THE RADIO EXPERIMENTER'S MAGAZINE

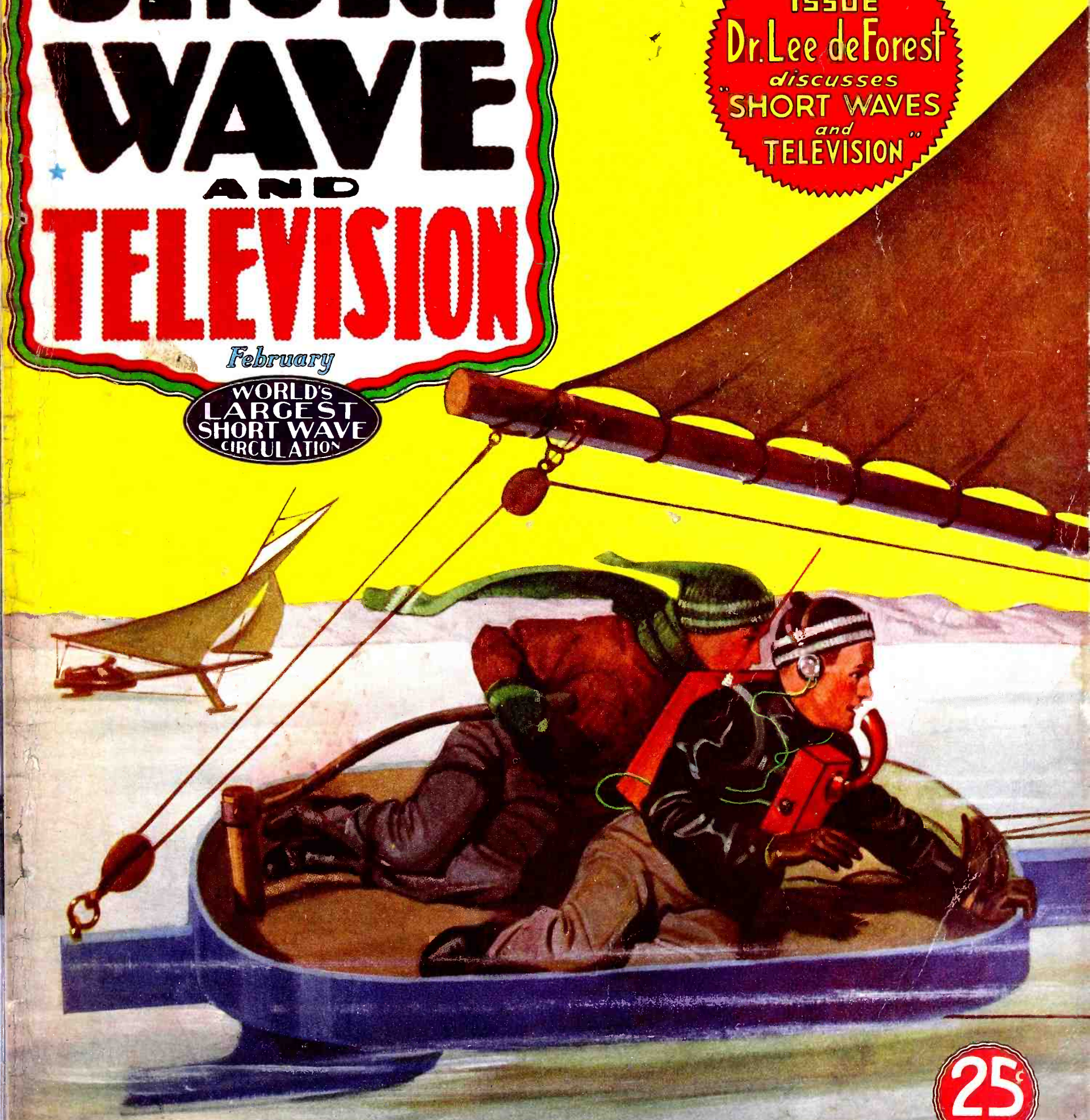
HUGO GERNSBACK
Editor

SHORT WAVE AND TELEVISION

February

WORLD'S LARGEST SHORT WAVE CIRCULATION

IN THIS ISSUE
Dr. Lee deForest
discusses
"SHORT WAVES and TELEVISION"



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IN THIS ISSUE: PROMINENT SHORT-WAVE AND TELEVISION AUTHORS

De Forest • Eckhardt • Hooton • Miller • Shuart • Herzog • Lewis

SHORT WAVE AND TELEVISION

HUGO GERNSBACK
Editor

H. WINFIELD SECOR
Managing Editor

GEORGE W. SHUART, W2AMN
Associate Editor

Combined With

Official SHORT WAVE LISTENER

Contents for February, 1937

Features in the March Issue

Beginner's "Super"—a 2-tube Superheterodyne of Low Cost and Unusual Efficiency, by Harry D. Hooton, W8KPX.

200-Watt Transmitter for the DX or "Traffic Hound." Uses the brand-new "Pen-Tet" exciter, by George W. Shuart, W2AMN.

Practical Antenna Hints, by Henry Johnstone.

Second Lesson in Television Course, by George Eckhardt.

A 16-550 Meter, "Band-Switching" 2-volt receiver for the "FAN."

Universal Power-Supply for the "Ham" Station, by W2AMN.

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OUR COVER

● THE cover illustration shows one of the thrilling Sports Events which lend themselves very well to broadcasting. The announcer's description of the thrills encountered while traveling at high-speed over the ice, are picked up by short waves. Description of this type of short-wave rebroadcast of thrilling events is given on page 602.

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HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

Short Waves and Television

By Dr. Lee de Forest, Ph. D., Sc. D.

● HOW true the bromide: "History Repeats Itself!" When Heinrich Hertz sowed the first seed of the etheric harvests which now blanket our entire globe in the entangled vines of radio-communication, he worked wholly with electric waves of a few meters or fractions of a meter in length. Some of his immediate successors investigated "centimeter waves."

My first research in the Yale Physics Laboratory concerned waves from a meter down to 15 centimeters in length. Marconi and Lodge were the first to employ frequencies as low as 3 million. As longer transmission distances were attempted the length of the waves employed grew in proportion. The *heavy artillery* of Poldu, Glace Bay, Manhattan Beach, Colon, generated waves of 1000 to 3000 meters from their thunderous spark-gaps. The Navy's dinosaurian arcs with 80 tons of magnets hissed 60,000 cycles, although their *hash* multiplied this even unto the third and fifth harmonic. Then to cap this yen for earth-hugging longitudinals came the alternators of Alexanderson and Goldschmidt, operating on the theory that by bringing the trans-oceanic terminals within a mere 600 wave-lengths of each other, absolute reliability of communication might be assured!

And this, mind you, was long after the Heaviside-Kennelly layer had been discovered, plummed, and professionally deprecated—deprecated by all but a few observing hams who were enabled (with its aid) and a few watts from small *bottles* (tubes) to find new friends at the antipodes, overcoming with their *short-wave* barrage absolute barriers of dawn and dusk to the almost audio-frequency Titans of the Communication Trust.

And then Modern Radio took a leaf from early *wireless* history and frequencies began to rise, until today we are all getting back to where Papa Heinrich began. Only with what an incomputable wealth of apparatus, tools, and knowledge to work them—accumulated by boys and men during the intervening 50 years!

Dr. Lee de Forest, one of the fathers of American radio and the man who put the "grid" in the vacuum tube.

And now that we again have our feet on the ground, and our heads in the Heaviside and Appleton layers, equipped with multi-grids and magnetrons, grid-glows, thyratrons and beams, the Pandora's Box of Short Wave and Ultra Short Wave wonders has begun to open for us, engineers of communication and industry and those who only play with short waves.

What has been wrought as yet is but a promise of greater things to come. The short-wave "surface has not been scratched." We begin vaguely to sense the possibilities of channel multiplication by double and triple tuning, given a sufficiently high frequency carrier. The media for conveying these carriers—co-axials, hollow conductors, dielectric conductors, guided-wave channels; reflecting, refracting, diffracting, absorbing arrays; beam transmitters and receivers—how little do we yet know of all these factors. Who can now predict their limitations? The undreamed of yesterday is common-place today. One who misses a single number of our ever-growing radio electronics journals may fall out of step, speedily drop behind. The army of research is ever advancing, new recruits continually enlisting. Those of us who would scout ahead, explore, must indeed be agile, forever wide awake to the advances of others along the line of front, equally ambitious, perhaps more clever, more daring originators.

It is so easy for us to stay with the main army; eyes right, follow the leaders; to aspire to think as they do, content to refine this, to mathematically establish that, to classify, summarize, record. Too many perhaps are so engaged in writing history that they have no time to *make* history.

Television seems to offer a case in point. Until three years ago it was the fashion to devise scanning discs, mirror drums, crater lamps. The crudities of this line of picture work became at last too apparent to be argued down. Following Farnsworth and Fernseh, Loewe, R.C.A., then Baird of London, abandoned mechanical scanners, went electronic terrifically. Until 'twould seem today that any decided, really significant advance along the cathode ray cannot be expected—only hoped for. Perhaps "Fifty million Frenchmen can't be wrong," but it is increasingly apparent that *fifteen million odd dollars, spent in cathodic research, have gone wrong!*

Scientists, engineers, finally directors, have been peering "around that corner" for the past four years in vain—to find, for all their tireless research and heroic expenditures, only a 7 x 12 inch picture, costing 6 or 10 dollars per square inch, and perhaps 2 dollars an hour to gaze upon.

That's more costly than a box at the Opera! And only *box-holders* can afford it. Television painted with a cathode brush, resembles a tiny sketching by Meissonier—beautiful in fine detail—but to be owned only by a few men of wealth.

When television shall become popular, in the *real meaning of that word,* it must be upon a screen approximating 3 or 4 square feet in area; and the entire receiver, picture and sound, must retail for $300 or less. It is apparent that only a mechanical scanning system can meet these unavoidable requirements. There is absolutely no reason why the *television problem* cannot be completely solved by the mechanical method with fineness of detail equal to that of the cathode picture, line interweaving, adequate picture frequency, acceptable brilliance, (*Continued on page* 643)

Second of a Series of "Guest" Editorials.

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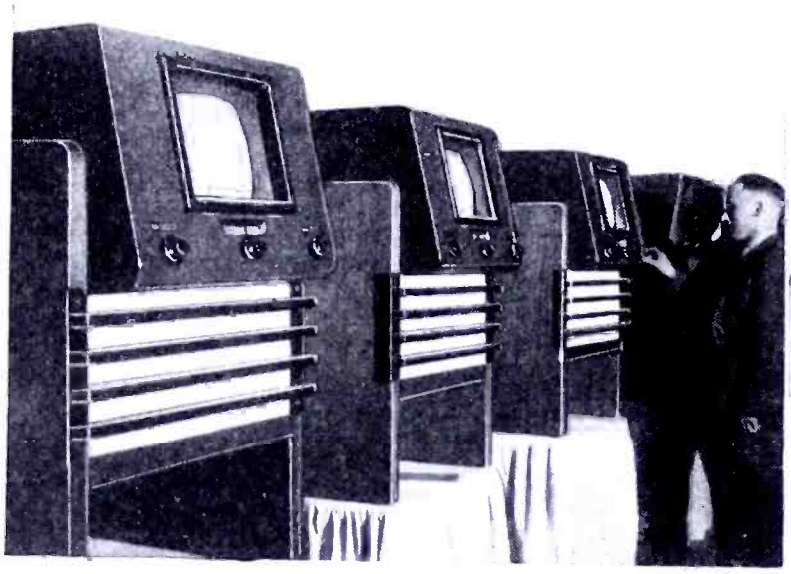
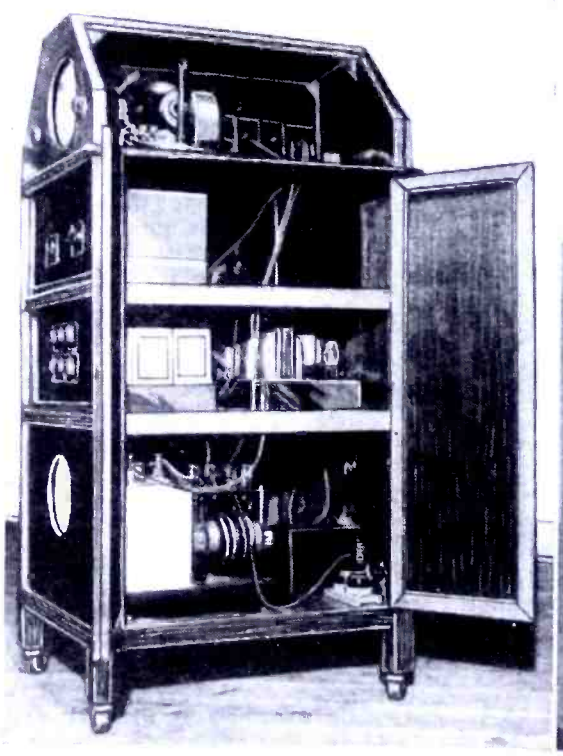
Television and Short Waves in Camera's Eye

•

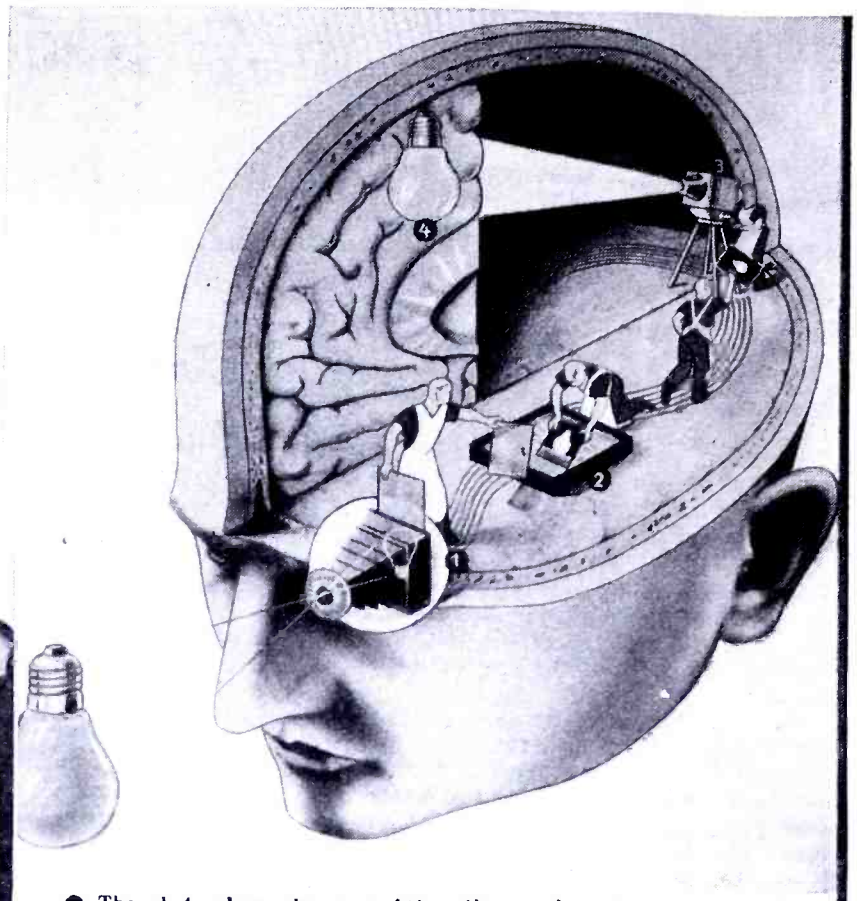
Television analogy—new German and Japanese television apparatus—latest All-Wave Receiver with extra-compact Phonograph.



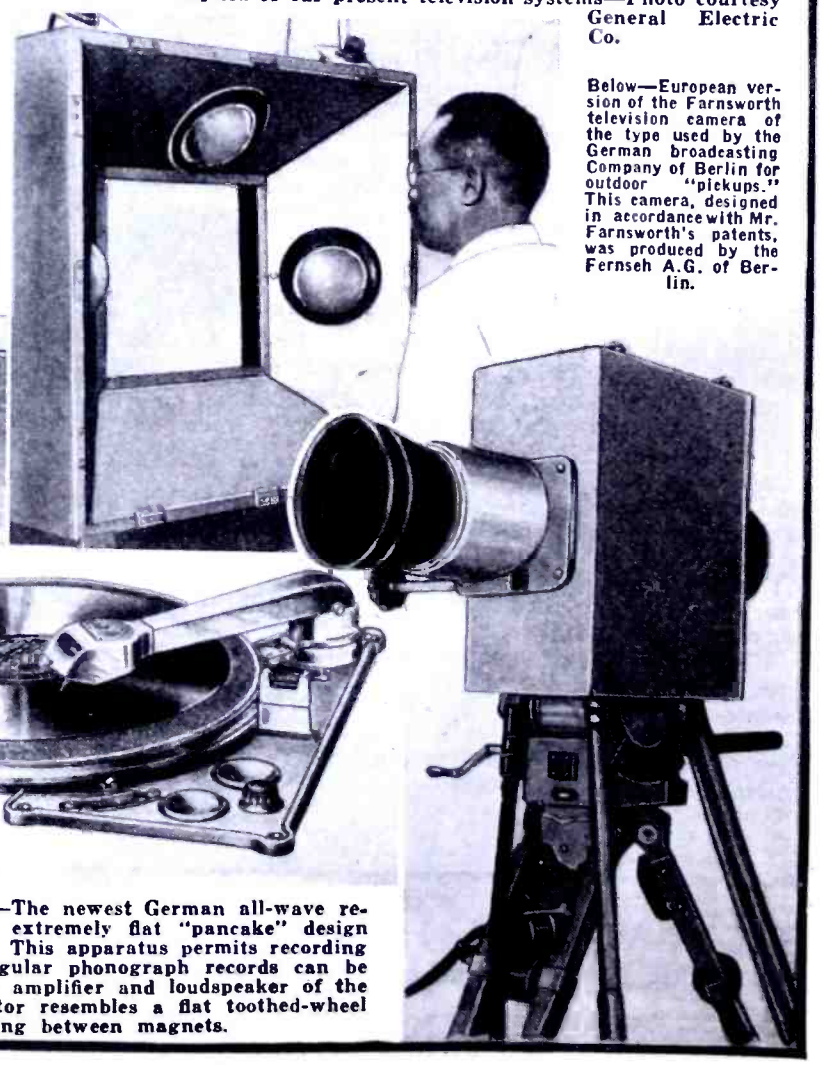
Above—A battery of newest type cathode-ray television receivers exhibited at the National Radio Show recently held in Berlin. Judging from the small number of controls, limited to three knobs, the tuning in of both voice and image on these highly perfected German television receivers has been reduced to the height of simplicity, so that any one can operate the sets.



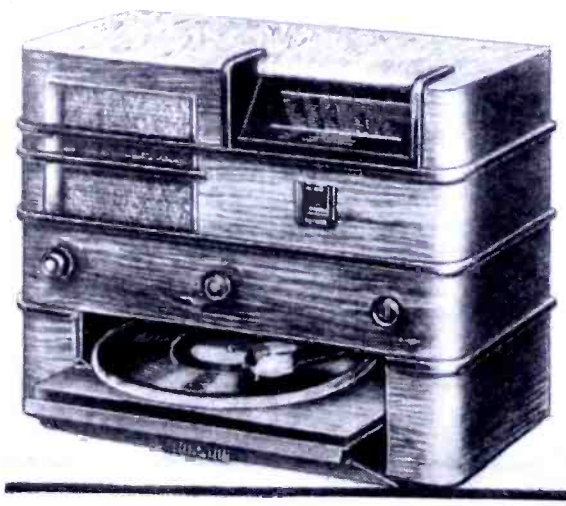
Right — Two photos show the very latest television receiver and studio pickup in use in Japan. Prof. Takayanagi constructed this apparatus, one of the first television transmitting and receiving stations in that country. It is expected that television will play an important role in the 1940 Olympic games to be held in Japan.



● The photo above shows an interesting analogy to our present-day television. The image of the electric light bulb, for example, is picked up by the lens of the eye, corresponding to the lens of the television camera. Here the image is reflected onto a light-sensitive surface, the retina of the human eye, or in television the chemically-treated, light-sensitive surface of a photo cell. The image is then transformed and proceeds to stage two, and eventually to stage three, where the image is received as shown in the picture, at the "sight-center" of the brain (or at the image receiving and translating device at the television receiver). At this point in our picture the image is reconstructed by the "sight-center" in the brain and we mentally SEE the lamp bulb held before the eye; the same thing happens in a television system, the image being flashed for example onto a screen at the end of a cathode-ray tube, as at 3 and 4 by analogy. Incidentally, the physiological action taking place between the eye and the "sight-center" in the brain, is thought to be electrical and practically a true replica of our present television systems—Photo courtesy General Electric Co.



Below—European version of the Farnsworth television camera of the type used by the German broadcasting Company of Berlin for outdoor "pickups." This camera, designed in accordance with Mr. Farnsworth's patents, was produced by the Fernseh A.G. of Berlin.



Above and at left—The newest German all-wave receiver features an extremely flat "pancake" design phonograph motor. This apparatus permits recording of programs or regular phonograph records can be played through the amplifier and loudspeaker of the set. The motor rotor resembles a flat toothed-wheel revolving between magnets.

How NBC ANNIVERSARY Program Provided Greatest SHORT WAVE Thrills

The most extensive short-wave pick-up program yet attempted, at least from the point of variety, was recently staged by NBC. Pick-ups from a diving submarine, speeding trains, Pikes Peak, Coast Guard Cutter, etc., thrilled thousands of broadcast listeners.

● *"SHIP dead ahead, Sir! Stand by and prepare to dive! Ship all ready, Sir! . . . Open No. 1 tank! . . . No. 1 tank open, Sir! . . ."* That's a small sample of the exciting program served to American broadcast listeners a few weeks ago by the National Broadcasting Company. This ambitious short-wave pickup program was one of the features of the Tenth Anniversary program of NBC.

Pick-ups from the top of Pike's Peak, the bottom of a coal mine, Navy planes, a submarine, two of the world's fastest streamline trains, and many others were heard. Short waves were responsible for most of the thrilling pick-ups.

From Radio City the program jumped to the main radio headquarters of the Cleveland Police. From there listeners heard the dispatches as they were sent out to radio scout cars. Cleveland Police called in the main office of the Ohio State Police, while the two patrol offices flashed duplicate orders to all radio cars in a *two-way* conversation—all thanks to short waves.

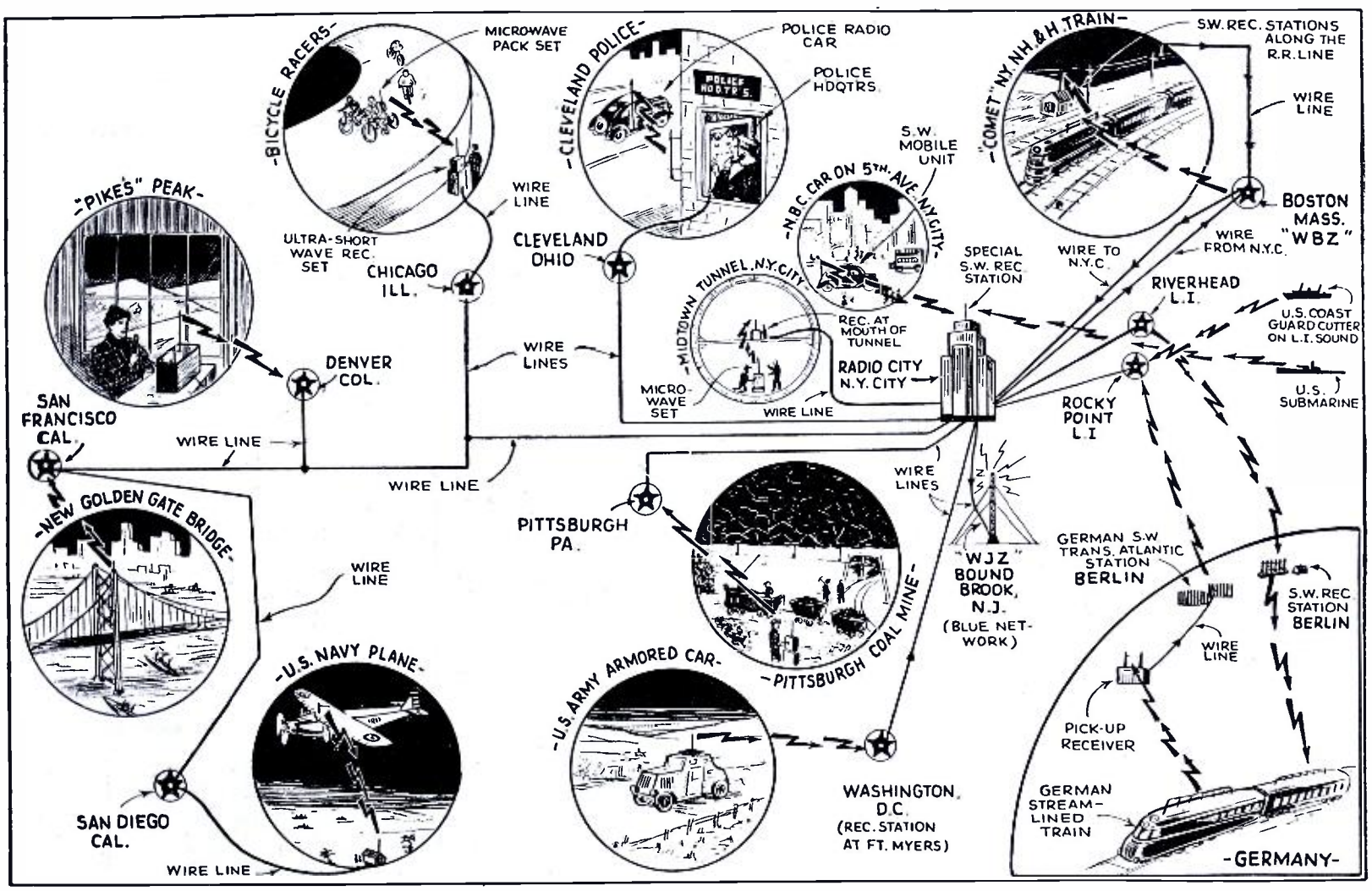
Next the U.S. Navy Submarine "S-20" cruising under the Atlantic Ocean off Sandy Hook was contacted. NBC's nautical announcer, Cameron King, described the operation of the undersea craft as it went into a special torpedo dive. The S-20 was heard via special short-wave equipment aboard the craft. The signal from the "Sub" was picked up by engineers atop the RCA Building in New York City. From the RCA roof the "submarine" signal was fed to the Radio City *master control room* and then to the NBC networks.

Instantly, after the conclusion of the S-20 "contact" the entire coast-to-coast network was "reversed" into Denver, and up to the top of Pike's Peak! Atop of the famous mountain, announcers described the snow-covered scenery visible for miles and their hard climb to the top. The program from Pike's Peak was broadcast from the mountain by special short-wave equipment, picked up by engineers in Denver and then "fed" to the transcontinental network of BC stations.

S-W Pick-Up Between Trains 8000 Miles Apart!

At this point the network listeners were treated to some trans-oceanic acrobatics. An announcer aboard the New York, New Haven and Hartford Railroad streamline train, *The Comet*, travelling between Boston and Providence, held a *two-way* conversation with a German announcer on the Berlin-Hamburg streamlined train making 90 miles per hour on its regular run in Germany. This was a very thrilling radio novelty—especially when the great distance separating the trains was considered.

The special facilities set up by the engineers for the *two-way* pick-ups in the United States and Germany, formed one of the most complicated technical jobs in radio. The Hamburg-Berlin train announcer spoke through special short-wave facilities aboard the train. These signals were picked up along the line by engineers of the *Reichs Rundfunk* and sent by special line to the giant transoceanic short-wave radio station in Berlin. The German station flung the program across the vast Atlantic, where it was picked up by *RCA Communications* at Rocky Point, Long Island. From Long Island the circuit continued to the Radio City *master control room,* *(Continued on page 646)*

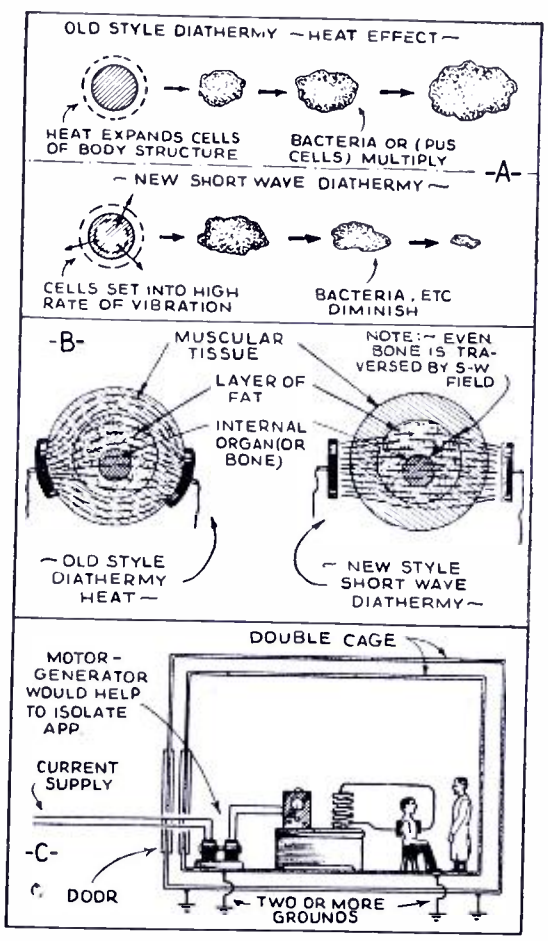


Above we obtain a "birdseye" view of the vast short-wave pick-up program recently staged by the National Broadcasting System. European as well as many far-flung S-W pick-ups in this country were featured. The most interesting, perhaps, was the S-W pick-up of conversation between persons aboard two speeding trains—one in Germany and the other in America.

Short-Wave "DIATHERMY"

Here we see the Inductotherm short-wave diathermy machine in operation. It delivers a 25-meter high-frequency electro-magnetic field; this field may be concentrated in the region of a disc electrode, here shown in proximity to the patient's head.

● THE medical profession has, in the past few years, become highly interested in short-wave diathermy. This newest scientific method of treating human ailments has received the usual amount of ballyhoo or wild publicity which all new scientific inventions of this nature usually receive. Some of the early investigations by European savants appeared to indicate that the effect of the short-wave field was selective or, in other words, that when a wavelength of say 6 meters, was used, a heating effect was produced, let us say, in some deep-seated part of the muscle or body. For example, if a physician was going to treat your liver with short-wave diathermy, according to some of the earlier investigations and claims, he would use a certain frequency or wavelength, various reports indicating a specific desirable frequency for a given ailment.



Top—Illustrating how some bacteria colonies multiply by old style diathermy treatment, but diminish with new short-wave diathermy. Center—Showing difference in current path between old diathermy and modern short-wave treatment. Below—Double grounded cage to shield S-W diathermy apparatus.

Heating Effect Not Dependent on Frequency

In several recent publications, one of them entitled, "Short Waves and Long Claims,"* this claim of a selective effect of the different frequencies seems to have been much overdrawn, and in a series of tests quoted in this bulletin, accompanied by graphic charts showing the *heating effect* over a given time for different types of diathermy apparatus, all the way from 6 meters to 24 meters, there seems to be but little choice in the wavelength or frequency used, in so far as the *heating effect* is concerned.

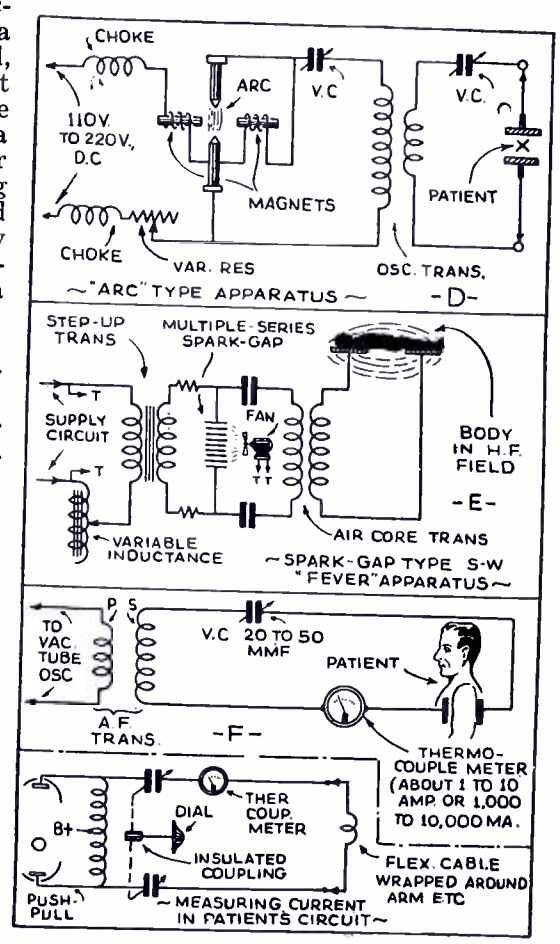
Of course, short-wave diathermy is only in its infancy and practically the whole subject has yet to be thoroughly investigated, and this will take a considerable amount of time and careful observation by specialists everywhere. The test just quoted showed that the short-wave diathermy machines were not any more effective in producing *heat* in the thigh or other part of the body than the usual type diathermy apparatus.

*General Electric X-Ray Corp.

Value of S-W Diathermy Depends on Vibration

However, it is not the *heating effect* particularly that we are after, according to Dr. William H. Dieffenbach, M.D., who recently presented an interesting paper entitled, "Ultra-Short Wave Therapy," before the American Institute of Homeopathy. As Dr. Dieffenbach points out, many physicians and electro-therapeutists have entertained a mistaken notion that ultra-short wave therapy is simply another type of diathermy or thermo-therapy (heat-therapy). As he further intimates, every high-frequency current can furnish heat in different degrees and the ultra-short wave is no exception. But the heat is not the specific curative agent and excessive heat will aggravate most infections.

The interesting new discovery mentioned by several authors is that the ultra-short wave therapy performs some of the apparent miracles attributed to it, by virtue of the fact that we here have a new technical effect—*cellular oscillation* (broadly speaking, *vibration*) describes it. In other words the microscopic cells composing the muscle and other tissues of the body, for example, are caused to *vibrate at tremendous frequencies* and as Dr. Dieffenbach further suggests—the excellent results obtained in inflammatory



Top—"Arc" type oscillator suggested by the author for S-W Diathermy. Center—Simplified circuit of spark-gap type S-W oscillator. Lower diagram shows various ways in which to connect an output meter for S-W Diathermy Treatments.

—Fact or Fancy?

By H. W. Secor

Physicians everywhere are rapidly installing short-wave diathermy machines for the treatment of various human ailments. Are the results secured superior to those obtained from the old type diathermy apparatus? Many arguments have been raised by various experts as to the best frequency to use—is the 6-meter wave superior to a 24-meter wave? These and other pertinent questions are covered in the accompanying discussion.

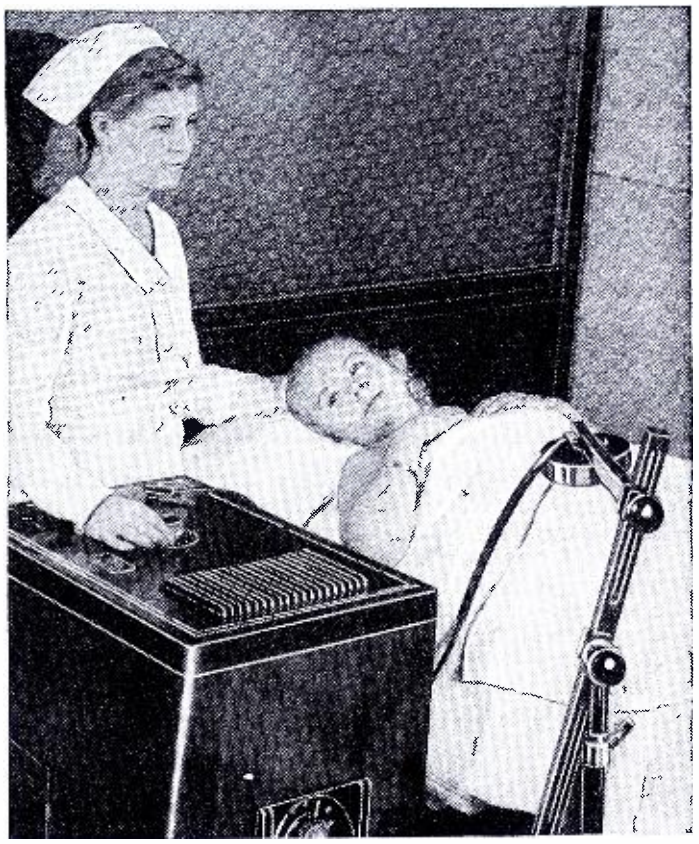
conditions and focal infections is due to *cellular oscillation, plus the gradual heating of the involved tissues.* This new effect is closely linked with the results of recent experiments which show that when we have to deal with infected tissues (with pus present); bacterial inhibition (restraint of growth) is not only due to the effect upon the bacteria themselves—but also to the change of tissue and culture media in which they are thriving.

One of the editors recently had some short-wave diathermy treatments for a certain ailment and it was highly interesting to note that no heat whatsoever was noticeable, even though the machine was fairly powerful.

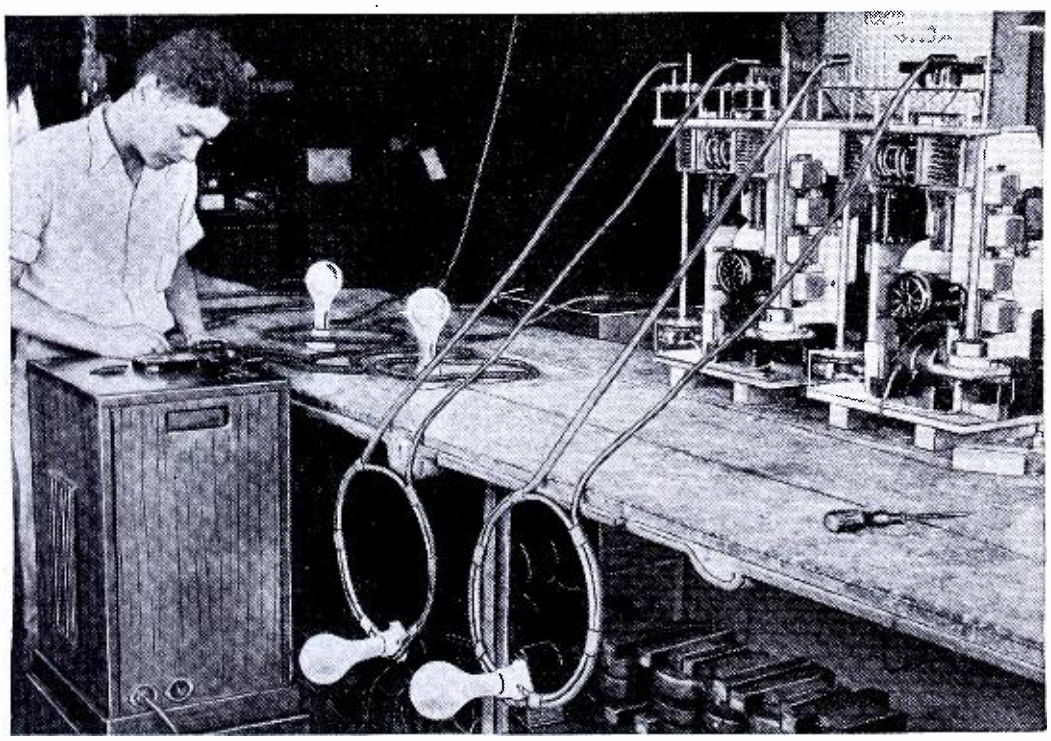
Selective Effect of Waves

An extremely interesting new observation by medical experts conducting tests with ultra-short wave diathermy has been made—the earlier medical investigators were perhaps far too enthusiastic in recommending certain frequencies such as 6-meter or 12-meter waves, etc., for certain ailments. Now the electro-therapeutists have discovered that when we insert a thermometer into a 40 pound piece of meat, for example, and start experimenting with various frequency waves, that—strange as it may seem—selective effects may be observed. In other words the inner tissue may be heated (as indicated by a thermometer) by a certain wavelength, while the outer tissues may be heated more quickly by a different wavelength. The latest experiments have shown that *no such selective effect* is to be noticed when we come to the *living* organism, as determined by using special thermo-couples placed in suitable positions, and noting the relative heating effects upon the deeper tissue, as well as the outer layers of tissue.

It is also interesting to note that both the usual plate electrode method of applying the higher frequency field was employed in these tests, as well as the method whereby several turns of insulated high-frequency cable are placed in proximity to the part of the body to be treated. The charts made during these tests show that there is a greater rise in the temperature of the subcutaneous tissue than in the underlying muscle, and that the temperature of the skin rises markedly. Further, this G.E. report states that there does not appear to be any selective thermo-action.



This photo shows a 9-meter short-wave diathermy treatment being administered for a stomach ailment, the oscillator mounted in the cabinet at the left utilizing the spark gap principle instead of vacuum tubes.



Here we see two spark-gap type short-wave diathermy machines being tested. The lamps are brilliantly lighted by the induced high-frequency current. Quenched spark-gaps are used.

Schliephake (famous German investigator) reasons that the effect of heat and high oscillations on the staphylococcic infection, by tissue changes and inhibitive effects upon the bacteria, produce bacteriolytic "end-products," which in turn produce antitoxins and antigens or *autovaccines*, through tissue reactions, which can destroy bacteria at distant parts.

