., also at Leopoldville, has been heard recently at 3:20 and 4 a.m. here, but not with the strength they had several years ago.

ANGOLA—CR6AA, at Lobito, and reported once as on 13.00 mc., is operating on both 7.177 and 7.614 mc. during their regular schedule. The 7.177 mc. signal is, surprisingly, the easier one to log, though inside the 40 meter amateur band!

NEW ZEALAND—ZMBJ, aboard the S.S. *Awatea*, and counting, when QSL'd. as New Zealand, has just sent a card to Murray Buitekant stating they will no longer confirm reports on their inverted speech transmissions. As that is their main fare, it will henceforth be rather difficult to elicit a card for a report, unless one is fortunate in tuning in ZMBJ when they happen to be using clear speech.

Mr. N. Stahevitch. W6. has reported a test transmission of a new Irish station on 6.19 mc., located at Moydrum, at 3:30 a.m. Nice DX to be first to hear. from West Coast. OM!

TRIPOLI—ICK. 9.46 mc., heard very FB at 4:15 p.m., during a holiday afternoon, with a man and woman speaking Italian, clear speech. Tripoli is in reality only a town in Libya, an Italian colony.

Static-Free Radio

(Continued from page 647)

of our regular broadcast stations, the transmission has been very much improved in a great many sections of the country and thus the static-free qualities of the new system are not so important as perhaps some of the other features, such as multiplex transmission possibilities and the high-fidelity feature.

It is interesting to note that the new "f.-m." wave can be made to do many unusual tricks, such as transmitting voice and facsimile signals simultaneously. Thus on one wave you can receive a musical program and a facsimile reproduction at the same time, a suitable facsimile reproducing machine being used, of course.

The new receivers, it has been announced, combining units for reception of the regular broadcast channels, as well as the new "f.-m." waves, will cost no more than the present average receiver when they are produced on a quantity basis.

The present-day shortwave receivers, or all-wave receivers provided with a shortwave section, cannot tune in the "f.-m." wave; but a special receiver has to be used.

As aforementioned, experimenters and Hams have intercepted the "f.-m." waves, however, with super-regenerative sets. Station W2XMN will relay the programs of John V. L. Hogan's high-fidelity station, WQXR. Mr. Hogan, according to reports, has filed a petition with the F.C.C. for permission to build an "f.-m." station in New York City.

Owners of the present type radio receivers, whether for regular broadcast waves or for short waves, need not worry that our present regular broadcast stations will swing over to the new "f.-m." system overnight, as it will take a long time to do this, even provided that our broadcast systems should decide to adopt the Armstrong system. So if you have been contemplating the purchase of a new receiver of standard type, you can rest assured that you will have your full service out of it before any radical change in our present broadcast station system will have taken place.

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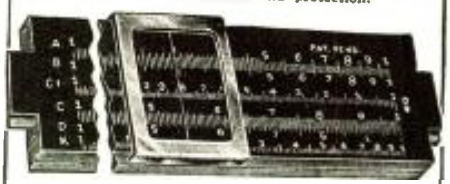

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RADIO ENGINEERING, BROADcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Colt St., Valparaiso, Ind.

MISCELLANEOUS

IMPERIAL ELECTRIC RAZOR, absolutely guaranteed. $1.59 postpaid. Kenneth W. Bailey, 815 West Wayne, Ft. Wayne, Indiana.

MOUNTED STEER HORNS SIX feet spread and good blowing horns for sale. Lee Bertillion, Mineola, Texas.

7 MILLIAMMETER, HEAVY RUBber insulation, high voltage lacquered cable, suitable for transmitter, 2c per foot. Gold Shield Products, 350 Greenwich St., New York City.

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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.

QSL—CARDS—SWL

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

RADIOS

PLANS 18 TESTED CRYSTAL sets, SW record 4250 miles, with "Radiobuilder"—year, 25c. Laboratories, 7700-A East 14th, Oakland, California.

SHORT WAVE RECEIVERS

USED DOERLE'S, D-38, BS-5, 7C, reconditioned by factory, 40% off. See January, 1938 Short Wave & Television for description. Kusterman, 68 Barclay St., New York.

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TELEVISION

TELEVISION EXPERIMENTAL KIT $9.50. Arthur Pohl, 4829 Merritt, Detroit, Mich.

TEST EQUIPMENT

YOUR OLD TEST EQUIPMENT is worth money. Write now, telling us what you have and we will send our cash offer. We can supply any Rider Manual circuit for 25c per page. Reo Radio Co., 178 Greenwich St., New York.

WIND ELECTRIC PLANTS

BUILD WIND LIGHT PLANT. Complete plans and valuable catalog 10c. Welders, Electric Fencers, LeJay Manufacturing, 417 LeJay Building, Minneapolis, Minnesota.

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

FOR SALE, GOOD GENE-MOTOR, write William Fitzgerald, 72 Franklin Blvd., Pontiac, Mich.

35 WATT XMITTER WITH POWER supply, tubes, coils $20. W9QZV, Wentworth, Wis.

SELL — 433 VARIETIES U. S. postage stamps mounted professionally in album. Do not confuse with cheap foreign collections. $35 cash. 425 power Wollensak microscope—$8.50. Cost $20. Boy Mechanic Book set—$3.00. Cost $8.00. F. P. Pratt, Jr., Salisbury, N.C.

FOR SALE: BRAND NEW DESK type 50 watt phone 80 watt code 5-10-20 meter transmitter, fully guaranteed, at reasonable price. Illustrated description furnished. Alvin Abrams (W2DTT), 20 Laurel Hill Terrace, New York City.

SKY BUDDY $14.00. RSR CLIPper $9.00. S9 Super-Skyrider $29.00. W9ARA, Butler, Missouri.

METAL LOCATOR. RADIO INstrument, very sensitive, locates buried metals. Like new in original packing case, price $40. Russell Free, Box 3, Hot Springs, New Mexico.

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BEST OFFER IN USED U. S. commemoratives or migratory duck stamps gets my I.C.S. Radio Operators' Handbook. Ward E. Williams, 1414 10th Ave., Lake Charles, La.

HAVE AMPERITE MIKE, TYPEwriter, projector, radioptican, field glasses, electric shaver, electric trains and equipment. Many others. Let's swap lists. M. Epstein, 2953 Buckle, Indianapolis, Ind.

TRADE 5 INCH MAGNETIC speaker, micrometer vernier 23 plate variable condenser .00055 mfd., Imp gasoline hand torch, small artistic bakelite cabinet. Want phones, telescope, or binders for "R&T" magazine. Alexander Podstepny, 217 Pine St., Phila., Penna.

10 METER PHONE TRANSMITter A1 condition 20 watts, 5 tubes for swap complete. I want good short wave receiver. Hartman, 5713—5th Ave., Brooklyn, N. Y.

TRADE: COMPLETE "CHARLES Atlas" dynamic tension health course, set ten sex books like new, for N.R.I. course or similar radio course. Also take Ghirardi's Radio Physics Course. Earl Olson, 206—5th Ave., S.W., Watertown, S. Dak.

HAVE: SILVER KEY WOUND watch, perfect running shape, Bruno guitar, banjo-uke. Want code machine such as Teleplex, Instructograph, CW x'mitter with coil, xtal power pack, etc., a Readrite analyzer. Want Sky Champion. Write John Womack, Dimmitt, Texas.

SWAP 303 SAVAGE RIFLE GOOD cond., fishing tackle new, ski boots worn once 9½, ¾ H.P. Reversible motor and Gen. Motors 7 tube aircell receiver for ham equipment and meters. Kenneth C. Douglas, Orleans, Vt.

TRADE 0-300 DC VOLTMETER, two tube regenerative electron coupled set, five meter set, good power supply, coils, earphones, modern tubes, other parts, for good S.W. receiver as S.W.3 or transmitting equipment. Walter Turchin, 953 Jackson Ave., New York, N. Y.

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TRADE—2A FOLDING CAMERA, Electrical Eng. course cost $80.00, 4 tube BCA Victor BC radio. Want good S.W. factory made radio such as Hallicrafter, etc. Also have other parts. W. Fuller, 709 Fenton, Lansing, Mich.

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WANTED: 60 LINE LENS DISC and motor. Write to Jack Miller, 41 Widman Street, Rochester, N. Y.

WILL TRADE RADIO PARTS suitable for hams or SWL's for fishing tackle. W2DMT, 538 E. 6th St., N.Y.C.

NOTICE—ANYONE HAVING ANY of the following—watch repairing tools, watchmaker's lathe, staking tools, course in radio, watchmaking course, DX-4 receiver—drop a card to Miner, Oakdale, Iowa.

TRADE NO. 10 CHEMCRAFT chemistry set in very good condition and 2—456 kc. Hammarlund air-tuned i.f.'s. Want 8mm projector, phono motors, power transformers, 8mm Kodak titler. W2FZE, 152 Fifth St., Elizabeth, N. J.