After reading some of the clinical reports supplied by various concerns manufacturing short-wave therapy apparatus, as well as reports given in some of the medical journals, it would certainly seem that we still have a tremendous amount to learn about short waves and their medical use. In one report, it was stated that a patient who was treated for a certain ailment had the effect of the disease aggravated with 15-meter waves, but that in later treatments with 4-meter waves he improved progressively. One physician found that actinomycosis was stimulated by 15-meter waves and was inhibited (restrained) by 4-meter waves.

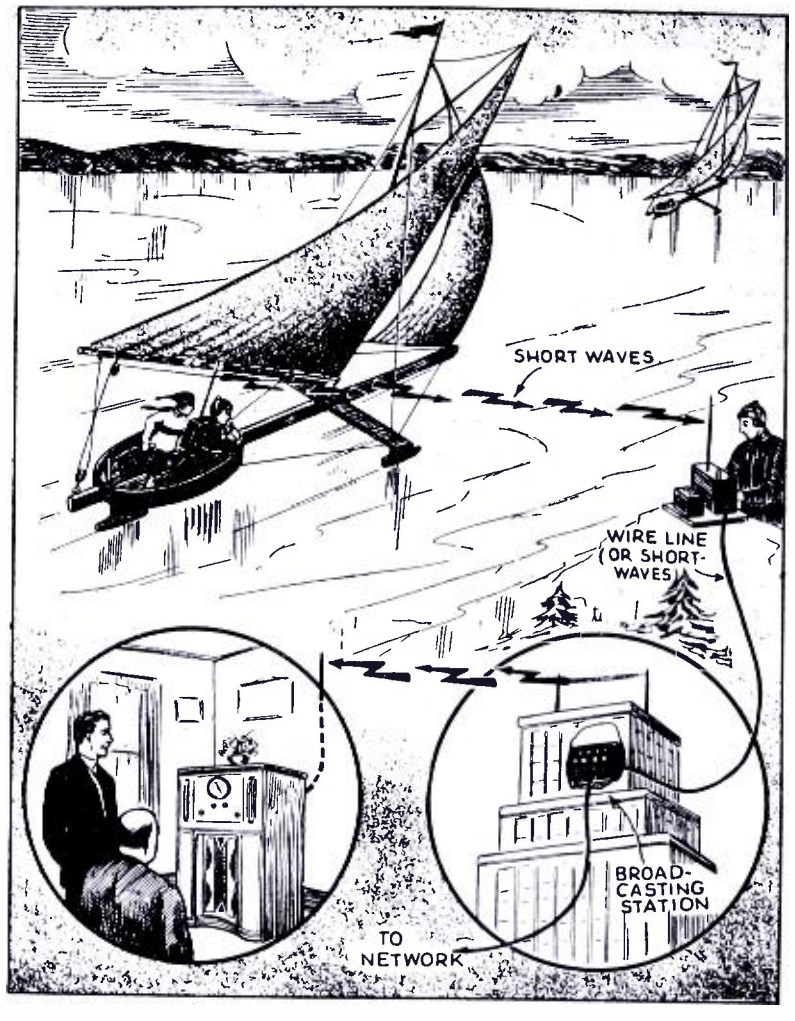
Why Not Use "Arc" for S-W Diathermy?

The average type of short-wave diathermy apparatus now offered to the medical profession, rated at anywhere from 100 to 400 watts, uses vacuum tube oscillators to provide the high frequency current. These machines are generally fitted with variable controls for regulating the dosage or amount of current passed (*Continued on page* 642)

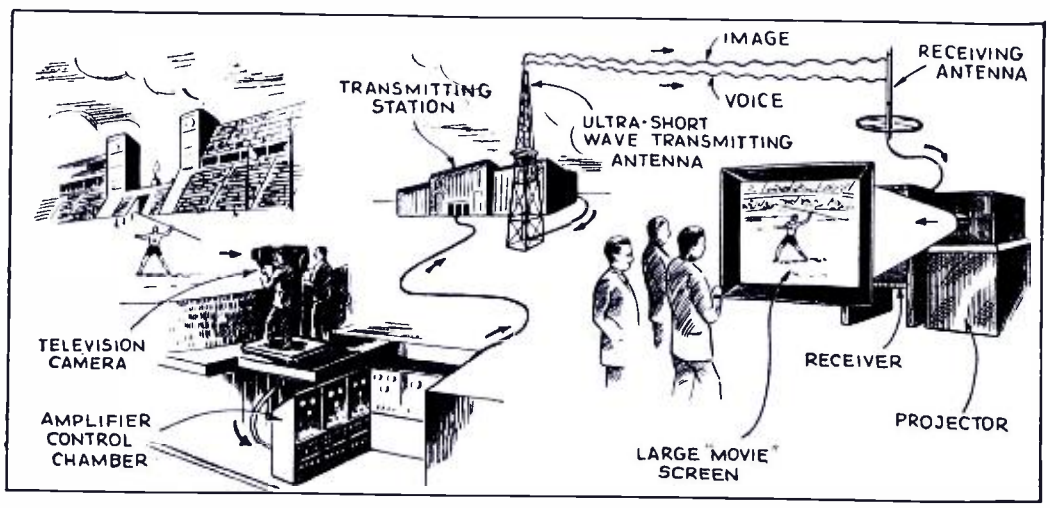
Broadcast from Speeding Iceboat a Thrill

● THE broadcast program experts are frequently hard-pressed to provide new and thrilling features for their radio audiences. The front cover illustration, as well as the accompanying picture, illustrates a very exciting broadcast possibility—the first-hand description by a broadcast announcer from a speeding iceboat. Iceboat racing is one of the most thrilling of all our winter sports and while not popularly known, perhaps, the iceboat is one of the fastest moving devices in which man has ever traveled. With a good strong wind a mile-a-minute speed is very ordinary for an iceboat. The accompanying photo-diagram shows how such special short-wave pickups are handled by the broadcast companies. The use of ultra-short-wave or micro-wave transmitters carried on the announcer's person is becoming quite commonplace, and our illustration shows how such a portable transmitter, weighing possibly no more than 15 or 20 pounds, including batteries, may relay the announcer's voice to a nearby pickup station located anywhere from one-quarter to one-half mile or more away from the iceboat. From the pickup station on shore the announcer's voice is relayed again over a wire line to the *key* station of the broadcast network, or—in an emergency—and where wire-line facilities are not available, the voice may be relayed on *short waves* to the nearest pickup station, which may be located anywhere from a few miles to 15 or 20 miles from the local *relay* transmitter. Tomorrow when we have television in our homes, we shall undoubtedly have a great many more sport programs, especially such thrilling events as iceboat races, flashed on our television screens along with the voice of the announcer as he travels 80 to 100 miles an hour over the ice.

The illustration at the right shows how such thrilling sports as Iceboat Racing are picked up by short wave, and relayed to the broadcast network, the broadcast eventually finding its way into our homes.



Television Flashes from Europe



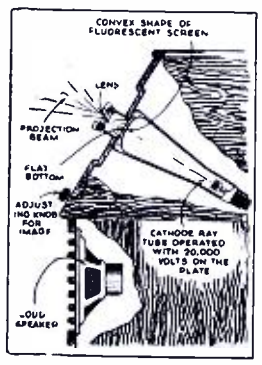
The diagram above shows television was actually employed to broadcast both voice and image of the various contestants at the famous Olympic Games held in Germany. A co-axial cable connected the switchboard at the stadium with the ultra-short-wave television transmitter.

Greatest Television Experiment

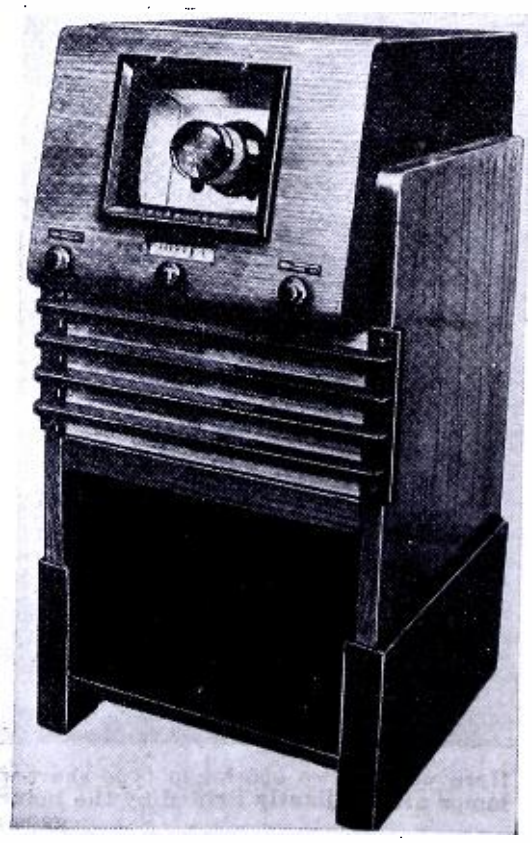
● THE illustration above shows complete schematic diagram of the television arrangements as carried out at the recent German Olympics. This was undoubtedly one of the greatest, if not the most ambitious television experiment carried out anywhere up to the present time. At the left—the Olympic Stadium situated near Berlin, with long-distance television camera in action. Directly below this camera is the room with the central switchboard and pre-amplifiers. A co-axial cable connects the switchboard with the ultra-short-wave transmitter, which is located in front of the transmitter building (the Berlin Radio Tower) with USW antennas on top of this building. At the right side, is one of the public television stations, equipped with large-size television projection reproducers, which were installed at the "Deutschland" Exhibition, etc. We see on the screen a scene from the Olympic contest.

New Projector-Type Vision Receiver

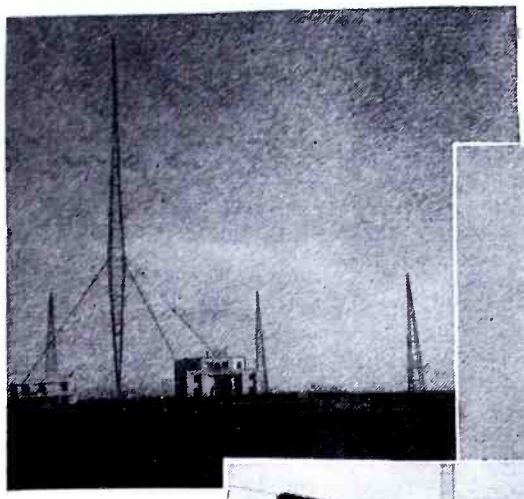
● LARGE size television images, at least 18 inches square are really needed in order to popularize this newest branch of the radio, so far as home entertainment is concerned. While many of us have seen some very excellent demonstrations, both in this country and abroad, of television images about 5 by 7 inches or even 6 by 8 inches, still this size of image is rather small when the family wishes to view the full size figure of a "tap dancer," for example. The diagram (*Continued on page* 634)



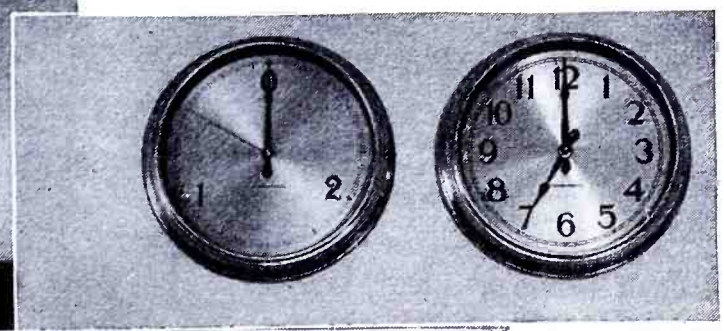
Above—diagram of the newest German television image projector with magnifying lens placed in front of the cathode ray tube. At right—photo of the new "projector-type" Telefunken television receiver.

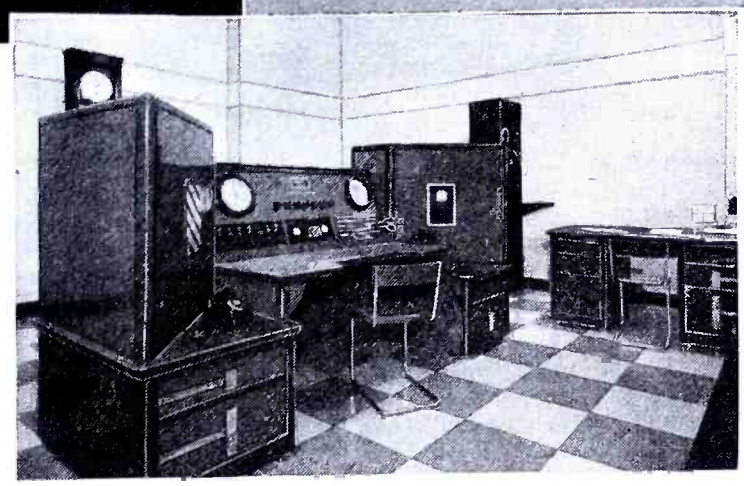


RADIO "EL MUNDO" Has Novel Studio Clock



Above: In the foreground is the aerial of Station LR1 which transmits programs on the broadcast band. The three masts in the background support the aerial for the "Short-Wave" Transmitter.





Above: All LR1, "Radio El Mundo" studios are fitted with electric clocks and also the new 3 minute clocks. Left: Control desk at Radio Station "El Mundo." At right — oscillograph and calibrating dials. Center—3 minute and secondary clocks on control panel and master clock on wall.

● NO other industry in the world depends more upon the full usage of available time, than does the broadcasting industry. In this field of activity, where every minute is directly translated into dollars and cents, it is essential to regulate the time-keeping facilities and to coordinate them in such a manner that the listener will receive his full share of entertainment and the advertiser will be apportioned his measure of air time.

This problem has confronted radio broadcasters since the first commercial programs were transmitted. All manner of clock equipment was tried, with varying degrees of success, but it remained for engineers of the *International Business Machines Corporation* to develop a Self-regulating Electric Time System designed exclusively to meet the problem of broadcast time control.

One of the most recent installations of this system has been made in South America's newest and largest broadcasting station, Radio El Mundo (LR1) in Buenos Aires, Argentina. Not only does this new station operate on the American broadcast plan, but it goes the average domestic broadcaster one better by insuring that every program occupies *exactly* the time apportioned, and that programs go on the air at *precisely* the time scheduled.

For example, at twelve minutes after the hour the entertainment program of the customer comes to an end. The announcer has three minutes in which to close the program and transfer to another studio for the next program. He watches the two large clocks on the (*Continued on page* 633)

Ernest Stricker, A Pioneer in Short Waves

● ALL those who are interested in radio technique must be aware of the constant advance of short waves. Overseas communication companies, for instance, with their high-power transmitting stations make a much wider use of short waves than they do of long waves. It is a well-known fact that the early application of short waves was made by radio amateurs.

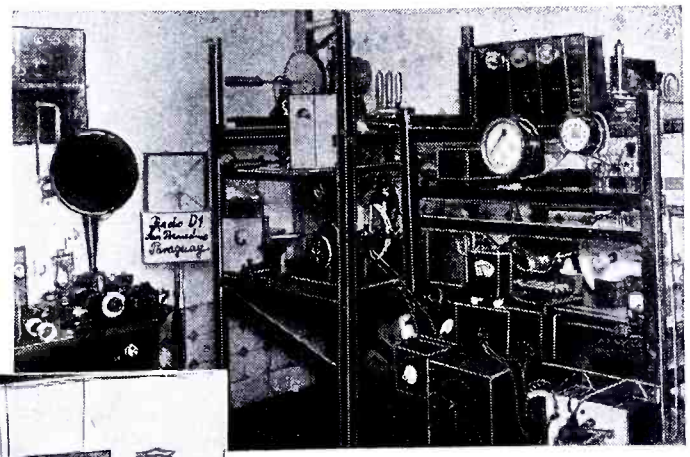
Among them, the most outstanding South American radio amateur is, without doubt, Ernest Stricker, who utilized short waves from the beginning of the radio era. Both of his private stations —one of which is situated at Mar del Plata, Argentine Republic, and the other at San Bernardino, Paraguay—contain transmitting and receiving equipment of such an order that very few amateurs in the world can boast of possessing a better layout. As early as 1920, Stricker installed his first transmitting station for medium length waves at Mar del Plata, thus establishing a private station in a place where no radio equipment whatsoever existed. It should be noted that until then no transmission, either telegraphic with Morse signals or telephonic, had ever taken place in this part of the world; Stricker's audience was composed of a few persons who listened intently and regularly to the transmission broadcast of his station.

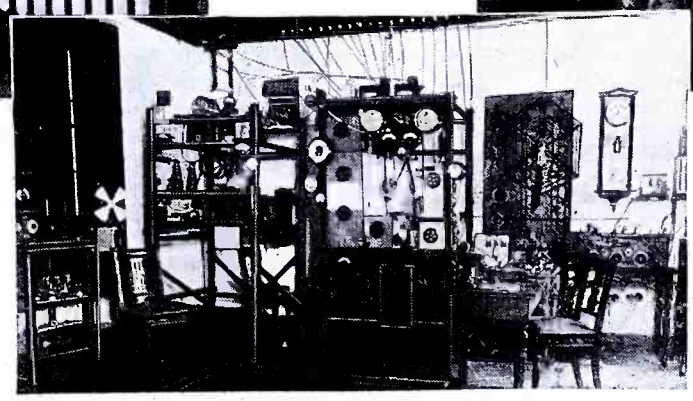
Two years later, at the time when regulation was being introduced in radio programs, Stricker was the first to receive an official license for the erection of a short-wave station with a power—remarkable at that time—of 50 watts! However, it must be noted that what they termed "short" waves at that time were waves which (*Continued on page* 633)

Ernest Stricker, (at left).

Right: Mr. Stricker's transmitter at San Bernardino in Paraguay.

Below: Mr. Stricker's transmitter at Mar del Plata. Center, 3 kw. long-wave transmitter; left, the short-wave transmitter.



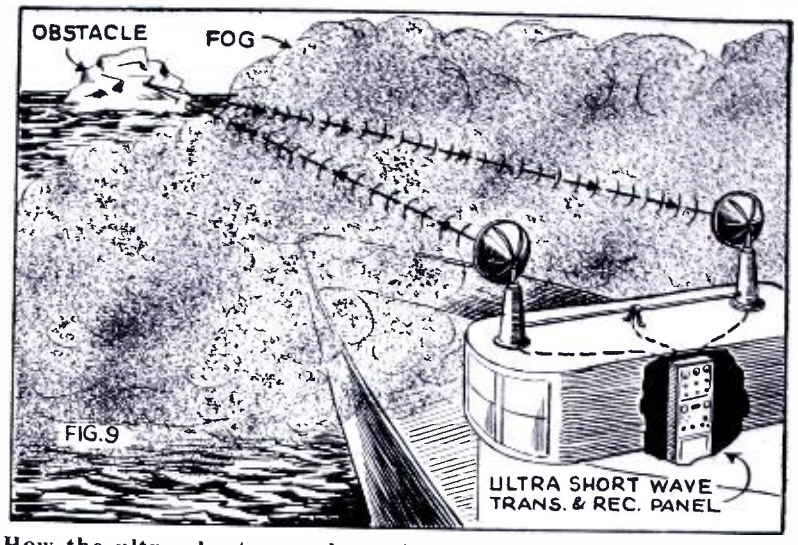


S.S. "Normandie" Detects Obstacles With Ultra Short Waves

The S.S. *Normandie,* pride of the French mercantile marine, carries one of the very latest devices for locating obstacles, whether they happen to be icebergs, derelicts, etc. These obstacles may be detected at a distance of several miles. This remarkable detector employs ultra short waves and works on the principle of the reflection of the wave from the obstacle, the echo being detected by a sensitive receiver.

● THE tragedy of the S.S. *Titanic* is still fresh in the public mind, and any device which will help the officers in charge of a great ocean liner to detect the presence in advance of obstacles or derelicts, which may lie in the path of the ship, will always be particularly welcome.

The magnificent S.S. *Normandie* has installed for regular service, a brand-new *obstacle detector* which, strange as is may seem, utilizes ultra short waves. The waves are radiated in a beam from a parabolic reflector and a suitable transmitter placed at its focus, and if this beam strikes an obstacle, the reflected "echo wave" is picked up on a second reflector and sensitive receiver. The distance of the obstacle from the ship can also be instantly checked, and it will not be long, in our opinion, before international rules promoting safety at sea will require as regular equipment, apparatus of this type for use on every passenger-carrying ship.



How the ultra short wave beam is reflected back in the form of an "echo" from an obstacle, such as an iceberg or a derelict, providing warning to the officers of the S.S. "Normandie," even though the obstacle is located several miles away.

The credit for the development of this very fine piece of scientific apparatus goes to the *Societe Française Radio-Electrique,* who provide the following description of it.

Principle of Detection

The detection method is based upon the property of *very short waves* of being conveniently diffracted by an obstaele. According to the results of our research work the nature of the obstacle (metal, dielectric, semi-conductor, etc...) does not seem to have any marked importance on the results.

Consequently (fig. 1), if a very short wave transmitter E sends out a beam which reaches obstacle 0, the latter diffracts waves of the same length which it will be possible to catch with receiver R.If, on the other hand, care has been taken to prevent any direct reception of the transmitter by the receiver (direct path E R) reception in R will be zero as long as no obstacle is within view: the presence of an obtacle will thus be detected by the operation of the receiver.

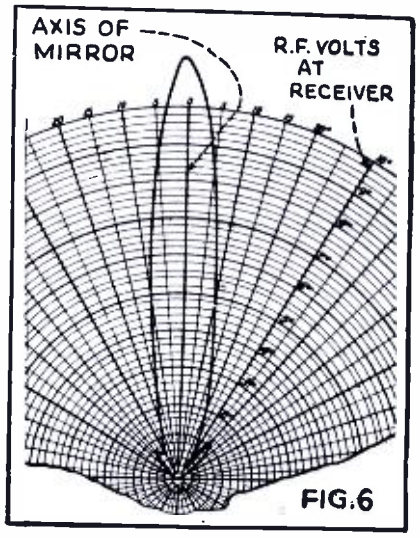


Diagram above shows sharply-focused, ultra short wave beam radiated from special tube and parabolic reflector.

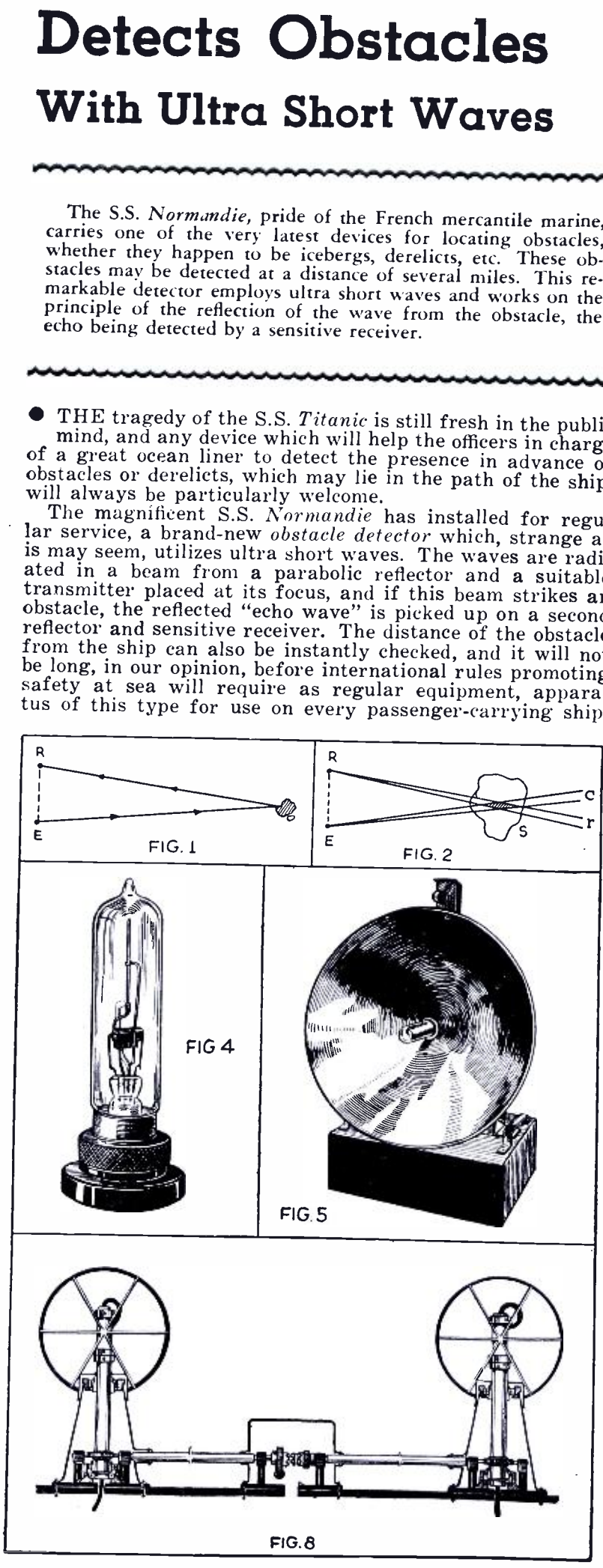
Moreover, very short waves possessing the property of being easily concentrated at the transmission as well as at the reception, the direction of the obstacle (EO or RO) will be given with the precision corresponding to the sharpness of the beams.

Lastly, the operation of the system is entirely independent from atmospheric conditions (rain, fog, etc.).

Principle of the Apparatus

The preceding paragraph indicates that the system must *be able to detect the presence of the obstacle and to give its bearing.*

This aim can be reached with very short waves, of about 16 centimeters (about 6.4"), that is to say the shortest waves it is possible to generate today. The advantage of using them is that it is possible to concentrate them very easily in sharp beams, of only a few degrees, with small size reflectors. It will thus be possible to find out the direction of the obstacle, within a few degrees (about five). On the transmitting side the power it is possible to generate on these waves is small: only a few tenths of a watt. To obtain interesting ranges it is therefore necessary to also concentrate the transmitted beam. The zone common to the transmitter and receiver beams thus becomes very restricted and to be able to *detect* an unknown obstacle it will be necessary to use a sweeping system of some kind to explore the zone to survey. If, for instance (fig. 2), one has to survey a space of horizontal section S, the beams will be concentrated in zones of horizontal section c and r and a sweeping system controlling the beams will make common part S explore the whole region S. The (*Continued on page* 630)



Diagrams above show how the U.S.W. beam is reflected from an obstacle; also appearance of special tube with antenna "built in," and how the tube is placed at the focus of a parabolic reflector. Lower diagram shows gear for controlling reflectors.

TELEVISION COURSE

Lesson 1 . . .

By George H. Eckhardt

Author of "Electronic Television."

We are glad to announce herewith the first lesson of a new *Television Course* prepared by George H. Eckhardt, author of "Electronic Television." Mr. Eckhardt has been in close touch with the various commercial television companies and a special effort has been made to describe this new art in A-B-C style, so that practically anyone can understand the subject as presented.

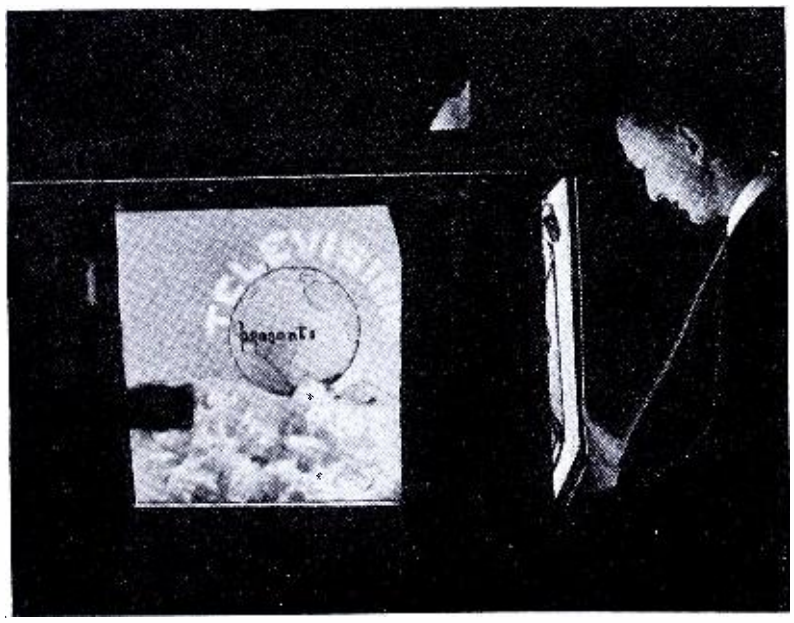
● TELEVISION is undoubtedly the next big step forward in the science of radio communication. Millions of dollars have been spent on experimenting, and now the large companies involved, after considerable thought, have decided that television has progressed to the point where it can be taken out of the research laboratory, where its secrets were closely guarded, and tried out in the field. The senses of sight and sound always go hand in hand; it was necessary that sound go with vision in order that the motion picture might attain its present high state of development; and in radio vision must also eventually accompany sound.

Television research has been carried on in the laboratories of larger companies, it has been expensive research, and the results have been closely guarded until this time. The great cost of television research has made it almost impossible for the individual experimenter with limited resources to take part in the work. The time seems at hand, however, when the individual may have some part in television.

To understand television it is necessary that one be thoroughly grounded in the fundamentals. Fantastic claims have been made for television, claims made by people who, had they understood the fundamentals, would never have made those claims. Television is a new art and a new science. Its progress thus far has been healthy, if slow, and in this series of articles only definite and proved facts regarding television will be dealt with.

What Is Television?

The first and most important question to be asked and answered is—"WHAT IS TELEVISION?" And the next question is—"WHAT DOES IT ATTEMPT TO DO?" Then comes the question—"HOW DOES TELEVISION ACCOMPLISH THIS?"

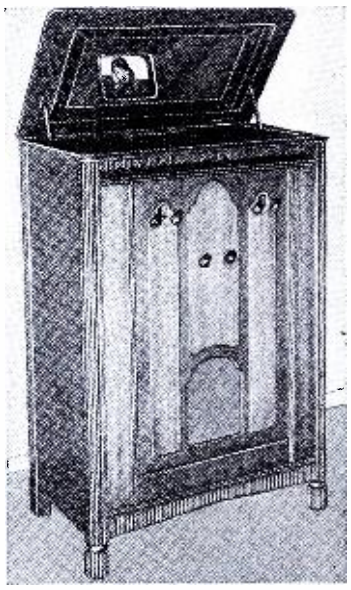


The "theme" of a television program. Television programs will not sign "on" and "off" with songs, as in radio, but with "theme" pictures. This shows a scene in the Farnsworth studio where the "theme," a small world in clouds, revolves in a miniature stage. This is the *actual* small stage which is televised. Courtesy Farnsworth Television, Inc.

The very word "television" itself seems to answer the first question. It comes from two words, a Greek word "tele" meaning "at a distance," and a Latin word "videre" meaning "to see,"—hence "to see at a distance." That does not mean to see at a distance by means of a powerful telescope, but to see at a distance, by means of cables or radio. Therefore television is limited by the limitations of its means of communication—that is by the limitations of radio communication.

Photo at left shows rear view of RCA television receiver, while below we have a front view of the same receiver.

Above—How the image is scanned line by line; as though the picture were cut into strips cemented to a ribbon.



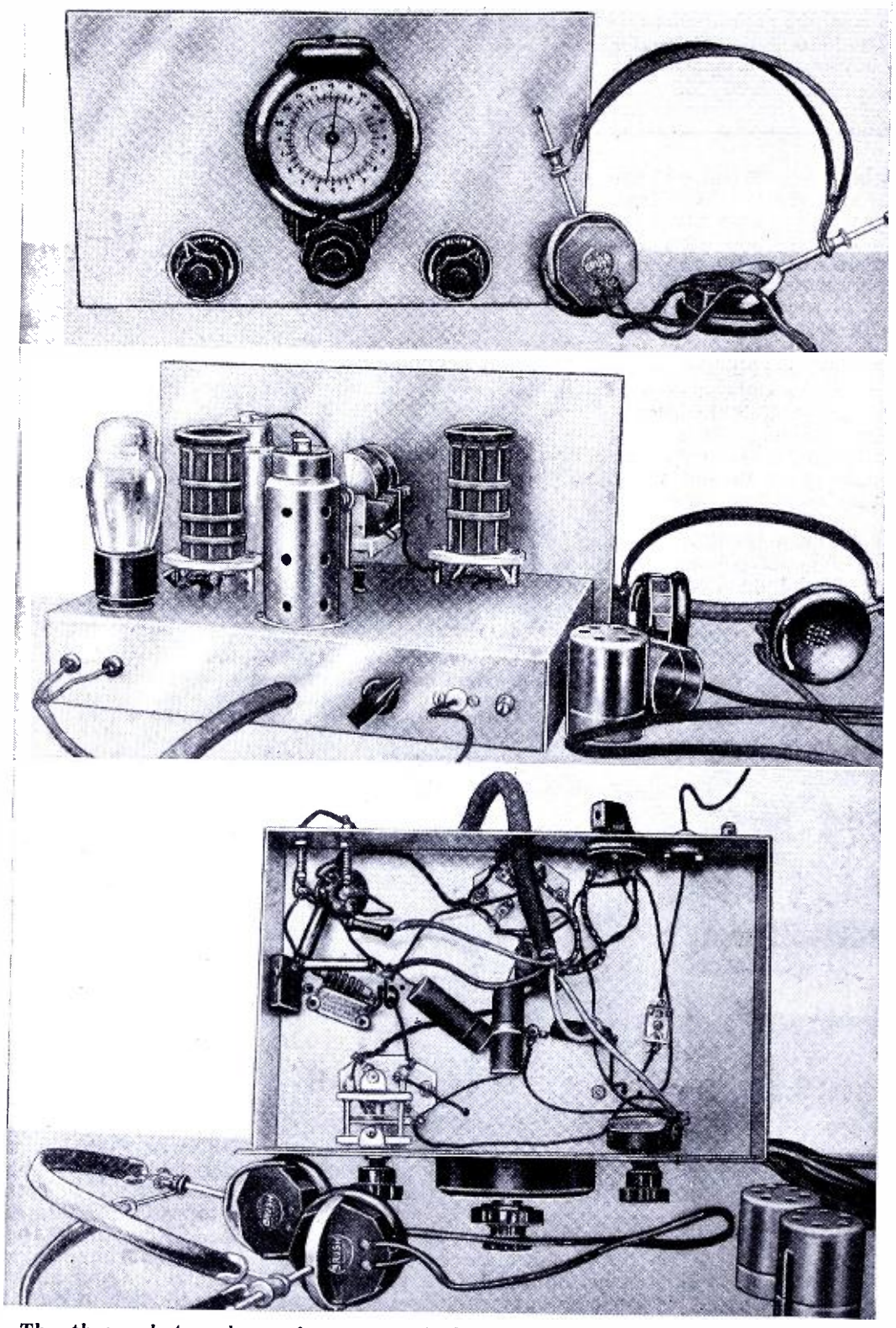
How then can a picture in motion—a true "moving picture"—be transmitted through space? The limitations of radio (and wire), communication are such that (1) the picture must be taken apart at the receiver, (2) transferred into radio signals and transmitted; (3) these radio signals must be received, and (4) the signals must again be assembled into a picture at the receiver. And all this must be done rapidly enough to give the illusion of motion, if a "moving picture" is to be received at the receiver. Of course it is not as simple as all this, but fundamentally this is exactly what television must do.

Now radio communication may be regarded as two-dimensional, that is—it has time and intensity. The signal can change as it goes along. In short, it may be likened to a tape or a line. This is all very well for sound, since one sound follows another in a broadcast, sound broadcasting—or sound itself—being along a single line, as it were.

However, in a picture a difficulty arises. A picture is not along a single line, it has height and breadth. This makes the problem three dimensional; intensity, height and breadth. How then can height and breadth be reduced to a single line for transmission purposes over radio, and then again reassembled? This was the earliest problem of television, a problem before radio itself was thought of, since television, or the idea of television, is far older than radio itself.

(*Continued on page* 639)

FOR THE "FAN" • "T.R.F.-3" RECEIVER



The three photos above show respectively front, rear and bottom views of the "T.R.F.-3"—a receiver for the short-wave "Fan." The phones shown are of the latest super-sensitive "crystal" type and have a high impedance.

● DURING the past few months a number of new tubes have been added to the popular 2-volt battery-operated series. Perhaps the most interesting types, from the short-wave experimenter's viewpoint at least, are the 1A4, the 1B4 and the 1F4. The 1A4 is a 4-element tube with electrical characteristics very similar to the 34, except that it has a less remote cut-off; the 1B4 is also a tetrode and is similar to the 32. Both tubes are much smaller in size, however, which takes up less space and allows more efficient shielding.

The 1F4 is a new power amplifier pentode, which has an amplification factor of 340, a filament and plate drain of only 0.120 ampere and 8.0 milliamperes respectively, a maximum undistorted output of 0.34 watt and requires only 4½ volts of negative "C" bias when the plate voltage is 135. The recommended load resistance is 16,000 ohms. It is hardly necessary to point out that this tube is ideal for output purposes in the small battery-operated regenerative or T.R.F. short-wave receiver.

3 Tubes Used Only

The three-tube short-wave set illustrated and described in this article is designed especially for these new tubes. As Fig. 1 shows, a 1A4 is used as a tuned R.F. amplifier, a 1B4 as a regenerative detector and a 1F4 as resistance-capacity coupled A.F. amplifier. The coils are of the plug-in type, wound on 6-prong forms as specified at the end of this article, four pairs being required to cover the range from 13 to 200 meters. Regeneration is controlled by varying the 1B4 screen voltage with the usual 50,000 ohm potentiometer which operates very smoothly in this particular circuit. Due to the extremely high audio gain developed in the 1F4 stage, almost as much volume is obtained from the single pentode as can be had from two tubes of the 30 or 33 types. If a sensitive speaker is used, most of the more powerful stations can be brought in with fairly good volume. However, the receiver as shown here is designed for head-phones rather than a speaker.

This 3-tube all-around short-wave receiver will appeal to the short-wave "Fan." It is simple to build and has high sensitivity as well as good selectivity. It operates on 2 volts D.C. and the plate voltage may be supplied from "B" batteries or a B-eliminator. Plug-in coils are used to cover the various bands from 13 to 200 meters. Band-spread is provided by a 2-speed dial of new design.

Layout Tried Out Experimentally

This set, as the photos and drawings show, is built up on a 7×11×2 inch chassis and a 7×12 inch panel. Both are of electralloy construction, which is much easier to work than steel, and are cut and drilled as shown in Figs. 2 and 3. The layout illustrated was selected only after much changing and shifting of the parts on a *cardboard dummy chassis* to find the arrangement best suited to this particular circuit. Any changes in the mechanical construction of the receiver, therefore, are not recommended.

The actual construction of the set is not difficult but the work should be done slowly and carefully. The holes for the tube and coil sockets and the large panel drillings are made before the panel and chassis are fastened together and before any of the parts are mounted. It is best to drill as many of the small holes as possible before mounting the sockets, tuning condensers, etc., in order to keep the metal "dust" off the insulation. Once imbedded in the isolantite, these small filings are extremely difficult to remove and will certainly impair the efficiency of the set even if they do not cause an actual short-circuit. The same precaution must be observed when soldering the various connections; use just enough of the rosin-core solder to make a good joint and keep the iron hot, clean and well-tinned. Use either the

Uses New 2-Volt Tubes

By Harry D. Hooton, W8KPX

solid or stranded hook-up wire for connecting the parts together and keep all leads, especially those in the R.F. circuits, as short and direct as possible.

Test Circuits Carefully

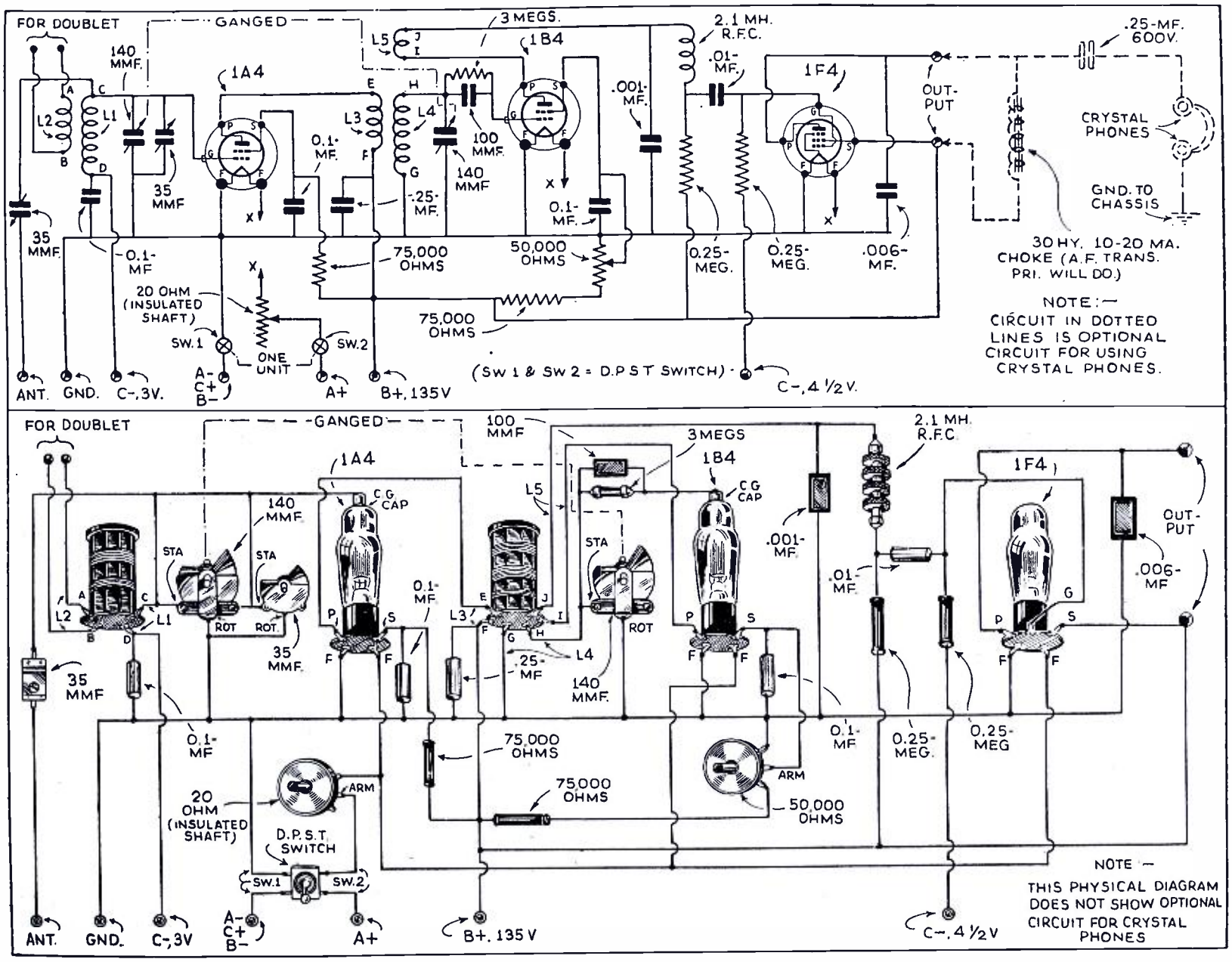
After the set has been wired, *go over each circuit carefully*, referring to Fig. 1 or the picture diagram, in order to make sure that all of the connections are correct. It is always a good policy to test from each "B" plus lead to the chassis in order to determine whether any short-circuits are in existence, *before applying the plate and screen voltages!* A pair of head-phones (not the crystal phones) and the 4½ volt "C" battery will serve for this purpose. If the circuit has been correctly wired and the by-pass condensers are good, a loud click should be heard the first time the connection is made and very weak ones or none at all on all contacts thereafter. If a loud click is heard *every time the connection is made and another when it is broken*, a short-circuit exists or the by-pass condensers are leaky. Condensers of the paper dielectric type which have been used in another set should never be placed in any part of the circuit where the high voltage is present. The soldering and resoldering may cause the paper dielectric to break down, and if this happens the builder may lose an entire set of tubes. A new by-pass unit costs only a few cents and it is always best to be safe.

New Dial Has High and Low Ratios

The dial used with this receiver is the new Crowe *Front-O-Panel* type which has only recently been released. Unlike most airplane dials the entire assembly mounts directly on the front of the panel, no large cut-outs being required. The two-speed planetary mechanism built into the dial gives either a fast tuning ratio of 30 to 1 or a slow speed of 165 to 1 in 360 degrees. This extremely slow speed and the notched knobs allow a precise adjustment of the tuning condenser on even the very weakest stations.

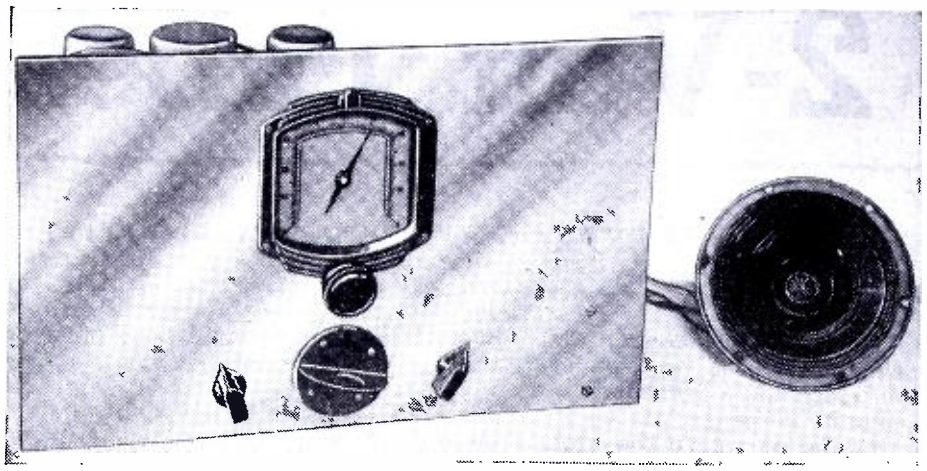
New "Crystal" Phones Used

For best results, a pair of high-impedance head-phones should be used in the plate circuit of the 1F4 tube. As the photographs show, the author uses a pair of the Brush Type A crystal phones, which have an impedance of 50,000 ohms. When the crystal headset is used, however, it cannot be inserted directly into the 1F4 plate lead but must be coupled to the tube through a small blocking condenser of .05 mf. 600 volts or larger rating. The "B" current drawn by the 1F4 plate may be returned through either a choke of about 30 henries, 10-15 milliamperes rating or a 25,000 ohm resistor as shown in Fig. 1. The .05 mf. condenser should be of good (*Continued on page* 634)



Complete wiring diagrams, both schematic and picture type, are given above for the "T.R.F.-3" receiver. The tubes operate from a 2-volt source of "A" supply which may be batteries.

The RGH Super



Front view of the "RGH" superhet receiver and loudspeaker. The plug-in coils fit into a shielded compartment just under the tuning dial.

● THE RGH Super is a simple, low-cost, all-wave, 5-tube superheterodyne circuit designed around easily available parts and front-panel plug-in coils. A complete circuit diagram is shown in Fig. 1. The tubes used and their functions are lettered on the diagram.

The Circuit

The antenna signal is fed directly to the grid of the mixer tube through a small semi-variable condenser. The signal is tuned by the front section of the variable condenser in conjunction with the upper winding of the plug-in coil. The intermediate frequency difference is maintained by beating this tuned signal with one generated in the oscillator section of the mixer tube. This local signal is tuned by the rear section of the tuning gang in series with a fixed 0.0005-mf. padding capacity connected across the lowest winding of the plug-in coil in the oscillator grid circuit. The center winding is connected in the oscillator plate circuit and is used as the tickler.

The intermediate frequency difference between the incoming signal and the local oscillator is adjusted manually for each band by means of the 50-mmf. midget across the first-detector tuning condenser.

Single I.F. Stage Used

A single I.F. stage is included (two I.F. transformers) using doubly tuned I.F. transformers and a variable-mu tube. Volume is controlled by varying the bias of this tube. The particular control used must have a taper suitable to accommodate the large current drawn by such tubes when the control is advanced. To assure noiseless control a by-pass condenser of about 0.25 mf. may be added from the high volume end of the control to the chassis ground. (Shown dotted in diag.)

The second I.F. transformer feeds the pentode second-detector tube. This stage is biased and is resistance-coupled to the power-pentode output stage which in turn feeds the amplified signal to the electro-dynamic speaker.

Power for the operation of the receiver is obtained from an A.C. power transformer with suitable filament windings and a high-voltage winding capable of delivering 70 ma., at 700 volts center-tapped. This voltage is rectified by means of the 80 tube. The speaker field is used as a reactor in the D.C. filter circuit from which it simultaneously receives its magnetizing current. The filtering action of the field is aided by the use of two high-quality 8-mf. electrolytics with a 525 volt peak rating.

Adjustable Band-Spread—Optional Feature

Should the experimenter desire to listen-in on the crowded amateur bands, adjustable electric band-spread may be added to the circuit as indicated in Fig. 2. The condenser E is a small semi-variable condenser with a range from 2 to 20 mmf. A pointer knob and calibrated scale should be used with the 0.0001-mf. midget band-spread condenser.

To use the band-spread tuner on any particular band the coil and main tuning condenser is set for that band and tuning accomplished with the 50 mmf. trimmer and the 0.0001-mf. band-spread tuner. If a calibrated plate is also used on the trimmer, stations may be suitably logged.

For normal operation of the band-spread circuit the condenser E is opened wide. Should the experimenter, however, desire to cover a wider range on the band-spread tuner the capacity E may be increased slightly. This wider range is accomplished at some slightly increased difficulty in tuning of the main gang condenser. It is consequently not advantageous to increase E by more than one or two turns.

Beat Oscillator

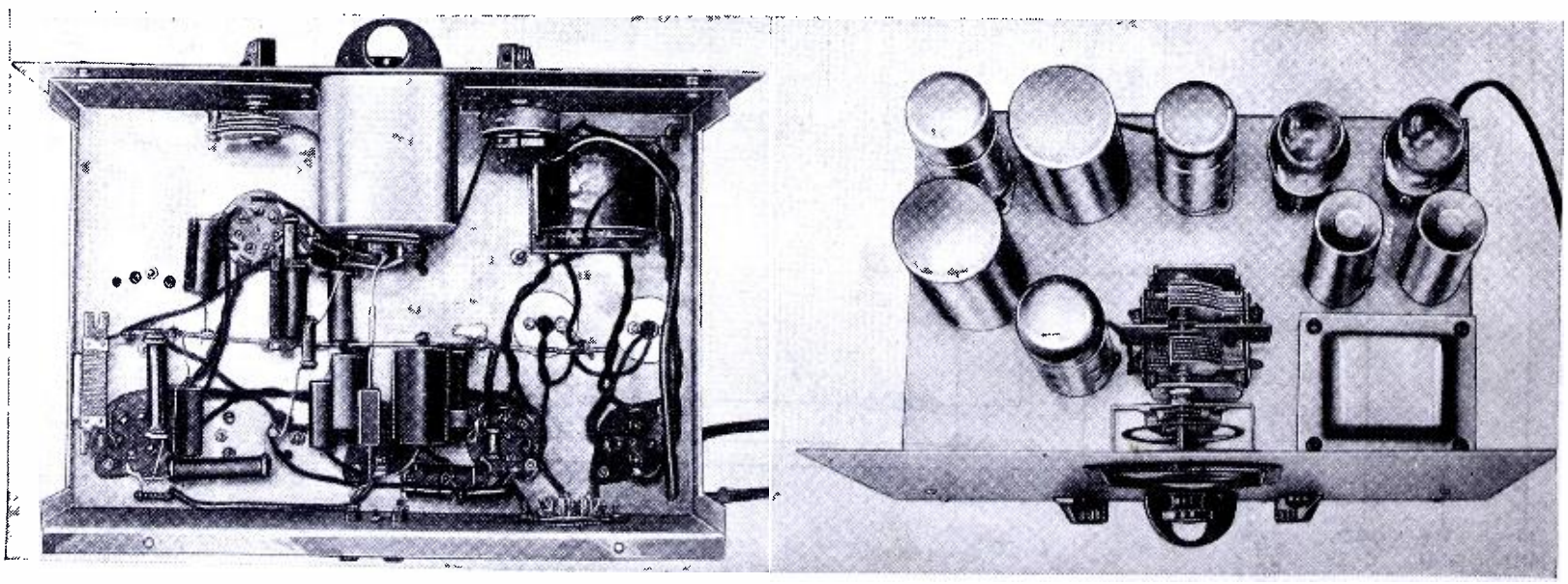
To assist in locating that very weak signal, or to listen to unmodulated code it may be to the experimenters advantage to add a beat oscillator to the RHG circuit. Details of such a circuit are given in Fig. 3. The signal is radiated to the I.F. circuits by means of a rod erected on but insulated from the chassis near the second I.F. transformer. The length of the rod is adjusted to the strength of the signal desired from the beat oscillator. A length slightly greater than the I.F. tube is usually sufficient.

Coil Winding Data

The coils are of the five-prong front panel plug-in type. The coils are wound on bakelite forms that fit snugly inside the plug-in forms. Complete data for the size of wire used and the number of turns for each band is contained in the accompanying chart.

Alignment Procedure

If a signal generator is available the I.F. stages may be aligned at either 456 or 465 kc. The I.F. frequency is not critical since *tracking* is accomplished by a manual control.



These two views of the top and bottom of the "RGH" superhet show for one thing, its relatively simple construction. The shield can in which the plug-in coils fit is observed in the center of the bottom view.

—A Dandy Set for the FAN

This month's $20.00 Prize Winner.

By Robert G. Herzog, E.E.

A Five-Tube Plug-in Coil Superheterodyne with optional Adjustable Band-Spread. Only Standard Parts Used. Has "built-in" rectifier and set operates on 110 volts, 60 cycle A.C. Range 11 to 200 meters.

The signal generator is connected to the grid of the mixer tube through an 0.25-mf. condenser and is tuned to the I.F. peak. An output meter can be connected across the speaker transformer primary or across the voice coil. The I.F. trimmers are then tuned for maximum signal, as shown on the output meter, starting with the secondary trimmer on the second I.F. transformer and working toward the primary on the first I.F. transformers. The process should be repeated to assure accurate adjustment. During the adjustment the volume control should be turned about two-thirds of the way up and the signal controlled by means of the attenuator provided on the signal generator.

The I.F. transformers may be peaked on any weak station in the advent that a signal generator is not available. The station is tuned-in and the volume adjusted so that the signal is just audible in the loud speaker. The trimmers are adjusted for maximum volume starting with the secondary trimmer on the second I.F. transformer and working toward the primary trimmer on the first I.F. transformer. The volume is kept just audible in the speaker by turning down the volume control. The station should be retuned and the adjustment repeated once or twice to assure peak performance. A fair size aerial and a ground connection should be used with the set for best results.

Code Interference

If code of the I.F. frequency interferes with reception in any particular locality the I.F. transformers may be peaked at some slightly different frequency.

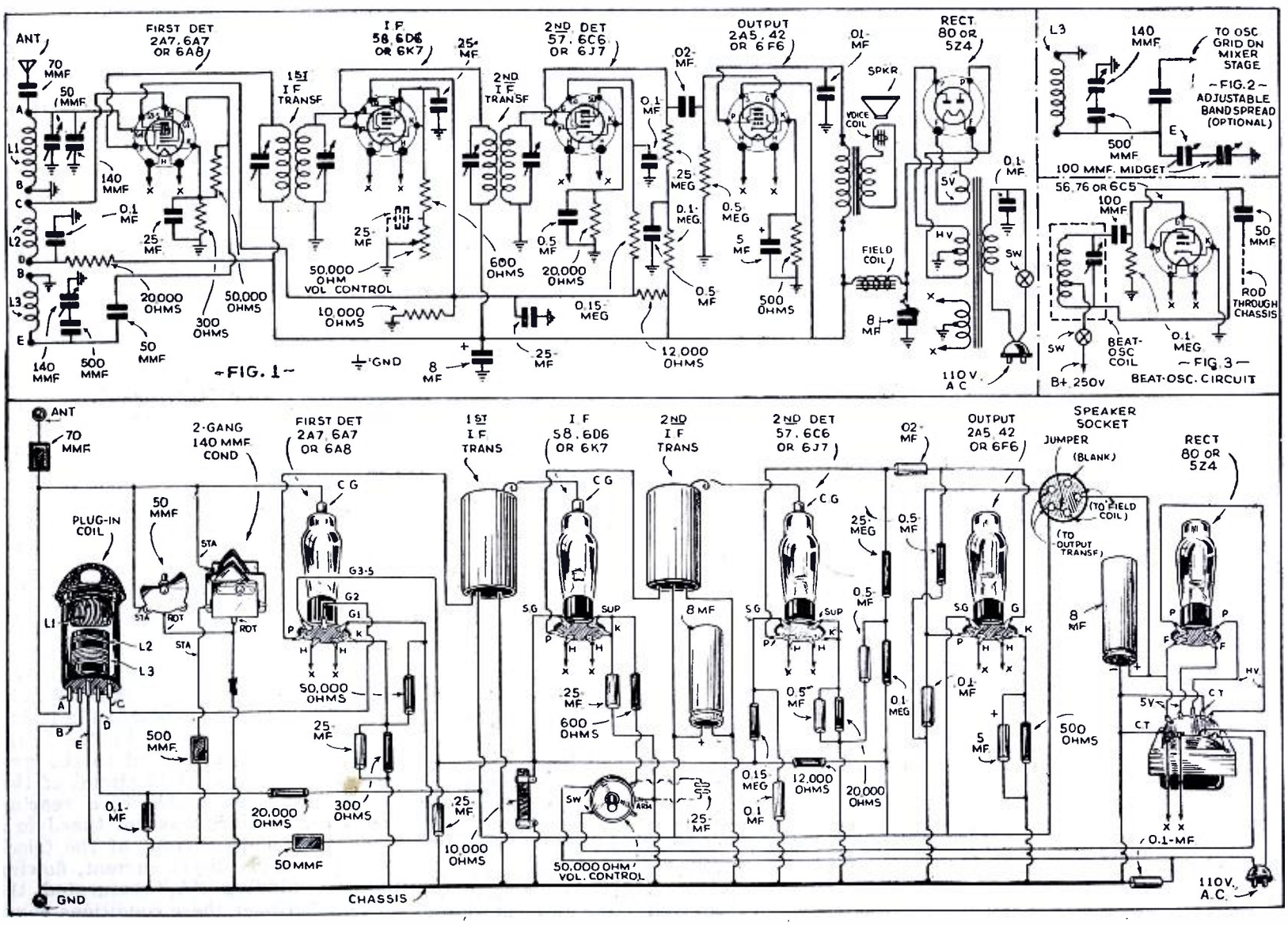
Tuning

The RGH Super will prove easy to tune and will bring in stations from all parts of the world. To locate a foreign station on any one band it is usually advisable to tune in some powerful station on the same band and adjust the manual trimmer for best results on that band; then rotate the dial around the position where the foreign station is located and increase the volume.

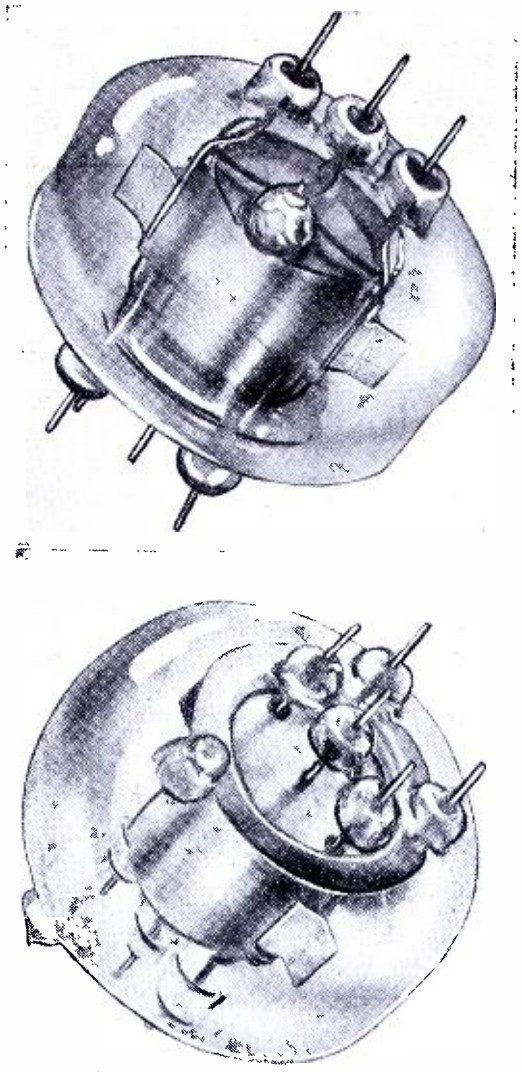
List of Parts RGH Super

Coils, Etc.—
1—Set 5-Prong Plug-In Coils
2—465 kc I.F. Transformers
1—Power Transformer; 700 volt Secondary, 70 ma.
1—Pentode Speaker; 1500 to 1800-ohm field
Condensers—
1—Two-Gang Tuning Condenser 0.00014 mf.
1—50 mmf. Midget Tuning Capacity
1—70 mmf. Semi-Variable Capacity
2—8 mf. 525 volt Electrolytic

(*Continued on page* 632)



Wiring diagram of the "RGH" superhet—it uses 5 tubes and has its own "built-in" rectifier circuit.



Photos Courtesy Bell Telephone Laboratory

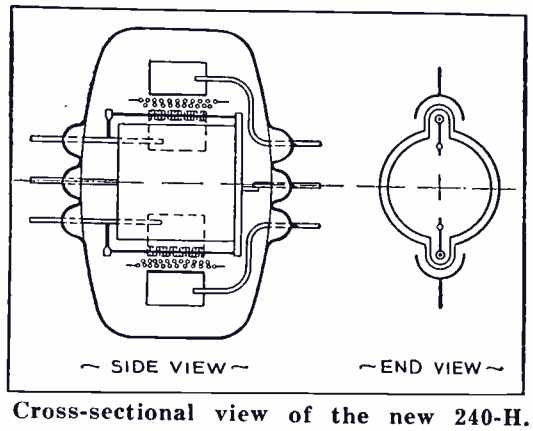
Two views of the new high-frequency tube model 240-H; it has two sets of elements in a single envelope.

New High-Frequency Tube

A new high-frequency tube having two sets of elements in one envelope. One watt output is obtainable at 150 mc.

● A SIMPLE three-element tube of the type used at low frequencies, will go into oscillation at high frequencies because of the internal capacitance of the tube. At moderate frequencies this capacitance can be neutralized as in the familiar "neutrodyne" circuit, but this is ineffective at very high frequencies. Another serious difficulty in this range is the fact that the time required for an electron to travel from the grid to the plate is quite comparable to the duration of one oscillation. A large number of electrons will then be drawn up to the grid while it is positive, will pass through it and be repelled toward the plate while the grid is negative. The energy for this action on the electrons must come from the grid circuit, and since the grid circuit is one of high impedance, a serious loss in grid voltage will ensue. In the limiting case, the grid voltage falls so low that the system ceases to operate. This effect is minimized, first, by speeding up the electrons through the use of high voltages, and second, by spacing the tube elements very close together. The capacitance of the tube is neutralized by the addition of a screen grid.

The Western Electric No. 240 H vacuum tube recently described by Mr. Samuel before the *Institute of Radio Engineers* has two sets of elements mounted inside the same glass envelope. These are connected to the external circuit to form a push-pull arrangement. Elaborate provisions have been made for shielding the two elements and using very short leads from the envelope to the active elements. Very small spacing between elements is provided by careful manufacture and long insulation paths to permit high plate voltage. As a result this tube has an input resistance at 150 million cycles of 30,000 ohms as compared to 1,000 ohms for a typical tube of the conventional type. At 300 million cycles the input resistance of the 240 H vacuum tube is still above 5,000 ohms, while for conventional tubes it is so low as to make them completely inoperative. When operating as a class "A" amplifier at 150 megacycles, an output of one watt is obtained with the distortion 40 db below the fundamental. Under these conditions the stage gain is 20 db. Output of 10 watts with a plate efficiency of 60 to 70% and a gain of 20 db are secured with class "B" operation.



Cross-sectional view of the new 240-H.

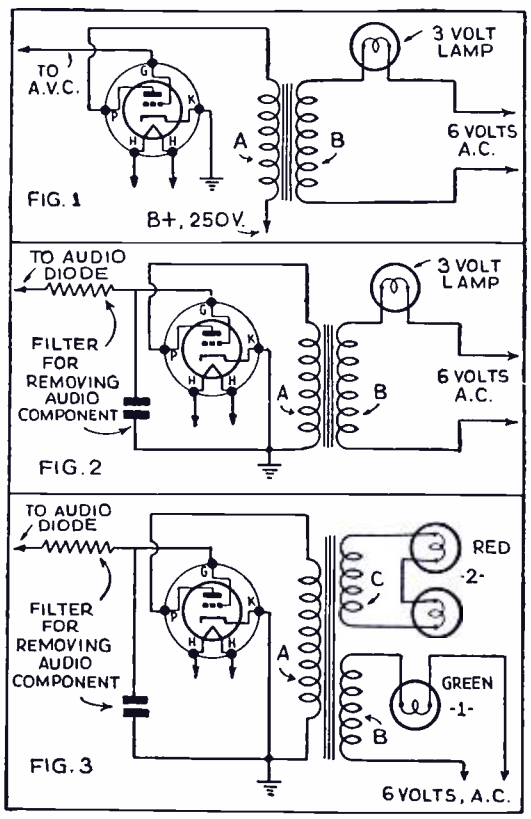
The Spectrumatic Tuning Indicator

By Paul Smith

● TIME was when the radio listener needed no other indicator than his ear to tell him when the receiver was properly tuned. He had several tuning controls, usually three, each of which he adjusted to maximum volume. Later these three tuning controls were connected together so that he need tune only one. However, it was still a matter of adjusting this control for maximum volume.

Several years ago sets with *automatic volume control* (AVC) became popular. With AVC the ear was no longer an indicator of correct tuning. If the set was slightly detuned, the AVC automatically increased the receiver gain so that the volume, from a given station, was essentially constant through a considerable range of tuning. However, the quality is best only when the set is accurately tuned. This condition made tuning indicators essential in the better grade radios.

The first tuning indicator used was merely a plate current meter. It had several rather serious defects, since the current being measured was quite low the meter necessarily was not only expensive but extremely delicate. It was slow acting due to the momentum of relatively heavy moving parts and was insensitive to slight changes of tuning. In the following years the tuning meter went through several changes up to the shadow tuning stage. However, it was still a meter, still delicate and still insensitive. It was required that the operator watch two points at once, in other words, keep one eye on the tuning indicator and the other on the dial.



Three interesting circuits showing development of the new spectrumatic tuning indicator. This arrangement works independently of signal strength and requires no adjustment for different signal strengths.

The next evolution of the tuning indicator was the cathode-ray tube or better known as "Magic Eye." In this magic eye several defects of the mechanical type meter were eliminated. It is considerably more sturdy, it is quick acting and is somewhat more beautiful than the meter. It was, however, often even less sensitive than a meter and requires watching two points.

Paralleling this evolution almost from its very beginning, is the Midwest Color Spectrumatic Tuning Indicator. Several years ago Midwest engineers recognized these defects and broke a new and better trail to the desired results. In its original form (See Figure 1), the indicator was called a Tunalite. The pilot light which illuminates the dial was used also as the indicator. As the station was tuned in, the brilliancy of the pilot light was decreased. In this application a dependable standard radio tube and pilot light replaced the meter. In the circuit shown in Figure 1, the AVC voltage was applied to the grid of a triode. In the plate circuit of this triode was a saturable core reactor. When the receiver was not tuned to a signal, the plate current of the triode was high. This direct current, flowing through winding "A," saturated the iron core. Under these conditions winding "B" of- (*Continued on page* 638)

WORLD-WIDE SHORT-WAVE REVIEW

—Edited By C. W. PALMER

German "Acorn" Tubes

● GERMAN radio men now have "acorn" tubes to use in U.H.F. apparatus, according to a report in the latest issue of *RAFA* (Stuttgart).

The tube is similar in size to the American 955 type but is different in shape, having a ring-shaped seal-off at the lower end instead of the center as found in the American tubes.

This new tube, shown in the illustration here, is made by Telefunken and is being used in the transmitters and receivers in their latest micro-wave experiments.

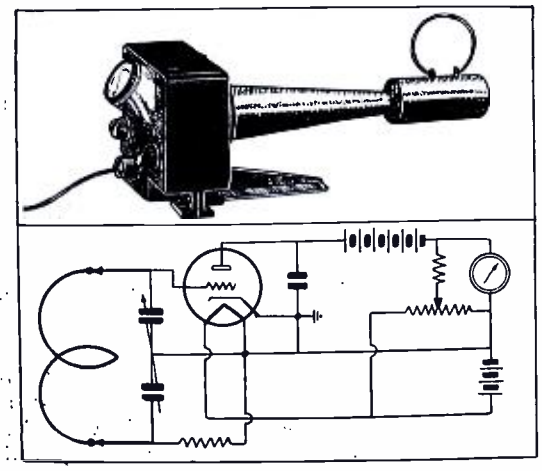
Ultra-Short Wavemeter

● THE correct adjustment of an ultra-short wave transmitter, whether it is a ham "rig" or a commercial set-up, requires the services of a dependable wavemeter. The usual type employed is the absorption type which is placed in inductive relation to the coils or wiring of the xmitter and thus picks up a certain amount of power, depending on the state of resonance or mis-match between the two circuits. Thus the brightest light or greatest meter deflection is obtained when the two are exactly in resonance.

A commercial absorption wavemeter for the wavelengths between 3 and 12 meters was shown in the latest issue of *L'Onde Electrique* (Paris). This device which is available commercially is accurate to within 0.1 of one per cent over the waveband covered. It consists of a single triode tube which acts as a detector, the plate current of which varies with signal intensity. A balancing or zero-adjusting resistance circuit is used so that the meter reads zero until a signal is received.

The waveband between 3 and 12 meters is covered in four steps, with four coils which are tuned by a split-stator condenser having a high-ratio dial.

While not often used for the purpose, a sensitive absorption wavemeter can be used for adjusting receivers as well as transmitters. In the case of super-regenerative sets, the detector is oscillating and in the superteterodyne type, the local oscillator can be used to pickup a signal in the wavemeter which then reads the oscillator frequency and not that of the input signal. However, this is very handy for calibrating U.H.F. sets.



Hook-up and appearance of wavemeter for ultra short waves.

● The Editors have endeavored to review the more important foreign magazines covering short-wave developments, for the benefit of the thousands of readers of this magazine who do not have the opportunity of seeing these magazines first-hand. The circuits shown are for the most part self-explanatory to the radio student, and whenever possible the constants or values of various condensers, coils, etc., are given. Please do not write to us asking for further data, picture-diagrams or lists of parts for these foreign circuits, as we do not have any further specific information other than that given. If the reader will remember that wherever a tuned circuit is shown, for instance, he may use any short-wave coil and the appropriate corresponding tuning condenser, data for which are given dozens of times in each issue of this magazine, he will have no difficulty in reconstructing these foreign circuits to try them out.

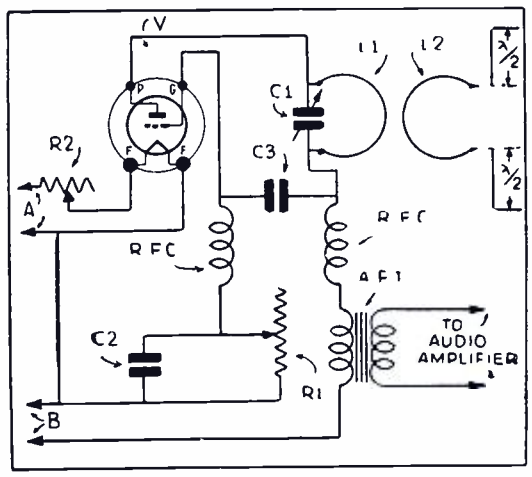


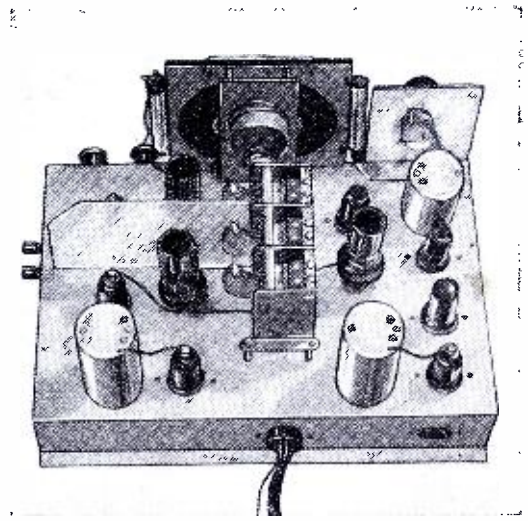
Diagram of French 3-10 meter receiver.

A French 3-10 Meter Receiver

● IN connection with some experiments on the wavelengths of 3 to 10 meters being conducted by the *Societe des Radioelectriciens* and described in the latest issue of *L'Onde Electrique* (Paris) the circuit shown here was printed.

The set is a super-regenerative one using a single tube which performs the three functions of R.F. oscillator, quench oscillator and detector. The beat frequency is controlled by a variable resistance R1 in the grid circuit of the tube. The tuned circuit is connected in the plate of the tube and a small condenser C3 provides the necessary grid-plate coupling needed for oscillation.

(Continued on page 636)



Six-tube short-wave Superhet in which a regenerative first detector is used.

An Australian S.W. Superhet

● TO give the reader an idea of what is going on "down and under" in Australia, the circuit of a 6-tube short-wave superhet published in a recent issue of *Wireless Weekly* (Sydney) is shown here.

The set uses American tubes, which seems to be the rule rather than the exception there, and it will be noted that the tubes chosen are among the later developments in the "metal" line.

The set uses plug-in coils in the aerial, interstage and oscillator circuits, so that the greatest possible efficiency can be achieved even at the cost of making the set less handy to operate.

For the reception of C.W. signals and to simplify the tuning of weak 'phone carriers, a beat oscillator is coupled to the 6Q7 second detector, by using the diode plates as a coupling means. This prevents detuning the I.F. coil and also allows the use of a high-efficiency high-mu triode detector.

It will be particularly noticed that the first detector, a 6L7, is used as a regenerative circuit. The author claims that this steps up the gain so much that only a single I.F. stage is needed. However in the Editor's opinion one would have to be very, very careful in the adjustment of this regeneration to keep the detector out of oscillation, which would cause the set to go hay-wire. There is no doubt, of course that high sensitivity can be obtained in this way with a minimum of tubes.

The values of the parts are indicated on the circuit for those who may wish to experiment with it.

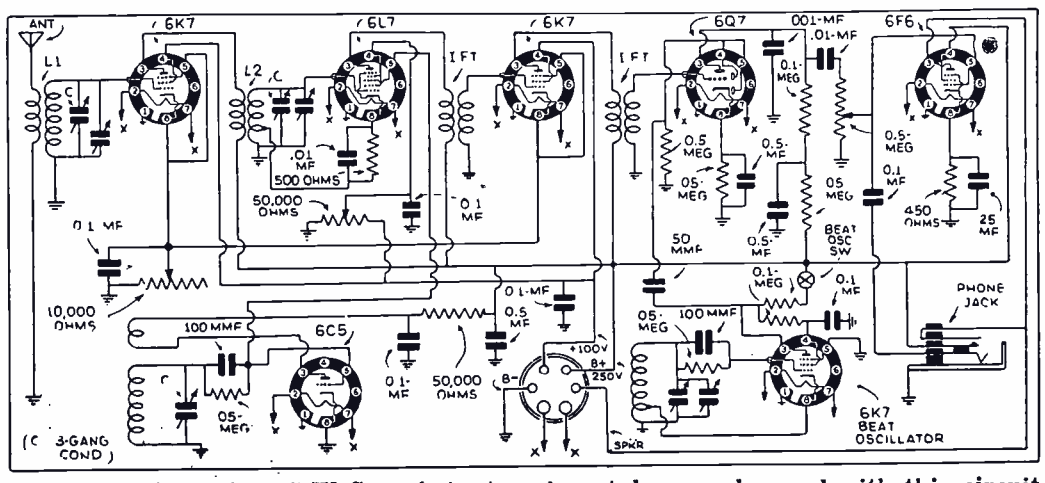
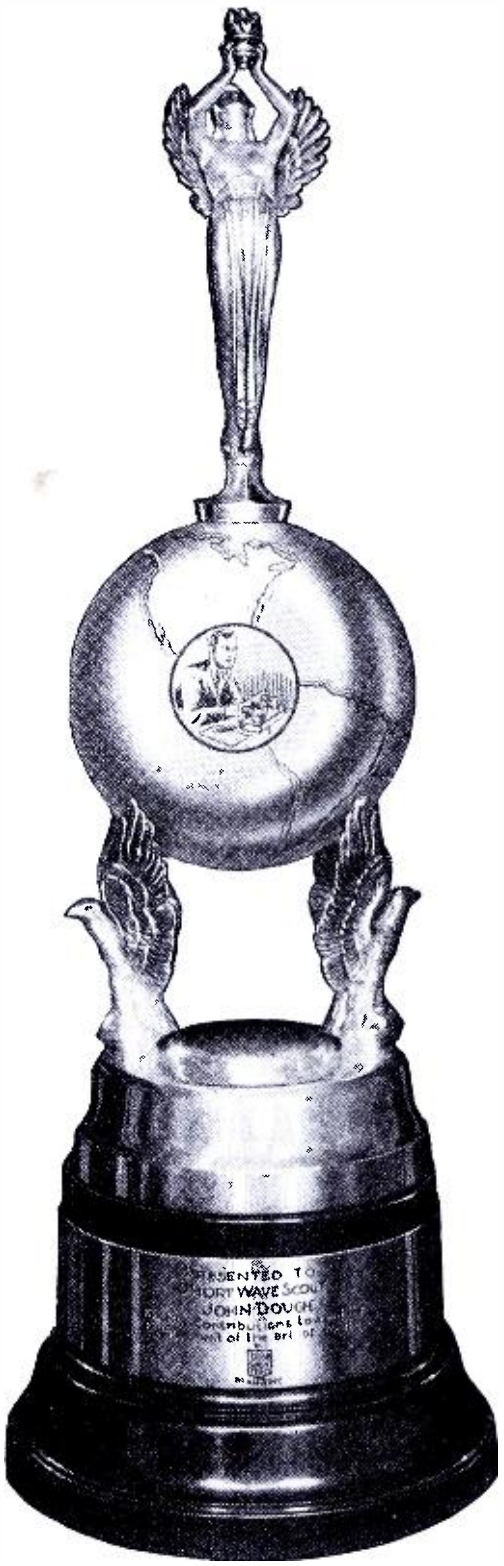


Diagram of Australian S-W Superhet. American tubes can be used with this circuit.



SHORT WAVE . SCOUTS

THIRTY-FIFTH TROPHY

Presented to

SHORT WAVE SCOUT

FLOYD REESE

2241 Pierce Avenue
Niagara Falls, N.Y.

For his contribution toward the advancement of the art of Radio

by

SHORT WAVE TELEVISION

Magazine

35th TROPHY WINNER

98 Stations—76 Foreign

● We take pleasure in awarding the thirty-fifth trophy to Floyd Reese, Niagara Falls, N.Y., who had 98 verification cards which came within the rules of the contest. Seventy-six of these were from *foreign* stations. Mr. Reese used a 10-tube General Electric receiver, but failed to state what type of antenna employed. Congratulations, Mr. Reese, and we sincerely hope you enjoy the Trophy. Just the opposite of last month, when we received only one entry, this month we received a number, all ranging from 73 to 98 entries, proving that the boys are staying on the job.

Some of the contestants for this thirty-fifth Trophy sent in lists numbering as high as 115 stations, but only sent in from 70 to 75 cards, stating that the others had not been received. We wish to point out that the list should coincide with the cards which you enter in this contest. Those stations listed, for which cards are not sent, are disqualified and are of no particular value in the contest, besides complicating the checking to a considerable degree.

Also, we wish to point out again that your cards should be stacked in the package *in the same order* as the stations are listed, in order to facilitate examination.

The list of stations received and verified by this month's winner follows:

Call Freq. Station Name and Location
W1XAL, 6,040 kc., Int. University of the Air, Boston, Mass.
W1XAL, 11,790 kc., Int. University of the Air, Boston, Mass.
W1XK, 9,570 kc., Westinghouse Electric, Boston, Mass.
W2XAF, 9,530 kc., Voice of Electricity, Schenectady, N.Y.
W2XAD, 15,330 kc., Voice of Electricity, Schenectady, N.Y.
W2XE, 15,270 kc., Atlantic Broadcasting Co., New York City.
W2XE, 11,830 kc. Atlantic Broadcasting Co., New York City.

(*Continued on page* 647)

Honorable Mention

George Pasqualle, Kansas City, Mo.

R. D. Wade, Amarillo, Texas

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

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

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

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

Trophy Contest Entry Rules

● THE rules for entries in the **SHORT WAVE SCOUT Trophy Contest** have been amended and 50 per cent of your list of stations submitted must be "foreign." The trophy will be awarded to the **SHORT WAVE SCOUT** who has logged the **greatest number** of short-wave stations during any 30 day period; (he must have at least 50 percent "foreign" stations). This period need not be for the immediate month preceding the closing date. The complete list of rules appeared in the September 1935 issue.

In the event of a tie between two or more contestants, each logging the same number of stations (each accompanied by the required minimum of 50 percent "foreign") the judges will award a similar trophy to each contestant so tying. Each list of stations heard and submitted in the contest must be sworn to before a Notary Public and testify to the fact that the list of stations heard were "logged" over a given 30 day period, that reception was verified and that the contestant personally listened to the station announcements as given in the list.

Only commercial "phone," Experimental or Broadcast stations should be entered in your list, no "amateur transmitter" or "commercial code" stations. This contest will close every month on the 25th day of the month, by which time all entries must be in the editors' hands in New York City. Entries received after this date will be held over for the next month's contest. The next contest will close in New York City January 24th; any entries received after that date will be held over till the next month.

The winner each month will be the person sending in the greatest number of **verifications. Unverified** stations should **not** be sent in as they will not count in the selection of the winner. At least 50 percent of the verifications sent in by each listener must be for stations located **outside** of the country in which he resides! In other words, if the contestant lives in the United States at least 50 percent of his "veries" must be from stations **outside** of the United States. Letters or cards which do not specifically verify reception, such as those sent by the Daventry stations and, also by commercial telephone stations will not be accepted as verifications. **Only letters or cards which "specifically" verify reception of a "given station," on a given wave length and on a given day,** will be accepted! In other words it is **useless** to send in cards from commercial telephone stations or the Daventry stations, which state that **specific** verifications will **not** be given. Therefore do not put such stations on your **list** for entry in the trophy contest!