72 EDITIONS "HISTORY OF OUR Country," original price 25c each, good condition, average amount of pages in each 30-35, size 7" x 10½". Will swap for what have you? Margaret Schleicher, 930 Hamilton Blvd., Peoria, Ill.

HAVE A THREE TUBE all-wave receiver. Would like to trade for ham equipment. Also have Mallory "B" eliminator and good Carter Genemotor. Make trade offer. Milton Bender, Saugus, Calif.

VOLUMES 1 AND 2 RIDERS Service Manuals, also Radio Telegraphy and Telephony by Duncan and Drew, value $20, for camera, guns, skis, electric motors, what have you? T. Booth, Mt. Shasta, Calif.

WANT RADIO PARTS, 8MM movies, art photos, magazines. Have 5 meter A.C. transceiver, microphone, telescope, miniature camera, commemorative stamps. W. M. McDonald, 271 Pearl St., Cambridge, Mass.

(Continued on opposite page)

Electronic Television Course

(Continued from page 656)

to the third electrode where each electron dislodges five or more electrons from the third electrode. This process may be carried through as many as twelve to fourteen successive stages. Thus, it can be seen that from a single electron emitted from the suriace of the first electrode, when carried through twelve successive stages, we have a tremendous amount of electrons on the final collecting electrode. By the use of this principle an amplification of many million times may be obtained in a single tube. We shall see how this phenomenon is taken advantage of in the transmission of television images in subsequent chapters of this course.

Curing Television's Ills

(Continued from page 655)

and Y somewhat greater than Y1. It is difficult to secure accuracy much greater than this, except in the laboratory.

Figs. 12D and 12E show the effect of applying oscillating voltage either to the c-r tube or to the grid of a video tube. Frequencies of 400 to 1000 cycles per second are satisfactory for the vertical test and 150,000 to 200,000 cycles for the horizontal.

Adjustments should be made in the sweep controls of the set to assure even spacing between bars. The test pattern is of great value in determining the linearity of the scanner when no test transmissions are on the air.

"Cairo Conference" Changes

● A NUMBER of new regulations adopted at the Cairo Conference last year have already gone into effect in the United States.

The ARRL will ignore—at least for the time being—one of the major changes; that of punctuation symbols. These were originated in the telegraph conference, held at the same time, and were consented to by the radio conference.

The old QSA code, however, has been abandoned for indicating signal strength and readability, combined. The new QSA code refers to strength only, being:—QSA 1—Barely perceptible; QSA 2—Weak; QSA 3—Fairly good; QSA 4—Good; QSA 5—Very good.

Readability is indicated by a QRK code, in which:—QRK 1—Unreadable; QRK 2—Readable occasionally; QRK 3—Readable with difficulty; QRK 4—Readable; QRK 5—Perfectly readable.

The familiar abbreviation TNX or TKU for *thanks* or *thank you* has been replaced by the still shorter TU—a great time-saver if you're habitually grateful.

Two new classifications of emissions are now in use. Type A0 emission is basic uninterrupted carrier; A1, c.w. telegraphy; A2, modulated telegraphy; A3, telephony; A4, facsimile; A5, television.

Answers to QUIZ on page 650

1. *a*, *b*, and *c*. *d* is spark transmission.
2. *c*
3. *b*
4. *b*
5. *a*, *b*, and *c*.
6. *b*
7. *a*, *b*, *c*, *d*, *e*, and *f*.
8. *a*, *b*, and *c*.
9. *d*
10. *a*, *b*, *c*, *d*, and *f*.
11. *aC*, *bF*, *cB*, *dE*, *eA*, *fD*.
12. He didn't send them—he received them; they were sent by an assistant.
13. *b*
14. *b*
15. Mainly *c*, but also *b*, to a lesser extent.
16. *d*
17. *b*
18. *b*—or if an AC set, *c*.

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World S-W Stations

(Continued from page 668)

Mc.	Call	
6.079	DJM	BERLIN, GERMANY, 49.34 m., Addr., Broadcasting House. 4.50-11 pm.
6.077	OAX4Z	LIMA, PERU, 49.35 m. Radio National 7 pm.-1.30 am. Except Sun.
6.075	VP3MR	GEORGETOWN, BRI. GUIANA, 49.35 m. Sun. 7.45-10.15 am.; Daily 4.45-8.45 pm.
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 4.15-5 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.
6.060	W3XAU	PHILADELPHIA, PA., 49.5 m. Relays WCAU Tues., Fri., Sun. 1 pm.-Mid. Wed. 1-10 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	GSA	DAVENTRY, ENGLAND, 49.59 m., 10.45 am.-12 n., 12.20-4, 4.15-6 pm.
6.050	HJ1ABG	BARRANQUILLA, COL., 49.65 m., Addr. Emisora Atlantico. 11 am.-11 pm.; Sun. 11 am.-8 pm.
6.050	HP5F	COLON, PAN., 49.59 m., Addr. Carlton Hotel. Irregular.
6.045	RV15	KHABAROVSK, U.S.S.R., 49.63 m. 2-11 am.
6.045	XETW	TAMPICO, MEXICO, 49.6 m. Irregular 7-11 pm.
6.040	W4XB	MIAMI BEACH, FLA., 49.65 m. 1-3 pm., 9 pm.-12 m. Relays WIOD.
6.040	W1XAL	BOSTON, MASS., 49.65 m., Addr. University Club. Irregular.
6.033	HP5B	PANAMA CITY, PAN., 49.75 m., Addr. P. O. Box 910. 10.30 am.-2, 6-10 pm.
6.030	VE9CA	CALGARY, ALTA, CAN., 49.75 m. Thur. 9 am.-1 am.; Sun. 12 n.-12 m.
6.030	RV59	MOSCOW, U.S.S.R., 49.75 m. 5-6, 10-11 pm. Irregular.
6.030	OLR2B	PRAGUE, CZECHOSLOVAKIA, 49.75 m. (See 11.875 mc.) Off the air at present.
6.023	XEUW	VERA CRUZ, MEX., 49.82 m., Addr. Av., Independencia 98. 10 pm.-1 am.
6.020	DJC	BERLIN, GERMANY, 49.83 m., Addr. (See 6.079 mc.) 1-4.30 pm.
6.017	HI3U	SANTIAGO DE LOS CABALLEROS D. R., 49.85 m. 7.30-9 am., 12 n.-2 pm., 5-7 pm., 8-9.30 pm.; Sun. 12.30-2, 5-6 pm.
6.015	PRA8	PERNAMBUCO, BRAZIL, 49.84 m., Radio Club of Pernambuco, 4-9 pm.
6.010	OLR2A	PRAGUE, CZECHOSLOVAKIA. 49.92 m., Addr. (See OLR, 11.84 mc.) Wed., Thurs., 4.40-5.10 pm.
6.010	COCO	HAVANA, CUBA, 49.92 m., Addr. P. O. Box 98. Daily 7.55 am.-12 m., Sun. until 11 pm.
6.010	VK9MI	S. S. KANIMBLA, 49.92 m. (Travels between Australia and New Zealand). Sun., Wed., Thurs. 6.55-7.30 am.
6.010	CJCX	SYDNEY, NOVA SCOTIA, 49.92 m. Relays CJCB 7 am.-1 pm., 4-8 pm. 1.30 pm. 8.30 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. 9 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.

(Continued on following page)

BARTER and EXCHANGE FREE ADS (continued)

WILL SWAP A.R.R.L. LICENSE manual, eighth edition, Hohman guitar chord book, Hohman practical violin book, "The Principles Underlying Radio Communication" book by U. S. Army Signal Corps. Bill Schroeder, 803 Wisconsin, Peoria, Ill.

SWAP 5-TUBE SHORT WAVE radio, good condition, and Eastman Jiffy Kodak for Argus enlarger, 35mm developing tank, other developing equipment. All letters answered. Edward Wooten, 14 Maiden Lane, Raleigh, N. C.

FOR TRADE, QUITE A LOT OF radio parts and other things. Will trade for curios of any kind, or horns of any kind. D. R. SMEDLY, Star R, Box X, Rushville, Illinois.

WANTED A SW RCVR IN GOOD condition. Trade for it a good 35mm still projector and/or Boys' Life complete Jan. '32-Dec. '38. W. D. Archer, 6202—29th Ave., N. E., Seattle, Wash.

WANT SMALL OCTAGON CONcertina, English or Boston female bulldog, rifles, Indian pottery, relics, coins, vases, statuary. Have guitar, mandolin, banjo-uke, ukulele, banjo, taxidermy courses, steel-engravings, list. Stanley Pytel, 5025 Ogden Ave., Cicero, Illinois.

WILL PAY DIFFERENCE BEtween my Ultra-Skyrider, model SX10, and Hammarlund Super-Pro, or National HRO. Nothing older than 1936 model wanted. My receiver is in A-1 condition. J. H. Hood, 37 Club Drive, Greenville, S. C.

HAVE OVER TWO YEARS ISSUES Short Wave & Television. Will swap for equal value in SWL cards or? Also have part of N.R.I. course. Swap for? Warren Dame, Old Connecticut Path, Cochituate, Mass.

WANTED: ALL BACK ISSUES OF Short Wave Craft between June, 1930, and May, 1932. Will pay cash or trade. State price and condition of magazines. J. DeSousa, Jr., 81 Greendale Ave., Needham Heights, Mass.

HAVE 2 TUBE SHORT WAVE RECeiver battery set, earphones and tubes included for what have you? Would like Doerle set. Donald Van Dasen, Gilbertville, N. Y.

HAMS WANTED, I NEED VERmont for W.A.S. Want to make a sked with Vermont or Delaware hams on 40 meters. How about it, some of you fellers? W7GPP, The Dalles, Oregon.

HAVE STROMBERG CARLSON magnetic pickup outfit, all electric, complete speaker, GE motor arms, etc. Want code machine or transmitter, or what have you? James Rush, 14 Madison Ave., Pleasantville, N. Y.

HAVE AUTOMATIC CODE MAchine with tapes, code course. Also meters, microphones, ham parts, pickup, All Star receiver, etc. Swap for Sprayberry's late Radio Course, fast camera, testing equipment or? S. J. Niecwicz, 79 Church St., Broad Brook, Conn.

WANTED: LATE CANDLER "JUnior" code course or Instructograph. Have N. W. Taxidermy course, G. E. electric clock, also .22 repeating rifle in good working condition. Donald Willis, 212 Madison Street, Platteville, Wisconsin.

HAVE OLD U.S. COINS, C.S.A. bills, scarce Fla. notes, many Southern bills, old books, magazines, butterflies. Wanted a good car radio, early U.S. covers, stamps for a reply. L. Signor, Dover, Fla.

3 TUBE GROSS HAM RECEIVER, electrical band spread, six coils, 20-550 meters, "B" plate power supply, also filament supply transformer. Want bug key, Candler course, typewriter or? Gerald Collins, Pinecrest Sanatorium, Powers, Mich.

TRADE RADIO PARTS, B ELIMInator, detective magazines, books, tools, bookmatch covers, stamps, skull, cash, for short wave set, radio courses, antique glassware, paper weights or what have you? Russell, Box 314, Hawley, Minnesota.

HAVE TRUMPET, COST $38.50, in very good condition. Will trade for test equipment or anything in radio. Don Morse, 25½ E. Main St., Freeport, Illinois.

HAVE MODEL AF UNIVEX CAMera like new. Will swap for receiver or amplifier parts. All letters will be answered. Address all letters to Richard Judkins, 7432 Chappel Ave., Chicago, Ill.

HAVE KW HIGH POWER PLATE transformer, over 2,000 volt ct. at 600-1000 MA. Will swap for 20 meter xtals, xtal mike, typewriter, meters, other xmitter parts or what have you? W9QZV, Wentworth, Wis.

WANTED: TYPEWRITER, BINOCulars, books by Shaftsbury, Zane Grey, Ralston Press, Harvard Classics. Offer mimeographing, courses in art (Federal Schools), salesmanship, mental power, journalism, health, body building. R. T. Biggin, 116 Church Rd., Rockledge, Pa.

TRADE HALLICRAFTERS SX 17 receiver complete with speaker. Purchased December 2nd, 1938. Still covered by factory guarantee and in first class condition. What have you to offer? Marvin W. Shellhamer, P. O. Box 104, Tamaqua, Penna.

TRADE — QST 1929-1934 COMplete 60 copies, also Fall 1938 Radio Amateur Call Book. Want used or mint U. S. stamps. What have you? Vic C. Besancon, W6OLI, 406 West Ash St., San Diego, Calif.

SWAP COLLECTION OF 410 FOReign stamps in album, 85 different kinds, 75 tubes, volume controls, radio books and radio parts for what have you? R. W. Dieter, R2, Box 109, Blue River, Wis.

SWAP: EMERSON 110V. D.C. motor, 1/6 h.p. 1750 rev., Benjamin air rifle, Essex 4 tube broadcast radio. Will trade for radio parts, equipment or what have you? Wallace Braley, Kellogg, Iowa.

SWAP 330 DIFF. U.S. IN NICE album for a D.C. 0-1 milliammeter. Also have radio parts, magazines. K. E. McLain, R.R.3, Arcanum, Ohio.

HAVE BOOKS, MAGAZINES, stamp and coin publications, pennants, old radio parts, stamp albums and printing to trade for stamps and coins, or 16mm projector. Andrew Hanes, 35 Krakow St., Garfield, N. J.

HAVE "B" ELIMINATORS, "A" eliminator, radio parts, "Flying Aces," "Short Wave Craft" '32-'36, model airplane kits (15), ship kit. Want AC "SW-3" with power supply, guitar, or? Clarence Schwenkel, 123 N. Bedford, Madison, Wis.

WANTED, A GOOD 16MM MOtion picture camera and films for 5 tube Doerle rcvr. complete. Best offer takes it. Charles Wilson, 228 Church St., Phoenixville, Pa.

TRADE 5 TUBE T.R.F. SW REceiver, black crystal finish cabinet 18" x 12" x 9", built-in 6" dynamic, bandspread, etc. Want Candler course or? Write W9IMJ, 616 N. Central, Chicago.

WANTED — PORTABLE LOUDspeaker set, preferably a superheterodyne. Must be light and self-contained. State price, weight and details. Write for my list of trade items. Harry Bohm, R-1, Hinsdale, Ill.

POSTCARD COLLECTOR — 1,000 postcards (view only) for an Ellen 6A four tube, or Amateurs Favorite DX3, or Univex projector. Write K. Burtsch, 1332 E. Taylor, Kokomo, Ind.

TRADE PAIR OF NATIONAL FB7-FBX 40 meter bandspread coils for 80 meter bandspread coils. Must be A1 condition. W6PVE, 1516 Sherman St., Alameda, Calif.

WILL SWAP NEW HARVARD Classics, 51 vol., 1—4 tube model 57 Philco radio for radio parts or shotguns. Chas. Cavanaugh, 5915 So. Damen, Chicago, Ill.

WILL TRADE RADIO EQUIPment for U.S. stamps. Have radio books, records, and radio parts to trade. Want a good record selector changer. Carl A. Kowalski, WILLS, 601 Perrin Ave., Lafayette, Ind.

WANTED: RECORD CHANGER OR xtal mike. Have all kinds parts, carbon mike, record player, etc. Also have SW3 receiver with coils. Bill Sampson, Jr., 2208 Floyd, Richmond, Va.

SWAP 40 U.S. COMMEMS. FOR 50 tax tokens, facsimile Confederate bill for 10 tax tokens or 10 U.S. Commems., 25 postmarks for 10 tax tokens. Swap SWL cards. Henry Kereluk, 2648 N. Menard Avenue, Chicago, Illinois.

WILL EXCHANGE 50 FOREIGN stamps for 15 U.S. commem. Oklahoma tax token for each commem. Newspaper for 10 commem. Five postmarks for each commem. Orville Arnold, Box 311, Henryetta, Oklahoma.

SWAP—$13 AUTO HOT WATER heater, for two 2 mfd 3000 v filter cond.'s or dual tank cond. 5000 v insulation, or what have you? Frank Smith, W8JZM, 1267 Logan Ave., Tyrone, Pa.

HAVE GOOD VIOLIN AND BOW and Mossberg—six shot 22 with telescope. Want S.W. receiver, transmitter with power, typewriter or what have you? Will pay cash for above mentioned. K. Scott, Box 209, Hendersonville, N. C.

BEST OFFER TAKES STAMP collection, radio parts and tubes, taxidermy course. Have Crosley "Jewel-Box" 8-tube electric radio with speaker and tubes. All letters answered. A. Komperda, 4808 S. Seeley A., Chicago, Ill.

WILL TRADE PRINTING FOR anything radio or photographic; magazines, etc. 100% answers. Steve Salata, 137 16th St., Wheeling, W. Va.

WANTED: RECORD CHANGER, power pack, meters and other things. I have DeForest complete radio course, mike trans. (new), phono records, 5 meter transmitter, short wave set, and S.B. mike. Everything answered. Bill Godden, Emmetsburg, Iowa.

HAVE CHEMISTRY EQUIPMENT (glassware, etc.), Chemcraft set number 7½, and United States stamp collection in album. Want .22 single shot rifle, other rifles. State make, model, condition, etc. Glen Elliott, 513 Wenonah, Oak Park, Illinois.

WANTED: ELECTRIC TRAINS, any make—regarding conditions accepted. Describe locomotive number, etc. Will pay cash or trade. Have Freed-Eisemann 6-T. bat. radio, crystal sets, piano rollers, earphones. John L. Evans, 1016 Easthigh, Oskaloosa, Iowa.

HAVE 2-VOLT TUBES: 1—19, 2—30's, 1—32, 2—33's, 2—34's. Raytheons and Tung-sols. Value $6.00. Used 1 or 2 hrs. Want good microphone or multi-meter, or what have you. Oran Robertson, W6QCZ, Box 643, Holtville, California.