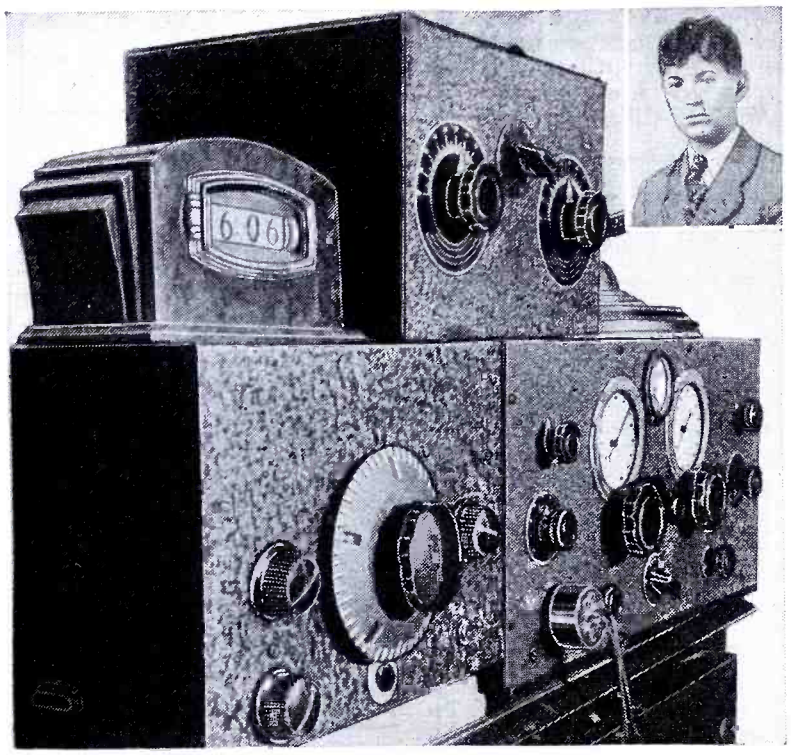
SHORT WAVE SCOUTS are allowed the use of any receiving set, from a one-tuber up to one of sixteen tubes or upwards, if they so desire.

When sending in entries, note the following few simple instructions: Type your list, or write in ink, **penciled matter is not allowed.** Send verification cards, letters and the list all in one package, either by mail or by express prepaid; **do not split up the package.** Verification cards and letters will be returned, at the end of the contest, to their owner; the expense to be borne by **SHORT WAVE & TELEVISION** magazine.

In order to have uniformity of the entries, when writing or typing your list, observe the following routine: USE A SINGLE LINE FOR EACH STATION; type or write the entries IN THE FOLLOWING ORDER: Station call letters; frequency station transmitts at; schedule of transmission if known (all time should be reduced to Eastern Standard which is five hours behind Greenwich Meridian Time); name of station, city, country; identification signal if any. Sign your name at the bottom of the list and **furthermore state the type of set used by you to receive these stations. State total No. stations.**

SHORT WAVES and • • • Our Readers Forum. LONG RAVES

Robert Irwin's S-W Listening Post Photo Takes Prize



S-W "Listening Post" of Robert R. Irwin, Chicago, Ill. Looks like business—and it is!

Editor, SHORT WAVE & TELEVISION:

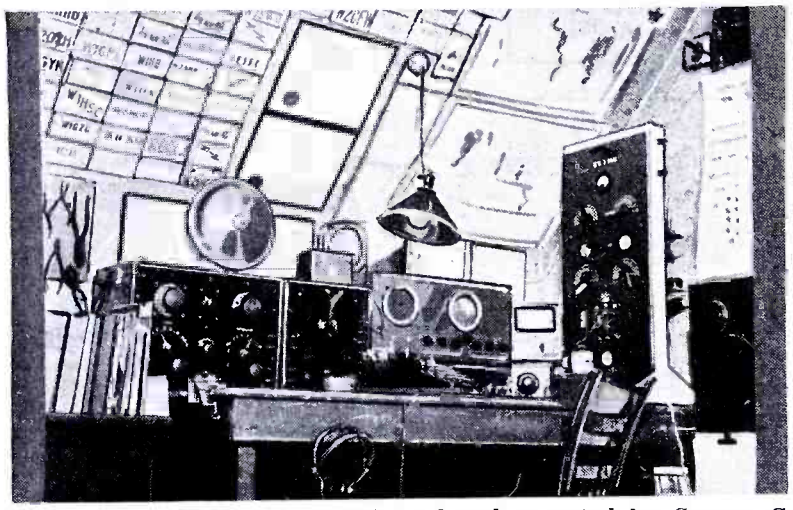
The photo at the left shows a close-up view of my short-wave receiving equipment. At the left of the photo is the receiver described in the April, 1936, issue of *Short Wave Craft*. The receiver to the right is an RME 9D. Beside the direct-reading dial clock, is the Antenna System Tuner that was described in the April, 1935, issue of *Short Wave Craft*. I use Trimm phones instead of the speaker for most of my tuning. The aerial is a "guy wire" type doublet. I have a nice collection of verification cards which doesn't show in the photo.

I enjoy the short-wave "Kink" feature of your magazine, besides the many other articles.

Very truly yours,
ROBERT R. IRWIN, 918 W. Gunnison St., Chicago, Illinois.

(Glad to see that you have profited from some of our designs, which are worked out at considerable expense. Let's hear from more of our "S.W.&T." set constructors.—Editor.)

George Coffin Has "Live" Ham Station



Boy! what a Ham Station! Owned and operated by George C. Coffin, VE1HH, of Charlottetown, P.E.I.

Editor, SHORT WAVE & TELEVISION:

The lineup is 47 Xtal osc., 46 buffer or doubler and a pair of 46's in the final run at 75 watts input. The "sky" wire is a current-fed, half-wave 40 meter "rig," with series tuning on 3.5 mc. and parallel on 7 mc. Use three crystals and work all bands.

The receiving end is taken care of by an ACR-136 receiver. The other receiver is a ship-board type using three 230 tubes and covers from 200 meters to 4,200 meters.

VE1HH is an ORS also OBS but is glad to have a good "rag-chew" anytime. The station has three operators, the OM who is also an opr in the Militia unit, a YL opr and also a RCNVR opr.

Will be glad to swap photos of the "rig" with anyone.

GEORGE C. COFFIN, VE1HH,
15 Pownal St.,
Charlottetown, P.E.I.

(A fine "rig"—sounds like business.—Editor.)

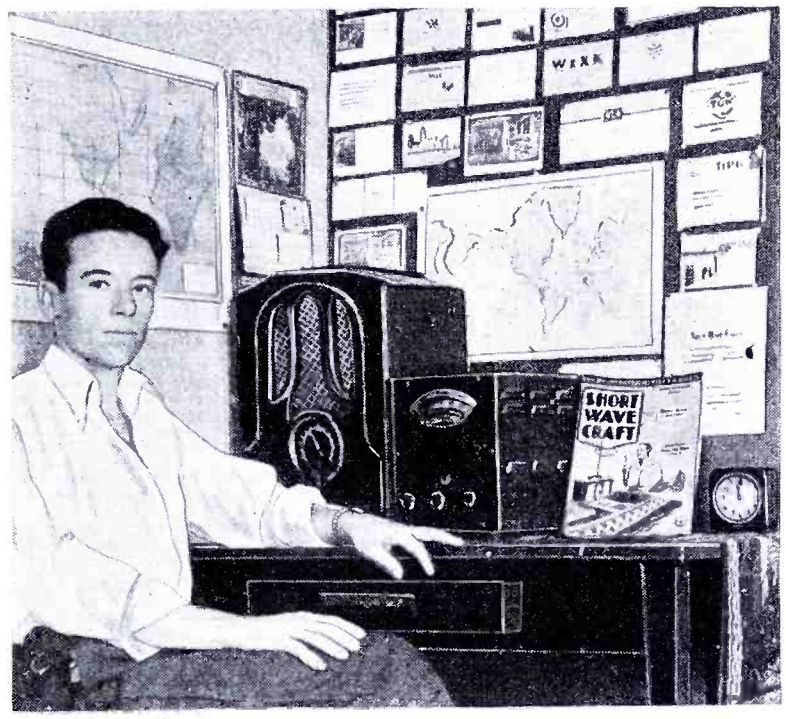
W8PIF Has Fine "Ham" Station

Editor, SHORT WAVE & TELEVISION:

W8PIF has 80 watts input to the final amplifier and consists of a 47 xtal osc.; a 210 buffer and a pr. 210's in push-pull in the "final." DX is W 1-2-3-8-9 and VE 3.

At left—National FBXA Superhet; then comes the speaker, with lamp mounted on top of it, then the monitor, with ear

(*Continued on page* 634)



Jack Knapp's S-W "Listening Post," located at Los Angeles, Calif.

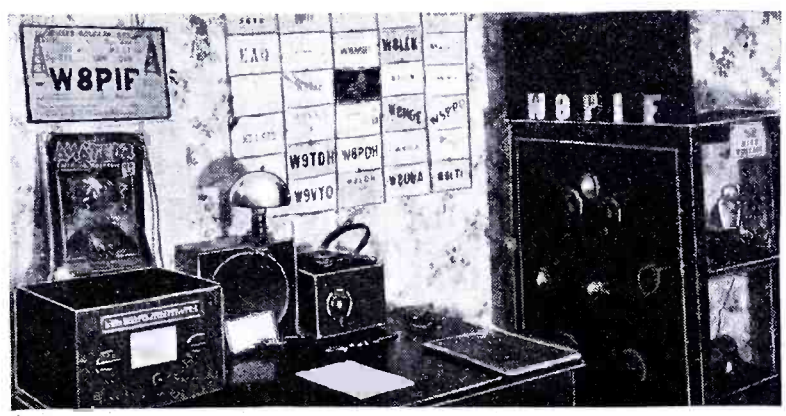
Jack Knapp Has Swell Listening Post

Editor, SHORT WAVE & TELEVISION:

The accompanying photo shows my short-wave listening post and some of the Q. S. L. cards I have received from various stations. I have accomplished some very fine DX work at this post. My receiving set is a home-built superhet equipped with a beat oscillator. I also have a Patterson pre-selector. I am a member of the *Short Wave League*. I have been reading your magazine for a long time and think it is just about "tops."

JACK KNAPP, 737 Fraser Ave., Los Angeles, Cal.

(Looks like a very fine Listening Post and why not give our readers the benefit of your experience in designing and building the superhet, if you have any new ideas incorporated therein.—Editor.)



P. A. Donaldson, W8PIF, operates this crack "Ham" station.

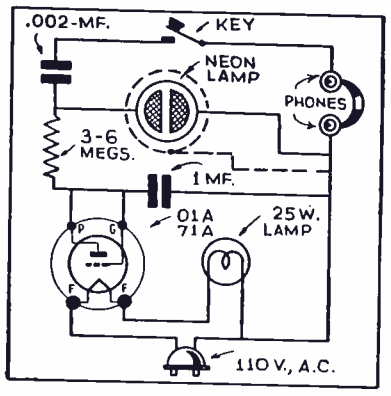
$5.00 FOR BEST SHORT-WAVE KINK

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

$5.00 PRIZE

ELECTRIC CODE SET

As I haven't seen an A.C. Neon Code Oscillator published here yet, I am submitting the following circuit with the hopes that it will be accepted. The diagram is self-explanatory. It might be added, however, that if the tone is "fuzzy" it is advisable to reverse the line plug. If the tone still has a slight ripple, wind one turn of insulated wire around the top of the neon tube, connected as shown by the dotted line, should solve this difficulty. I mounted my outfit on a piece of ply-wood 5 x 11", and therefore assume that the slight ripple in the tone, without the neutralizing wire, is due to the close proximity of the 25 watt bulb. The power-plant and neon may be covered by a square tin, leaving only the phone clips and key exposed. —Herbert R. Roach.



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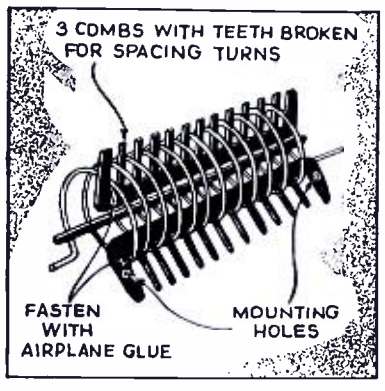
COIL MOUNTING



This is my favorite kink. To make this kink you obtain three combs which you think will fit your transmitting coil. In this case, I broke every other pin and the coil plus combs fitted perfectly. To hold the combs in place, I used airplane glue. To mount the coil in my case I used "stand-off" which looks like this. The comb of course is a natural insulator for the coil.—Thomas Bailey.

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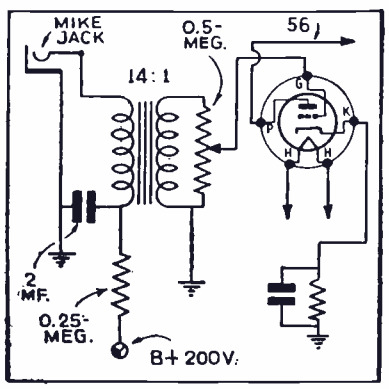
MIKE CURRENT FROM PLATE SUPPLY

Many readers will be interested in learning the method I use to obtain mike current directly from my power-supply. The method is very simple. A 250,000 ohm resistor is connected in series with the B plus and mike. The other side of the mike is grounded. The 2 m.f. by-pass condensers shown in the drawing, together with the resistor, insures a minimum of



hum. The mike current in this case will be approximately 1 ma., depending of course upon the resistance of the microphone.—George Wadey.

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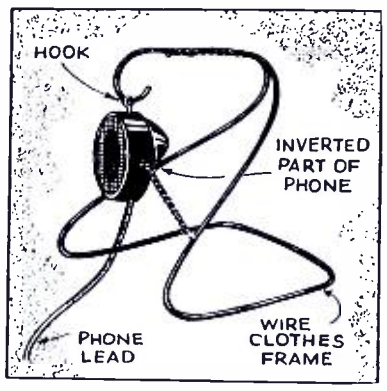
MIKE STAND

My kink is a single-button mike taken from a French phone. First take the mike out of its two shells. The one which was on the front of the mike is inverted and four holes are drilled to hold screws so that it may be mounted on a frame of some kind. The frame which I am using at the present time is a steel clothing hanger bent so that the mike can be mounted on it. Refer to the drawing for further details.—Howard Miller.



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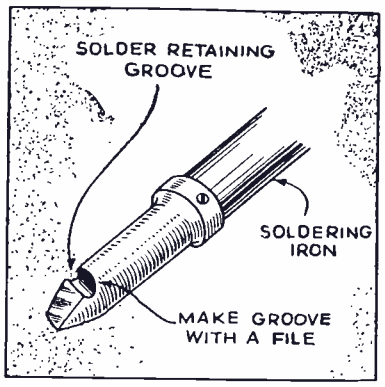
WIRE-TINNING TIP FOR FOR IRON

Recently, I had a task requiring the use of a great deal of tinned wire. I hit upon an idea which I consider very practical and it certainly is a time-saver. I am submitting the kink for those who would like to try it, and you will be amply repaid for the little trouble you have in making the tip. I made my tip from a brass rod, having the same diameter as the other tips of my iron. The design is wide faced as you can see from the sketch. Make the tip as shown, and when complete use a small rat-tail file to make the groove, as indicated. When finished, tin the tip, including the groove and allow the groove



to fill with solder. To tin your wire, have it thoroughly cleaned and lightly coated with a small amount of soldering paste.—Alfred M. Turner.

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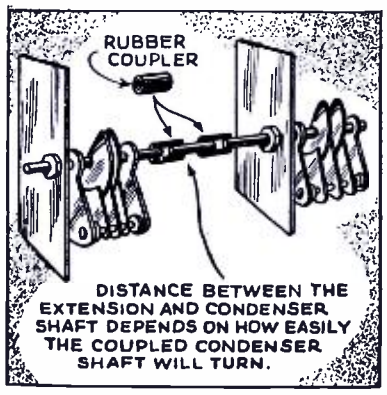
CONDENSER COUPLING

Here is a sketch of a condenser coupler which you may be interested in. It may be used temporarily or permanently. The condenser coupler is a rubber tube. The inside diameter of the rubber tube should be a little smaller than the condenser shaft, so that when the condenser shaft is inserted in the rubber tube it will fit snugly. The wall of the rubber tube should be about 1/16th of an inch. The condenser shafts need not be perfectly in line. I used a small piece from a rubber siphon for my coupler.—Riyoso Masuda.



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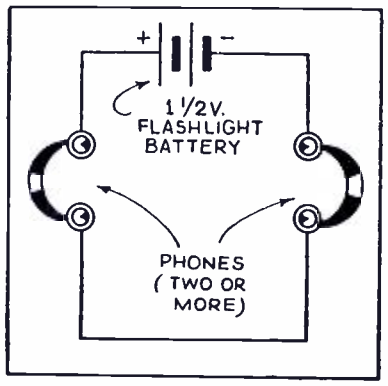
CUTS DOWN BOOT-LEGGING

I have been experimenting with a great many telephone circuits, but found this one to be the simplest and the most efficient. In fact they worked so well for me that I am installing several in my home. The circuit contains two pairs of earphones, or as many as you wish, and one battery. This kink ought to help the 5-meter bootlegging problem a little.—Latham Clarke. (Well said, m'lad—Ed.)



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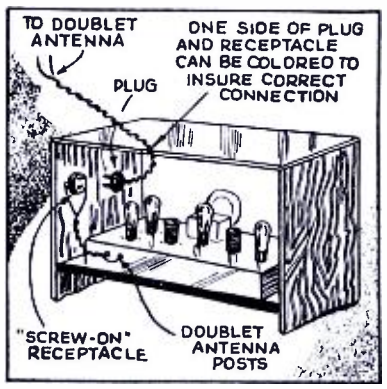
PLUG FOR ANTENNA

Herewith is a kink which I have found very helpful whenever it became necessary or convenient to remove the doublet antenna from my set. On most sets this seems to involve untwisting the wires from around a pair of screws which is not only bothersome, but often causes the wires to break off. With this inexpensive "plug receptacle" arrangement, one can quickly and conveniently disconnect the antenna from the set for any purpose, such as moving the set or isolating it during a severe thunderstorm, etc.—William F. Boyle.



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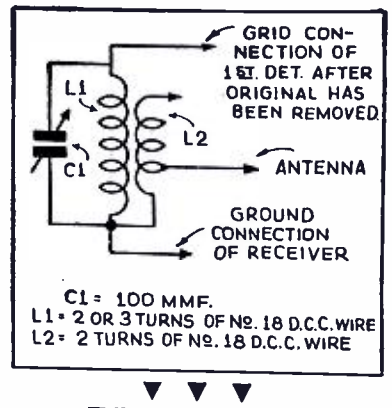
CONVERT YOUR SUPER TO 10 METERS

Herewith is a kink which enables owners of band-switching superhets to put their receivers on 10 meters. This kink enables a person to "listen on 10" with only a slight reduction in volume over that on 20 meters. With the bandswitch on the 20-meter band and the grid connection on the converter made and with the converter ground on the receiver ground and the antenna on the antenna coil. Tune the set the same way as on 20 meters, only the 10-meter band will fall on some other part of the dial. Also, tune the converter grid condenser until the minimum noise level is obtained. You are then ready for 10 meter reception.—Lloyd M. Isaacson.



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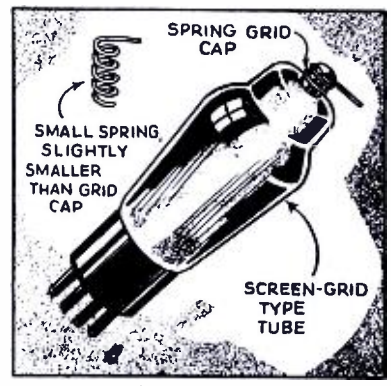
F.B. GRID CLIP

The sketch herewith shows my emergency grid clip and it works so well that I use it most of the time. The spring should be slightly smaller than the grid cap on the tube so that it will fit tightly. When putting the spring on, twist it slightly and it will go on easily and fit tightly. This clip can be made part of the grid lead, thus eliminating the necessity for a soldered connection.—Billy Green.



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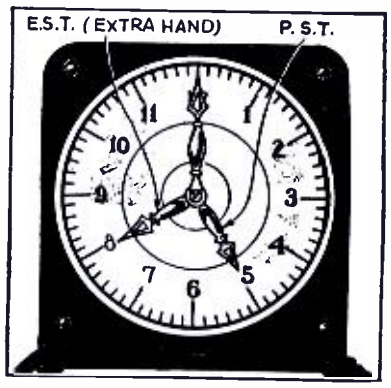
NEW CLOCK IDEA

As you know, most all magazines give schedules of programs in Eastern standard time only. So here is an idea! Just add an extra hand to your present clock, a piece of black wire or anything handy will do, then set it to the zone you live in. Example:—If 5 p.m. P.S.T. set extra hand three hours ahead and it will be 8 p.m. E.S.T. Both hour hands should be soldered together. In this way you don't have to guess at the time the program will be on or look at the clock twice.—Harold A. Vance.



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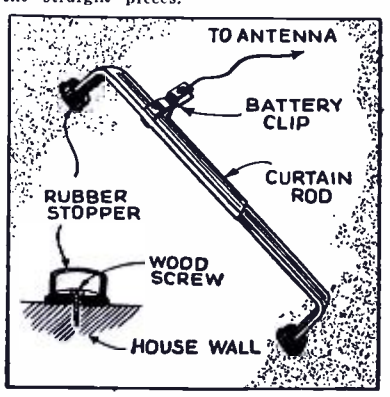
INDOOR ANTENNA

Here is my kink that should interest 5- and 10-meter fans. In the sketch is shown my novel curtain rod antenna on which I have received the 6th and 7th districts on 10 and 20 meters—very often my 1-tube super-regenerative receiver with good volume. The antenna is made of two curtain rods (four lengths) that are tubular. Two of the lengths that have curves on one end must each have the curve cut off, thus eliminating the curves merely using the straight pieces.



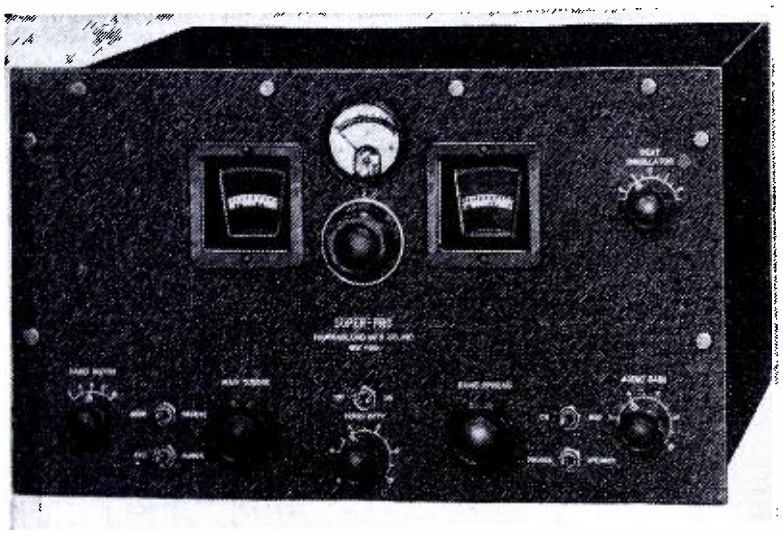
WHAT'S NEW In Short-Wave Apparatus

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

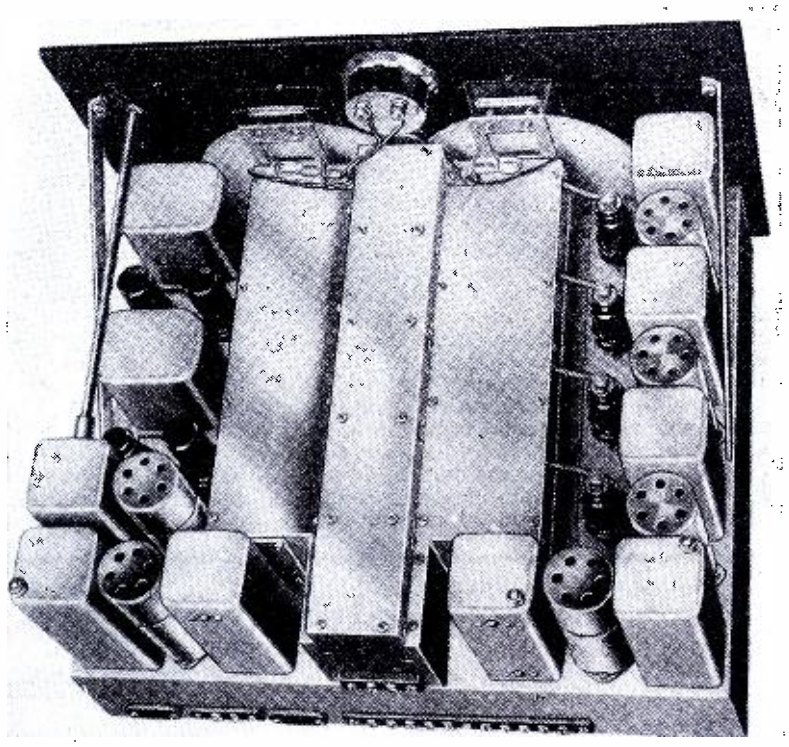
The New "Super Pro" Hammarlund

By Donald Lewis

The latest creation of the Hammarlund engineers is this Super Pro model. It sports a new array of glass and metal tubes, 16 in all. The actual band-widths required may be accurately selected at will. Other new features are a calibrated sensitivity control and an audio-gain control, also calibrated. The receiver covers five ranges: 2.5 to 5; 5 to 10, and 10 to 20 mc. and from 540 to 1160 and 1160 to 2500 kc. It has two tuned R.F. stages.



Front view of new Hammarlund "Super Pro" receiver—it has 16 tubes and covers 5 bands. Beat oscillator for "CW" reception is provided. Bands are selected by a switch.



Rear view of new "Super Pro" chassis. The coil switch mechanism is enclosed in the control shielded compartment. Switches are provided to change from AVC to manual control, also from "send" to "receive."

● MANY new unusual features have been incorporated in an improved model of the "Super Pro" professional receiver just developed in the communication engineering department of the well-known Hammarlund Company.

In this modified model, a combination of glass and metal tubes are being used—eight metal tubes and eight glass tubes—to secure the combined high efficiency afforded by both types.

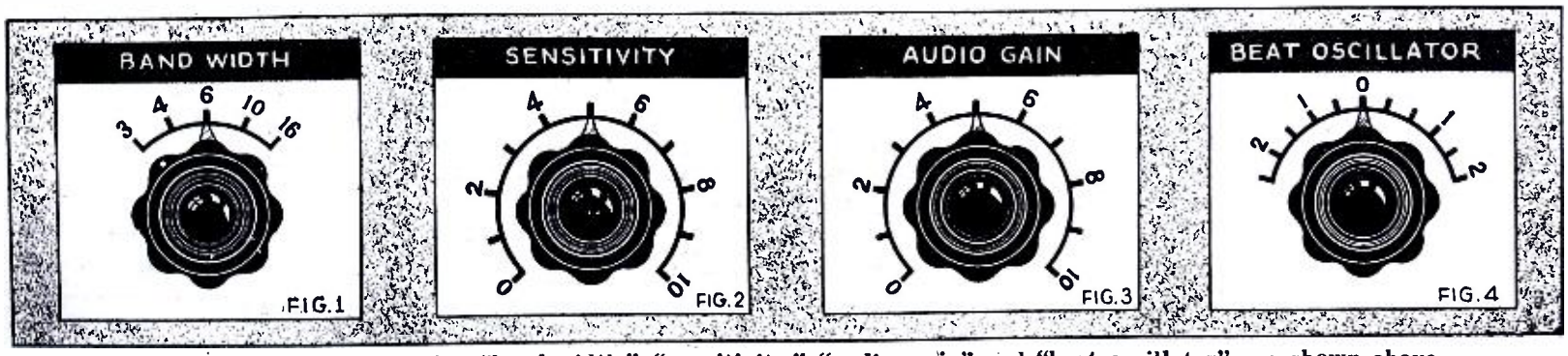
One of the important features of this improved model is a five-range band-width scale engraved on the front panel. With the aid of this exclusive tuning device it is possible, for the first time, to accurately select the *actual* band-widths required. That is, if the operator wishes to tune to, let us say, a band width of 3 kc. or 16 kc., he can actually turn the knob to either one of these calibrations on the panel. In this manner, not only is the highest technical precision achieved, but also the most effective results.

A new calibrated *sensitivity* control and *audio-gain* control represent two more outstanding features. The calibrations of both these controls also appear directly on the panel, and enable the operator to select the proportionate sensitivity or audio-gain required for each signal. Thus, an actual calibrated tuning table can be made for signals from any station.

For the operator interested in C.W. code signals, there is an additional improved new feature—a calibrated beat-oscillator control. With this unit it is now possible to select a beat note of between 0 and 2000 cycles on either side of the carrier with intermediate values available too.

By adjusting the band-width control, a *tone-control* effect is also available, since the high or low notes can be cut off or heard at will dependent upon the band selected. An additional feature of the new "Super Pro" is the special cam switch, which is a fine example of mechanical and electrical engineering skill. In this switch there are five shielded sections with five silver-plated bakelite knives in each unit. Each knife glides into four silver-plated phosphor-bronze spring clips, and each spring clip is divided into two sections. Thus, a positive 6-point contact is made every time a knife is moved via the special brass cams. This switch is so positive that even heavy jars cannot upset it. Leakage is also impossible since the coils not in use are short-circuited.

With the band-width control at the minimum setting or with the primary and secondary of the I.F. transformers farthest away, the selectivity with a signal 10 times the input, is only 5.5 kc. and at 1000 (*Continued on page* 641)

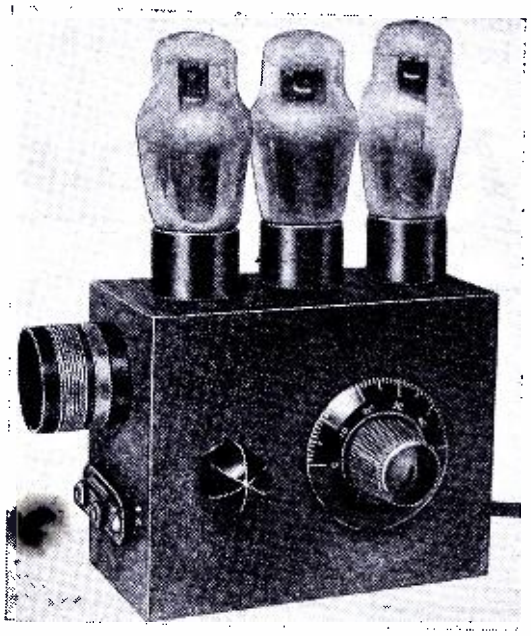


The calibrated controls for "band-width," "sensitivity," "audio gain" and "beat oscillator" are shown above.

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

3-Tube A.C.-D.C. Receiver for the "FAN" . . .

By L. J. Miles, E.E.



Appearance of 3-tube A.C.-D.C. receiver of special interest to the S.W. "Fan." The bands covered are 12 to 600 meters; coils are available to cover up to 3000 meters. The "plate-supply" is built in. No. 595.

● DESIGNED for the short-wave "fan" who wishes to construct an inexpensive yet highly efficient set which will produce excellent results, this compact short-wave receiver uses a minimum of parts in a time-tried circuit. The entire set may be constructed for only a few dollars and will give excellent results.

Examining the diagram, we find that three type 76 (or 37) tubes are used in the well-known regenerative type of circuit. The first of these functions as a grid-leak, grid-condenser type detector, followed by one stage of audio amplification, in order to boost up the volume to a comfortable point. The third tube, by connecting the grid and plate terminals together is used as a rectifier, thereby eliminating the need for batteries of any kind.

Signals are fed into the detector tube through the small series condenser C1, which is adjustable for each coil range. Highly efficient plug-in coils are used in order to cover the range from 12 to 600 meters. Special coils extend this range up as high as 3,000 meters if desired. Tuning is accomplished by means of C3 (0.00014 mf.) which is mounted on the right-hand side of the cabinet. Regeneration is controlled by means of the potentiometer R3 (100,000 ohms) which varies the plate voltage on the detector tube (shown at left-hand side of cabinet). The audio component of the detector output is fed into the grid of the audio frequency amplifier by means of the combination R2-C5-R4, having values of 150,000 ohms, 0.01 mf. and 250,000 ohms respectively. Headphones are connected in the plate circuit of this stage. The line voltage is reduced to the proper value for the filaments of the tubes by means of the line cord R6, which contains a built-in resistor (350 ohms). Thorough filtering action is obtained by the large dual condenser C7 (4 mf. per section) and the resistor R5 (4700 ohms), reducing any trace of hum to a minimum. Condenser C6 (0.01 mf.) prevents any traces of tunable hum from occurring.

The entire receiver is built into a small black shrivel finished cabinet, measuring only 5⅝"x4⅛"x2⅛" and weighing only four pounds. The approximate wavelength ranges of the four short wave coils are 12-22 meters, 22-44, 43-90, 90-200 meters. The two broadcast coils furnished additional cover approximately 200-600 meters. Longer wave coils are available upon request. Tune slowly and in the usual manner with any regenerative receiver.

This article has been prepared from data supplied by courtesy of Eilen Radio Laboratories.

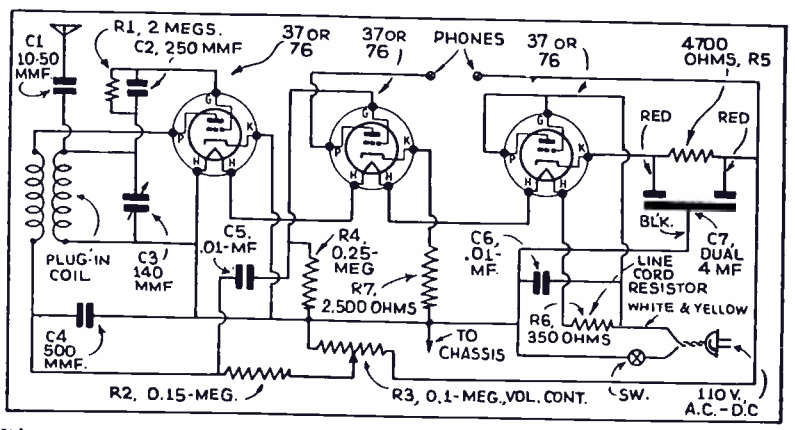


Diagram of 3-tube, 110 volt A.C.-D.C. receiver. A fine "personal" set for use with headphones.

Solving Power-Supply Problems

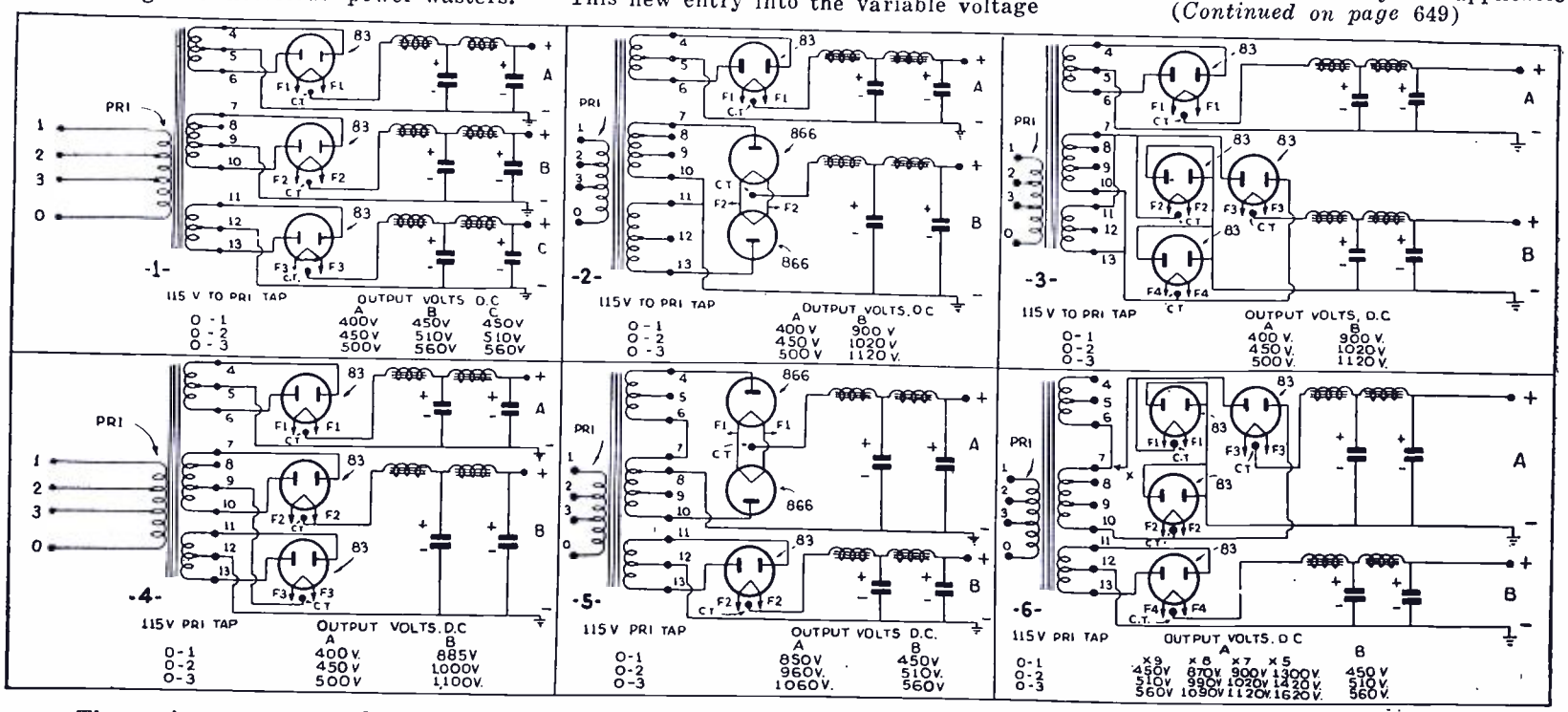
By Richard B. Shimer

● MANY methods, mostly makeshift, have been used to obtain a variety of voltages from a single transformer. Bleeders, series resistors, tapped primaries and secondaries are but a few of these. All have the bad feature of transformer inefficiency and extra cost for the results obtained. Bleeders and resistors for voltage dividing and cutting are notorious power-wasters. Tapped transformers with tapped secondaries are poor aids, though better than resistors.

A prominent manufacturer has recently announced a new type of transformer that eliminates many of the above difficulties and includes new exclusive features that have not been heretofore presented.

This new entry into the variable voltage plate transformer field retains the best features of the old methods—namely a tapped primary for adjusting to line voltage conditions and providing accurate adjustment of the secondary voltages, but doing away with the inefficiencies mentioned before. It has three separate plate windings, designed so that they are applicable

(*Continued on page* 649)



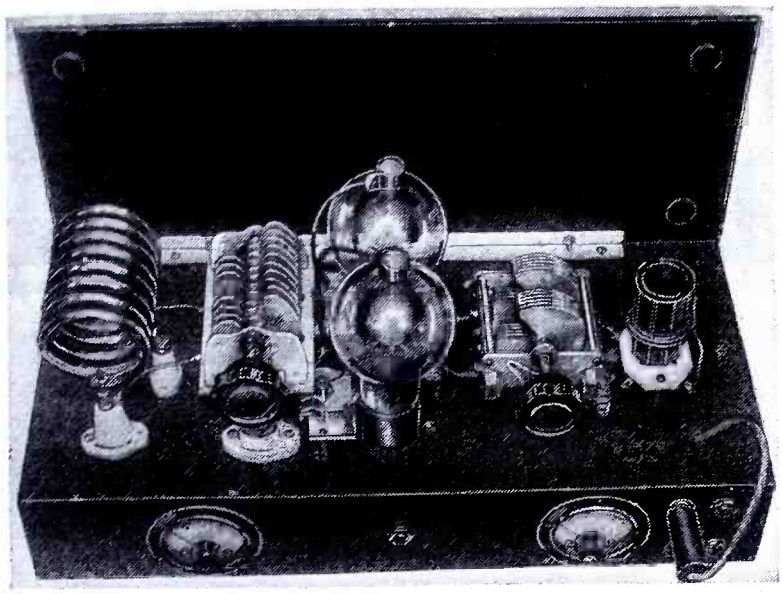
The various power-supply circuits shown above will help to solve most of your problems in this direction. No. 594

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

10 & 20 Meter Transmitter

By George W. Shuart, W2AMN

The 200 watt transmitter described in this article is capable of world-wide "DX." It is compact and efficient and is designed particularly for 10 and 20 meter operation.



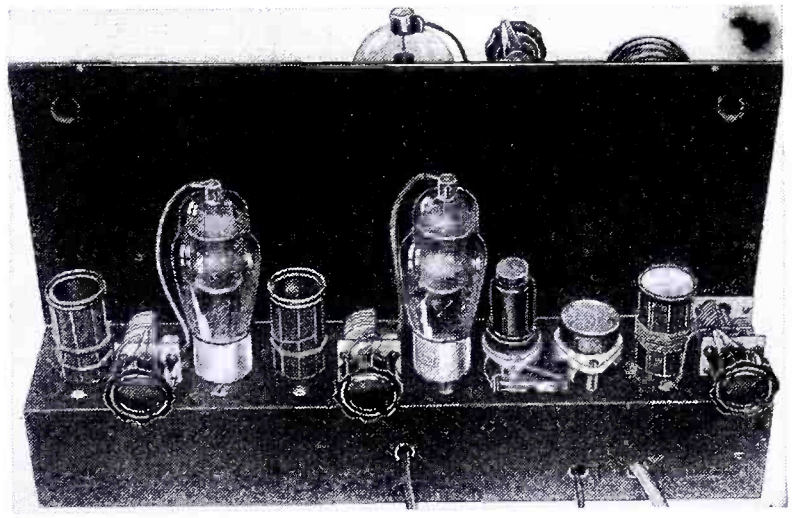
The final amplifier with the 10 meter coils in place.

● DX!—that ever alluring thrill present in amateur radio and for which many gallons of midnight oil has been burned, is best and most consistently accomplished on the 20 and, at the present time, the 10 meter band. With this in mind, we endeavored to construct a simple, compact and efficient transmitter to be used solely for these two DX producing amateur bands.

Of course, in keeping with progress, we have used the latest tubes; tubes which now operate more efficiently at 28 mc. than older type tubes could be made to operate on 3.5 or 7 mc. The main problem in considering the design of this transmitter was whether or not it should be complicated and have an output of some 300 or 400 watts, or of the simplified type with an output of 100 to 200 watts. The difference between the signal of the two transmitters at the receiving end would undoubtedly be very slight, and in most cases the 100 watt transmitter would make as good a showing as one having twice that power. Therefore, the circuit was simplified as much as possible and the output of the transmitter limited to between 100 and 200 watts.

New "Beam" Tubes Used

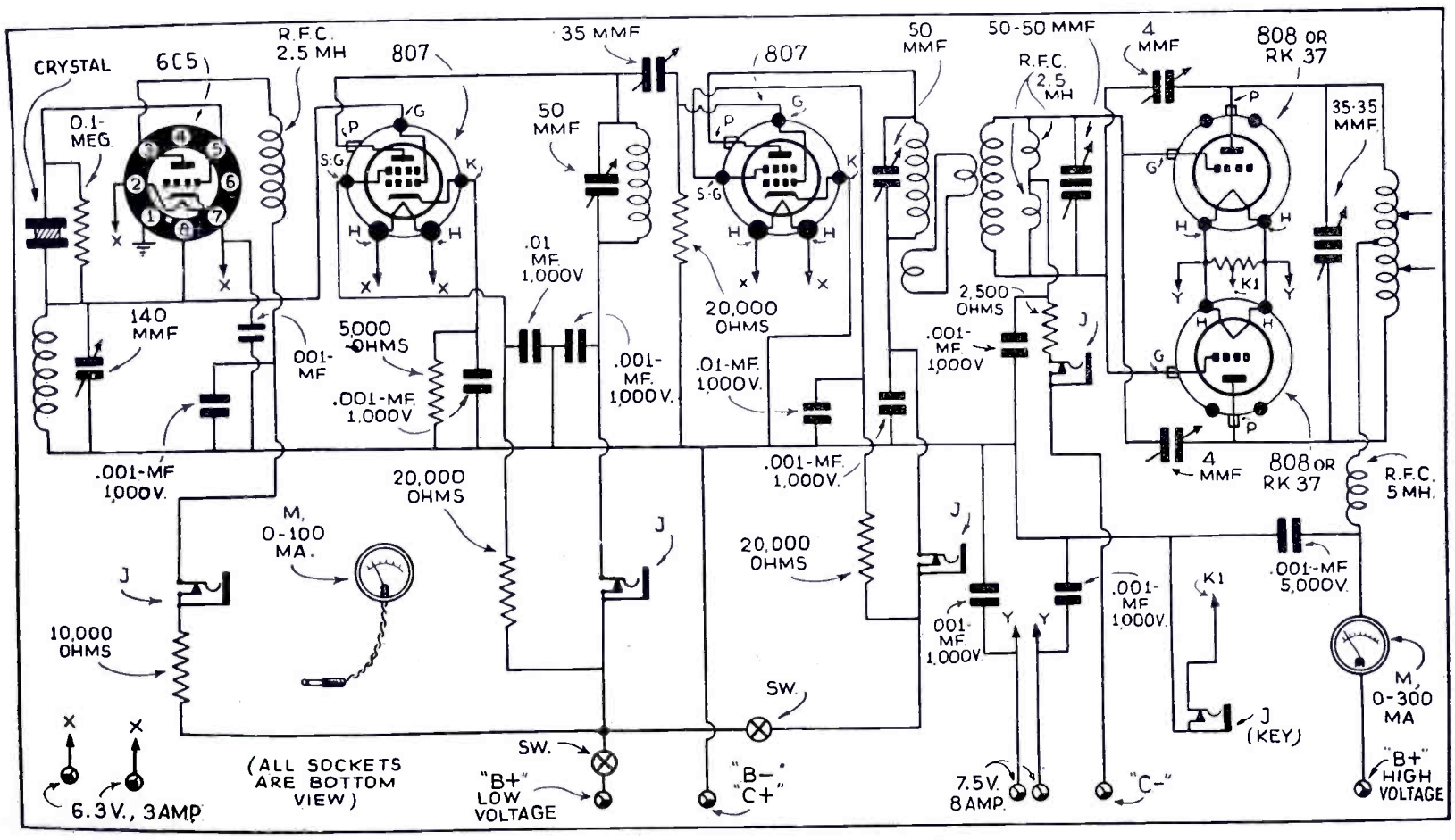
Referring to the photographs, we see that the entire transmitter, excluding the power supply, is mounted on an 11x17 inch chassis. The push-pull high-frequency amplifier stage,



The low-power exciter stages; a 6C5 and two 807's.

shown toward the front of the chassis while the 3-tube exciter unit is along the rear edge. A 7-inch shield separates the two sections of the transmitter. This is done in order to reduce as much as possible the danger of R.F. in the final amplifier seeping back into the low power stages.

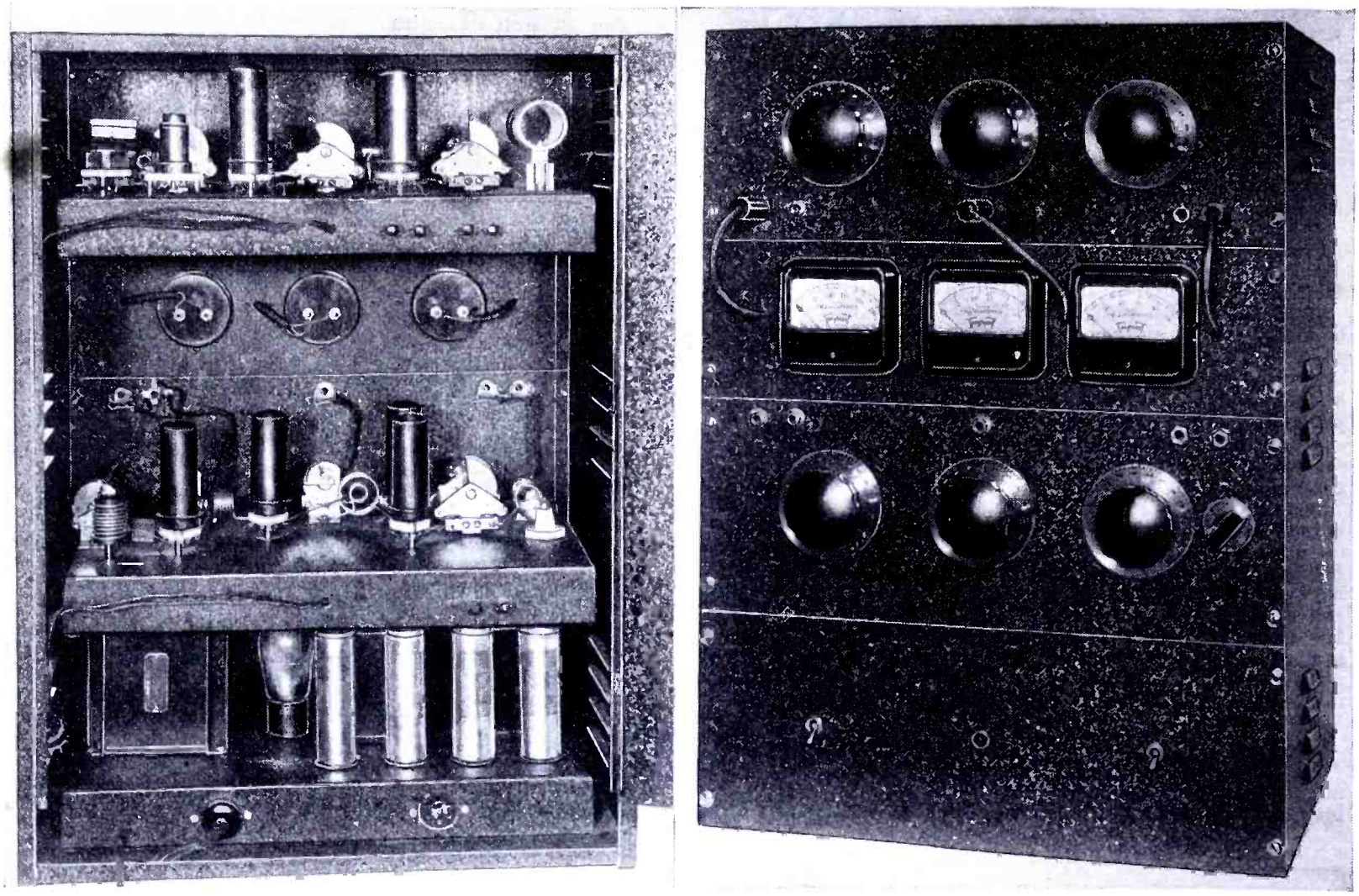
We start out with the 6C5 metal triode direct-coupled to an 807; the latter being the new *beam* tube designed for transmitting purposes. The two tubes form an excellent *crystal-oscillator* and *frequency-* (*Continued on page* 644)



Wiring diagram of the complete transmitter—note its simplicity.

THE RADIO AMATEUR

Conducted by Geo. W. Shuart



Front and rear views, of the complete 80 to 5 meter transmitter, it covers all of the most popular "amateur bands."

A 1937 DESK TYPE Transmitter

By George W. Shuart, W2AMN

Part 3—Conclusion

This is the third and final installment of the "1937 Desk Type Transmitter." Complete information is given regarding the power-supply and the photos show the complete transmitter. This is an outfit of which anyone might well be proud and its performance is "tops!"

● IN the two previous installments of the "Desk Type Transmitter," the R.F. units were described. One of these was for all bands from 80 down to 10 meters and the other was a complete 5-meter MOPA. As previously suggested, the two transmitters are operated from a *single* power-supply but, of course, not at the same time. This installment covers in details the power-supply unit and shows the complete transmitter.

As can be seen in the photograph, the transmitter consists of three 7 inch panels and one 5 inch panel. Starting at the bottom we have the power-supply, and then the 5-meter transmitter; above this is the panel containing the three transmitters; finally at the top is the *low-frequency* or 80 to 10 meter transmitter.

The jacks for measuring various currents in both transmitters have been so located that the meters may be plugged from one transmitter to the other. For instance, in the 5-meter transmitter the jacks are at the top edge of the panel, while on the other transmitter the jacks are along the bottom edge of the panel. Each of the three meters is equipped with a plug for switching from one transmitter to the other. The method of switching the power-supply from one transmitter to the other depends upon the desires of the constructor. In this particular arrangement we have resorted to plugging in the desired transmitter at the rear edge of the power supply chassis. However, a much better arrangement would be a three or four pole double-throw switch. Really, a three-pole switch would suffice because the B minus can be common to both transmitters.

Parts 1 and 2 of this article on a Desk Type Transmitter appeared in the December and January numbers.

On the front of the power-supply panel we have two switches and a pilot light. One switch is for turning the entire transmitter on and is connected in the 110 volt line, while the other breaks the center tap of the high-voltage winding on the transformer, allowing the B voltage to be removed for stand-by purposes

during communication. The power-supply panel is of the same dimensions as the others being 7x19 inches and is fastened to a 2 inch, 11x17 inch sub-base. The height of the sub-base and the dimensions of the parts used in the power supply should be carefully noted, because there is exactly 5 inches head-room and, of course, if the power transformer or other parts should extend more than 5 inches above the base, the whole thing would just not fit into the cabinet with the other equipment, the cabinet being 26 inches high.

The power transformer in this particular case was exactly 5 inches high and, of course, just fits into the space available. This transformer is a combination filament and plate transformer. The high-voltage secondary is 625 volts either side of the center tap. There is one 5-volt, 3 ampere winding for the rectifier and two 6.3 volt windings at 3 amperes each. Only one of the 6.3-volt (*Continued on page* 637)

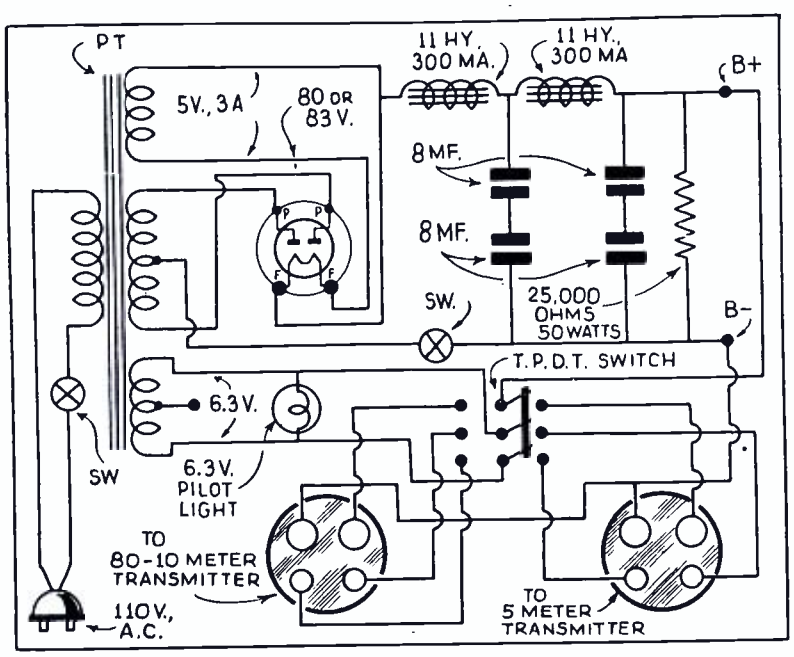


Diagram of the power-supply.

Top and bottom views of Transmitter. Diagram at Left.

Cutting Chassis Holes in a Jiffy!

By A. G. Heller

● WHILE the traditional "breadboard" still has a legitimate place in radio experimenting, the requirements of modern circuits for good shielding, and the general desire of experimenters for improved appearance, is making the use of all-metal chassis increasingly popular, even for very small and simple sets. Besides, the prices of ready-formed chassis, panels, racks, boxes, etc., in all sizes and shapes, are now so low that even the "ham" with a thin pocketbook can well afford them.

Drilling small holes to pass No. 6 or 8 screws is easy, a small hand drill serving the purpose. However, when it comes to making larger holes for mounting filter condensers, tube sockets, meters, etc., the constructor usually finds himself with a job on his hands. The usual instructions are: "Drill a circle of small holes and cut out the disc with a cold chisel; then smooth off the hole with a half-round file." Sounds simple, but this is a tedious method and rarely results in a hole even remotely resembling roundness. Five socket holes and two meter holes by this means are a full day's work for the average kitchen mechanic.

There really is no excuse anymore for this sort of sloppy construction, for there are now available inexpensive tools that save time, trouble and tempers and make set construction a pleasure rather than a pain. The most important aid to the tired drill-grinder is the self-aligning punch shown in action in Figure 1. Just pin-punch the center of the desired hole with the short, pointed rod supplied with this device, place the chassis between the two halves of the punch, draw a deep breath, sock (*Continued on page* 637)

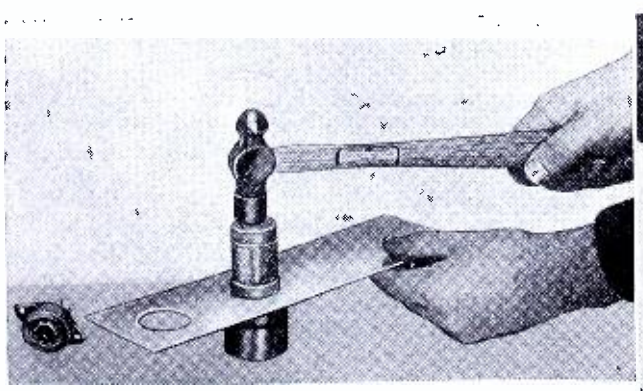


Fig. 1 (above) 1⅜-inch socket holes being cut in ¼" steel chassis. Holes are perfectly round and without burrs. The punch should be placed over a leg of the table for solid support.

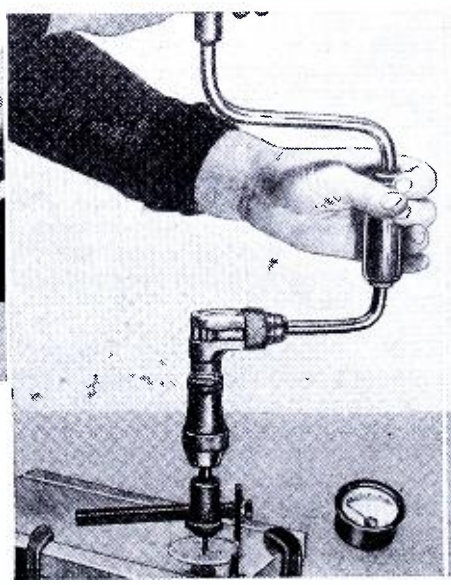


Fig. 2 (center) How to mount and brace a panel when drilling large holes for meters, etc. Keep the brace straight and turn it slowly to give the cutting tool a chance to "bite" into the metal.

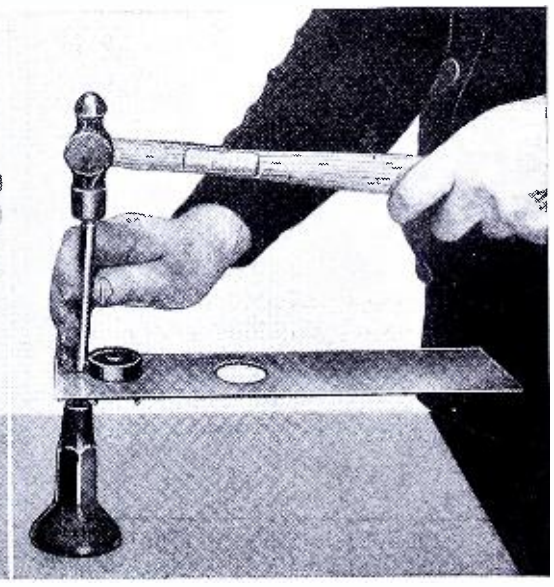


Fig. 3 (right) Eyelets and rivets are easily and quickly fastened with this simple anvil-and-punch set.

LET'S "Listen In" With Joe Miller

Our Short-Wave "DX" Editor

Winner of Thirtieth "S.W. Scout" Trophy.

This month Mr. Miller tells how S-W Listeners can set a "goal" for themselves. This is the fourth article by Mr. Miller. We shall be glad to have our readers send us suggestions, as well as data on new stations not mentioned here. Queries should be accompanied by a 3-cent stamp.

John De Myer of Lansing, Michigan — Grand is the word that aptly describes both the man and his DXing! 426 "Foreigns" heard — 82 countries!

● THIS month we are going to stress a most important factor in successful DXing, if one is to qualify himself as an expert DXer.

If one is to succeed in life, one sets a *goal* for himself, and then devotes all his energies to the attainment. No less is this factor in importance, in the field of DXing, our own experience has definitely shown.

Whereas we would tune for DX whenever we felt moved to do so (and that wasn't too often, despite our enthusiasm), after we had set a definite DX goal for ourselves we were at it all of our spare time, plugging for that DX goal!

In the beginning, several years ago, we set for ourselves a goal of 5 VAC, and 40 countries verified. The attainment of that goal was in itself a time of justifiable pride in our DXing ability.

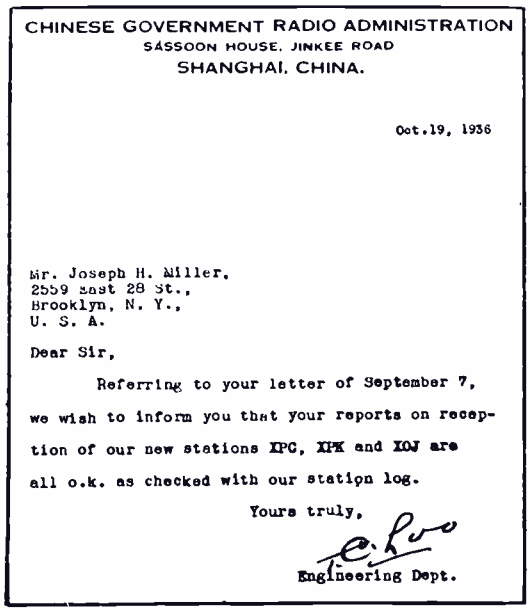
Always, after attaining our goal at the time, we set a new one, a few notches higher, so that we never "let down" in our efforts, and, needless to say, in looking over our large and quite complete collection of QSLs, we harbor a feeling of *work well done*, and of accomplishment that ranks high in the DXing world today.

Getting down to "brass tacks," here's what we suggest for all DXing readers of our articles:—*list all your veries, and total the number of stations heard in each of the six continents, the number of countries heard, and countries verified.* Say, for instance, you've one veri from each of the six major continents, you can claim I VAC, two from each of six continents, 2VAC, and so on, upwards.

Then set for yourself a goal of 5 VAC, in beginning, and about 40 countries verified. This is a good mark for any beginner to "shoot at." Upon attainment of this goal, one begins to qualify as a "real DXer."

Once you've something to aim for, in DXing, you'll be surprised at your eagerness to attain that goal! It makes the game far more interesting than to merely listen to the "foreign locals" — as any form of *competition* lends its charm to the sport of DX hunting.

We are going to work out a plan to list each DXer's "pedigree," whose name may appear in our columns, and it will doubtless be very interesting to watch each DXer's progress *towards* his own goal in DXing! So go to it, and our good word is—set yourself a DX goal, and "keep plugging"! Taking our monthly tips, and trying for all those rare 'uns, *persistently*, you should be able to show the "boys" a real DX mark in the *near future!* Good luck to all!


CHINESE GOVERNMENT RADIO ADMINISTRATION
SASSOON HOUSE, JINKEE ROAD
SHANGHAI, CHINA.

Oct.19, 1936

Mr. Joseph H. Miller,
2559 East 28 St.,
Brooklyn, N. Y.,
U. S. A.

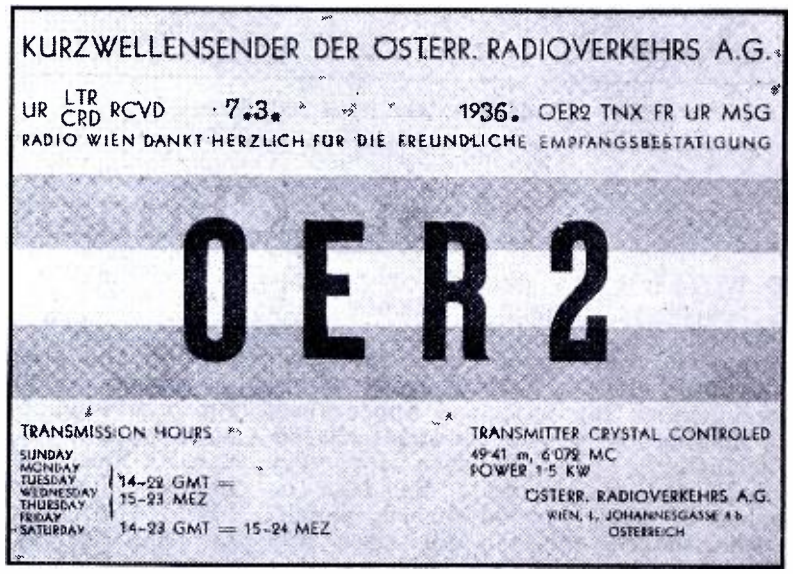
Dear Sir,

Referring to your letter of September 7, we wish to inform you that your reports on reception of our new stations XPC, XPK and XOJ are all o.k. as checked with our station log.

Yours truly,

Engineering Dept.

XPC - XPK - XOJ. Three of China's newest commercials verified! "Tops" on any DXer's list!



OER2—Vienna. From "Waltz-land" comes this handsome veri. A fine addition to any collection!

Tahiti Comes Through

FO8AA, 7.1 mc. located at Papeete, Tahiti, in the South Seas, has been putting in a fairly reliable signal within the last month. The regular sked is Tuesdays and Fridays from 11 p.m. to midnite, but FO8AA often carries on well after midnite. Our friend, John De Myer, heard FO8AA "open up" at 10:57 p.m. with a clock striking 6, followed by an orchestra rendition of "La Marseillaise." John says all announcements are in French and Tahitian.

It is very difficult to place FO8AA, tuning through the terrific 40 meter "CW" band, but once you find the signal, you'll be well repaid for your efforts! Having no QRA available, we addressed our reports merely: Radio Station FO8AA, Papeete, Tahiti, South Sea Islands.

RV15 Goes Back!

RV15, at Khabarovsk, Siberia, which tried a new frequency of 5.72 mc. for about three weeks, has returned to their former 4.273 mc. frequency. Without a doubt the 5.72 mc. frequency was much the better received of the two, here in the U.S. They really did put in an excellent signal during their brief sojourn on the higher frequency! Out in "Frisco," Ashley Walcott similarly regrets the change from new to old.

Celebes - Java

YBZ, Menado, on 7.68 mc., has been heard one morning at 6:20 a.m. phoning, but, although we "logged" the signal OK, we did not ascertain until lately just what we had heard. This is a new station in Java, and is generally heard in "contact" with PNI, 8.775 mc.; at Makassar, also in Celebes. As these two are situated on either extremity of a large island in Java, radio was probably found quite necessary to make communication easier. Ashley Walcott hears both often, around 6 a.m.

(*Continued on page* 635)

CORRECTED AND REVISED Monthly

World S-W Station List

Complete List of Broadcast, and Telephone Stations

All the stations in this list use telephone transmission of some kind. Note: Stations marked with a star ★ are the most active and easily heard stations and transmit at fairly regular times.

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

Stations are classified as follows: C—Commercial phone. B—Broadcast service. X—Experimental transmissions.

Around-the-Clock Listening Guide

It is a good idea to follow a general schedule as far as wavelength in relation to the time of the day is concerned. The observance of these simple rules will save time.

From daybreak till 6 p.m. and particularly during bright daylight, listen between 13 and 19 meters (21540 to 15800 kc.)

To the east of the listener, from about 11 a.m.-5 a.m., the 19-35 meter will be found very productive. To the west of the listener this same band is generally found best from about 12 m. until 7 a.m. (After dark, results above 35 meters are usually much better than during daylight.) These general rules hold for any location in the Northern Hemisphere.

Short-Wave Broadcasting, Experimental and Commercial Radiophone Stations

NOTE: To convert kc. to megacycles (mc.) shift decimal point 3 places to left: Thus, read 21540 kc. as 21.540 mc.

31600 kc. W2XDU
-BX- 9.494 meters
ATLANTIC BROADCASTING CO.,
485 MADISON AVE., N.Y.C.
Relays WABC daily 5-10 p.m., Sat., Sun. 12:30-5, 6-9 p.m.

31600 kc. W4XCA
-BX- 9.494 meters
MEMPHIS, TENN.
Relays WMC daily

31600 kc. W8XAI
-BX- 9.494 meters
STROMBERG CARLSON CO.
ROCHESTER, N.Y.
Relays WHAM daily 7:30 a.m.-12.05 a.m.

31600 kc. W8XWJ
-BX- 9.494 meters
PENOBSCOT TOWER
DETROIT, MICH.
Daily 6 a.m.-12:30 a.m.
Sun, 8 a.m.-12 M.

21540 kc. W8XK
-B- 13.93 meters
WESTINGHOUSE ELECTRIC
PITTSBURGH, PA.
7-9 a.m.; relays KDKA

21530 kc. GSJ
-B- 13.93 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND

21520 kc. W2XE
-B- 13.94 meters
ATLANTIC BROADCASTING CORP.
485 Madison Ave., N.Y.C.
Relays WABC 7:30 a.m.-1 p.m.

21470 kc. ★GSH
-B- 13.97 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
6-8:45 a.m.. 9 a.m.-12 n.

21420 kc. WKK
-C- 14.01 meters
AMER. TEL. & TEL. CO.,
LAWRENCEVILLE, N. J.
Calls S. America 8 a.m.-4 p.m.

21080 kc. PSA
-C- 14.23 meters
RIO DE JANEIRO, BRAZIL
Works WKK Daytime

21060 kc. WKA
-C- 14.25 meters
LAWRENCEVILLE, N. J.
Calls England
noon

21020 kc. LSN6
-C- 14.27 meters
HURLINGHAM, ARG.
Calls N. Y. C.
8 a. m.-5 p. m.

20860 kc. EHY-EDM
-C- 14.38 meters
MADRID, SPAIN
Works S. America, mornings.

20700 kc. LSY
-C- 14.49 meters
MONTE GRANDE
ARGENTINA
Tests Irregularly

20380 kc. GAA
-C- 14.72 meters
RUGBY, ENGLAND
Calls Argentina, Brazil, mornings

20040 kc. OPL
-C- 14.97 meters
LEOPOLDVILLE, BELGIAN CONGO
Works with ORG in morning

20020 kc. DHO
-C- 14.99 meters
NAUEN, GERMANY
Works S. America, mornings

19900 kc. LSG
-C- 15.08 meters
MONTE GRANDE, ARGENTINA
Tests Irregularly, daytime

19820 kc. WKN
-C- 15.14 meters
LAWRENCEVILLE, N. J.
Calls England, daytime

19680 kc. CEC
-C- 15.24 meters
SANTIAGO, CHILE
Works Buenos Aires and Colombia daytime

19650 kc. LSN5
-C- 15.27 meters
HURLINGHAM, ARGENTINA
Calls Europe, daytime

19600 kc. LSF
-C- 15.31 meters
MONTE GRANDE, ARGENTINA
Tests Irregularly, daytime

19480 kc. GAD
-C- 15.4 meters
RUGBY, ENGLAND
Works with Kenya, Africa, early morning

19355 kc. FTM
-C- 15.50 meters
ST. ASSISE, FRANCE
Calls Argentine, mornings

19345 kc. PMA
-B,C- 15.51 meters
BANDOENG, JAVA
Calls Holland early a.m.
Broadcasts Tues., Thur., Sat., 10:00-10:30 a.m. Irregular

19260 kc. PPU
-C- 15.58 meters
RIO de JANEIRO, BRAZIL
Works with France mornings

19220 kc. WKF
-C- 15.60 meters
LAWRENCEVILLE, N. J.
Calls England, daytime

19200 kc. ORG
-C- 15.62 meters
RUYSSELEDE, BELGIUM
Works with OPL mornings

19160 kc. GAP
-C- 15.66 meters
RUGBY, ENGLAND
Calls Australia, early a.m.

19020 kc. HS8PJ
-B- 15.77 meters
BANGKOK, SIAM
Mon. 8-10 a.m.

18970 kc. GAQ
-C- 15.81 meters
RUGBY, ENGLAND
Calls S. Africa, mornings

18890 kc. ZSS
-C- 15.88 meters
KLIPHEUVEL, S. AFRICA
Works Rugby 6:30 a.m.-12 n

18830 kc. PLE
-C- 15.93 meters
BANDOENG, JAVA
Calls Holland, early a. m.

18680 kc. OCI
-C- 16.06 meters
LIMA, PERU
Works various S.A. stations daytime

18620 kc. GAU
-C- 16.11 meters
RUGBY, ENGLAND
Calls N. Y., daytime

18345 kc. FZS
-C- 16.35 meters
SAIGON, INDO-CHINA
Phones Paris, early morning

18340 kc. WLA
-C- 16.36 meters
LAWRENCEVILLE, N. J.
Calls England, daytime

18310 kc. GAS
-C- 16.38 meters
RUGBY, ENGLAND
Calls N. Y., daytime

18299 kc. YVR
-C- 16.39 meters
MARACAY, VENEZUELA
Works Germany, mornings

18250 kc. FTO
-C- 16.43 meters
ST. ASSISE, FRANCE
Calls S. America, daytime

18200 kc. GAW
-C- 16.48 meters
RUGBY, ENGLAND
Calls N. Y., daytime

18135 kc. PMC
-C- 16.54 meters
BANDOENG, JAVA
Phones Holland, early a. m.

18115 kc. LSY3
-C- 16.56 meters
MONTE GRANDE, ARGENTINA
Tests irregularly

18040 kc. GAB
-C- 16.63 meters
RUGBY, ENGLAND
Calls Canada, morn. and early aftn.

17810 kc. PCV
-C- 16.84 meters
KOOTWIJK, HOLLAND
Calls Java, 6-9 a. m.

17790 kc. ★GSG
-B- 16.86 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
6-8:45, 9 a.m.-12n.

17780 kc ★W3XAL
-B- 16.87 meters
NATIONAL BROAD. CO.
BOUND BROOK, N. J.
Relays WJZ. Daily exc. Sun. 9 a.m.-5 p.m.

17775 kc. PHI
-B- 16.88 meters
HUIZEN, HOLLAND
Irregular

17760 kc. ★W2XE
-B- 16.89 meters
ATLANTIC BROADCASTING CORP.
485 Madison Ave., N.Y.C.

17760 kc. DJE
-B- 16.89 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:05-5:15, 5:55-11 a.m.

17760 kc. IAC
-C- 16:89 meters
PISA, ITALY
Calls ships, 6:30-7:30 a. m.

17755 kc. ZBW5
-B- 16.9 meters
P.O. Box 200
HONGKONG, CHINA
Irregular 11:30 p.m.-1:15 a.m., 4-10 a.m.

17741 kc. HSP
-C- 16.91 meters
BANGKOK, SIAM
Works Germany 4-7 a.m.

17650 kc. XGM
-C- 17 meters
SHANGHAI, CHINA
Works London 7-9 a.m.

17520 kc. DFB
-C- 17.12 meters
NAUEN, GERMANY
Works S. America near 9:15 a.m.

17510 kc. VWY2
-C- 17.13 meters
KIRKEE, INDIA
Works Rugby 2-7 a.m.

17310 kc. W3XL
-X- 17.33 meters
NATIONAL BROAD. CO.
BOUND BROOK, N. J.
Tests Irregularly

17120 kc. WOO
-C- 17.52 meters
A. T. & T. CO.,
OCEAN GATE, N. J.
Calls ships

17080 kc. GBC
-C- 17.56 meters
RUGBY, ENGLAND
Calls Ships

16385 kc. ITK
-C- 18.31 meters
MOGADISCIO, ITAL. SOMALILAND
Calls IAC around 9:30 a.m.

16270 kc. WLK
-C- 18.44 meters
LAWRENCEVILLE, N. J.
Phones
Arg., Braz., Peru. daytime

16270 kc. WOG
-C- 18.44 meters
OCEAN GATE, N. J.
Calls England,
morning and early afternoon

16240 kc. KTO
-C- 18.47 meters
MANILA, P. I.
Calls Cal., Tokio and ships
8-11:30 a.m.

16233 kc. FZR3
-C- 18.48 meters
SAIGON, INDO-CHINA
Calls Paris and Pacific Isles

15880 kc. FTK
-C- 18.90 meters
ST. ASSISE, FRANCE
Phones Saigon, morning

15865 kc. CEC
-C- 18.91 meters
SANTIAGO, CHILE
Works other S.A. stations afternoons

15810 kc. LSL
-C- 18.98 meters
HURLINGHAM, ARGENTINA
Calls
Brazil and Europe, daytime

15760 kc. JYT
-X- 19.04 meters
KEMIKWA-CHO, CHIBA-KEN, JAPAN
Irregular in late afternoon and early morning

15660 kc. JVE
-C- 19.16 meters
NAZAKI, JAPAN
Phones Java 3-5 a.m.

15620 kc. JVF
-C- 19.2 meters
NAZAKI, JAPAN
Phones U.S., 5 a.m. & 4 p.m.

15460 kc. KKR
-C- 19.4 meters
RCA COMMUNICATIONS,
BOLINAS, CAL.
Tests irregularly

15450 kc. IUG
-C- 19.41 meters
ADDIS ABABA, ETHIOPIA
Calls IAC 9:15-10:30 a.m.

15415 kc. KWO
-C- 19.46 meters
DIXON, CAL.
Phones Hawaii 2-7 p.m.

15370 kc. ★HAS3
-B- 19.52 meters
BUDAPEST, HUNGARY
Broadcasts Sundays. 9-10 a.m.

15360 kc. DZG
-X.C- 19.53 meters
REICHSPOSTZENSTRALAMT, ZEESEN, GERMANY
Tests irregularly

15355 kc. KWU
-C- 19.53 meters
DIXON, CAL.
Phones Pacific Isles and Japan

15340 kc. ★DJR
-B- 19.56 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
8-9 a.m.

15330kc.★W2XAD
-B- 19.56 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays
WGY 10 a.m.-4:30 p.m.

15310 kc. GSP
-B- 19.6 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE,
LONDON, ENGLAND
Irregular, 6-8 p.m.

15290 kc. LRU
-B- 19.62 meters
"EL MUNDO"
BUENOS AIRES, ARGENTINA, S. A.
Daily 6 a.m.-5:50 p.m.

15280 kc. ★DJQ
-B- 19.63 meters
BROADCASTING HOUSE
BERLIN, GERMANY
6-8, 8:15-11 a.m. also
Sundays 11:10 a.m.-12:20 p.m.

15270 kc. ★W2XE
-B- 19.65 meters
ATLANTIC BROADCASTING CORP.
485 Madison Av., N.Y.C.
Relays
WABC daily, 1-6 p.m.

(All Schedules Eastern Standard Time)

15260 kc. GSI
-B- 19.66 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
12:15-3:45 p.m.

15252 kc. RIM
-C- 19.67 meters
TACHKENT, U.S.S.R.
Phones RKI near 7 a.m.

15250 kc. W1XAL
-B- 19.67 meters
BOSTON, MASS.
Irregular, in morning

15245 kc. ★TPA2
-B- 19.68 meters
"RADIO COLONIAL"
PARIS, FRANCE
Service de la Radiodiffusion
98, bis. Blvd. Haussmann
2-3, 5:55-11 a.m.

15230 kc. HS8PJ
-B- 19.32 meters
BANGKOK, SIAM
Irregular, Mon. 8-10 a.m.

15230 kc. ★OLR
-B- 19.70 meters
PRAGUE
CZECHOSLOVAKIA
Irregular

15220 kc. ★PCJ
-B- 19.71 meters
N.V. PHILIPS' RADIO
EINDHOVEN, HOLLAND
Tues. 4:30-6 a.m.
Wed. 8-11 a.m.
Sun. 7:30-8:30 a.m.

15210 kc. ★W8XK
-B- 19.72 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
9 a.m.-7 p.m.
Relays KDKA

15200 kc. ★DJB
-B- 19.74 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:05-5:15, 5:55-11 a.m.
Sun. also 11:10 a.m.,-12:20 o.m.

15190 kc. ZBW4
-B- 19.75 meters
HONGKONG, CHINA
P. O. Box 200
Irregular 11:30 p.m.-1:15 a.m., 4-10 p.m.

15180 kc. ★GSO
-B- 19.76 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE,
LONDON, ENGLAND
3-5 a.m.

15180 kc. RW96
-B- 19.76 meters
MOSCOW, U.S.S.R.
Sun. 1-2 p.m.

15160 kc. JZK
-B- 19.79 meters
TOKIO, JAPAN
Test 4-5 p.m. Mon. and Thurs. and at other times

15150 kc. YDC
-B- 19.80 meters
NIROM
BANDOENG, JAVA
6-7:30 p.m., 10:30 p.m.-2:20, 5:30-9:30 a.m.

15140 kc. ★GSF
-B- 19.82 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
6-8:45, 9 a.m.- 12 n.

15120 kc. HVJ
-B- 19.83 meters
VATICAN CITY
10:30 to 10:45 a.m., except Sunday
Sat. 10-10:45 a.m.

15110 kc. ★DJL
-B- 19.85 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
12-2, 8-9 a.m., 11:35 a.m.-4:30 p.m. Also 6-8 a.m., Sun.

15090 kc. RKI
-B, C- 19.88 meters
MOSCOW, U.S.S.R.
Phones Tashkent near 7 a.m. and relays RNE on Sundays 10-11 a.m.

15055 kc. WNC
-C- 19.92 meters
HIALEAH, FLORIDA
Calls Central America, daytime

14980 kc. KAY
-C- 20.03 meters
MANILA, P. I.
Phones Pacific Isles

14970 kc. LZA
-B,C- 20.04 meters
RADIO GARATA,
SOFIA, BULGARIA
Broadcasts Sun. 12:30-8 a.m., 10 a.m.- 4:30 p.m., Daily 5-6:30 a.m., 12 n-2:45 p.m.

14960 kc. PSF
-C- 20.43 meters
RIO de JANEIRO, BRAZIL
Works with Buenos Aires daytime

14950 kc. HJB
-C- 20.07 meters
BOGOTA, COL.
Calls WNC, daytime

14940 kc. HII
-C- 20.08 meters
CIUDAD TRUJILLO, D.R.
Phones WNC daytime

14940 kc. HJA3
-C- 20.08 meters
BARRANQUILLA, COL.
Works WNC daytime

14845 kc. OCJ2
-C- 20.21 meters
LIMA, PERU
Works other S.A. stations daytime

14653 kc. GBL
-C- 20.47 meters
RUGBY, ENGLAND
Works JVH 1-7 a.m.

14640 kc. TYF
-C- 20.49 meters
PARIS, FRANCE
Works Saigon and Cairo 3-7 a.m., 12 n.-2:30 p.m.

14600 kc. JVH
-B,C- 20.55 meters.
NAZAKI, JAPAN
Broadcasts Daily 12 m.-1 a.m.
Irregular 5-11:30 p.m.
Phones Europe 4-8 a.m.