SWAP 16" MAG. SPEAKER, FOReign stamps, postmarks, Baby Brownie camera, sharp tuner dial. Auto safety lighter, 2-tube short wave set with amplifier and speaker, banjo-uke. Send offer. R. Lewis, Griffithville, Ark.

HAVE 2-TUBE RADIO, 80 AND 200-500 m. coils, no power supply. Cook electrical course, 16 mm. movie projector, erector set, 1922-1923 Pop. Mechanics. Want $10-$12 slide rule. Douglas Phelps, Sidney, New York.

TRADE OVER 100 RADIO MAGS., manuals, coils, phones. Want Candler Jr., code course, Ultra Sky Rover, AC-DC. List free. John Moskal, 85 Gardner Ave., South Attleboro, Mass.

HAVE FEDERAL PHOTO ENlarger, never used; Mossberg .22 caliber rifle in good condition and stamps. Want short wave rcvr., radio parts or what have you. All letters answered. Harold Tucker, QRS 342, West Point, N. Y.

SWAP WESTINGHOUSE DYNAmotor output 1000 v. 400 ma., input 12 v., with 6 v. input, 500 v. 200 ma. Mounting bracket. Want Auto "B" supply with 90 v. tap. J. Zubas, Irvington, N. Y.

I HAVE FOR SWAP 2 GRAFLEX cameras, 2 view cameras, 5x7 and 3¼x5½, also 3A Eastman Kodak. Want a good 12-gauge hammerless shotgun or? Fred R. Wolcott, 273 Medford Road, Syracuse, N. Y.

SWAP a 32V MOTOR-GENERAtor, meters, a book "Radio Operating Questions and Answers," by Nilson and Hornung, issues of Q.S.T., S.W.&T., and Popular Science Mag., and stamps. What have you? W9IAW, Tom Smyth, Beloit, Kansas.

EXCHANGE TWO WESTERN electric 250 watt tubes, Kolster power amplifier, Thordarson transformers, 250 watt Clarostat, etc. Want signal generator and tube tester. C. D. Larimore, W9BBS, 408 East 11th St., North Platte, Nebr.

SWAP STROMBERG - CARLSON short wave converter 4 tubes. Convert any radio A.C. in short wave. 3 bands. Want a candid camera or other kind. Write to R. Garcia, 300 W. 17th St., New York.

WANTED: CANDLER JUNIOR code course; small all wave receiver. Have 800 books, fiction and non-fiction from which equal value can be selected. Also complete file of "Life." Howard W. Sieger, 110 Nobles Lane, Pittsburgh, 10, Pa.

I HAVE AN 8-IN. UTAH DYnamic speaker. Want Call Book or? Ovide Lee, 220 Adams St., Alpena, Mich.

HAVE CARTOONING COURSE, motor efficiency guide, scout handbook, B-eliminator, several pairs of magnetic phones, and American Boy and Popular Science Magazines. What have you got? H. C. Patchen, 23 Grand St., Sidney, N. Y.

HAVE 500 GREASE GUN WASHers (leather), 125 radiator and gas tank cap washers (leather). Trade for radio, photographic, musical equipment. If you grease cars you need these. Value $26.25. Harry L. Tucker, 1828 G St., N.W., Washington, D. C.

WANTED — SKY BUDDY OR other similar set. Have 6V to 275V vibrator power supply, receiving tubes, head phones, 8" dynamic speaker, meters, etc. A. L. Purdy, 2608 Elm St., El Paso, Texas.

GOLD AND SILVER U. S. COINS, stamps, covers, postcards, radios, books, etc., for your offers. hobby goods, foreign paper money, auto radiator, name plates, skis, films, printing supplies. Rudolph Zak, 2509 East 89th, Cleveland, Ohio.

WANTED: TO BUY—COMPLETE 20 meter phone transmitter with about 200 watts input. Pay cash. Charles Rosen, 6271 Clemens, St. Louis, Mo.

HAVE B FLAT LOW PITCH clarinet in good condition to exchange for good communication receiver such as Howard or Hallicrafter. Lester Carter, Box 452, Clanton, Ala.

WANTED — USED INSTRUCTOgraph tapes, Continental code. Write Iran Walker, 944 West Main St., Platteville, Wisconsin.

(Continued on following page)

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BARTER and EXCHANGE FREE ADS (continued)

TRADE: COMPACT TRANSMITter; uses plug-in coils, xtal stage—59 final stage 242-A. Chassis 7" by 13". Less power supply. Want microscope or what have you? W9TAE, 2901 N. Kilbourn Ave., Chicago, Illinois.

HAVE ATWATER KENT 60 minus cabinet, 3 tube A.C.-S.W., 3 tube Kadette, loads other stuff. Want Sky Buddy or similar R.X. Prefer some one near Chicago. Robert Perlich, 3635 So. Wood St., Chicago, Ill.

WILL TRADE UTAH JUNIOR X-mitter (new); Triplett 1200-A V-O-M tester (new); Meissner beat frequency oscillator (new). Want S.W. receiver, Instructograph or Teleplex with tapes. Write for offer. G. H. Burkhart. Box 202. Woodsfield, Ohio.

WANTED: OLD "HAM" CALL Book and map of U.S.A. Will pay their postage for sending it. My QRA is Luther Schnake, 1608 Campbell Ave., Des Plaines, Ill.

HAVE A NATIONAL 4 TUBE Thrill Box SW-4 to swap for a 30-30 or 32 special. (Battery Set). Will answer all letters. Thor Holm, Cooperstown, N. Dakota.

WILL SWAP 1/6 HORSEPOWER motor, jig saw, 6 tube Monarch radio, long and short wave, fair shape, for tube tester and A.C.-D.C. volt-ohm-milliammeter. Ward Smith, 7428 Idlewild St., Pittsburgh, Penna.

WANTED — FIVE METER RE-ceiver and sending set, also small spark coil. Will swap white and colored mice, also breeding cages and mouse circus. J. Burns, R.1, Langhorne, Pa.

TRADE FIRST FLIGHT, FIRST day, dedication covers over 3 yrs., for unused U.S. commem. blocks. Foreign stamps for U.S. War medals for what? Richard H. Munro. 384 Palisade Ave., Union City, N. J.

WANT: SUPER CLIPPER OR Doerle D38. Will give 2 tube A.C.-D.C. receiver, double button American mike, Knight A.C. transceiver, 3" speaker, plug-in coils, plus cash. Herbert Makela, 1129 16th Ave., E. Hibbing, Minnesota.

HAVE THREE TUBE ALL-WAVE receiver; also 25 watt crystal controlled transmitter. Would like to trade for transmitting equipment. E. E. Bateman, R.1, Box 56. Saugus, Calif.

HAVE RADIO PARTS, SHORT wave converter, stamps, books, want set of Hammarlund S.W. K-4, 17 and 270 meter plug-in coils or? Bud Carson, 1618 W. Second St., Dayton, Ohio.

HAVE 5 TUBE A.C. SHORT WAVE receiver, dynamic speakers, power transformers, Western Electric cradle phone, Baldwin headphones, radio magazines. Want binoculars, photographic equipment or midget receiver. M. Simon, Box 441, Gary, Indiana.

TRADE A W.E. 625-A MIKE, A 160 meter crystal, and a National Union type 210 tube, all for a good mounted Billey or similar crystal for about 7275 kcs. Write: W2KRF, Mount Vernon, N. Y.

EXCHANGE 5 TUBE SILVERtone set, without panel or top, very good shape. Will swap for typewriter or what have you? Will be glad to answer any requests. Russell B. Gurney, Jr., Salem Depot, N. H.

WILL TRADE 1 41 PLATE CARDwell transmitting condenser for an electric phono pick-up, either crystal or magnetic or? Please write. Harold Brace, Jr., Bridge Ave., Berwyn, Pa.

WANTED — PORTABLE TYPEwriter and short wave receiver. Anyone having either of these please write. Have 15 jewel Swiss wristwatch in fine condition and some cash to trade. All correspondence answered. R. H. Miner, Oakdale, Iowa.

WILL SWAP GUITAR IN A1 shape for small transmitter, receiver, radio parts and books. All offers answered 100%. Will exchange SWL cards with anyone, anywhere. QSL 100%. Lucien Guitard, Sturgeon Falls, Ont., Canada.

HAVE TRANSCEIVER USING 6J5G and 12A7 and American microphone model SJ single button, also have radio physics book by Ghirardi, have power su- ly tapped 250V, 6V, 4V, 1½ V. What have you? John Krawizyk, 1457 So. 9th St., Camden, N. J.

SWAP MEN'S JEWELED SWISS wristwatch, perfect condition. ¼ H.P. G.E. motor; model 53A Springfield .22 rifle for what have you? Joseph N. Mosieh, 4002 6th Avenue, Brooklyn, N. Y.