14590 kc. WMN
-C- 20.56 meters
LAWRENCEVILLE, N. J.
Phones England
morning and afternoon

14535 kc. HBJ
-B- 20.64 meters
RADIO NATIONS,
GENEVA, SWITZERLAND
Broadcasts irregularly

14530 kc. LSN
-C- 20.65 meters
HURLINGHAM, ARGENTINA
Calls N.Y.C. afternoons

14500 kc. LSM2
-C- 20.69 meters
HURLINGHAM, ARGENTINA
Calls Rio and Europe daytime

14485 kc. TIR
-C- 20.71 meters
CARTAGO, COSTA RICA
Phones Cen. Amer. & U.S.A. Daytime

14485 kc. HPF
-C- 20.71 meters
PANAMA CITY, PAN.
Phones WNC daytime

14485 kc. TGF
-C- 20.71 meters
GUATEMALA CITY, GUAT.
Phones WNC daytime

14485 kc. YNA
-C- 20.71 meters
MANAGUA, NICARAGUA
Phones WNC daytime

14485 kc. HRL5
-C- 20.71 meters
NACAOME, HONDURAS
Works WNC daytime

14485 kc. HRF
-C- 20.71 meters
TEGUCIGALPA, HONDURAS
Works WNC daytime

14470 kc. WMF
-C- 20.73 meters
LAWRENCEVILLE, N. J.
Phones England in daytime

14460 kc. DZH
-C,X- 20.75 meters
REICHSPOSTZENSTRALAMT,
ZEESEN, GERMANY
Irregular

14440 kc. GBW
-C- 20.78 meters
RUGBY, ENGLAND
Calls U.S.A., afternoon

13990 kc. GBA
-C- 21.44 meters
RUGBY, ENGLAND
Calls Buenos Aires, late afternoon

13820 kc. SUZ
-C- 21.71 meters
ABOU ZABAL, EGYPT
Works with Europe 11 a.m.-2 p.m.

13690 kc. KKZ
-C- 21.91 meters
RCA COMMUNICATIONS,
BOLINAS, CAL.
Tests irregularly

13635 kc. SPW
-B- 22 meters
WARSAW, POLAND
Mon., Wed., Fri. 12:30-1:30 p.m.
Irregular at other times

13610 kc. JYK
-C- 22.04 meters
KEMIKAWA-CHO, CHIBA-KEN, JAPAN
Phones California till 11 p. m.

13585 kc. GBB
-C- 22.08 meters
RUGBY, ENGLAND
Calls Egypt & Canada, afternoons

13415 kc. GCJ
-C- 22.36 meters
RUGBY, ENGLAND
Calls Japan & China early morning

13390 kc. WMA
-C- 22.40 meters
LAWRENCEVILLE, N. J.
Phones England
morning and afternoon

13380 kc. IDU
-C- 22.42 meters
ASMARA, ERITREA, AFRICA
Works with Rome daytime

13345 kc. YVQ
-C- 22.48 meters
MARACAY, VENEZUELA
Calls Hialeah daytime

13285 kc. CGA3
-C- 22.58 meters
DRUMMONDVILLE, QUE., CAN.
Works London and Ships afternoons

13075 kc. VPD
-X- 22.94 meters
SUVA, FIJI ISLANDS
Daily exc. Sun. 12:30-1:30 a.m.

12840 kc. WOO
-C- 23.36 meters
OCEAN GATE, N. J.
Calls ships

12825 kc. CNR
-B, C- 23.39 meters
DIRECTOR GENERAL
Telegraph and Telephone Stations, Rabat, Morocco
Broadcasts, Sunday, 7:30-9 a. m.

12800 kc. IAC
-C- 23.45 meters
PISA, ITALY
Calls Italian ships, mornings

12780 kc. GBC
-C- 23.47 meters
RUGBY, ENGLAND
Calls ships

12396 kc. CT1GO
-B- 24.2 meters
PAREDE, PORTUGAL
Sun. 10-11:30 a.m., Tues., Thur., Fri. 1:00-2:15 p.m.

12325 kc. DAF
-C- 24.34 meters
NORDDEICH, GERMANY
Works German ships daytime

12290 kc. GBU
-C- 24.41 meters
RUGBY, ENGLAND
Calls N.Y.C., afternoon

12250 kc. TYB
-C- 24.49 meters
PARIS, FRANCE
Irregular

12235 kc. ★TFJ
-B,C- 24.52 meters
REYKJAVIK, ICELAND
Phones England mornings,
Broadcasts Sun. 1:40-2:30 p.m.

12215 kc. TYA
-C- 24.56 meters
PARIS, FRANCE
Works French Ships in morning and afternoon

12150 kc. GBS
-C- 24.69 meters
RUGBY, ENGLAND
Calls N.Y.C., afternoon

12130 kc. DZE
-C,X- 24.73 meters
REICHSPOSTZENSTRALAMT,
ZEESEN, GERMANY
Tests irregularly

12060 kc. PDV
-C- 24.88 meters
KOOTWIJK, HOLLAND
Tests irregular

12000 kc. RNE
-B- 25 meters
MOSCOW, U. S. S. R.
Sun. 6-9, 10-11 a.m., 12:30-6 p.m.
Wed. 6-7 a.m.
Daily 12:30-6 p.m.

11991 kc. FZS2
-C- 25.02 meters
SAIGON, INDO-CHINA
Phones Paris, morning

11955 kc. IUC
-C- 25.09 meters
ADDIS ABABA, ETHIOPIA
Calls IAC around 12 m.

11950 kc. KKQ
-X- 25.10 meters
BOLINAS, CALIF.
Tests, irregularly, evenings

11940 kc. FTA
-C- 25.13 meters
STE. ASSISE, FRANCE
Phones CNR morning,
Hurlingham, Arge., nights

11900 kc XEWI
-B- 25.21 meters
MEXICO CITY, MEX.
Mon., Wed. 3-4 p.m.; Tues., Thurs., 7:30-8:45, 10:30 p.m.-12m.; Fri. 3-4, 9 p.m.-12m.; Sat. 9-11 p.m.; Sun. 1-2:15 p.m.

11880 kc. ★TPA3
-B- 25.23 meters
"RADIO COLONIAL"
PARIS, FRANCE
2-5 a.m., 12:15-6 p.m.

11875 kc. ★OLR
-B- 25.24 meters
PRAGUE, CZECHOSLOVAKIA
Daily 1:30-4 p.m., Mon. and Thur. 7-9 p.m.
Also at other times

11870 kc. ★W8XK
-B- 25.26 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
7-10:30 p.m.
Relays KDKA

11860 kc. YDB
-B- 25.29 meters
N.I.R.O.M.,
SOERABAJA, JAVA
Sat. 7:30 p.m.-2 a.m. (Sun.)
Daily 10:30 p.m.-2 a.m.

11860 kc. GSE
-B- 25.29 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND

11855 kc. DJP
-B,X- 25.31 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
Irregular, 11:35 a.m.-4:30 p.m.

11830 kc. W9XAA
-B- 25.36 meters
CHICAGO FEDERATION OF LABOR
CHICAGO, ILL.
Relays WCFL 6:30 a.m.-4 p.m., 9 p.m.-12 m.

11830 kc. ★W2XE
-B- 25.36 meters
ATLANTIC BROADCASTING CORP.
485 MADISON AVE., N. Y. C.
Relays WABC 6-10 p.m.

11820 kc. GSN
-B- 25.38 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE,
LONDON, ENGLAND
Irregular

11810 kc. ★HJ4ABA
-B- 25.4 meters
P. O. BOX 50,
MEDELLIN, COLOMBIA
11:30 a.m.-1 p.m., 6:30-10:30 p.m.

11810 kc. ★2RO
-B- 25.4 meters
E.I.A.R.
Via Montello 5
ROME, ITALY
Daily 6:43-10:30, 11:30 a.m.-12:40 p.m.; Sun. 6:43-9, 11:30 a.m.- 12:40 p.m.

11800 kc. JZJ
-B- 25.42 meters
TOKIO, JAPAN
Tests Mon. and Thurs. 4-5 p.m., and at other times.

11795 kc. DJO
-B,X- 25.43 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
Irregular

11790 kc. W1XAL
-B- 25.45 meters
BOSTON, MASS.
Daily 5:15-6:15 p.m.
Sun, 5-7 p.m.

11770 kc. ★DJD
-B- 25.49 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
11:35 a.m.-4:30 p.m.; 4:50-10:55 p.m.

11760 kc. OLR
-B- 25.51 meters
PRAGUE,
CZECHOSLOVAKIA

11750 kc. ★GSD
-B- 25.53 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
12:15-5:45 p.m., 6-8 p.m.

11730 kc.
-B- 25.57 meters
"RADIO PHILCO"
SAIGON, INDO-CHINA
Irregular 5:30-9:30 a.m.

11730 kc. PHI
-B- 25.57 meters
HUIZEN, HOLLAND
8:30-10:30 a.m. except Tues. and Wed.

11720 kc. ★CJRX
-B- 25.6 meters
WINNIPEG, CANADA
Daily, 8 p. m.-12 m.

11715 kc. ★TPA4
-B- 25.61 meters
"RADIO COLONIAL"
PARIS, FRANCE
6:15-10:15 p.m.
10:45 p.m.-1 a.m.

11710 kc. SM5SX
-B- 25.63 meters
STOCKHOLM, SWEDEN
Daily 11 a.m.-5 p.m.
Wed. till 6 p.m.

11680 kc. KIO
-X- 25.68 meters
KAHUKU, HAWAII
Broadcasts Tues. 12:30-1 a.m.
Irregular

11600 kc. ★COCX
-B- 25.86 meters
HAVANA, CUBA
Relays CMX
8 a.m.-1 a.m.

11595 kc. VRR4
-C- 25.87 meters
STONY HILL, JAMAICA, B.W.I. Works WNC daytime.

11560 kc. VIZ3
-X- 25.95 meters
AMALGAMATED WIRELESS OF AUSTRALASIA
FISKVILLE, AUSTRALIA
Calls Canada evening and early a.m.

11500 kc. PMK
-B-C- 26.09 meters
BANDOENG, JAVA

11413 kc. CJA4
-C- 26.28 meters
DRUMMONDVILLE,
QUE., CAN.
Tests with Australia irregularly in evenins

11280 kc. HIN
-B- 26 meters
LA VOZ DEL PARTIDO DOMINICANO, CIUDAD TRUJILLO, D.R.
4:40-5:40 p.m.

11200 kc. XBJQ
-X- 26.79 meters
BOX 2825,
MEXICO CITY, MEX.
Irregular

11050 kc. ZLT4
-C- 27.15 meters
WELLINGTON, N. ZEALAND
Phones Australia and England early a.m.

11000 kc. PLP
-B, C- 27.27 meters
BANDOENG, JAVA
Relays YDB 5:30-10:30 or 11 a.m., Sat. till 11:30 a.m.

10970 kc. OCI
-C- 27.35 meters
LIMA, PERU
Works with Bogota, Col., evenings

10840 kc. KWV
-C- 27.68 meters
DIXON, CAL.
Works with Hawaii evenings.

10770 kc. GBP
-C- 27.85 meters
RUGBY, ENGLAND
Calls
Sydney, Austral. early a. m.

(All Schedules Eastern Standard Time)

7626 kc. RIM
-C- 39.34 meters
TACHKENT, U.S.S.R.
Works with Moscow early morning

7610 kc. KWX
-C- 39.42 meters
DIXON, CAL.
Works with Hawaii, Philippines, Java and Japan nights.

7550 kc. TI8WS
-B- 39.74 meters
"ECOS DEL PACIFICO"
P. O. BOX 75 PUNTA ARENAS, COSTA RICA
6 p.m.-12 m.

7520 kc. KKH
-C- 39.89 meters
KAHUKU, HAWAII
Works with Dixon and broadcasts irregularly nights

7510 kc. JVP
-B,C- 39.95 meters
NAZAKI, JAPAN

7500 kc. RKI
-C- 40 meters
MOSCOW, U.S.S.R.
Works RIM early a.m.

7390 kc. ZLT2
-C- 40.6 meters
WELLINGTON, N.Z.
Works with Sydney 3-7 a.m.

7380 kc. XECR
-B- 40.65 meters
FOREIGN OFFICE, MEXICO CITY, MEX.
Sun. 6-7 p.m.

7281 kc. HJ1ABD
-B- 41.04 meters
CARTAGENA, COLO.
Irregularly, evenings

7100 kc. FO8AA
-B- 42.25 meters
PAPEETE, TAHITI
Tues. and Fri. 11 p.m.-12 m.

7100 kc. HKE
-B- 42.25 meters
BOGOTA, COL., S. A.
Tue. and Sat. 8-9 p. m.; Mon. & Thurs. 6:30-7 p. m.

7074 kc. HJ1ABK
-B- 42.69 meters
CALLE, BOLIVIA,
PROGROSO-IGUALDAD
BARRANQUILLA, COLOMBIA
Sun. 3-6 p.m.

7030 kc. HRP1
-B- 42.67 meters
SAN PEDRO SULA, HONDURAS
Reported on this and other waves irregularly in evening

6996 kc. PZH
-B- 42.88 meters
P. O. BOX 18,
PARAMIRABO, DUTCH GUIANA
Sun. 9:36-11:36 a.m.
Mon. and Fri. 5:36-9:36 p.m.
Tues. and Thur. 8:36-10:36 a.m., 2:36-4:36 p.m.
Wed. 3:36-4:36, 5:36-9:36 p.m.
Sat. 2:36-4:36 p.m.

6976 kc. HCETC
-B- 43 meters
TEATRO BOLIVAR
QUITO, ECUADOR
Thurs. till 9:30 p.m.

6905 kc. GDS
-C- 43.45 meters
RUGBY, ENGLAND
Calls N.Y.C. evening

6860 kc. KEL
-X- 43.70 meters
BOLINAS, CALIF.
Tests irregularly
11 a. m.-12 n.; 6-9 p. m.

6850 kc. TI6OW
-B- 43.8 meters
ONDA del CARIBE
PUERTO LIMON, COSTA RICA
Irregularly 8-9:30 p.m.

6850 kc. XGOX
-B- 43.8 meters
NANKING, CHINA
6:30-9 a.m.

6800 kc. HI7P
-B- 44.12 meters
EMISORIA DIARIA de COMERCIO, CIUDAD TRUJILLO, DOM. REP.
Daily exc. Sat. and Sun. 12:40-1:40, 6:40-8:40 p.m.; Sat. 12-40-1:40 p.m.; Sun. 10:40 a.m.-11:40 a. m.

6780 kc. HIH
-B- 44.25 meters
SAN PEDRO de MACORIS
DOMINICAN REP.
12:10-1:40 p.m., 7:30-9 p.m., Sun. 3-4 a.m., 4:15-6 p.m. p.m.; 4:40-7:40 p.m.

6755 kc. WOA
-C- 44.41 meters
LAWRENCEVILLE, N. J.
Phones England, evening

6750 kc. JVT
-B,C- 44.44 meters
NAZAKI, JAPAN
KOKUSAI-DENWA KAISHA, LTD., TOKIO

6730 kc. HI3C
-B- 44.58 meters
"LA VOZ DE LA FERIA"
LA ROMANA, DOM. REP.
12:30-2 p.m. 5-6 p.m.

6710 kc. ★TIEP
-B- 44.71 meters
LAVOZ DEL TROPICO
SAN JOSE, COSTA RICA
APARTADO 257, Daily 7-10 p.m.

6672 kc. YVQ
-C- 44.95 meters
MARACAY, VENEZUELA
Broadcasts Sat. 8-9 p.m.

6650 kc. IAC
-C- 45.11 meters
PISA, ITALY
Calls ships, evenings

6635 kc. ★HC2RL
-B- 45.21 meters
P. O. BOX 759, GUAYAQUIL, ECUADOR, S. A.
Sunday, 5:45-7:45 p. m.
Tues., 9:15-11:15 p. m.

6630 kc. HIT
-B- 45.25 meters
"LA VOZ de la RCA VICTOR,"
APARTADO 1105, CIUDAD TRUJILLO, D.R.
Daily exc. Sun. 12:10-1:40 p.m., 5:40-8:40 p.m., also Sat. 10:40 p.m.-12:40 a.m. (Sun.)

6625 kc. ★PRADO
-B- 45.28 meters
RIOBAMBA, ECUADOR
Thurs. 9-11:45 p.m.

6558 kc. HI4D
-B- 45.74 meters
CIUDAD TRUJILLO, DOMINICAN REPUBLIC
Except Sun. 11:55 a.m.-1:40

6550 kc. TIRCC
-B- 45.8 meters
RADIOEMISORA CATOLICA COSTARRICENSE
SAN JOSE, COSTA RICA
Sun. 11 a.m.-2 p.m., 6-7, 8-9 p.m., Daily 12 n.-2 p.m., 6-7 p.m., Thurs. 6-11 p.m.

6545 kc. YV11RB
-B- 45.84 meters
"ECOS de ORINOCO",
BOLIVAR, VENEZUELA
6-10:30 p.m.

6520 kc. ★YV6RV
-B- 46.01 meters
VALENCIA, VENEZUELA
11 a.m.-2 p.m., 5-10 p.m.

6500 kc. HIL
-B- 46.15 meters
APARTADO 623
CIUDAD TRUJILLO, D.R.
12:10-1:40 p.m., 5:40-7:40 p.m.

6477 kc. HI4V
-B- 46.32 meters
CIUDAD TRUJILLO, D.R.
LA VOZ de LA MARINA
11:40 a.m.-1:40 p.m., 5:10-9:40 p.m.

6450 kc. HJ4ABC
-B- 46.51 meters
APARTADO 39
IBAQUE, COLOMBIA
11 a.m.-12 n., 8-11 p.m.

6450 kc. HI8A
-B- 46.51 meters
CIUDAD TRUJILLO, DOM. REP.
8:40-10:40 a.m., 2:40-4:10 p.m., Sat. 9:40-10:40 p.m., Sun 2:40-4:40 p.m.

6425 kc. W9XBS
-X- 46.7 meters
NATL. BROAD. CO.
CHICAGO, ILL.
Relays WMAQ. Irregular

6420 kc. HI1S
-B- 46.73 meters
PUERTO PLATA, DOM. REP.
11:40 a.m.-1:40 p.m., 5:40-7:40, 9:40-11:40 p.m.

6410 kc. TIPG
-B- 46.8 meters
APARTADO 225,
SAN JOSE, COSTA RICA
"LA VOZ DE LA VICTOR"
12 n.-2 p.m., 6-11:30 p.m.

6400 kc. YV9RC
-B- 46.88 meters
CARACAS, VENEZUELA
7-11 p.m.

6355 kc. YV1RG
-B- 47.2 meters
MARACAIBO, VENEZUELA
8-11 p.m.

6316 kc. HIZ
-B- 47.5 meters
CIUDAD TRUJILLO
DOMINICAN REPUBLIC
Daily except Sat. and Sun.
11:10 a.m.-2:25 p.m., 5:10-8:40 p.m.; Sat. 5:10-11:10 p.m.; Sun., 11:40 a.m.-1:40 p.m.

6300 kc. YV12RM
-B- 47.62 meters
MARACAY, VENEZUELA
8-10:30 p.m.

6282 kc. CO9WR
-B- 47.76 meters
P.O. BOX 85,
SANCTI SPIRITUS, CUBA
4-6, 9-11 p.m.

6280 kc. HIG
-B- 47.77 meters
CIUDAD TRUJILLO, D.R.
7:10-8:40 a.m., 12:40-2:10, 8:10-9:40 p.m.

6243 kc. HIN
-B- 48 meters
CIUDAD TRUJILLO, D.R.
LA VOZ DEL PARTIDO DOMINICANO
12 n.-2 p.m., 7:30-9:30 p.m.

6235 kc. HRD
-B- 48.12 meters
LA VOZ DE ATLANTIDA
LA CEIBA, HONDURAS
8-11 p.m., Sat. 8 p.m.-1 a.m. (Sun.); Sun. 4-6 p.m.

6230 kc. OAX4G
-B- 48.15 meters
Apartado 1242
LIMA, PERU
Daily 7-10:30 p.m.

6185 kc. HI1A
-B- 48.5 meters
P. O. BOX 423, SANTIAGO, DOMINICAN REP.
11:40 a. m.-1:40 p. m.
7:40-9:40 p. m.
Wed. 6-10:30 p.m.

6175 kc. HJ2ABA
-B- 48.58 meters
TUNJA, COLOMBIA
1-2; 7:30-9:30 p.m.

6171 kc. XEXA
-B- 48.61 meters
DEPT. OF EDUCATION
MEXICO CITY, MEX.
7-11 p.m.

6170 kc. HJ3ABF
-B- 48.62 meters
BOGOTA, COLOMBIA
7-11:15 p. m.

6160 kc. ★YV3RC
-B- 48.7 meters
CARACAS, VENEZUELA
11 a.m.-2 p.m., 4-10:30 p.m.

6150 kc. CSL
-B- 48.78 meters
LISBON, PORTUGAL
7-8:30 a.m., 2-7 p.m.

6150 kc. ★CJRO
-B- 48.78 meters
WINNIPEG, MAN., CANADA
8 p. m.-12 m.
Sun. 3-10:30 p. m.

6147 kc. COKG
-B- 48.8 meters
BOX 137, SANTIAGO, CUBA
9-10 a.m., 11:30 a.m.-1:30 p.m., 3-4:30 p.m., 10-11 p.m., 12 m.-2 a.m.

6145 kc. HJ4ABU
-B- 48.8 meters
PEREIRA, COL.
9-11 a.m., 7-8 p.m.

6140 kc. ★W8XK
-B- 48.86 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
Relays KDKA
9 p.m.-1 a.m.

6135 kc. HJ1ABB
-B- 48.9 meters
BARRANQUILLA, COL., S. A.
P. O. BOX 715,
11:30 a.m.-1 p.m.; 4:30-10 p.m.

6135 kc. HI5N
-B- 48.9 meters
SANTIAGO, D.R.
6:40-9:10 p.m.

6132 kc. HIX
-B- 48.93 meters
CIUDAD TRUJILLO,
DOMINICAN REP.
Sun. 7:40-10:10; Daily 12:40 1:10 p.m., 4:40-5:40 p.m.; Tues. and Fri. 8:10-10:10 p.m.

6130 kc. TGXA
-B- 48.94 meters
GIORNAL LIBERAL PROGRESSISTA, GAUTEMALA CITY, GUAT.
Heard in the evening.

6130 kc. COCD
-B- 48.94 meters
"LA VOZ DEL AIRE"
CALLE G y 25, VEDADO, HAVANA, CUBA
Relays CMCD 11 a.m.-12 n., 7-10 pm., Sun. 12 n.-4 p.m.

6130 kc. ZGE
-B- 48.94 meters
KUALA LUMPUR,
FED. MALAY STATES
Sun., Tue., and Frl., 6:40-8:40 a. m.

6130 kc. ★VE9HX
-B- 48.94 meters
P.O. BOX 998
HALIFAX, N.S., CANADA
Mon.-Fri., 9 a.m.-1 p.m., 5-11 p.m.
Fri. 1-3 p.m.; Sat., Sun. 9 a.m.-1 p.m., 2-11 p.m.
Relays CHNS

6122 kc. HJ3ABX
-B- 49 meters
LA VOZ de COLOMBIA
CALLE 14, No. 738,
BOGOTA, COLOMBIA
5:45-11:30 p.m.

6120 kc. ★W2XE
-B- 49.02 meters
ATLANTIC BROADCASTING CORP.
485 MADISON AVE., N. Y. C.
Relays WABC, 11 p.m.-12 m.

6120 kc. XEFT
-B- 49.02 meters
AV. INDEPDENCIA 28,
VERA CRUZ, MEX.
11 a.m.-4 p.m., 7:30 p.m.-12 m.
Sat. also 6:30-7:30 p.m.
Sun. 11 a.m.-4 p.m., 9 p.m.-12 m. Relays XETF

6115 kc. OLR
-B- 49.05 meters
PRAGUE
CZECHOSLOVAKIA
Irregular

6110 kc. GSL
-B- 49.1 meters
DAVENTRY
B. B. C., BROADCASTING HOUSE, LONDON, ENGLAND
Irregular 4-5:45, 6-11 p.m.

6110 kc. VUC
-B- 49.1 meters
CALCUTTA, INDIA
Daily except Sat., 3-5:30 a. m., 9:30 a. m.-noon;
Sat., 11:45 a. m.-3 p. m.

6105 kc. HJ4ABB
-B- 49.14 meters
MANIZALES, COL., S. A.
P. O. Box 175
Mon. to Fri. 12:15-1 p. m.; Tues. & Fri. 7:30-10 p. m.; Sun. 2:30-5 p. m.

6100 kc. ★W3XAL
-B- 49.18 meters
NATIONAL BROADCASTING CO.
BOUND BROOK, N. J.
Relays WJZ
Monday, Wednesday, Saturday, 5-6 p.m., Sun. 12 m.-1 a.m.

6100 kc. ★W9XF
-B- 49.18 meters
NATL. BROAD. CO.
CHICAGO, ILL.
Tues., Thurs., Fri. 12 m.-1 a.m., 8 p.m.-11.59 p.m.
M., W., Sat., 12 m-1 a.m.
Relays WENR

6097 kc. ZTJ
-B- 49.2 meters
AFRICAN BROADCASTING CO.
JOHANNESBURG, SOUTH AFRICA.
Sun.-Fri. 11:45 p.m.
12:30 a.m. (next day)
Mon.-Sat. 3:30-7 a.m.
9 a.m.-4 p.m.
Sun. 8-10:15 a m.; 12:30-3 p.m.

6092 kc. HJ4ABE
-B- 49.25 meters
MEDELLIN, COLO.
Daily 11 a.m.-12 n., 6-10:30 p.m.

6090 kc. ★CRCX
-B- 49.26 meters
TORONTO, CANADA
Daily 5:30-11:30 p.m.
Sun. 5-11:30 p.m.

6090 kc. VE9BJ
-B- 49.26 meters
SAINT JOHN, N. B., CAN.
7-8:30 p. m.

6090 kc. ZBW2
-B- 49.26 meters
P. O. BOX 200
HONGKONG, CHINA
Irregular 11:30 p.m.-1:15 a.m., 4-10 a.m.

6085 kc. HJ5ABD
-B- 49.3 meters
"LA VOZ DE VALLE"
CALI, COLOMBIA
12 n.-1:30 p.m., 5:10-9.40 p.m.

6083 kc. VQ7LO
-B- 49.31 meters
NAIROBI, KENYA, AFRICA
Mon.-Fri. 5:45-6:15 a.m., 11:30 a.m.-2:30 p.m. Also 8:30-9:30 a.m. on Tues. and Thurs.; Sat. 11:30 a.m.-3:30 p.m.; Sun. 11 a.m.-2 p.m.

6080 kc. CP5
-B- 49.34 meters
LAPAZ, BOLIVIA
7-10:30 p. m.

6080 kc. HP5F
-B- 49.34 meters
CARLTON HOTEL
COLON, PANAMA
11:45 a.m.-1:15 pm., 7:45-10 p.m.

6080 kc. W9XAA
-B- 49.34 meters
CHICAGO FEDERATION OF LABOR
CHICAGO, ILL.
Relays WCFL
Sunday 11:30 a. m.-9 p. m. and Tues., Thurs., Sat., 4 p. m.-12 m.

6079 kc. DJM
-B,X- 49.34 meters
BROADCASTING HOUSE,
BERLIN, GERMANY

6072 kc. OER2
-B- 49.41 meters
VIENNA, AUSTRIA
9 a. m.-5 p.m., Sat. to 6 p.m.

6070 kc. HJ4ABC
-B- 49.42 meters
PERIERA, COL.
9-11 a.m., 7-8 or 9 p. m.

6070 kc. VE9CS
-B- 49.42 meters
VANCOUVER, B. C., CANADA
Sun. 1:45-9 p. m., 10:30 p. m.-1 a. m.; Tues. 6-7:30 p. m., 11:30 p. m.-1:30 a. m. Daily 6-7:30 p. m.

6065 kc. HJ4ABL
-B- 49.46 meters
MANIZALES, COL.
Daily 11 a.m.-12 n., 5:30-7:30 p.m. Sat. 5:30-10:30 p.m.

6060 kc. ★W8XAL
-B- 49.50 meters
CROSLEY RADIO CORP.
CINCINNATI, OHIO
5:30 a.m.-8 p.m.; 11 p.m.-1 a.m.
Relays WLW

6060 kc. W3XAU
-B- 49.50 meters
PHILADELPHIA, PA.
Relays WCAU
8 p.m.-11 p.m.

6060 kc. OXY
-B- 49.50 meters
SKAMLEBOAEK, DENMARK
1-6:30 p.m.

6050 kc. GSA
-B- 49.59 meters
DAVENTRY
B. B. C., BROADCASTING HOUSE, LONDON, ENGLAND
Irregular 6-8 p.m.

6050 kc. HJ3ABD
-B- 49.59 meters
COLOMBIA BROADCASTING, BOX 509, BOGOTA, COL.
12 n.-2 p.m., 7-11 p.m., Sun. 5-9 p.m.

6045 kc. HI9B
-B- 49.63 meters
SANTIAGO
DOM. REP.
Irregular 6 p.m.-11 p.m.

6042 kc. HJ1ABG
-B- 49.65 meters
EMISORA ATLANTICO
BARRANQUILLA, COLO.
11 a.m.- 11 p.m.
Sun. 11 a.m.- 8 p.m.

6040 kc. W4XB
-B- 49.67 meters
MIAMI BEACH, FLA.
Relays WIOD 12 n.-2 p.m., 5:30 p.m.-12 m.

6040 kc. PRA8
-B- 49.67 meters
RADIO CLUB OF PERNAMBUCO
PERNAMBUCO, BRAZIL
1-3 p.m., 4-7:30 p.m. daily

(All Schedules Eastern Standard Time)

6040 kc. ★W1XAL
-B- 49.67 meters
BOSTON, MASS.
Tues., Thurs. 7:15-9:15 p.m.
Sun 5-7 p.m.

6040 kc. YDA
-B- 49.67 meters
N.I.R.O.M.
TANDJONGPRIOK, JAVA
10:30 p.m.-2 a.m. Sat. 7:30 p.m., 2 a.m. (Sun.)

6030 kc. HJ4ABP
-B- 49.75 meters
MEDELLIN, COL.
Relays HJ4ABQ 8-11 p.m.

6030 kc. ★HP5B
-B- 49.75 meters
P. O. BOX 910
PANAMA CITY, PAN.
12 n.- 1p.m., 7-10:30 p.m.

6030 kc. VE9CA
-B- 49.75 meters
CALGARY, ALBERTA, CAN.
Thurs. 9 a.m.-2 a.m. (Fri.); Sun. 12 n.-12 m.
Irregularly on other days from 9 a.m.-12 m.

6025 kc. HJ1ABJ
-B- 49.79 meters
SANTA MARTA, COLO.
5:30-10:30 p.m. except Wed.

6020 kc. ★DJC
-B- 49.83 meters
BROADCASTING HOUSE, BERLIN
11:35 a.m.-4:30 p.m., 4:50-11 p.m.

6020 kc. XEUW
-B- 49.82 meters
AV. INDEPENDENCIA, 98, VERA CRUZ, MEX.
8 p.m.-12:30 a.m.

6018 kc. ZHI
-B- 49.85 meters
RADIO SERVICE CO.,
20 ORCHARD RD.,
SINGAPORE, MALAYA
Mon., Wed. and Thurs 5:40-8:10 a.m. Sat. 10:40 p.m.-1:10 a.m. (Sun.) Every other Sunday 5:10-6:40 a.m.

6015 kc. HI3U
-B- 49.88 meters
SANTIAGO de los CABALLEROS, DOM. REP.
7:30-9 a.m., 12 n.- 2 pm., 5-7 p.m., 8-9:30 p.m., Sun 12:30-2, 5-6 p.m.

6012 kc. HJ3ABH
-B- 49.91 meters
BOGOTA, COLO.
APARTADO 565
6-11 p.m.
Sun. 12 n.-2 p.m., 4-11 p.m.

6010 kc. VP3MR
-B- 49.9 meters
GEORGETOWN, BRI. GUIANA, S.A.
Sun. 7:45-10:15 a.m.
Daily 4:45-8:45 p.m.

6010 kc. ★COCO
-B- 49.92 meters
P.O. BOX 98
HAVANA, CUBA
Daily 9:30 a.m.-1 p.m., 4-7 p.m., 8-10 p.m.
Sat. also 11:30 p.m.-2 a.m.

6005 kc. HP5K
-B- 49.96 meters
BOX 33, COLON, PANAMA
7:30-9 a.m., 12 n.-1 p.m., 6-9 p.m.

6005 kc. ★CFCX
-B- 49.96 meters
CANADIAN MARCONI CO., MONTREAL, QUE., CAN.
Relays CFCF 6 a.m.-11:15 a.m.
Sun. 9 a.m.-11:15 p.m.

6000 kc. HJ1ABC
-B- 50 meters
QUIBDO, COLOMBIA
5-6 p.m., Sun. 9-11 p.m.

5990 kc. ★XEBT
-B- 50.08 meters
MEXICO CITY, MEX.
P. O. Box 79-44
8 a.m.-1 a.m.

5988 kc. HJ2ABD
-B- 50.10 meters
BUCARAMANGA, COL.
11:30 a.m.-12:30 p.m., 5:30-6:30, 7:30-10:30 p.m.

5968 kc. HVJ
-B- 50.27 meters
VATICAN CITY
2-2:15 p. m., daily. Sun., 5-5:30 a. m.

5950 kc. HJN
-B- 50.42 meters
BOGOTA, COL.
6-11 p.m.

5940 kc. TG2X
-B- 50.5 meters
GUATEMALA CITY, GUAT.
4-6, 9-11 p.m., Sun. 2-5 a.m.

5930 kc. HJ4ABD
-B- 50.51 meters
LA VOZ CATIA,
MEDELLIN, COLOMBIA
8-11:30 p.m.

5915 kc. HH2S
-B- 50.72 meters
PORT AU PRINCE, HAITI
BOX A103,
7-9:45 p.m.

5910 kc. YV15RV
-B- 50.76 meters
MARACAY, VENEZUELA
Irregular

5898 kc. YV8RB
-B- 50.86 meters
"LA VOZ de LARA"
BARQUISIMETO, VENEZUELA
12 n.- 1p.m., 6-10 p.m.

5885 kc. HCK
-B- 50.98 meters
QUITO, ECUADOR, S. A.
8-11 p.m.

5875 kc. HRN
-B- 51.06 meters
TEGUCIGALPA, HONDURAS
1:15-2:15, 8:30-10 p.m., Sun. 3:30-5:30, 8:30-9:30 p.m.

5865 kc. HI1J
-B- 51.15 meters
BOX 204,
SAN PEDRO de MACORIS, DOM. REP.
12 n.-2, 6:30-9 p.m.

5853 kc. WOB
-C- 51.26 meters
LAWRENCEVILLE, N. J.
Calls Bermuda, nights

5850 kc. ★YV5RMO
-B- 51.28 meters
CALLE REGISTRO, LAS DELICIAS APARTADO de CORRES 214
MARACAIBO, VENEZUELA
8:45-9:45 a.m., 11:15 a.m.-12:15 p.m., 4:45-9:45 p.m. Sun. 11:45 a.m.-12:45 p.m.

5830 kc. ★TIGPH
-B- 51.5 meters
ALMA TICA,
APARTADO 800,
SAN JOSE, COSTA RICA
11 a.m.-1 p.m., 6-10 p.m.,
Relays TIX 9-10 p.m.

5800 kc. ★YV2RC
-B- 51.72 meters
RADIO CARACAS
CARACAS, VENEZUELA
Sun. 8:30 a.m.-10:30 p.m.
Daily 11 a.m.-1:30 p.m., 4-9:30 p.m.

5790 kc. JVU
-C- 51.81 meters
NAZAKI, JAPAN

5780 kc. OAX4D
-B- 51.9 meters
P.O. Box 853
LIMA, PERU
Mon., Wed. & Sat. 9-11:30 p.m.

5720 kc. RV15
-B- 52.45 meters
KHABAROVSK, SIBERIA, U. S. S. R.
Daily, 1-10 a.m.

5720 kc. YV10RSC
-B- 52.45 meters
"LA VOZ de TACHIRA,"
SAN CRISTOBAL, VENEZUELA
6-11:30 p.m.

5713 kc. TGS
-B- 52.51 meters
GUATEMALA CITY, GUAT.
Wed., Thurs. and Sun. 6-9 p.m.

5500 kc. TI5HH
-B- 54.55 meters
SAN RAMON, COSTA RICA
Irregularly 3:30-4, 8-11:30 p.m.

5145 kc. PMY
-B- 58.31 meters
BANDOENG, JAVA
5:30-11 a.m.

5077 kc. WCN
-C- 59.08 meters
LAWRENCEVILLE, N. J.
Phones England irregularly

5025 kc. ZFA
-C- 59.7 meters
HAMILTON, BERMUDA
Calls U.S.A., nights

5000 kc. TFL
-C- 60 meters
REYKJAVIK, ICELAND
Calls London at night.
Also broadcasts irregularly

4975 kc. GBC
-C- 60.30 meters
RUGBY, ENGLAND
Calls Ships, late at night

4820 kc. GDW
-C- 62.24 meters
RUGBY, ENGLAND
Calls N.Y.C., late at night

4790 kc. VE9BK
-BX- 62.63 meters
RADIO SALES SERVICE, LTD., 780 BEATTY ST., VANCOUVER, B.C., CAN.
Daily exc. Sun. 11:30-11:45 a. m., 3-3:15, 8-8:15 p.m.

4752 kc. WOO
-C- 63.1 meters
OCEAN GATE, N. J.
Calls ships irregularly

4600 kc. HC2ET
-B- 65.22 meters
Apartado 249
GUAYAQUIL, ECUADOR
Wed., Sat., 9:15-11 p.m.

4320 kc. GDB
-C- 69.44 meters
RUGBY, ENGLAND
Tests, 8-11 p. m.

4272 kc. WOO
-C- 70.22 meters
OCEAN GATE, N. J.
Calls ships irregularly

4098 kc. WND
-C- 73.21 meters
HIALEAH, FLORIDA
Calls Bahama Isles

4002 kc. CT2AJ
-B- 74.95 meters
PONTA DELGADA,
SAO MIGUEL, AZORES
Wed. and Sat. 5-7 p. m.

3040 kc. YDA
-B- 98.68 meters
N.I.R.O.M.
TANDJONGPRIOK, JAVA
Daily exc. Sat. 6-7:30 p.m., 5:30-10:30 or 11 a.m., Sat. 5:30-11:30 a.m.

Alphabetical List of S-W Stations

By Call-Letter and Frequency

(Frequency in Megacycles)

CALL	FREQ.
CB960	9.06 mc.
CEC	19.68
CEC	15.87
CEC	10.67
CGA3	13.29
CGA4	9.33
CJA3	11.41
CJRO	6.15
CJRX	11.72
CNR	12.83
CNR	8.04
COCD	6.13
COCH	9.43
COCO	6.01
COCQ	9.75
COCX	11.6
COKG	6.15
CO9JQ	8.67
CO9WR	6.28
CP5	6.08
CRCX	6.09
CSL	6.15
CSW	9.93
CT1AA	9.65
CT1GO	12.40
CT2AJ	4.00
DAF	12.33
DAF	8.77
DFB	17.52
DGU	9.650
DJA	9.560
DJB	15.20
DJC	6.02
DJD	11.77
DJE	17.76
DJL	15.11
DJM	6.08
DJN	9.54
DJO	11.8
DJP	11.86
DJQ	15.28
DJR	15.34
DZA	9.68
DZB	10.04
DZC	10.29
DZE	12.13
DZG	15.36 mc.
DZH	14.46
EAQ	9.86
EDM	20.86
EDM	10.07
EHY	20.86
EHY	10.07
EHZ	10.37
FO8AA	7.1
FTA	11.94
FTK	15.88
FTM	19.36
FTO	18.25
FZR3	16.23
FZS	18.35
FZS2	11.99
GAA	20.38
GAB	18.04
GAD	19.48
GAP	19.16
GAQ	18.97
GAS	18.31
GAU	18.62
GAW	18.20
GBA	13.99
GBB	13.59
GBC	17.08
GBC	12.78
GBC	8.68
GBC	4.98
GBL	14.65
GBP	10.77
GBS	12.15
GBU	12.29
GBW	14.44
GCA	9.71
GCB	9.28
GCI	8.73
GCJ	13.42
GCQ	8.76
GCS	9.02
GCU	9.95
GCW	9.79
GDB	4.32
GDS	6.91
GDW	4.82
GSA	6.05 mc.
GSB	9.51
GSC	9.58
GSD	11.75
GSE	11.86
GSF	15.14
GSG	17.79
GSH	21.47
GSI	15.26
GSJ	21.53
GSL	6.11
GSN	11.82
GSO	15.18
GSP	15.31
HAS3	15.37
HAT4	9.13
HBJ	14.54
HBL	9.60
HBP	7.80
HCETC	6.98
HCJB	8.95
HCK	5.89
HC2AT	8.40
HC2ET	4.60
HC2JSB	7.85
HC2RL	6.64
HC2TC	7.98
HH2S	5.92
HH3W	9.65
HIG	6.28
HIH	6.78
HII	14.94
HIL	6.50
HIN	6.24
HIN	11.28
HIT	6.63
HIX	6.13
HIZ	6.32
HI1A	6.19
HI1J	5.86
HI1S	6.42
HI3C	6.10
HI3U	6.02
HI4D	6.56
HI4V	6.48
HI5N	6.14
HI7P	6.80
HI8A	6.45
HI9B	6.05
HJA3	14.94
HJB	14.95
HJN	5.95
HJU	9.50
HJ1ABB	9.56
HJ1ABC	6.0
HJ1ABD	7.28
HJ1ABE	9.50
HJ1ABG	6.04
HJ1ABJ	6.03
HJ1ABK	7.07
HJ1ABP	9.62
HJ2ABA	6.18
HJ2ABC	9.59
HJ2ABD	5.98
HJ3ABD	6.05
HJ3ABF	6.17
HJ3ABH	6.01
HJ3ABX	6.12
HJ4ABA	11.81
HJ4ABB	6.11
HJ4ABC	6.45
HJ4ABC	6.07
HJ4ABD	5.93
HJ4ABE	6.09
HJ4ABH	9.52
HJ4ABL	6.06
HJ4ABP	6.03
HJ4ABU	6.15
HJ5ABD	6.09
HKB	9.93
HKE	7.10
HKV	8.80
HPF	14.49
HP5B	6.03
HP5F	6.08
HP5J	9.62
HP5K	6.01
HRD	6.24
HRF	14.49
HRL5	14.49
HRN	5.88
HRP1	7.03
HS8PJ	9.35
HS8PJ	19.02 mc.
HS8PJ	15.22
HSP	17.74
HVJ	15.12
HVJ	5.97
IAC	17.76
IAC	12.80
IAC	8.38
IAC	6.65
IDU	13.39
ITK	16.39
IUC	11.96
IUG	15.45
(I)2RO	11.81
2RO	9.64
JVE	15.66
JVF	15.62
JVH	14.60
JVM	10.74
JVN	10.66
JVP	7.51
JVT	6.75
JVU	5.79
JYK	13.61
JYR	7.88
JYS	9.84
JYT	15.76
JZI	9.53
JZJ	11.8
JZK	15.16
KAY	14.98
KAZ	9.99
KEE	7.72
KEJ	9.01
KEL	6.86
KES	10.41
KIO	11.68
KKH	7.52
KKR	15.46
KKZ	13.69
KTO	16.24
KWO	15.42
KWU	15.36
KWV	10.84
KWX	7.61
LKJ1	9.53
LRU	15.29 mc.
LRX	9.66
LSF	19.60
LSG	19.90
LSI	9.80
LSK3	10.25
LSL	15.81
LSL2	10.30
LSM2	14.50
LSN	9.89
LSN	14.53
LSN5	19.65
LSN6	21.02
LSX	10.35
LSY	20.70
LSY3	18.12
LZA	14.97
OAX4D	5.78
OAX4G	6.23
OCI	18.68
OCI	10.97
OCJ2	14.85
OER2	6.07
OLR	15.23
OLR	11.76
OLR	11.88
OPL	20.04
OPM	10.14
ORG	19.20
ORK	10.33
OXY	6.06
PCJ	15.22
PCJ	9.59
PCV	17.81
PDK	10.41
PDV	12.06
PHI	17.78
PHI	11.73
PLE	18.83
PLO	11.50
PLP	11.5
PLV	9.42
PMA	19.35
PMC	18.14
PMK	11.5
PMN	10.26
PMY	5.15
PNI	8.78
PPU	19.26
PRADO	6.63
PRA8	6.04
PRF5	9.50
PSA	21.08
PSF	14.96
PSH	10.22
PSK	8.19
RIM	15.25
RIM	7.63
RIO	10.17
RIR	10.08
RKI	15.09
RKI	7.50
RNE	12.0
RV15	5.72
RAN	9.60
RW96	15.18
SM5SX	11.71
SPW	13.64
SUV	10.06
SUX	7.86
SUZ	13.82
TFJ	12.24
TFK	9.06
TFL	5.0
TGF	14.49
TGS	5.71
TGWA	9.45
TGXA	6.13
TG2X	5.94
TIEP	6.71
TIGPH	5.83
TIPG	6.41
TIR	14.49
TIRCC	6.55
TI4NRH	9.67
TI5HH	5.50
TI6OW	6.85
TI8WS	7.55
TPA2	15.25
TPA3	11.88

(Continued on page 653)

15260 kc. GSI
-B- 19.66 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
12:15-3:45 p.m.