WILL SWAP TUBES, RADIO parts, power supply, Sky Buddy radio and Agfa clipper camera for short wave converter, small transmitter or what? Send for list. Paul Kent, 1116 E. High St., Rockville, Indiana.

TRADE RTI CORRESPONDENCE course, Kato converter 110 DC to 110 AC 10 Va. converter 6—250 DC, portable typewriter, receiver parts, diagrams for winding 110 volt 700 watt generator. Want transmitter or parts. R. H. Hilgers, Plainville, Kansas.

TRADE—TUNGAR BULBS, USED, 2 and 6 amps sizes. Also 1 Sheidon type G rectifier. For air rifle or used tubes. S. Andrewski, 11 Horatio St., Newark, N. J.

WILL TRADE CAMERA, AGFA Ilex, with anastigmat F.7.5 lens shutter-speed to 1/100 second, with case. Cost $12.50. Want volt-ohmmeter or tube-tester or what have you. Eugene Wright, P.O. Box 1794, Vernon, Texas.

WANT TO BUY OLD MOTORcycle, for about $15. Have radio parts and receiver to trade. Edward Peckham, 202½ N. Minnesota, Wichita, Kansas.

RADIO PHYSICS COURSE AND Radio Operating Questions and Answers to swap for high voltage plate transformer and filter parts. Also hundred used receiving tubes to swap for ham stuff. W5GUY, Rio Hondo, Texas.

HAVE 6", 8" AND 10" FARADAY 6 volt gongs like new; Seth Thomas time switches; relays; overload switches for low DC; Hawkins Electric Guides; want Univex movie equip.; 8 mm film or? Wendell, Pretty Prairie, Kansas.

TRADE METERS, RADIO PARTS, or cash for any drummer's supplies you have. Want complete set of drums and cymbals. Will buy single pieces as well as sets. Milton Lippin, 214 E. 54th St., Brooklyn, N. Y.

USED HAWAIIAN GUITAR AND case, cost $25.00, complete and free lessons. Cost $29.00 when new. Want model gas engine and plane kit or what? Walter Dunn, 1822 Roys Ave., Elkhart, Ind.

HAVE 2 TENNIS RACQUETS, 12-in. Peerless dynamic. Esquire and Pop. Mech. magazines; Hollywood night club match covers. Want Rider Manuals, tube tester or record changer. John Littljohann, 1736 Gundry, Long Beach, Calif.

I HAVE J. E. SMITH RADIO course, microscopes and many other articles. What have you? Am interested in everything. R. Mummert, 310 W. Douglas, Freeport, Illinois.

WANTED — RIDER'S MANUALS, 1 to 7, analyzer, signal generator, condenser tester, oscillograph and other test equip. W. D. Brooks, Penn Ave., East Liverpool, Ohio.

WANTED: PARTS FOR 100 W. transmitter. Have electric clipshave razor, 5 tube D.C. Atwater Kent. B-eliminator, radio parts, $145.00 refrigeration course, refrigerator tools, 16 mm camera and projector. Nesbit A. Boyles, Hartford City, Ind.

TRADE AUTOMOBILE AND MOtorcycle license plates with collectors in other states and countries. Will buy if cheap. Swap shortwave set and big Western hat for old car, or? Anthony Shupienus, Newport, N. J.

WANTED: A "BUG" KEY IN good condition. Have radio parts to trade or will buy if the price is right. Also interested in transmitting parts. Snick's Ham Shack, Box 244, Perry, Iowa.

HAVE GAS WASH. MACH. MOtor, meters, 6L6s, T20 and other parts. Wanted used Natl. SW3 or? and ham gear. What have you? Henry Macaro, China Road, Winslow, Maine.

TRADE BEAUTIFULLY HAND woven knitting bags, hand hooked rugs, other items or cash for interesting old bottles, flasks, barber bottles, old colored prints, lithographs, engravings. Gary Thompson, Lakeview Terrace, Asheville, North Carolina, U.S.A.

HAVE 6 TUBE BATTERY RADIO, shortwave kit, 3 tube, violin, riding belt, rabbits, radio parts, books on radio, courses. Want any radios, 1 to 3 tubes, battery powered, and guinea pigs. Hillary A. Munk, North Somers, Connecticut.

HAVE UNDERWOOD TYPEwriter, Elgin bicycle motor, 3 eye microscope 500 power. Want Contax, Leica, candid, tenor saxophone Buscher, King preferred, or what have you? J. Scionti, Jr., 9920 37th Ave., Corona, N. Y.

WILL SWAP COMBINATION TATtooing machine, tattoo outfits, complete tattooing course, etc., for small short wave radios, headphones, Instructograph, radio parts, code oscillator. E. E. Dye, 321 East State St., Kennett Square, Pa.

ASSORTED STAMPS, FOREIGN and U.S. Value $25.00. Want headphones automatic key, transmitter parts. What have you? Mike Monaghan, 218 S. 2nd St. West Branch, Mich.

SWAP UNITED STATES STAMP collection, many mint commemoratives mint blocks, etc. Want balloon tire bicycle in good condition and Argus candid camera in good condition. L. Bernstein, 1071 Elder Ave., Bronx, N. Y.

NEW THORDARSON OSCILLOscope. W.E. power transformer, Stewart-Warner converter, electric turntable and pickup, A.C. 12" Jensen speaker, other items. Want test meters, Riders Manuals or cameras. Edgar D. Growden, 818 Gephart Drive, Cumberland, Md.

FOR TRADE — REMINGTON standard typewriter, electric razor, battery radio, new set (10) fiction books (8 by Jack London) in exchange for what? E. G. Bartlett, Atlanta, Mo.

HAVE 1916 MODEL T FORD roadster, very good condition, run less than 6000 miles. Want phone xmitter or what have you? William J. Moore, Stanley, N. Y.

SWL EXCHANGE

WOULD LIKE TO SWAP SWL fotos, post card views, and correspondence with anyone. All letters answered 100%. QRA—Edward Lendzioszek, 107th Co. C.C.C., Pittsfield, Mass., U.S.A.

SEND ME YOUR QSL'S, SWL'S, your city or country and shack photos under cover from any foreign country via Air Mail. My return letter to you same way. M. Grzesak, 4953 So. Loomis St., Chicago, Ill., U.S.A.

WOULD LIKE TO EXCHANGE my QSL for SWL cards. All answered 100%. W6KQS, Melvin E. Walton, 1314 Park Ave., Inglewood, Calif.

HELLO SWL'S OF ASIA, AUStralia, Central and South America, Canada, Africa, W8 and W7 district, Atlantic & Pacific Islands. Exchange cards. I SWL promptly 100%. Derek Gray, Culvers Close, Winchester, Hampshire, England.

ATTENTION SWL'S. WILL SWAP cards and keep correspondence with you. Jag an Svensk. Eric Hultgren, 77 Seaview Terrace, Bridgeport, Conn., U.S.A.

ATTENTION FOREIGN HAMS and SWL's. Let's swap cards. I will send mine at once on receipt of yours. What say OM? Lew Molteni, 519—21 St., Union City, New Jersey, U.S.A.

ATTENTION YL'S ES OM'S. Wud like to exchange SWL's with anyone interested and correspond with any SWL, preferably SWL members. I QSL 100%. 73's, 88's. Harry E. Meier, 7 Booseveit Ave., Cranford, N. J.

WOULD LIKE TO EXCHANGE SWL crds with all foreign listeners. Also from Nevada, Idaho, North Dak., New Mex., Wyoming, Delaware and Arkansas. I QSL 100%. QRA, John L. Ballin, 40 East 66th St., New York, N. Y.

SWL'S—SHORT WAVE LISTENers all over the world. I QSL 100%. Swap photos of American autos for foreign makes. QRA—G. E. Kilpatrick, W10—SWL—W3, Conshohocken, Pa., U.S.A.

ATTENTION HAMS: MOST BEAUtiful SWL and QSL cards for exchange. What have you? Samples given. Postage appreciated. S.W. Post. % Ray and Don Kailbuorn, R.D. No. 3, Geneseo, Pa.

SWL'S IN AMERICA, EUROPE, Asia, Africa, Australia and elsewhere, if you want a nice QSL send me yours, I QSL 100%. Also have a few fotos. Earle L. Hoare, VE1AI, 83 Preston St., Halifax, N. S., Can.

ATTENTION OM'S ES YL'S, I'LL send you my new SWL card for yours. I QSL 100%, U. S., foreign, or anywhere. 73s. QRA Paul Ankerman, 404 Lima St., Wapakoneta, Ohio, U.S.A.

CORRESPONDENCE WANTED from foreign countries. I will swap SWL cards, postcards and foto. I'll QSL 100%. I will answer all letters. QRA: Howard Schrieffer, 614 Soniat St., New Orleans, Louisiana, U.S.A.

ATTENTION! SWL'S, WILL SWAP my SWL card for yours. I QSL 100% the day I get your card. 73's es best DX. Milton Benson, 1 No. Main St., So. Hadley Falls, Mass., U.S.A.