15252 kc. RIM
-C- 19.67 meters
TACHKENT, U.S.S.R.
Phones RKI near 7 a.m.

15250 kc. W1XAL
-B- 19.67 meters
BOSTON, MASS.
Irregular, in morning

15245 kc. ★TPA2
-B- 19.68 meters
"RADIO COLONIAL"
PARIS, FRANCE
Service de la Radiodiffusion
98, bis. Blvd. Haussmann
2-3, 5:55-11 a.m.

15230 kc. HS8PJ
-B- 19.32 meters
BANGKOK, SIAM
Irregular, Mon. 8-10 a.m.

15230 kc. ★OLR
-B- 19.70 meters
PRAGUE
CZECHOSLOVAKIA
Irregular

15220 kc. ★PCJ
-B- 19.71 meters
N.V. PHILIPS' RADIO
EINDHOVEN, HOLLAND
Tues. 4:30-6 a.m.
Wed. 8-11 a.m.
Sun. 7:30-8:30 a.m.

15210 kc. ★W8XK
-B- 19.72 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
9 a.m.-7 p.m.
Relays KDKA

15200 kc. ★DJB
-B- 19.74 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:05-5:15, 5:55-11 a.m.
Sun. also 11:10 a.m.-12:20 p.m.

15190 kc. ZBW4
-B- 19.75 meters
HONGKONG, CHINA
P. O. Box 200
Irregular 11:30 p.m.-1:15 a.m., 4-10 p.m.

15180 kc. ★GSO
-B- 19.76 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE,
LONDON, ENGLAND
3-5 a.m.

15180 kc. RW96
-B- 19.76 meters
MOSCOW, U.S.S.R.
Sun. 1-2 p.m.

15160 kc. JZK
-B- 19.79 meters
TOKIO, JAPAN
Test 4-5 p.m. Mon. and Thurs. and at other times

15150 kc. YDC
-B- 19.80 meters
NIROM
BANDOENG, JAVA
6-7:30 p.m., 10:30 p.m.-2:20, 5:30-9:30 a.m.

15140 kc. ★GSF
-B- 19.82 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
6-8:45, 9 a.m.- 12 n.

15120 kc. HVJ
-B- 19.83 meters
VATICAN CITY
10:30 to 10:45 a.m., except Sunday
Sat. 10-10:45 a.m.

15110 kc. ★DJL
-B- 19.85 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
12-2, 8-9 a.m., 11:35 a.m.-4:30 p.m. Also 6-8 a.m., Sun.

15090 kc. RKI
-B, C- 19.88 meters
MOSCOW, U.S.S.R.
Phones Tashkent near 7 a.m. and relays RNE on Sundays 10-11 a.m.

15055 kc. WNC
-C- 19.92 meters
HIALEAH, FLORIDA
Calls Central America, daytime

14980 kc. KAY
-C- 20.03 meters
MANILA, P. I.
Phones Pacific Isles

14970 kc. LZA
-B,C- 20.04 meters
RADIO GARATA,
SOFIA, BULGARIA
Broadcasts Sun. 12:30-8 a.m., 10 a.m.- 4:30 p.m., Daily 5-6:30 a.m., 12 n-2:45 p.m.

14960 kc. PSF
-C- 20.43 meters
RIO de JANEIRO, BRAZIL
Works with Buenos Aires daytime

14950 kc. HJB
-C- 20.07 meters
BOGOTA, COL.
Calls WNC, daytime

14940 kc. HII
-C- 20.08 meters
CIUDAD TRUJILLO, D.R.
Phones WNC daytime

14940 kc. HJA3
-C- 20.08 meters
BARRANQUILLA, COL.
Works WNC daytime

14845 kc. OCJ2
-C- 20.21 meters
LIMA, PERU
Works other S.A. stations daytime

14653 kc. GBL
-C- 20.47 meters
RUGBY, ENGLAND
Works JVH 1-7 a.m.

14640 kc. TYF
-C- 20.49 meters
PARIS, FRANCE
Works Saigon and Cairo 3-7 a.m., 12 n.-2:30 p.m.

14600 kc. JVH
-B,C- 20.55 meters.
NAZAKI, JAPAN
Broadcasts Daily 12 m.-1 a.m.
Irregular 5-11:30 p.m.
Phones Europe 4-8 a.m.

14590 kc. WMN
-C- 20.56 meters
LAWRENCEVILLE, N. J.
Phones England
morning and afternoon

14535 kc. HBJ
-B- 20.64 meters
RADIO NATIONS,
GENEVA, SWITZERLAND
Broadcasts irregularly

14530 kc. LSN
-C- 20.65 meters
HURLINGHAM, ARGENTINA
Calls N.Y.C. afternoons

14500 kc. LSM2
-C- 20.69 meters
HURLINGHAM, ARGENTINA
Calls Rio and Europe daytime

14485 kc. TIR
-C- 20.71 meters
CARTAGO, COSTA RICA
Phones Cen. Amer. & U.S.A. Daytime

14485 kc. HPF
-C- 20.71 meters
PANAMA CITY, PAN.
Phones WNC daytime

14485 kc. TGF
-C- 20.71 meters
GUATEMALA CITY, GUAT.
Phones WNC daytime

14485 kc. YNA
-C- 20.71 meters
MANAGUA, NICARAGUA
Phones WNC daytime

14485 kc. HRL5
-C- 20.71 meters
NACAOME, HONDURAS
Works WNC daytime

14485 kc. HRF
-C- 20.71 meters
TEGUCIGALPA, HONDURAS
Works WNC daytime

14470 kc. WMF
-C- 20.73 meters
LAWRENCEVILLE, N. J.
Phones England in daytime

14460 kc. DZH
-C,X- 20.75 meters
REICHSPOSTZENSTRALAMT,
ZEESEN, GERMANY
Irregular

14440 kc. GBW
-C- 20.78 meters
RUGBY, ENGLAND
Calls U.S.A., afternoon

13990 kc. GBA
-C- 21.44 meters
RUGBY, ENGLAND
Calls Buenos Aires, late afternoon

13820 kc. SUZ
-C- 21.71 meters
ABOU ZABAL, EGYPT
Works with Europe 11 a.m.-2 p.m.

13690 kc. KKZ
-C- 21.91 meters
RCA COMMUNICATIONS,
BOLINAS, CAL.
Tests Irregularly

13635 kc. SPW
-B- 22 meters
WARSAW, POLAND
Mon., Wed., Fri. 12:30-1:30 p.m.
Irregular at other times

13610 kc. JYK
-C- 22.04 meters
KEMIKAWA-CHO, CHIBA-KEN, JAPAN
Phones California till 11 p. m.

13585 kc. GBB
-C- 22.08 meters
RUGBY, ENGLAND
Calls Egypt & Canada, afternoons

13415 kc. GCJ
-C- 22.36 meters
RUGBY, ENGLAND
Calls Japan & China early morning

13390 kc. WMA
-C- 22.40 meters
LAWRENCEVILLE, N. J.
Phones England
morning and afternoon

13380 kc. IDU
-C- 22.42 meters
ASMARA, ERITREA, AFRICA
Works with Rome daytime

13345 kc. YVQ
-C- 22.48 meters
MARACAY, VENEZUELA
Calls Hialeah daytime

13285 kc. CGA3
-C- 22.58 meters
DRUMMONDVILLE, QUE., CAN.
Works London and Ships afternoons

13075 kc. VPD
-X- 22.94 meters
SUVA, FIJI ISLANDS
Daily exc. Sun. 12:30-1:30 a.m.

12840 kc. WOO
-C- 23.36 meters
OCEAN GATE, N. J.
Calls ships

12825 kc. CNR
-B, C- 23.39 meters
DIRECTOR GENERAL
Telegraph and Telephone Stations, Rabat, Morocco
Broadcasts, Sunday, 7:30-9 a. m.

12800 kc. IAC
-C- 23.45 meters
PISA, ITALY
Calls Italian ships, mornings

12780 kc. GBC
-C- 23.47 meters
RUGBY, ENGLAND
Calls ships

12396 kc. CT1GO
-B- 24.2 meters
PAREDE, PORTUGAL
Sun. 10-11:30 a.m., Tues., Thur., Fri. 1:00-2:15 p.m.

12325 kc. DAF
-C- 24.34 meters
NORDDEICH, GERMANY
Works German ships daytime

12290 kc. GBU
-C- 24.41 meters
RUGBY, ENGLAND
Calls N.Y.C., afternoon

12250 kc. TYB
-C- 24.49 meters
PARIS, FRANCE
Irregular

12235 kc. ★TFJ
-B.C- 24.52 meters
REYKJAVIK, ICELAND
Phones England mornings,
Broadcasts Sun. 1:40-2:30 p.m.

12215 kc. TYA
-C- 24.56 meters
PARIS, FRANCE
Works French Ships in morning and afternoon

12150 kc. GBS
-C- 24.69 meters
RUGBY, ENGLAND
Calls N.Y.C., afternoon

12130 kc. DZE
-C,X- 24.73 meters
REICHSPOSTZENSTRALAMT,
ZEESEN, GERMANY
Tests Irregularly

12060 kc. PDV
-C- 24.88 meters
KOOTWIJK, HOLLAND
Tests Irregular

12000 kc. RNE
-B- 25 meters
MOSCOW, U. S. S. R.
Sun. 6-9, 10-11 a.m., 12:30-6 p.m.
Wed. 6-7 a.m.
Daily 12:30-6 p.m.

11991 kc. FZS2
-C- 25.02 meters
SAIGON, INDO-CHINA
Phones Paris, morning

11955 kc. IUC
-C- 25.09 meters
ADDIS ABABA, ETHIOPIA
Calls IAC around 12 m.

11950 kc. KKQ
-X- 25.10 meters
BOLINAS, CALIF.
Tests, Irregularly, evenings

11940 kc. FTA
-C- 25.13 meters
STE. ASSISE, FRANCE
Phones CNR morning,
Hurlingham, Arge., nights

11900 kc XEWI
-B- 25.21 meters
MEXICO CITY, MEX.
Mon., Wed. 3-4 p.m.; Tues., Thurs., 7:30-8:45, 10:30 p.m.-12m.; Fri. 3-4, 9 p.m.-12m.; Sat. 9-11 p.m.; Sun. 1-2:15 p.m.

11880 kc. ★TPA3
-B- 25.23 meters
"RADIO COLONIAL"
PARIS, FRANCE
2-5 a.m., 12:15-6 p.m.

11875 kc. ★OLR
-B- 25.24 meters
PRAGUE, CZECHOSLOVAKIA
Daily 1:30-4 p.m., Mon. and Thur. 7-9 p.m.
Also at other times

11870 kc. ★W8XK
-B- 25.26 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
7-10:30 p.m.
Relays KDKA

11860 kc. YDB
-B- 25.29 meters
N.I.R.O.M.,
SOERABAJA, JAVA
Sat. 7:30 p.m.-2 a.m. (Sun.)
Daily 10:30 p.m.-2 a.m.

11860 kc. GSE
-B- 25.29 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND

11855 kc. DJP
-B,X- 25.31 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
Irregular, 11:35 a.m.-4:30 p.m.

11830 kc. W9XAA
-B- 25.36 meters
CHICAGO FEDERATION OF LABOR
CHICAGO, ILL.
Relays WCFL 6:30 a.m.-4 p.m., 9 p.m.-12 m.

11830 kc. ★W2XE
-B- 25.36 meters
ATLANTIC BROADCASTING CORP.
485 MADISON AVE., N. Y. C.
Relays WABC 6-10 p.m.

11820 kc. GSN
-B- 25.38 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE,
LONDON, ENGLAND
Irregular

11810 kc. ★HJ4ABA
-B- 25.4 meters
P. O. BOX 50,
MEDELLIN, COLOMBIA
11:30 a.m.-1 p.m., 6:30-10:30 p.m.

11810 kc. ★2RO
-B- 25.4 meters
E.I.A.R.
Via Montello 5
ROME, ITALY
Daily 6:43-10:30, 11:30 a.m.-12:40 p.m.; Sun. 6:43-9, 11:30 a.m.- 12:40 p.m.

11800 kc. JZJ
-B- 25.42 meters
TOKIO, JAPAN
Tests Mon. and Thurs. 4-5 p.m., and at other times.

11795 kc. DJO
-B,X- 25.43 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
Irregular

11790 kc. W1XAL
-B- 25.45 meters
BOSTON, MASS.
Daily 5:15-6:15 p.m.
Sun. 5-7 p.m.

11770 kc. ★DJD
-B- 25.49 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
11:35 a.m.-4:30 p.m.; 4:50-10:55 p.m.

11760 kc. OLR
-B- 25.51 meters
PRAGUE,
CZECHOSLOVAKIA

11750 kc. ★GSD
-B- 25.53 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
12:15-5:45 p.m., 6-8 p.m.

11730 kc.
-B- 25.57 meters
"RADIO PHILCO"
SAIGON, INDO-CHINA
Irregular 5:30-9:30 a.m.

11730 kc. PHI
-B- 25.57 meters
HUIZEN, HOLLAND
8:30-10:30 a.m, except Tues. and Wed.

11720 kc. ★CJRX
-B- 25.6 meters
WINNIPEG, CANADA
Daily, 8 p. m.-12 m.

11715 kc. ★TPA4
-B- 25.61 meters
"RADIO COLONIAL"
PARIS, FRANCE
6:15-10:15 p.m.
10:45 p.m.-1 a.m.

11710 kc. SM5SX
-B- 25.63 meters
STOCKHOLM, SWEDEN
Daily 11 a.m.-5 p.m.
Wed. till 6 p.m.

11680 kc. KIO
-X- 25.68 meters
KAHUKU, HAWAII
Broadcasts Tues. 12:30-1 a.m.
Irregular

11600 kc. ★COCX
-B- 25.86 meters
HAVANA, CUBA
Relays CMX
8 a.m.-1 a.m.

11595 kc. VRR4
-C- 25.87 meters
STONY HILL, JAMAICA, B.W.I.
Works WNC daytime.

11560 kc. VIZ3
-X- 25.95 meters
AMALGAMATED WIRELESS OF AUSTRALASIA
FISKVILLE, AUSTRALIA
Calls Canada evening and early a.m.

11500 kc. PMK
-B-C- 26.09 meters
BANDOENG, JAVA

11413 kc. CJA4
-C- 26.28 meters
DRUMMONDVILLE, QUE., CAN.
Tests with Australia irregularly in evening

11280 kc. HIN
-B- 26 meters
LA VOZ DEL PARTIDO DOMINICANO, CIUDAD TRUJILLO, D.R.
4:40-5:40 p.m.

11200 kc. XBJQ
-X- 26.79 meters
BOX 2825,
MEXICO CITY, MEX.
Irregular

11050 kc. ZLT4
-C- 27.15 meters
WELLINGTON, N. ZEALAND
Phones Australia and England early a.m.

11000 kc. PLP
-B, C- 27.27 meters
BANDOENG, JAVA
Relays YDB 5:30-10:30 or 11 a.m., Sat. till 11:30 a.m.

10970 kc. OCI
-C- 27.35 meters
LIMA, PERU
Works with Bogota, Col., evenings

10840 kc. KWV
-C- 27.68 meters
DIXON, CAL.
Works with Hawaii evenings.

10770 kc. GBP
-C- 27.85 meters
RUGBY, ENGLAND
Calls
Sydney, Austral. early a. m.

(All Schedules Eastern Standard Time)

10740 kc. ★JVM
-B,C- 27.93 meters
NAZAKI, JAPAN
Broadcasts Tues. and Fri. 2-3 p.m., Phones U.S. 2-7 a.m.

10675 kc. WNB
-C- 28.1 meters
LAWRENCEVILLE, N. J.
Calls Bermuda, daytime

10670 kc. ★CEC
-C- 28.12 meters
SANTIAGO, CHILE
Broadcasts Daily 7-7:15 p.m.

10660 kc. ★JVN
-B,C- 28.14 meters
NAZAKI, JAPAN
Phones Europe 3-8 a.m.
Broadcasts daily 12 m-1 a.m., 2-8 a.m.
Mon. and Thurs. 4-5 p.m.

10550 kc. WOK
-C- 28.44 meters
LAWRENCEVILLE, N. J.
Phones
Arge., Braz., Peru, nights

10520 kc. VLK
-C- 28.51 meters
SYDNEY, AUSTRALIA
Calls Rugby, early a.m.

10430 kc. YBG
-C- 28.76 meters
MEDAN, SUMATRA
5:30-6:30 a. m., 7:30-8:30 p. m.

10420 kc. XGW
-C- 28.79 meters
SHANGHAI, CHINA
Calls Manila and England, 6-9 a. m. and California late evening

10410 kc. PDK
-C- 28.80 meters
KOOTWIJK, HOLLAND
Calls Java 7:30-9:40 a. m.

10410 kc. KES
-X- 28.80 meters
BOLINAS, CALIF.
Tests evenings

10370 kc. EHZ
-C.-B- 28.93 meters
TENERIFFE, CANARY ISL.
Relays EAJ43, 2-4, 6-7 p.m.

10350 kc. LSX
-C- 28.98 meters
MONTE GRANDE, ARGENTINA
Tests Irregularly 8 p.m.-12 midnight.

10330 kc. ★ORK
-B-C- 29.04 meters
RUYSSELEDE, BELGIUM
Broadcasts 2:30-4 p.m.

10300 kc. LSL2
-C- 29.13 meters
HURLINGHAM, ARGENTINA
Calls Europe, evenings

10290 kc. DZC
-X- 29.16 meters
REICHSPOSTZENTRALAMET, ZEESEN, GERMANY
Broadcasts Irregularly

10260 kc. PMN
-B-C- 29.74 meters
BANDOENG, JAVA
Calls Australia 5 a.m.
Broadcasts Irregularly

10250 kc. LSK3
-C- 29.27 meters
HURLINGHAM, ARGENTINA
Calls Europe and U. S., afternoon and evening

10220 kc. PSH
-C- 29.35 meters
RIO DE JANEIRO, BRAZIL

10170 kc. RIO
-C- 29.5 meters
BAKOU, U.S.S.R.
Works with Moscow
10 p.m.-5 a.m.

10140 kc. OPM
-C- 29.59 meters
LEOPOLDVILLE, BELGIAN CONGO
Phones around 3 a.m. and 1-4 p.m.

10080 kc. RIR
-C- 29.76 meters
TIFLIS, U.S.S.R.
Works with Moscow early morning.

10070 kc. EDM-EHY
-C- 29.79 meters
MADRID, SPAIN
Works with S. America evenings

10055 kc. ZFB
-C- 29.84 meters
HAMILTON, BERMUDA
Phones N. Y. C. daytime

10055 kc. SUV
-C- 29.84 meters
ABOU ZABAL, EGYPT
Works with Europe 1-6 p.m.

10042 kc. DZB
-X- 29.87 meters
ZEESEN, GERMANY
Irregular

9990 kc. KAZ
-C- 30.03 meters
MANILLA, P.I.
Works with Java, Cal. and ships early morning

9950 kc. GCU
-C- 30.15 meters
RUGBY, ENGLAND
Calls N.Y.C. evening

9930 kc. HKB
-C- 30.21 meters
BOGOTA, COL.
Phones Rio de Janeiro evenings

9930 kc. ★CSW
-B- 30.21 meters
NATL. BROAD. STATION
LISBON, PORTUGAL
4-6 or 7 p.m.

9890 kc. LSN
-C- 30.33 meters
HURLINGHAM, ARGENTINA
Calls New York, evenings

9870 kc. WON
-C- 30.4 meters
LAWRENCEVILLE, N. J.
Phones England, evening

9860 kc. ★EAQ
-B- 30.43 meters
P. O. Box 951
MADRID, SPAIN
Daily 5:15-9:30 p.m.;
Saturday also 12 n.-2 p.m.

9840 kc. JYS
-X- 30.49 meters
KEMIKAWA-CHO, CHIBA-KEN, JAPAN
Irregular. 11:30 p.m.-3 a.m.

9800 kc. LSI
-C- 30.61 meters
MONTE GRANDE, ARGENTINA
Tests irregularly

9790 kc. GCW
-C- 30.64 meters
RUGBY, ENGLAND
Calls N.Y.C., evening

9760 kc. VLJ-VLZ2
-C- 30.74 meters
AMALGAMATED WIRELESS OF AUSTRALIA
SYDNEY, AUSTRALIA
Phones Java and N. Zealand early a.m.

9750 kc. ★COCQ
-B- 30.77 meters
HAVANA, CUBA
6:50 a.m.- 1 a.m.

9750 kc. WOF
-C- 30.77 meters
LAWRENCEVILLE, N. J.
Phones England, evening

9710 kc. GCA
-C- 30.89 meters
RUGBY, ENGLAND
Calls Arge. & Brazil, evenings

9675 kc. DZA
31.01 meters
ZEESEN, GERMANY
Irregular

9670 kc. TI4NRH
-B- 31.02 meters
AMANDO CESPEDES MARIN, APARTADO 40,
HEREDIA, COSTA RICA
Daily 8:30-10, 11:30 p.m.-12 m.

9660 kc. ★LRX
-B- 31.06 meters
"EL MUNDO"
BUENOS AIRES, ARGENTINA
6-10 p.m.

9650 kc. YDB
-B- 31.09 meters
N.I.R.O.M.
SOERABAJA, JAVA
Daily exc. Sat. 6-7:30 p.m., 5:30-10:30 or 11 a.m., Sat. 5:30-11:30 a.m.

9650 kc. ★CT1AA
-B- 31.09 meters
"RADIO COLONIAL"
LISBON, PORTUGAL
Tues., Thurs., Sat. 4-7 p.m.

9650 kc. DGU
-C- 31.09 meters
NAUEN, GERMANY
Works with Egypt in afternoon

9645 kc. HH3W
-B- 31.1 meters
P.O. BOX A117,
PORT-AU-PRINCE, HAITI
1-2, 7-8 p.m.

9645 kc. YNLF
-B- 31.1 meters
MANAGUA, NICARAGUA
8-9 a.m., 12:30-2:30, 6:30-10 p.m.

9635 kc. ★2RO
-B- 31.13 meters
E.I.A.R., ROME, ITALY
Daily 12:40-5:30 p.m.
Mon., Wed., Fri. 6-7:30 p.m.
Tues., Thurs., Sat. 6-7:45 p.m.

9620 kc. HJ1ABP
-B- 31.19 meters
P.O. BOX 37,
CARTAGENA, COL.
11 a.m.-1 p.m. 5-11 p.m.
Sun. 10 a.m.-1 p.m., 3-6 p.m.

9615 kc. HP5J
-B- 31.22 meters
APARTADO 867,
PANAMA CITY, PANAMA
12n-1:30 p.m., 6-10:30 p.m.

9600 kc. RAN
-B- 31.25 meters
MOSCOW, U.S.S.R.
Daily 7-7:30 p.m.,
Sun., Wed. and Fri. 6-8 p.m.

9600 kc. CB960
-B- 31.25 meters
SANTIAGO, CHILE
9:30 p.m. on

9595 kc. ★HBL
-B- 31.27 meters
LEAGUE OF NATIONS
GENEVA, SWITZERLAND
Saturdays, 5:30-6:15 p. m.
Mon. at 1:45 a.m.

9590 kc. ★PCJ
-B- 31.28 meters
N. V. PHILIPS RADIO
EINDHOVEN, HOLLAND
Sun. 2-3, 7-8 p.m. Tues. 1:30-3 p.m. Wed. 7-10 p.m.

9590 kc. ★VK2ME
-B- 31.28 meters
AMALGAMATED WIRELESS, LTD., 47 YORK ST.
SYDNEY, AUSTRALIA
Sun. 1-3, 5-11 a.m.

9590 kc. ★W3XAU
-B- 31.28 meters
PHILADELPHIA, PA.
Relays WCAU
Daily 12n-8 p.m.

9590 kc. VK6ME
-B- 31.28 meters
AMALGAMATED WIRELESS, LTD.
PERTH, W. AUSTRALIA
5-9 a.m.

9580 kc. ★ GSC
-B- 31.32 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
4-5:45, 6-8, 9-11 p.m.

9580 kc. ★VK3LR
-B- 31.32 meters
Research Section,
Postmaster Gen'ls. Dept.,
61 Little Collins St.,
MELBOURNE, AUSTRALIA
3:15-8:30, 8:45-9:45 a.m., except Sun., also Fri. 10 p.m.-2 a.m.

9575 kc. HJ2ABC
-B- 31.34 meters
CUCUTA, COL.
8 p.m.-12 n.

9570 kc. ★W1XK
-B- 31.35 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
SPRINGFIELD, MASS.
Relays WBZ, 7 a.m.-1 a.m.
Sun. 8 a.m.-1 a.m.

9565 kc. VUB
-B- 31.36 meters
BOMBAY, INDIA
11:30 a.m.-12:30 p.m., Tues., Thurs., Fri.

9560 kc. ★DJA
-B- 31.38 meters
BROADCASTING HOUSE, BERLIN
12:05-5:15 a.m., 5:55-11 a.m., 4:50-10:45 p.m.

9555 kc. HJ1ABB
-B- 31.38 meters
BARRANQUILLA, COL., S.A.
P. O. BOX 715
11:30 a.m.-1 p.m., 4:30-10 p.m.

9540 kc. ★DJN
-B- 31.45 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:05-5:15 a.m., 4:50-10:45 p.m.

9540 kc. VPD2
-B- 31.45 meters
SUVA, FIJI ISLANDS
AMALGAMATED WIRELESS OF AUSTRALASIA
Daily except Sun. 5:30-7 a.m.

9530 kc. ★W2XAF
-B- 31.48 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays WGY 4 p.m.-12 m.

9530 kc. JZI
-B- 31.48 meters
TOKIO, JAPAN
Tests 4-5 p.m. Mon. and Thur. and at other times

9525 kc. ZBW3
-B- 31.49 meters
HONGKONG, CHINA
P.O. Box 200
11:30 p.m.-1:15 a.m., 4-10 a.m.

9525 kc. LKJ1
-B- 31.49 meters
JELOY, NORWAY
5-8 a.m., 11 a.m.-6 p.m.

9520 kc. HJ4ABH
-B- 31.51 meters
ARMENIA, COLOMBIA
Irregular 5 p.m.-12 m.

9510 kc. ★VK3ME
-B- 31.55 meters
AMALGAMATED WIRELESS, Ltd.
167 Queen St.,
MELBOURNE, AUSTRALIA
Daily exc. Sun. 4-7 a.m.

9510 kc. ★GSB
-B- 31.55 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
3-5 a.m., 9 a.m.-12 n. 12:15-5:45, 6-8 p.m.

9500 kc. HJU
-B- 31.58 meters
NATIONAL RAILWAYS
BUENAVENTURA, COLOMBIA
Mon., Wed., Fri. 8-11 p.m.

9500 kc HJ1ABE
-B- 31.58 meters
P.O. BOX 31,
CARTAGENA, COLOMBIA
Daily 7:30-9 p.m.,
Mon. also 9:30-10:30 p.m.

9500 kc. PRF5
-B- 31.58 meters
RIO DE JANEIRO, BRAZIL
Irregularly 4:45-5:45 p.m.

9450 kc. TGWA
-B- 31.75 meters
MINISTRE de FOMENTO
GUATEMALA CITY, GUATEMALA
Daily 11 a.m.-1 p.m. 8 p.m. 12m.
Sat. 9 p.m.-5 a.m. (Sun).

9428 kc. ★COCH
-B- 31.8 meters
2 B ST., VEDADO,
HAVANA, CUBA
Daily 8 a.m.-7 p.m.
Sun. 11 a.m.-12 n.,
8:30-9:30 p.m.

9415 kc. PLV
-C- 31.87 meters
BANDOENG, JAVA
Phones Holland around 9:45 a.m.

9350 kc. HS8PJ
-B- 32.09 meters
BANGKOK, SIAM
Thur. 8-10 a.m.

9330 kc. CGA4
-C- 32.15 meters
DRUMMONDVILLE, CANADA
Phones England irregularly

9280 kc. GCB
-C- 32.33 meters
RUGBY, ENGLAND
Calls Can. & Egypt, evenings

9170 kc. WNA
-C- 32.72 meters
LAWRENCEVILLE, N. J.
Phones England, evening

9150 kc. YVR
-C- 32.79 meters
MARACAY, VENEZUELA
Works with Europe afternoons.

9125 kc. ★HAT4
-B- 32.88 meters
"RADIOLABOR,"
GYALI-UT, 22
BUDAPEST, HUNGARY
Sunday 6-7 p.m.

9060 kc. TFK
-C- 33.11 meters
REYKJAVIK, ICELAND
Phones London afternoons.
Broadcasts irregularly.

9020 kc. GCS
-C- 33.26 meters
RUGBY, ENGLAND
Calls N.Y.C., evenings

9010 kc. KEJ
-C- 33.3 meters
BOLINAS, CAL.
Relays NBC & CBS
Programs in evening irregularly

8975 kc. VWY
-C- 33.43 meters
KIRKEE, INDIA
Works with England in morning

8950 kc. HCJB
-B- 33.5 meters
QUITO, ECUADOR
7:30-9:30 p.m., except Monday
Sun. 11 a.m.-12 n.; 4-10 p.m.
-B- 34.09 meters

8795 kc. HKV
BOGOTA, COLOMBIA
Mon. and Thurs. 7-7:30 p.m.

8775 kc. PNI
-C- 34.19 meters
MAKASSER, CELEBES, N.I.
Phones Java around 4 a. m.

8765 kc. DAF
-C- 34.23 meters
NORDDEICH, GERMANY
Works German Ships irregularly

8760 kc. GCQ
-C- 34.25 meters
RUGBY, ENGLAND
Calls S. Africa, afternoon

8730 kc. GCI
-C- 34.36 meters
RUGBY, ENGLAND
Calls India, 8 a. m.

8680 kc. GBC
-C- 34.56 meters
RUGBY, ENGLAND
Calls ships

8665 kc. CO9JQ
-X- 34.62 meters
4 GENERAL GOMEZ
CAMAGUEY, CUBA
5:30-6:30, 8-9 p.m. daily except Sat. and Sun.

8590 kc. YNVA
-B- 34.92 meters
MANAGUA, NICARAGUA
7:30-9:30 p. m.

8560 kc. WOO
-C- 35.05 meters
OCEAN GATE, N. J.
Calls ships irregular

8400 kc. HC2AT
-B- 35.71 meters
CASSILLA 877
GUAYAQUIL, ECUADOR
8-11 p.m.

8380 kc. IAC
-C- 35.8 meters
Pisa, Italy

8190 kc. XEME
-B- 36.63 meters
CALLE 59, No. 517
MERIDA, YUCATAN
"LA VOZ de YUCATAN desde MERIDA
10 a.m.-12 n., 6 p.m.-12 m.

8185 kc. PSK
-C- 36.65 meters
RIO DE JANEIRO, BRAZIL
Irregularly

8036 kc. CNR
-B- 37.33 meters
RABAT, MOROCCO
Sunday, 2:30-5 p. m.

7975 kc. HC2TC
-B- 37.62 meters
QUITO, ECUADOR
Thurs., Sun. at 8 p.m.

7901 kc. LSL
-C- 37.97 meters
HURLINGHAM, ARGENTINA
Calls Brazil, night

7880 kc. JYR
-B- 38.07 meters
KEMIKAWA-CHO, CHIBA-KEN, JAPAN
4-7:40 a. m.

7860 kc. SUX
-C- 38.17 meters
ABOU ZABAL, EGYPT
Works with Europe 4-6 p.m.

7854 kc. HC2JSB
-B- 38.2 meters
GUAYAQUIL, ECUADOR
Evenings

7799 kc. ★HBP
-B- 38.47 meters
LEAGUE OF NATIONS,
GENEVA, SWITZERLAND
5:30-6:15 p. m., Saturday

7715 kc. KEE
-C- 38.89 meters
BOLINAS, CAL.
Relays NBC & CBS
Programs in evening irregularly

7630 kc. ZHJ
-B- 39.32 meters
PENANG, MALAYA
Daily 7-9 a.m.
also Sat. 11 p.m.-1 A.M. (Sun.)

(All Schedules Eastern Standard Time)

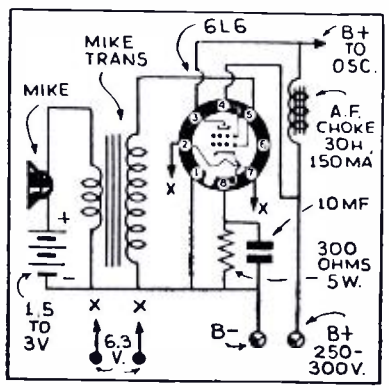
• • • Short Wave

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

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

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

EDITED BY GEORGE W. SHUART, W2AMN



Modulator (1036)

1-TUBE MODULATOR

Francis Monahan, Nashville, Tenn.

(Q) Kindly print in the Question Box a diagram of a 1-tube modulator for a 5 meter oscillator. I understand that a single 6L6 tube may be employed satisfactorily.

(A) We have shown a diagram using a single 6L6. The output of this modulator will be approximately 7 watts and will modulate an oscillator having an input of 14 or 15 watts. A sensitive, single-button carbon microphone should be used.

output voltages should be as follows; 45, 90, 135, 180, 250 volts. Would you be kind enough to print the diagram in a coming issue of the Question Box?

(A) In the diagram shown we have indicated a 15,000 ohm, 35 watt voltage divider with 4 sliders. These 4 sliding contactors should be adjusted with the aid of a D.C. voltmeter in order to obtain proper output voltages. The rectifier tube shown is an 83V, although an 80 may be used satisfactorily.

REGARDING PARTS AND PRICES

Alvin Mefford, Pauls Valley, Okla.

(Q) In the August issue of *Short Wave Craft* I find a very interesting diagram of a European A.F. amplifier with a flat response of 1 to 1,000,000 cycles. Will you please advise me where I may find blueprint, parts and prices for same?

(A) We have had many requests for information regarding apparatus described in the World-Wide Review department. However, as stated in the editor's note on that page, it is impossible for us to furnish any information other than that given. We also receive a number of requests for data regarding prices of parts and where to purchase them. We suggest that any one desiring such information and prices refer to the advertising pages of this magazine and write to the various radio houses whose advertisements will be found therein. They will all be pleased to furnish prices on any apparatus which you may desire.

CONVERTING B.C. RECEIVER

Arthur F. Hartman, New York City.

(Q) Would you please publish the information on how to convert 5-tube midget electric receiver into a long and short-wave set.

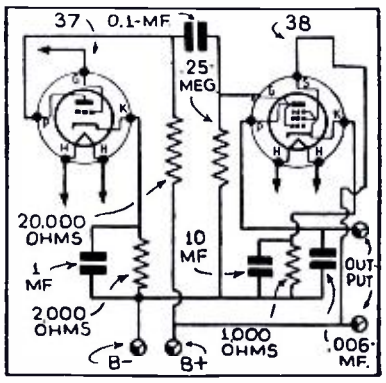
(A) As stated many times before in the Question Box, we do not advocate that fans or experimenters attempt to remodel *broadcast* receivers in order to obtain short wave reception. It is a most unprofitable proposition and in many cases the results will be entirely unsatisfactory. The best arrangement will be, of course, to build a short-wave receiver, following some of the designs found in past issues of this magazine. Or you may build a converter, many of which have been also illustrated in the Question Box.

6C6-37—2 TUBER

Mr. Gerrano, San Leandro, Cal.

(Q) I have a set of 3 winding plug-in coils covering a range of from 17 to 500 meters. These are 5 prong coils. Kindly show a diagram employing these coils with a 6C6 regenerative detector, resistance-coupled to a 37 audio amplifier. Regeneration in the detector stage should be controlled with a 50,000 ohm potentiometer.

(A) We have shown the diagram you request and have indicated the separate winding which has 2 connections on the coil base, employed as the tickler. The remaining small winding which is connected with the secondary is shown employed as an antenna coupling coil. A 100 mmf. variable condenser is necessary in the antenna circuit for the elimination of "dead-spots."



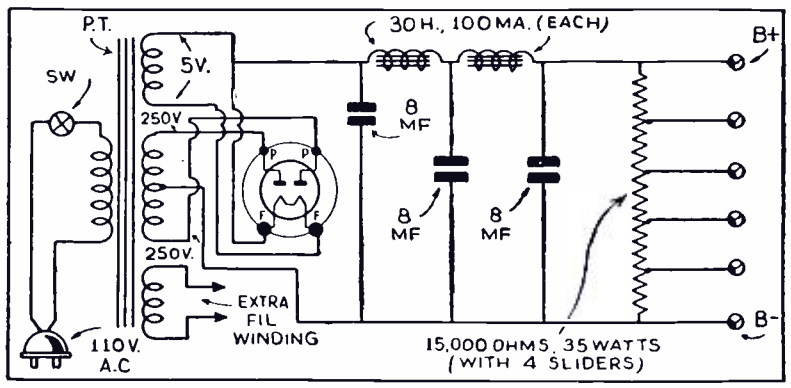
Amplifier (1039)

38 A.F. AMPLIFIER

Reginald Pearson, Wellan, Ont., Can.

(Q) I would appreciate an answer to the following question in one of your coming issues of the Question Box. I am using at present, a T.R.F. receiver with the following line-up, 6D6, 6C6 and 37 Audio amplifier. I have a 38 tube and would like to have you print a diagram showing how this can be connected to my receiver in order to operate a speaker.

(A) We have shown the connections for the 38 amplifier. This is resistance-coupled to the 37 amplifier of the receiver.

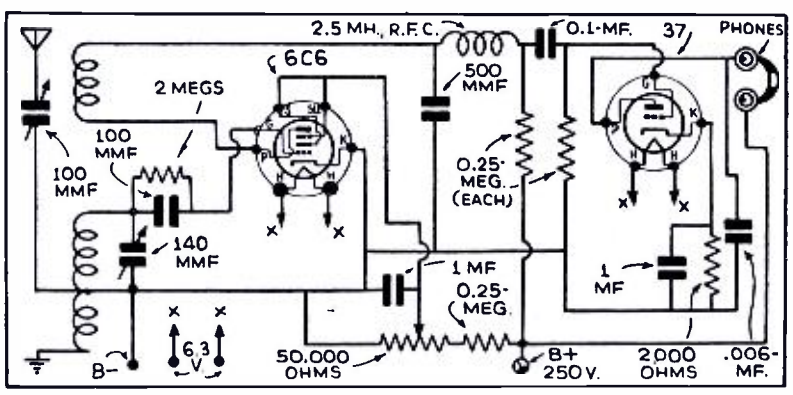


Power Supply Diagram for S-W Receivers (1037)

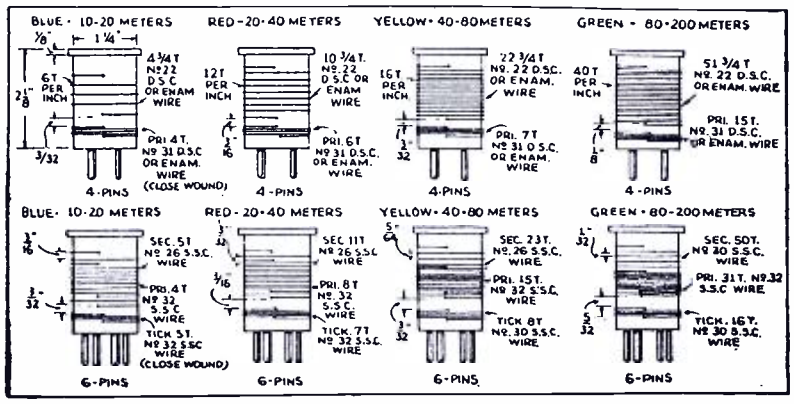
POWER SUPPLY DIAGRAM

L. E. Sandidge, Jr., Pocahontas, Miss.

(Q) I intend to construct a power supply which will operate on 110 volts, 60 cycle A.C. The



2-Tube Receiver Using Pentode and Triode (1040)



Complete Coil Data 2 and 3 Windings (1038)

COIL DATA

Raymond Paulino, Atlanta, Ga.