ATTENTION SWL FANS ALL OVER the world. Send me your SWL card for my collection and I will send you mine. Thx. Lewis Neuman, P.O. Box 8363, Pittsburgh (18) Pa.

WOULD LIKE TO EXCHANGE SWL cards with any ham in U.S.A. or foreign countries. Will QSL 100% all cards. John Kuhn, 226 S. Mt. Olivet Lane, Baltimore, Md., U.S.A.

CALLING CQ. ATTENTION ALL OM's es YL's. Let's swap SWL cards all around the world. I QSL 100%. John W. Clark, 28-24 Utopia Pky., Flushing, N.Y.C., N. Y.

ATTENTION SWL'S. FB NEW crd. 100% QSL here. Vince and Marie Stasen, 5347 Priscilla St., Phila., Pa., U.S.A.

WILL SWAP SWL CARDS WITH SWL listeners foreign countries and United States. Send me one of yours and I'll send you one of mine. Frank Von Putz, 86-12 55 Road, Elmhurst, L. I., N. Y., U.S.A.

WANTED—TO JOIN U. S. AND foreign short wave clubs. Will QSL 100%. QRA—Paul Bahr, 1205 W. 10th St., Marion, Indiana, U.S.A.

SWL'S ANYWHERE, YOUR SWL will be appreciated. I QSL 100%. QRA: Bill Stretter, 1542 W. 6th St., Brooklyn, N. Y., U.S.A.

(Continued on opposite page)

World S-W Stations

(Continued from preceding page)

Mc.	Call	
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.
6.002	CXA2	MONTEVIDEO, URUGUAY, 49.98 m. Addr. Rio Negro 1631. Relays LS2, Radio Prieto, Buenos Aires. 7.30-10.30 pm.
6.000	ZEA	SALISBURY, RHODESIA, S. AFRICA, 50 m. (See 6.147 mc., ZE8.) 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.
5.970	YV5RC	CARACAS, VEN., 50.26 m., Addr. Radio Caracas. Sun. 7 am.-10 pm. Daily 7-8 am., 1-1.45 pm., 4-9.30 or 10 pm.
5.960	HVJ	VATICAN CITY, 50.27 m. Off the air at present.
5.950	HH2S	PORT-AU-PRINCE, HAITI, 50.37 m., Addr. P. O. Box A103. 7-9.45 pm.
5.935	YV1RL	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.
5.920	YV4RH	VALENCIA, VEN., 50.68 m. 5-9.30 pm.
5.900	ZNB	MAFEKING, BRI. BECHUANALAND S. AFRICA, 50.84 m. Addr. The Govt. Engineer, P. O. Box 106. 6-7 am. 1-2.30 pm. Ex. Suns.
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.
5.885	HI9B	SANTIAGO, D. R., 50.95 m. Irregular 6-11 pm.
5.875	HRN	TEGUCIGALPA, HONDURAS, 51.06 m. 1.15-2.15, 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.
5.845	YV1RB	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.
5.835	TI6PH	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	TI6PH2	SAN JOSE, COSTA RICA, 51.59 m., Addr. Senor Gonzalo Pinto, H.
5.790	TG5	GUATEMALA CITY, GUAT., 51.75 m. Casa Preidenciel, Senor J. M. Caballeroz. Irregular.
5.758	YN0P	MANAGUA, NICARAGUA, 52.11 m. 8-9.30 pm.
5.740	YV2RA	SAN CRISTOBAL, VENEZUELA, 52.23 m., Addr. La Voz de Tachire. 11.30 am.-12 n., 5.30-9 pm., Sun. till 10 pm.
5.735	HC1PM	QUITO, ECUADOR, 52.28 m. Irregular 10 pm.-12 m.
5.145	OK1MPT	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.
4.995	VUD2	DELHI, INDIA, 60.06 m., Addr. All India Radio. 7.30 am.-12.30 pm.
4.950	VUM2	MADRAS, INDIA, 60.61 m. Addr. All India Radio. 7 am.-12 n.
4.905	VU8Z	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.

(Continued on page 703)

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The Radio Beginner

(Continued from page 660)

area around the transmitter, as shown in Figure 4. Since the ground wave rapidly diminishes in strength, it can be seen that on short waves there will be an area in which no signals from the particular transmitter will be observed. This phenomenon is known as *skip distance* and accounts for the long range communication on short waves. Skip distance seems to increase as the waves become shorter, the limit of skip being the diameter of the earth. Under certain ionospheric conditions and wavelengths, the sky wave may even miss the earth.

Natural Wavelength of an Antenna

If we were to erect an antenna in open space, we would have a device for responding to a radio wave. The wavelength of the receiving antenna would depend upon the length of antenna wire. The *natural* wavelength of the antenna would be its wavelength without the addition of any other equipment. If, for example, the antenna had a natural wavelength of 100 meters, it would be practically insensitive to all other wavelengths, except harmonics of the 100 meter wave. We could, of course, change the natural wavelength by making the antenna longer or shorter, but fortunately we have a much better method. If we were to insert a coil as shown in Figure 5, we would actually be adding wire to the length of the antenna. We could then vary the antenna by adding or subtracting turns from the coil, and in this way *tune* in to different wavelengths. The present method of tuning is to connect a variable condenser across the coil, as shown in Figure 5.

The radio wave manifests itself in the antenna as a very minute current of electricity. The insertion of the coil between the antenna and the ground will compel the current to flow through the coil, since the ground is at a lower potential than the antenna. We recall that an alternating current flowing through a coil will create a rising and collapsing magnetic field. In a previous lesson we learned that such a magnetic field could be transferred through space to another coil, creating a flow of electric current in that coil. We then have all the conditions necessary for taking the current in the antenna and putting it into our radio receiver.

Coupling Antenna to Receiver

There are a number of methods of connecting receivers to antennas, the simplest being *direct* coupling, illustrated in Figure 6A. In direct coupling the electrical energy is fed directly to the receiver. Figure 6B shows another form of coupling known as *electrostatic* coupling, in which the electrical energy of the antenna is transferred to the receiver by the charging and the discharging of the condensers. In *inductive* coupling, Figure 6C, we use two independent coils, one in the antenna circuit, and the other in the closed circuit of the receiver. In this case, the energy is transferred from the antenna circuit to the receiver by means of electro-magnetic induction. In actual practice both coils are wound on the same form, the antenna coil being known as the *primary* and the receiver coil being termed the *secondary*. Maximum transfer of energy is secured when both coils are tuned to the same frequency, or are in resonance.

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BARTER and EXCHANGE FREE ADS (continued)

SWL'S IN U.S.A., FOREIGN countries. I will send one of my new SWL cards to those who send me one of theirs. I QSL 100%. QRA is Jimmy Wrath, 1147 White St., Des Plaines, Ill.

HAMS, SWL'S ANYWHERE. Would appreciate your card for my collection—will send out exchange SWL card same day. QSL 100%. S. H. Giffin, 18 York Court, Guilford, Baltimore, Md.

ATTENTION SWL'S. I WILL answer all SWL cards received from anyone everywhere. QRA — Gerald Swanberg, 16 Seaver St., Brockton, Mass.

ENGLAND CALLING SWL'S AND Hams in all countries! Send me ur QSL and I will send mine. I QSL 100%. QRA: A. B. Robertson, "Thorncliffe," 5, York Rd., Southport, Eng.

SWL'S IN SOUTH AMERICA, especially, also all foreign countries outside of U.S.A. and Canada. I want to swap SWL crds with you. I QSL 100% with foreign listeners. George Cryder, R.D. No. 3, Delaware, Ohio. U.S.A.

WILL EXCHANGE CARDS WITH SWL's 100% from all over. George Skoba, 1837 South California Ave., Chicago, Illinois. U.S.A.

WILL EXCHANGE SWL CARDS with anyone. U.S.A., Can., Engl., Australia and N.Z. Include postage. Stamp collectors send stamps. QRA: Ric Spiralke, 2258 West 24, Chicago, Illinois. U.S.A.

I WOULD LIKE TO EXCHANGE view cards of your city with anyone in return for view cards of Omaha. I QSL 100%. Edw. Wilson, 2702 Burt St., Apt. 9, Omaha, Nebraska.

SWL'S OF THE WORLD. MY super SWL card would look FB on the wall in your shack. QRA: Caribbean Listening Post, Catano, Puerto Rico, West Indies.

How the VODER Creates Human Speech!

(Continued from page 651)

some of the keys the operator can control its quality so as to make those sounds. Other keys make the "stop consonants" like d, k, and p.

Another kind of sound enters into human speech, most importantly in the vowels, like a, e and o. It comes from the vocal cords, and is very complex and somewhat musical. In the Voder, therefore, there is an electrical source of sound corresponding to the vocal cords; and there is a pedal for changing its pitch and for giving to speech a rising or falling inflection as desired. When the operator wants the sounds made by the vocal cords, instead of whispered sounds or consonants, an arm rest switch is depressed. Then the particular parts of this vocalized sound which are wanted are selected by playing the proper keys.

The source for this sound is the so-called "relaxation oscillator" which gives a saw-toothed wave (like that used in television sweep oscillators) in contrast to the smoothly rounded wave of a pure musical note. This saw-toothed wave has a fundamental note which gives the whole sound a definite pitch. Broad changes in this pitch mark the difference between male and female voices; gliding change of pitch over a smaller range constitutes inflection. The Voder may be posed as a man or a woman by turning a knob; it may state a fact, ask a question or emphasize a word, according to the motion of its pedal.

When one talks one shapes his mouth cavity so that some particular parts of the complex sound come through clearly, while other parts are suppressed and unheard. This makes the difference between the vowel sounds. For the same purpose the Voder is provided with ten keys. Each of these operates a variable attenuator to control the current in a definite frequency range. Source of current for each attenuator is an electrical filter which picks from the saw-tooth wave one particular group of its overtones. Normally each attenuator is an open-circuit, so that no sound comes through. The vowel sounds require the selection of only one, two, three or four ranges of overtones; the other ranges contribute nothing to the sound. In human speech, some sound is found in every range, but the Voder seems to speak most understandably when the unimportant overtones are suppressed.

The sounds are generated by oscillators rich in harmonics. The harmonic and tonic combinations required for the various vowel and consonant sounds, ten for the "soft" sounds and three for the "click" sounds, are obtained by selection of the frequency components of the oscillator outputs by means of filter networks. The pitch of the "voice" is varied by a control operated by the operator's wrist. This is a frequency control of the tones from the oscillators (female and male voices).

Combinations of sounds are obtained by touching various keys, thus feeding the desired sounds (tonic and harmonic frequencies) selected by the filter networks in the input of the common amplifier. Sudden breaks (clicks and sharp sounds) such as found in t, k, p, etc., are controlled by three black keys on the control board.

The "secret" of the operation is in the filter networks which take harmonic combinations from the "multivibrator" and high-frequency (hiss) oscillators, to produce the sounds which make up the words.

The operator must be carefully trained in the selection of key combinations to make intelligent "sounds."

Considering all the keys, there are twenty-three different sounds available to the Voder operator. By combination of keys she can mix these sounds and by the fingering she can control the shading. All speech sounds can be produced, but the number any operator can make use of depends on her finger dexterity; even granted the ability, only long practice will bring skill. The young ladies who will operate the Voder at San Francisco and New York were selected from more than three hundred telephone operators; and through long practice they have acquired a sufficient vocabulary to converse on ordinary subjects.

Sounds in the Voder's repertoire are not confined to those of the human voice. Bleating of sheep, lowing of cattle, grunting of pigs, and even the rat-a-tat of the woodpecker can be produced with perfect realism.

Singing will undoubtedly be an early accomplishment of the Voder; this would require a few more keys and pitch controls, with a little more intricate operating technique.

New Dynamic Microphone

● A NEW dynamic microphone is being distributed by the Turner Company, known as the model 99. It is ruggedly built for use indoors and out, under a wide variety of climatic and temperature changes. An acoustic valve is provided to take care of changes in pressure due to climate or altitude and, according to the manufacturer's claims, it is even free from the effects of salt air. The output of this microphone is −59 db. and the response is flat within + or −4 db. from 60 to 9000 cycles. An adjustment is provided so that the microphone may be made semi-directional or non-directional. It is finished in gun-metal.

The company has also issued a catalog describing a number of microphone models, stands and accessories.

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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.

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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

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

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

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

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

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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

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World S-W Stations

(Continued from page 700)

Mc.	Call	
4.880	VUC2	CALCUTTA, INDIA, 61.48 m. Addr. All India Radio. 6.36 am.-12.06 pm.
4.880	HJ4ABP	MEDELLIN, COL., 61.44 m. 8-11 pm.
4.876	ZRD	DURBAN, SOUTH AFRICA, 61.5 m., Addr. (See ZRK, 9.606 mc.) Daily 12 m.-3.45 pm., Sat. till 4 pm., Sun. till 3.20 pm.
4.842	HJ3ABD	BOGOTA, COL., 61.95 m., Addr. La Nueva Granada, Box 509. 12 n.-2 pm., 7-11 pm., Sun. 5-9 pm.
4.800	HJ1ABE	CARTAGENA, COL., 62.46 m., La Voz de los Laboratorios Fuentes. Addr. Box 31. Daily 8.30 am.-11 pm., Sun. 10 am.-9 pm.
4.780	HJ1ABB	BARRANQUILLA, COL., 62.72 m. La Voz de Barranquilla. Addr. P. O. Box 715. 11.30 am.-1 pm., 4.30-10 pm.
4.772	HJ1ABJ	SANTA MARTA, COL., 62.86 m. 11.30 am.-2 pm., 5.30-10.30 pm. except Wed.
4.740	HJ6ABC	IBAGUE, COL., 63.25 m. 7 pm.-12 m.

BOOK REVIEW

THE EVOLUTION OF PHYSICS, Albert Einstein & Leopold Infeld. Size 7⅝" x 8¼", 319 pages, illustrated. Published by Simon & Schuster, New York City.

This is a book which traces the evolution of ideas in physics from the earliest mechanistic concepts to relativity and the quanta theories. It is written in simple language for the layman, being a collaboration between the world-famed physicist and one of his co-workers in research. It tells, in layman's language, the story of mankind's attempt to reason out its relationship to the world at large. The authors have likewise avoided all highly technical language and mathematical formulae. They bring out their points clearly by using comparisons with known facts of everyday experience, explaining the significance of all major contributions to science since the work of Newton. The book is divided into four major sections, each of which contains numerous chapters. The sections are: The Rise of the Mechanical View; The Decline of the Mechanical View; Field, Relativity; and Quanta. There are numerous diagrams which greatly aid the reader in comprehending the explanations, and a detailed index makes it easy to look up any items which are of particular interest.

S. W. League

(Continued from page 667)

Call	Freq. mc.	R	S	Observer
G6BW	28.245	4	9	Fitzpatrick
G6BY	28.120	5	7	Fitzpatrick
G6WY	28.170	5	6	Taglauer
G8SA	28.140	5	9	Taglauer, Noyes
G8SH	28.375	4	9	Fitzpatrick
G8GM	28.315	4	6	Fitzpatrick
G8KX	14.110	5	9	Fitzpatrick
G8BO	28.300	3	5	Halliday
G8MA	28.265	4	7	Noyes
G8MX	28.410	5	8	Noyes
G8UB	14.	3	4	Akhtar
G8NY	14.06	4	5	Akhtar
GM6WD	14.220	4	8	Fitzpatrick
GM6SR	14.025	5	9	Lendzioszek
GM6RG	28.450	5	8-9	Clarke, Halliday, Jordan, Noyes, Hegler, Taglauer, Henderson, Fitzpatrick
GM8WN	14.175	4	8	Fitzpatrick
GM8MN	14.110	5	7	Clarke
GI2CC	14.	5	7	Wood
GI8UW	14.08	3	5	Kemp
GW5KJ	28.220	5	9	Taglauer, Fitzpatrick
EI9J	28.250	5	7	Clarke, Noyes
PA0EO	28.285	4	8	Fitzpatrick
PA0MZ	14.100	4	6	Fitzpatrick, Akhtar
LA1G	14.145	4	6	Fitzpatrick
ON4ZK	28.230	5	8	Taglauer, Fitzpatrick
ON4PA	28.160	5	9	Taglauer, Fitzpatrick
ON4DI	14.085	4	8	Fitzpatrick
ON4VM	14.210	5	8	Fitzpatrick
ON4VK	28.440	5	9	Noyes
ON4ZA	28.385	4	6	Noyes
ON4DZ	14.10	5	6	Akhtar
HA8N	14.14	5	7	Akhtar
F3OO	14.090	5	7	Clarke
F3AL	14.040	5	6	Clarke
F8LX	14.000	5	6	Clarke
F8RV	14.080	5	7	Clarke
F8RR	28.145	5	9	Fitzpatrick, Noyes
F8MX	28.135	5	7	Fitzpatrick
F8NX	14.100	5	7	Clarke
F8NR	14.09	4	6	Kemp
I1KN	14.395	3	7	Lendzioszek
LX1AI	14.00	4	7	Lendzioszek

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		Station Log & Data Bk.		10c	
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Consolidated Wire & Associated Corp's.	Parts Mfr.	Information		Free	693
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(Continued from preceding page)

Aussies have fallen off badly since our last reports, and most of those heard last month were reported by Masud Akhtar, Observer for India.

Call	*Freq. mc.*	*R*	*S*	*Observer*
VK2ACL	14.14	5	5	Akhtar
VK2GM	14.115	5	6	Lang
VK2UC	14.1	5	7	Wells
VK2ADT	14.	4	7	Wood
VK3SG	14.	5	5	Akhtar
VK3ES	14.08	3	4	Akhtar
VK3KK	14.14	3	3	Akhtar
VK3SB	14.	4	5	Akhtar
VK3BM	14.06	5	5	Akhtar
VK4JP	14.140	4	7	L. Fuller
VK4KH	14.135	4	5-7	L. Fuller, Wallen, Wells
VK4JU	14.14	5	5	Akhtar
VK5TR	14.25	4	4	Akhtar
VK5CS	14.26	5	7	Akhtar
VK6MW	14.13	5	6-8	Hegler
VK6HB	14.13	4	5	Akhtar
VK6HT	14.05	5	8	Akhtar
VK7AB	14.00	4	6	Akhtar
VK7LZ	14.29	3	5	Akhtar

Most prominent last month among the Oceania stations were the K6's. The signal strength from this section of the world is very high, accounting for the large number being received.

K6OQM	29.000	5	8	Hegler
K6BNR	14.160	5	7-8	Lang, Jordan, Henderson, Wallen, Fitzpatrick, Parker, Hegler, L. Fuller, Slaughter
	28.630			Hegler
K6PMC	14.170	5	8	L. Fuller
K6MZQ	14.175	5	9	L. Fuller
K6KKC	14.180	5	9	L. Fuller
K6ILW	14.200	5	9	L. Fuller
K6OQE	14.220	5	7-8	L. Fuller, Fitzpatrick, Lang
K6GAF	14.215	5	8	L. Fuller
K6LEJ	14.225	4	7	L. Fuller, Wallen
K6NZQ	14.160	5	7	Wallen
K6OGN	14.120	5	6	Wallen
K6NZX	28.005	4	7	Fitzpatrick
K6OJI	14.155	4	8	Parker
K6OTH	14.190	4	9	Parker
K6PLZ	14.180	4	8	Parker
K6CMC	14.160	5	6-9	Parker, Lang
K6BLZ	14.160	4	7	Lang
K6FKN	14.220	5	6	Lang
VR6AY**	14.345	4-5	7-8	Hegler, Carling, Lendzioszek
ZL1GZ	28.200	4	6-8	L. Fuller
ZL3KZ	14.100	4	6	Henderson
W6NYD***	14.255	4	3	Parker, C. Fuller, Wallen, Fitzpatrick
KA1CS	14.148	4-5	5-9	Wood, Hegler, Akhtar
KA1ME	14.260	5	7	Lang
KA1JM	14.05	3	3	Akhtar
KA1JP	14.25	3-4	5-6	Akhtar
KA2OV	14.270	4-5	7	Lang
KA7EF	14.——	5	6	Akhtar
PK1MJ	14.——	5	4-5	Wood

From our observers in other lands, we have the following North American stations reported:—

K4FKC	14.16	5	5 Akhtar
K4FAY	14.17	3	4 Akhtar
K5AF	14.15	5	6 Akhtar
VP6FO	14.10	4	5 Akhtar

Call	*R*	*S*	*Observ.*	*Call*	*R*	*S*	*Observ.*
W1CND	5	5	Akhtar	W4DSY	3	3	Akhtar
W1CRW	5	5	Akhtar	W4BAZ	4	5	Akhtar
W1FGO	3	3	Akhtar	W5DLP	4	7	Sibbin
W1GLH	5	6	Akhtar	W5FIY	3	4	Akhtar
W2ACB	5	5	Akhtar	W5BUK	4	5	Akhtar
W2AZ	5	7	Akhtar	W5EHM	5	6	Akhtar
W2CRI	3	3	Akhtar	W6GYH	3	3	Akhtar
W2BYP	5	6	Akhtar	W6NCW	5	7	Sibbin
W2IKV	5	9	Akhtar	W6NBD	5	8	Sibbin
W2IXY	4	4	Akhtar	W6OI	4	7	Sibbin
W3GQD	5	7	Akhtar	W6LYY	4	7	Sibbin
W3PT	3	3	Akhtar	W8GLY	5	6	Akhtar
W3DQ	3	4	Akhtar	W8MUR	3	3	Akhtar
W3EOZ	5	6	Akhtar	W8NJT	3	5	Akhtar
W3AFG	5	7	Sibbin	W8CNO	4	7	Sibbin
W3BSM	4	7	Sibbin	W9LFX	3	3	Akhtar
W4BNR	5	8	Akhtar	W9CJP	5	6	Akhtar
W4AIT	3	3	Akhtar	W9QI	4	4	Akhtar

*W9AM is a portable on board the S.S. California, bound for the Antarctic. Operator contacts W9EYW in afternoons. Power of the transmitter is only 15 watts. Position of the ship on January 1st was off the northern coast of Brazil.

**It has been learned that, a short time ago, VR6AY was off the air, but it is believed that they have now returned, although they have not been heard here for over a month. However, the reports for December indicate that they are being heard in some parts of the country.

***W6NYD is, at the present writing, working portable in the K6 call area. The QRA is: 1001 18th Avenue, Honolulu, Hawaii.

Well, this closes up our department for another month. Don't forget to send along a picture of your listening post. Best 73's and lots of DX.

Special Features for HAMS and FANS in next issue.

Index to Advertisers

(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

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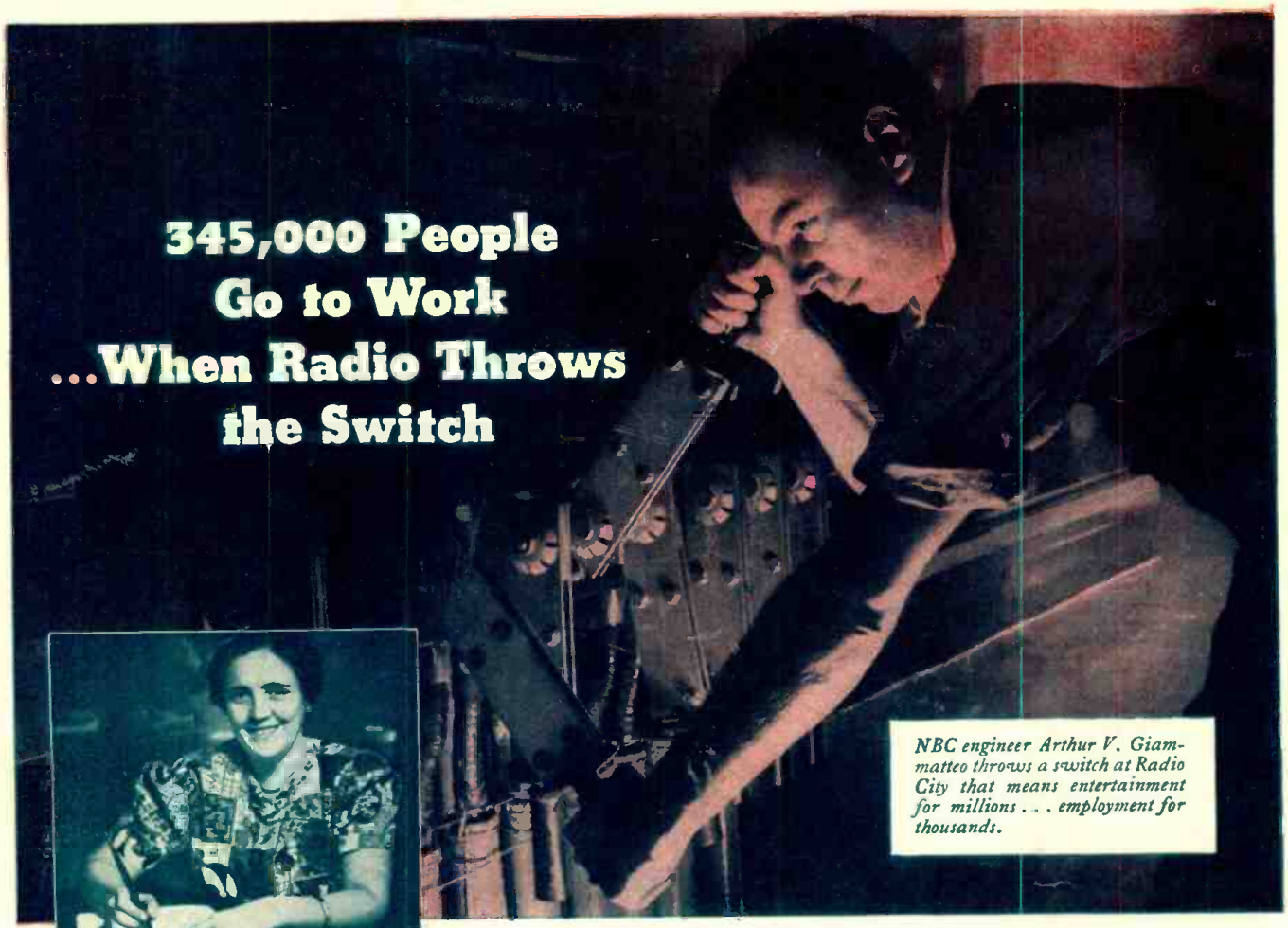

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