(Q) Would you be kind enough to print coil data for 2 and 3 windings coils, covering a range of from 15 to 200 meters, which may be tuned with a 140 mmf. condenser?

(A) We are reprinting the entire data on both 2 winding, 4 prong coils and 3 winding, 6 prong. These coils will serve with any of the regenerative T.R.F. receivers described in past issues of the Question Box, and elsewhere in this magazine.

USING PROPER TUBES

G. Marossi, Toronto, Ont., Can.

(Q) In past issues of *Short Wave Craft* I have seen many diagrams of A.C.-D.C. receivers using type 37, 78, or 6D6 tubes. I would like to use 2½ volt tubes in an A.C.-D.C. lineup.

(A) We do not recommend 2½ volt tubes be employed in A.C.-D.C. circuits. The proper tubes to use are shown in the diagrams and we recommend that you adhere to those recommended.

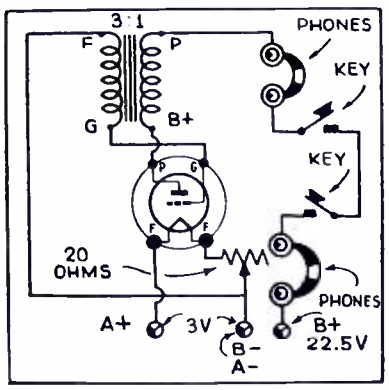
CHANGING TUBES

C. A. Doane, Jr., Marshfield, Ore.

(Q.) In your August, 1936, issue of *Short Wave Craft* on page 226, you described a receiver using two 27's. I would like to know if type 37's or 76's could be used, providing proper heating voltage is applied.

(A.) Most certainly any of the heater triodes may be used in the circuit mentioned in your question, and no changes will be necessary in values or circuit connections.

QUESTION BOX



Code Set (1041)

2-WAY CODE PRACTICE SET

Edward Kulwitz, Chicago, Ill.

(Q) I would like to construct a code practice set which can be used in the same manner as the regular telegraph circuits, 2-way communication with "break-in."

(A) We have shown a diagram using a conventional one-tube audio oscillator. By employing two sets of earphones and two keys, two-way communication and break-in may be had. The operator *standing by* should *close* his key, the message will then be heard by both operators. Should the operator *standing by* wish to *break* the other operator, it is only necessary to open his key, then nothing will be heard in either set of earphones and the transmitting operator will know that the receiving operator has opened the circuit in order to *break* him.

2-STAGE A.F. AMPLIFIER

Frank Caggiano, Bronx, N.Y.

(Q) Please print in your Question Box the diagram of an audio amplifier consisting of a 56, driving a pair of 2A5's in push-pull. I would like to connect this to my 2 tube regenerative set.

(A) In the diagram the 56 and 2A5's are shown, transformer coupling in the input circuit is indicated. This will serve satisfactorily if the output tube of the receiver is a triode such as a 56, 37, or 76.

RE: THREE TUBE DOERLE

Tedd Kubit, Cleveland, Ohio

(Q.) In regard to the improved 3-tube Doerle battery set, please tell me the reason for its quietness of operation. Also may an A.C. power supply be used for the plate voltages of the receiver?

(A.) Usually the battery set when operated from high-grade batteries is quiet because of the lack of disturbances usually communicated to the set through the power line. B batteries may be eliminated through the use of the so-called B-eliminator, which is really a power-supply intended to supply only the plate voltages.

EFFECT OF SHIELDED BUILDING

J. C. Nix, Dapp, Alta, Can.

(Q) A short-wave transmitter and receiver is to be placed in a building which has metal sheeting on both outside and inside. This building is near a grain elevator which is 95 feet high. This also has lightning arresters. What effect will this have on transmitting and receiving conditions?

(A) So long as the transmitting and receiving antenna is sufficiently clear of all of the outside of the shielded building, there should be no ill effects. Off hand, we believe there will be a considerable advantage in having the transmitter and receiver located in the shielded building. With the proper antenna lead-in system, you should experience a minimum of man-made interference.

2-STAGE PRE-SELECTOR

Merrill Weiler, Reading, Pa.

(Q) I would like to construct a pre-amplifier or a pre-selector, using two type 58 tubes. I would like to know if this would improve the selectivity of my receiver; also show the various voltages required.

(A) We have shown a diagram of two 58's employing 4 prong coils with 2 windings on each coil. The various voltages required are also shown. A pre-selector of this type when connected in front of a superheterodyne will increase the sensitivity tremendously, and if you are troubled with images, these will also be greatly reduced if not entirely eliminated. However the actual selectivity will apparently remain unchanged, that is if you are listening in on the 49 meter band, you will experience nearly as much interference as before, providing this interference was not due to images. We do not believe you will benefit by connecting a two-stage amplifier of this type to the regular regenerative detector.

5 METER RECEIVER

William L. Cox, Youngstown, Ohio.

(Q) Would you please print in the Question Box a diagram of a 5-meter super-regenerator using a 56 detector, a 56 first stage of audio, and a 2A5 pentode output amplifier. Regeneration is to be controlled with a potentiometer.

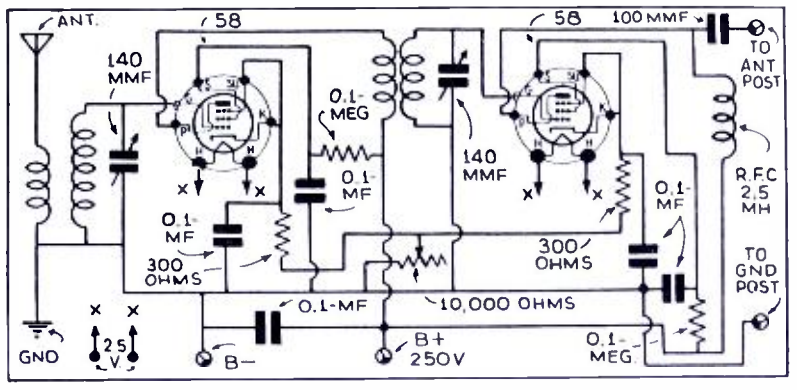
(A) We have shown the famous 56-2A5, 5 meter receiver and have omitted the 56 audio amplifier as it has been found entirely unnecessary because enough volume can be obtained with the single 2A5. We have shown a 500,000 ohm potentiometer in the grid circuit of the 2A5 for A.F. gain control. This will be found very useful.

TRIMMERS FOR SUPER-HET

Richard Tobin, Eau Claire, Wisc.

(Q) Kindly answer this question in the Question Box. Will the 2-tube Victor superhet work satisfactorily on 10 meters, and also is the balancing condenser necessary when padders are also part of the tuning condensers?

(A) The 2-tube Victor superhet will not work satisfactorily on 10 meters. The extra padding condenser in the detector tuning circuit is necessary for proper adjustment. The small padders on the tuning condenser should be set at minimum capacity.



2-Tube Pre-Selector (1043)

2-TUBE "HAM" RECEIVER

Sam Rotondo, Manayunk, Pa.

(Q) I am very much interested in receiving amateur stations and wish to construct the best possible 2-tube receiver. I will appreciate it very much if you publish the diagram in one of the coming issues of the Question Box, also furnish the coil data.

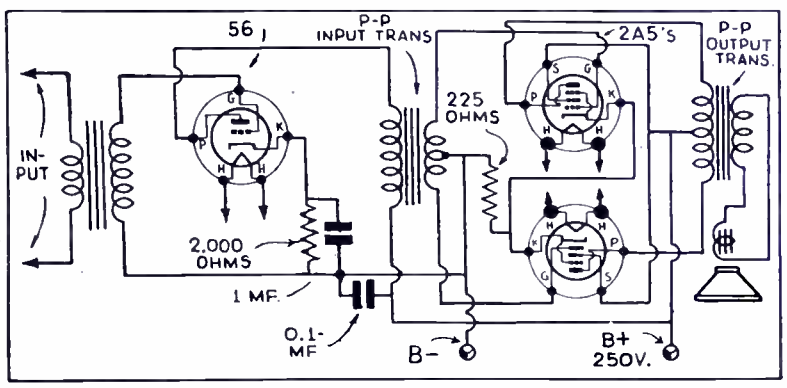
(A) Undoubtedly the most popular receiver for the embryo ham consists of a screen-grid regenerative detector and a single stage of audio amplification. Of course, in the crowded ham bands a receiver must have band-spread. As the diagram shows this is accomplished by connecting a 20 or 35 mmf, variable condenser in parallel with the 140 mmf, tuning condenser. The large condenser is used for band-setting, while the smaller one actually does the tuning. Coil data for this receiver can be found elsewhere in these pages.

AMPLIFIER TROUBLE

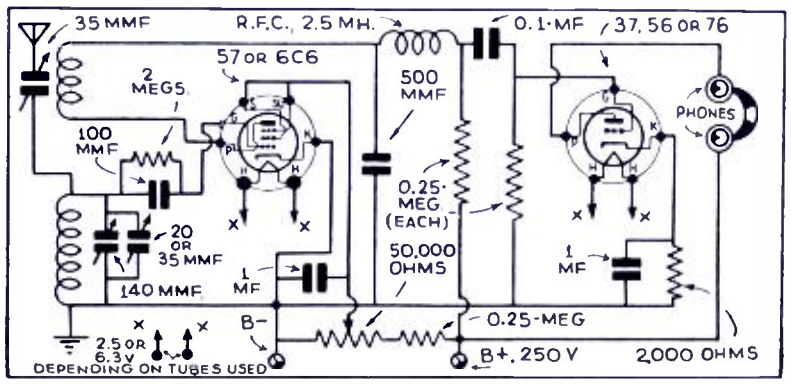
S. W. C. Reader. Newark. N.J.

(Q.) I have constructed an amplifier which was previously described and which uses a 57 and a 2A5. I was successful in getting the 57 stage to operate properly but could not make the 2A5 stage work at all. The amplifier resistor coupled and the coupling units are O.K. I have checked the wiring and it is also correct. Could you suggest something?

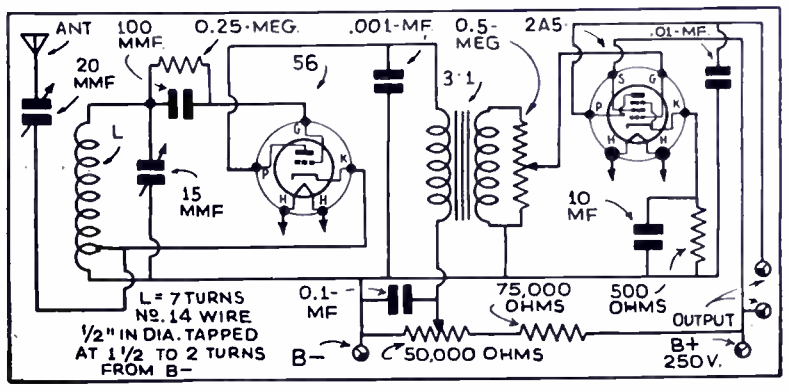
(A.) You neglected to state in the question whether or not the amplifier exhibited any examples of feed-back or howling. In most cases failure of radio apparatus is due to improper connections or a defective part. We suggest that you check the connections carefully and also examine each part such as condensers and resistors for a possible short-circuit or open-circuit. On the other hand, if your amplifier shows signs of howling or motor-boating, we suggest that you refer to the August, 1936, issue of the Question Box, page 355, and you will find complete information just how motor-boating and other amplifier ills may be overcome.



Amplifier With Push-Pull 2A5's (1042)



2-Tube Set For The "HAM" (1044)



One of the Best Five Meter Receivers (1045)

SHORT WAVE LEAGUE

HONORARY MEMBERS

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

Here's Your Button

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

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

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

When To Listen In

By M. Harvey Gernsback

All Schedules Eastern Standard Time

DAVENTRY

● THE current schedule of the British Empire Station is as follows: 3-5 a.m. on GSO and GSB. In addition GSG or GSH may be used; 6-8:45 a.m. (Sun. 7-8:45) on GSF and either GSH or GSG. * * * 9 a.m. to 12 n. on GSF, GSB and either GSH or GSG. * * * 12:15-3:45 p.m. on GSI, GSD and GSB; 4-5:45 p.m. on GSD, GSB and either GSC, GSL or GSA; 6-8 p.m. on GSC, GSD and either GSL or GSB. 9-11 p.m. on GSC and either GSL, GSA or GSD.

The frequencies of the Daventry stations are: GSA 6.05 mc. GSB 9.51 mc. GSC 9.58 mc. GSD 11.75 mc. GSF 15.14 mc. GSG 17.79 mc. GSH 21.47 mc. GSI 15.26 mc. GSL 6.11 mc. GSO 15.18 mc.

Daventry frequently changes the frequencies in use during any given transmission period to keep up with seasonal changes in receiving conditions, hence the above schedule may be modified at any time.

GERMANY

● THE present schedule of the German s-w stations is: 12.05-5:15 a.m. on DJA, DJB, DJN and DJE. DJL is also used from 12:05-2 a.m. 5:55-11 a.m. on DJA, DJB, DJQ and DJE. DJL and DJR are also used from 8-9 a.m. (DJL is for North America.) 11:35 a.m. to 4:30 p.m. on DJL, DJD, DJC and irregularly on DJP.

4:50-11 p.m. on DJA, DJC, DJD, DJN. DJA for Central America, DJN for South America and DJD and DJC for North America.

In addition on Sundays DJL is on from 6-8 a.m. and DJQ and DJB from 11:10 a.m. to 12.25 p.m. DJB is for North America. DJO is heard working with Rocky Point, L.I., irregularly from 12 n. to 5 p.m. DJM tests irregularly.

The German stations frequencies are: DJA 9.56 mc. DJB 15.2 mc. DJC 6.02 mc. DJD 11.77 mc. DJE 17.76 mc. DJL 15.11 mc. DJM 6.079 mc. DJN 9.54 mc. DJO 11.8 mc. DJP 11.86 mc. DJQ 15.28 mc. DJR 15.34 mc.

ETHIOPIA

● THE Addis Ababa stations are now operated by the Italians. IUC on 11.995 mc. phones IAC from 12 n. on. IUG on 15.45 mc. works IAC from 9:15-10:30 a.m.

OCEANIA

● TAHITI, of "Mutiny on the Bounty" fame, is now being heard in the New York area often. FO8AA, an amateur station at Papeete, broadcasts on 7.1 mc. from 11 p.m. to 12 m. or later each Tuesday and Friday. It is heard fairly well.

SPAIN

● WAR-TORN Spain has become a land of short wave stations. There are innumerable small stations on both sides broadcasting news daily. The 7 mc. "ham" band is filled with Spanish amateurs each evening. EHZ at Teneriffe in the Canary Isles on 10.37 mc. is heard very well at all hours and especially from 2-4 and 6-7 p.m. It relays EAJ43. Most of the programs consist of news dispatches.

EAQ is still on the air daily although its modulation has become very shallow.

JAPAN

● THE Japanese are testing 3 new 20 kw. transmitters for short-wave "broadcast" use. Up to the present they have made use of their commercial radio telephone transmitters for broadcasting on the short waves. The new stations are JZI, 9.53 kc.; JZJ, 11.8 mc.; and JZK, 15.16 mc. At present they are used on the Monday and Thursday programs for the eastern United States from 4-5 p.m. If successful they will be used at other times and the power increased.

JVH, 14.6 mc. is used for the daily program from 12 m. to 1 a.m. This station is also on the air frequently, at varying intervals, from about 5 p.m. till 11:30 p.m. It is heard fairly well at these times. JVN 10.66, JVM 10.74 or JVT 6.75 mc. are heard daily from 4-8 a.m.

SWEDEN

● SM5SX at Stockholm is broadcasting on 11.71 mc. daily from 11 a.m. to 5 p.m. and on Wednesday till 6 p.m. They have a 400 watt transmitter. Address is Royal Technical University.

SOUTH AMERICA

● THE winter schedule of LRU and LRX (during the period Argentina is on daylight saving from Nov. 1-Apr. 1) is as follows: LRU 15.29 mc., 6 a.m. to 5:50 p.m.; LRX 9.66 mc., 6-10 p.m. LRX is sometimes on later.

HJ4ABH on 9.52 mc. located at Armenia, Colombia, is heard frequently during the evening hours with a strong signal. YV-15RV at Maracay, Venezuela, on 5.91 mc. is a "newcomer."

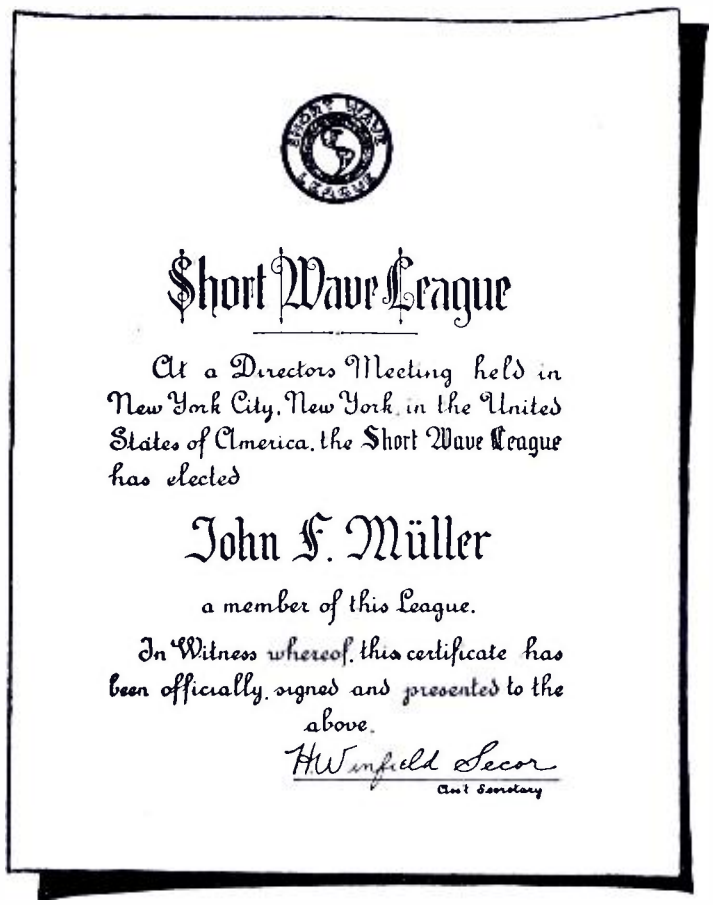
The 6 mc. band is now clear of summer static and the old familiar pandemonium has broken loose again. However, by careful tuning many South and Central Americans can be snared on an average evening.

ASIA

● ZBW at Honkong has 4 new wavelengths in operation now: ZBW2 on 6.09 mc. ZBW3 on 9.525 mc. ZBW4 on 15.19 mc. and ZBW5 on 17.755 mc. Power is now 2-2.6 kw. They can be heard daily from 11:30 p.m. to 1:15 a.m. and from 3 or 4-10 a.m. The best heard transmission in the New York area is that from 4-10 a.m., especially when the station operates on 15.19 mc. On Saturday the station is on till 11 a.m. and from 9 p.m. to 1:30 a.m. (Sun.) Announcements are made in English by an announcer with an Oxford accent. Daventry programs are frequently relayed from 7:30-8 a.m.

Java is heard daily on YDB, 9.65 mc., PLP 11 mc., and YDC 15.15 mc. from

(*Continued on page* 645)



Short Wave League

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

John F. Müller

a member of this League.

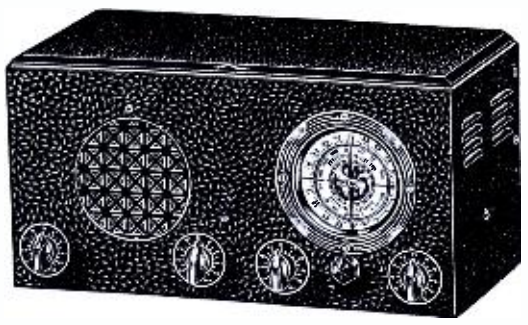
In Witness whereof, this certificate has been officially signed and presented to the above.

H. Winfield Secor
Asst Secretary

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

"NEW 1937 SHORT WAVE APPARATUS—THE IDEAL HOLIDAY GIFT"

(Guaranteed shipment of all orders within 24 hrs.)



EILEN RX-17 7-tube BANDSPREAD RECEIVER

(8½ to 3,000 meters)

See article p. 544 Jan. issue Short Wave and Television.

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

RX-17 is equipped with the famous **EILEN NOISE SUPPRESSOR**, the latest development of our laboratories and which is skyrocketing itself into immense popularity. This remarkable development, exclusive with **EILEN**, enables you to enjoy reception from those far-off stations with excellent clarity and volume.

Constructed of the finest materials and to conform with the highest engineering standards, this instrument uses two 6D6, two 6J5G, one 76, one 42, and one 5Y3 high gain tubes as **TUNED RF AMPLIFIER, TUNED ELECTRON COUPLED SCREEN-GRID REGENERATIVE DETECTOR**, powerful 3 stage audio frequency amplifier with power pentode output stage delivering 3 watts of audio power to the built-in high fidelity dynamic loudspeaker. **VARIABLE NOISE SUPPRESSOR**, rectifier and complete built-in **HUM-FREE** power supply. **BANDSPREAD TUNING**—a special electron tube circuit enabling the operator to reduce or eliminate certain types of noises occurring in all short wave receivers—automatic headphone jack—smooth and noiseless controls—highly efficient interchangable inductors—doublet or aerial-ground connections—**POWERFUL** hi-fidelity audio system—large, illuminated airplane type vernier dial—sensitivity, volume, and selectivity that will amaze you—are features to be found in **RX-17**.

RX-17 in BEAUTY, as well as performance, is in a class by itself—heavy steel cabinet with hinged lid finished in durable black shrivel—colored dial lights behind black and white scale—chrome plated escutcheon—calibrated dial plates—plated chassis and shielding—Operates entirely from your 105 to 130 volts AC house current.

RX-17 under fair conditions will bring in dozens of foreign as well as domestic short wave stations with enormous volume. Try one and see for yourself!

RX-17, complete, READY TO USE, with 7 RCA or Sylvania tubes, 12 low-loss silver plated coils for 8½ to 3000 meters, wired, in cabinet, and 7 page instruction booklet..... **$21.75**

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

KIT For those who wish to build their own we offer: of all parts, coils for 8½-3000 meters, unwired (less tubes & cabinet)..... **$14.95**
Cabinet, extra..... $2.50
7 matched Sylvania tubes, extra..... 3.35
Wired and tested, extra..... 2.00

AMATEURS: Model RX-17-AB has same specifications as RX-17 except that it is equipped with plate voltage cut-off switch and special bandspread coils for 20-40-80-160 M bands spreading these bands 80% of dial scale. Add $1 to price of RX-17. (10 meter band coils if desired extra $1.45).

MODEL RX-18 and **RX-18-AB** are identical with the above model, but possess an eighth tube enabling the wave length range to be extended down to 1½ meters. Add $4.50 to price of corresponding RX-17 model.

HF-19 One-Tube Transceiver

5 Meters

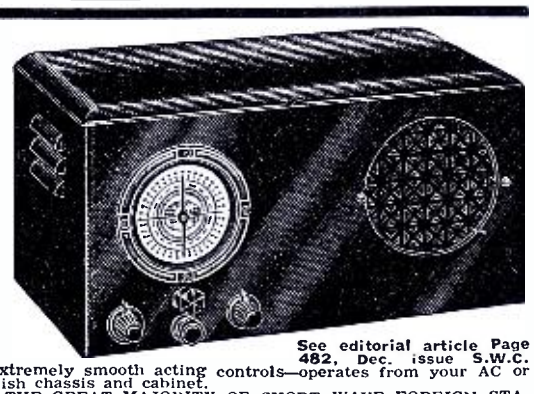
A masterpiece in simplicity! An unequalled value for the experimenter who is interested in an inexpensive transceiver which will enable him to maintain reliable 2 way communication with a friend. So simple that even a beginner may readily obtain remarkable results with it. Uses one type 19 (twin 2 in 1 tube) in special circuit producing great volume and signal strength. Operates from 2 dry cells and 90 to 135 volts of B battery.

HF-19 TRANSCEIVER KIT, of necessary parts, and simple instructions, less cabinet, tube, microphone, unwired..... **$3.95**
Beautiful crackle finish cabinet extra....$1.25
Type 19 tube, extra..... $ .65
Wired and tested, extra..... 1.50
Microphone for above, extra..... 1.95

BS-5

6-Tube Band switch Receiver

10 to 600 Meters



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

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

Uses two 6D6, one 76, one 43, one K42A, and one 2525 tubes as RF amplifier, electron coupled screen grid regenerative detector, powerful 2 stage audio amplifier with pentode output stage, rectifier, and complete built-in power supply.

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

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

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

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

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

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

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

7C 5-Tube

Short Wave Receiver
8¼ to 625 meters

Bigger and More Powerful Than Ever A Giant in Performance

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

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

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

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

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

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

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

3-Tube Short Wave Radio Only $3.25

(less tubes, phones, unwired)

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

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

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

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

AN-5 Four Tube BANDSPREAD RECEIVER

A powerful and highly selective short wave receiver designed for the fan who prefers the use of headphones. Uses 6F7-6D6-76-84 tubes in five-tube performance circuit as TUNED RF amplifier, TUNED electron coupled screen grid regenerative detector, two stage audio amplifier, rectifier & built-in power supply. **HUM-FREE. POWERFUL.** Readily operates a speaker. Operates from your 105-130 volt AC house current.

AN-5, complete with 4 matched tubes, coils for 9 to 200 meters, cabinet, wired, READY FOR USE..... **$15.95**

Broadcast band coils (2), extra..... $1.45

AMATEURS: Model AN-5-AB has same specifications as AN-5 except that has plate voltage cut-off switch and special bandspread coils for 20-40-80-160 meter bands. Add $1 to price of AN-5.

HF-35 3-Tube SW Transmitter

A powerful and well engineered amateur band transmitter of great beauty and efficiency—**AT A PRICE WITHIN THE AMATEUR'S REACH.** Uses 59-46-46 tubes as **TRITET CRYSTAL CONTROLLED OSCILLATOR—CLASS C RF POWER AMPLIFIER**—built-in antenna tuning system—beautiful, black shrivel metal case and shelving—Triplett meters—Eilen transmitting dials—highest quality construction — 35 watts of power output on **20-40-80-160 M bands. A transmitter that you can be proud to own.** An excellent exciter unit for high power stages to be added later. 3 coils for any 1 band and instructions included.

HF-35, assembled, and ready to wire (less tubes, power supply, crystal, holder and additional coils)..... **$21.95**
Matched Arcturus Tubes (3)..... $2.15
Eilen quartz crystal (80 or 160)..... $1.95
Eilen crystal holder..... 1.00
Coils for additional bands, per set..... 1.45

HV-475 1-Tube power supply for use with HF-35, less tube (ready to wire)..... **$12.45**
Labor for wiring extra $1.00
83 tube for HV-475, extra 55 cents

M-15 3-Tube Modulator for use with HF-35 and capable of modulating its entire output at 100%, priced at (less tubes)..... **$14.95**
Three Arcturus tubes, 56-53-53, extra.. $1.95

FREE: New 1937 catalogue

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

JUST OFF THE PRESS!

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

EILEN RADIO LABORATORIES, Dept. SC 2, 136 Liberty Street, NEW YORK, N. Y.

S.S. "Normandie" Detects Obstacles with Ultra Short Waves

(*Continued from page* 604)

speed of exploration varying with the displacement speed of the expected obstacles.

The concentrated beam of 16 cm. waves sweeps an angle of 40° on each side of the course followed by the ship; this beam is reflected by the obstacle and the reflected ray is detected by a suitable receiver.

Characteristic curves of the special U.C.-16 (French) tube, showing the power handled as a function of the grid and plate voltages are given below.

Rapid Study of the Apparatus

Transmitter.

The transmitter includes a 16 mm. wave generator, modulated at 7,500 cycles. The oscillator utilizes the property of charged grid triodes of generating very high frequency oscillations.

The tube designed for the purpose of generating 16 cm. waves has its grid carried to a 250 volt potential whilst the plate is brought down to a potential of—70 volts in relation to the filament. Fig. 3 gives the power generated by this tube in relation to grid and plate voltages. The power supplied is transmitted to a quarter wave antenna, 4 cm. in length. This antenna is once for all tuned to the generated wave and is placed inside the glass bulb. Fig. 4 shows the whole tube. The latter is placed inside of a parabolic mirror of 75 cm. (30") aperture and 12 cm. (4.8") focal length in such a way that point A where there is a current maximum on the antenna is exactly at the focus of the mirror. Fig. 5 shows the tube fitted inside the mirror.

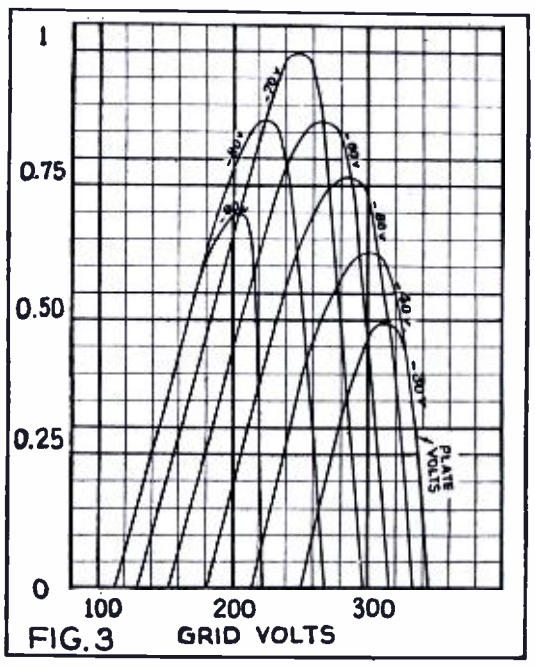


Fig. 3—Curves showing relation of plate and grid potentials for special tube, U.C. 16.

The diagram (fig. 6) of the beam transmitted has been experimentally plotted. One sees that the field is reduced to half of its value for a rotation of 8° from the maximum. The aperture of the beam can thus be considered as being 16°. It is this value which has been found the most suitable as in these conditions the movements of the ship have no influence on the operation of the apparatus.

The grid potential is suitably modulated at 7.500 cycles.

The transmitter runs on the ship mains 110 volts D.C. through a converter supplying 110 volts A.C. and through a stabilized rectifier.

Receiver.

The receiver includes a high frequency tube similar to the transmitter bulb and operating as a detector.

The receiving antenna is also housed into the glass container of the tube and the whole is placed inside a parabolic mirror identical to the transmitting one.

When a beam reflected by an obstacle reaches the receiver, the current detected by the high frequency tube is sent to an amplifier and reception takes place by earphones and with a visual indicator (indicator lamp). At this moment, the beams which were revolving are automatically stopped in their exploration and are focused on the direction of the obstacle which has just been discovered. It is then possible to make all measurements for obtaining the bearings of the obstacle.

Moreover, by comparing with a cathodic ray oscillograph the received 7.500 cycles frequency with the transmitted one it is possible to get an idea of the distance between the obstacle and the apparatus and consequently between the ship and the said obstacle.

The power necessary for the receiver is supplied by a A.C. 110 volt converter and a stabilized rectifier.

The transmitting and receiving stages as well as the various indicators are housed in the same metal cabinet.

Mechanical device for exploration of the ship's course.

We have seen in the preceding description that the transmitted beam must sweep a 40° angle on each side of the ship's course and that the receiving mirror must follow the movement of the transmitter's projector. We have been led to develop an apparatus conducting this double and simultaneous operation.

In this device, the control of the exploration can be either automatic by means of a motor or by hand, thanks to a wheel placed on the cabinet housing the mains supply. Passing from one of these systems to the other takes place by means of a clutch which is also automatically released when an obstacle has been detected. At this moment the projectors are brought to a standstill whilst the signal lamp glows.

Lastly, when the detector is not used a special device enables to turn the mirrors backwards *in order to reduce the wind action on them.*

Tests made and results obtained.

With a view to giving the final touch to the adjustment of the device and to checking the expected ranges, systematic tests under normal conditions of operation have been conducted aboard various ships.

During a first series of tests, the transmitter and receiver both included and antenna fitted with a cylindro-parabolic projector, the beam having an efficient aperture of 7°. The two apparatus, transmitter and receiver, have been placed independently on the side of the ship at a height of about 8 metres (about 26 ft.) above sea level, the distance between the two machines being around 6 metres (19.6 ft.)

The trip was from Havre to Dunkirk and Rotterdam and back through Antwerp.

During these tests the coast was at a distance varying between 3 and 7 kilometres (1.8 to 4.2 miles) and operations took place in the following manner:

The transmitted beam was directed towards some point of the coast. A suitable orientation given to the receiver permitted to detect a reflected wave. By swinging the receiver to one side or the other of the point reached, the reception of the echo was lost for an angle variation of the order of 5°.

With the same device some tests of echo have been made on ships passing by and it has been possible to locate some of them up to distances of the order of 7 kilometres (4.2 miles.)

For a second series of tests a device was installed on board to permit to point both projectors at the same time towards the obstacle to detect.

The two projectors were mounted on an axis which could rotate on two bearings placed at each end and a copper screen prevented any direct radiation of the transmitting antenna on the receiving aerial.

This device gave the possibility of receiving echos on ships at a distance around 7 kilometres (4.2 miles.)

On the other hand tests made from a spot on the coast, at Saint Marc near Saint Nazaire enabled us *to detect the buoys of the entrance of the harbor at a distance of about 3 kilometres (1.8 miles) and the Carpenter's Tower 5 kilometres (3 miles) away.*

These various tests have confirmed the aptitude of these equipments to detect obstacles, have shown that this detection was possible up to 7 (4.2 miles) to 10 kilometres (6 miles) and have given bearings with errors under 5 degrees. *Bulletin De La S.F.R.*

RGH Super

(*Continued from page* 609)

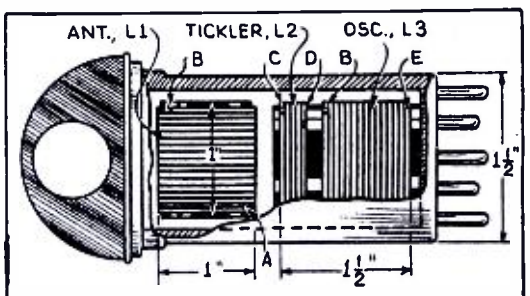
1—5 mf. 35 volt Electrolytic
2—0.5 mf. 1—0.02 mf.
3—0.25 mf. 1—0.0005 mf.
3—0.1 mf. 1—0.00005 mf.
1—0.1 mf.

RESISTORS

1—50,000 ohm Variable High Current Taper (Vol. Control.)
1—500 ohm 5 watt 2— 20,000 ohm
1—500,000 ohm 1— 12,000 ohm 2 watt
1—250,000 ohm 1 10,000 ohm 2 watt
1—150,000 ohm 1— 600 ohm
1—100,000 ohm 1—300 ohm
1— 50,000 ohm

MISCELLANEOUS

1—Chassis and Panel 1—Airplane Dial
1—Coil Shield 3—Knobs
5—Tube Sockets Speaker Socket
1—Coil Socket Antenna Posts
3—Grid Clips Solder, Wire, Etc.
3—Tube Shields (if glass tubes are used)



		TURNS	WIRE	COVERING	SPACING
80 TO 200	80-200M. OSC.	37	26	E	dS
	TICKLER	23	30	DS	CW
	ANTENNA	39	26	E	dS
40 TO 80	40-80M. OSC.	26	24	E	dS
	TICKLER	16	30	DS	CW
	ANTENNA	24	24	E	dS
20 TO 40	20-40M. OSC.	16	20	E	dS
	TICKLER	9	30	DS	CW
	ANTENNA	15	20	E	dS
11 TO 20	11-20M. OSC.	8	16	E	dS
	TICKLER	5	24	E	CW
	ANTENNA	7	16	E	dS

DS = DOUBLE SILK CW = CLOSE WOUND
dS = DOUBLE SPACED E = ENAMEL

Are You a Subscriber? See Pages 646 and 650 for Remarkable Subscription Offers.

Radio "El Mundo" Has Novel Radio Clock

(*Continued from page* 603)

studio wall. The hands of the clock on the left point to zero, as the hands of the other clock meet the twelfth minute. As they do the left-hand clock starts automatically. The hand sweeps slowly around the dial which is divided into three equal sectors of one minute each, subdivided by seconds. The announcer can see at a glance exactly how much time remains in which to "sign off" the program.

The *seconds-beat* clock begins operating three minutes before each quarter hour, or at 12, 27, 42 and 57 minutes. Both this clock and the regular *secondary* clock at its side are remotely controlled by a *master clock* located in the control room. This *master clock* sends out an indicating impulse every minute, the impulse causing each regular *secondary* clock to move ahead one minute. Twenty additional correcting impulses are sent out during the last minute of the hour, as an added factor in insuring absolutely uniform time throughout the system. The *master clock* itself is an excellent time-keeper but to insure absolute accuracy it is checked hourly by the Argentine Naval Observatory.

Every studio at El Mundo is equipped with a pair of these clocks, and similar pairs of clocks are installed as an integral part of the panel at the main control desk and on the panels of studio control desks. A regulating wire also actuates clocks installed at the transmitters, some miles away, in perfect synchronization.

As an added feature the management of El Mundo has installed an Autograph Recorder to record the performance of artists. Each artist appearing signs his name on the paper record roll of this recording device and actuates a lever which stamps the time of the signature.

The regular broadcasts from El Mundo, or LR1, are transmitted on a frequency of 1,070 kilocycles, using a power of 75,000 watts. The short-wave transmitter, which uses LRU and LRX as calls, broadcasts the same program on frequencies of 15,290 and 9,580 kilocycles, with a power of 10,000 watts. R.C.A. long and short-wave transmitters are installed at San Fernando, F.C.C.A., Province of Buenos Aires, on a plot of 40,000 square metres, which was specially chosen for its suitable characteristics.

The station is owned by Empresa Editorial Haynes, Publishers of *El Mundo*, a daily newspaper with a circulation of more than a quarter of a million.

A similar installation of this specially designed *time-recording* equipment has been in use for some time at Station WCAU in Philadelphia, Pa.

Ernest Stricker, A Pioneer in Short Waves

(*Continued from page* 603)

were inferior in length to 300 meters. In 1925, Stricker established for the first time his famous station D1 at Mar del Plata on 80 meters wavelength. Thus, he hoped to be heard by a friend who lived a short distance away and possessed a receiver. He was extremely surprised to receive some time later a letter from New Zealand, stating that his station had been heard in that far-away land. That letter proved the incredible fact that an 80-meter wave could be heard over a distance of some 12,000 kilometers, (7,200 miles), which marked, so to speak, the birth of long distance short-wave communication from the Argentine.

Ernest Stricker is now in constant communication with all parts of the world, and his station has often been utilized by the Government of the Argentine Republic, which fully appreciated its qualities during trial transmissions. The War Ministry occasionally sends Stricker a note asking him to make observations at a given hour on a broadcast transmitted on a certain wavelength.

"T.R.F.-3" Receiver Uses New 2-Volt Tubes

(*Continued from page* 607)

quality; if it should break down or become leaky, the phones would probably be ruined.

The author has operated this receiver about a week before writing this article. Although conditions have not been very good during this time, most of the usual "local" foreign and domestic stations have been received with plenty of volume on the phones and fairly good volume on the speaker. The antennas used are one 185 feet long and 25 feet high and another 50 feet long and 15 feet high; the same stations were received on both with practically the same volume. The 50 foot length would probably be better suited to the use of the average short-wave "fan."

If any additional information or advice is required, the author shall be glad to supply it if a *stamped and self-addressed envelope* is enclosed for reply. Address all letters direct to the author in care of *Short Wave and Television.*

Range	R.F. Grid	Det. Grid	Spacing*	Primary Tickler	Primary & Ant.
13-29	5	5	1"	6	4
28-58	12	12	1-9/16"	8	6
55-105	26	26	2-1/16"	10	10
100-250	45	45	Close Wound	17	15

All coils are wound with No. 26 D.C.C. copper wire on XP-53 (1½") 6-prong ribbed forms. Tickler must be wound in same direction as grid coil; primary and antenna coils are wound in the opposite direction. Make one set (one R.F. and one Det.) for each band.

* Note: Spacing given is the distance between the grid and the filament ends of the coil; not the distance between turns. The 100-250 meter coil is close wound with no spacing between the turns.

List of Parts

HAMMARLUND

1 2-gang tuning condenser, 140 mmf.
1 Midline midget condenser, 35 mmf.
2 ST-12 tube shields
2 Isolantite sockets, 4-prong
2 Isolantite sockets, 6-prong
1 R.F. choke, 2.1 millihenry
1 set XP-53 coil forms (see text and coil table)

AEROVOX

1 Dual .1-.1 mf., 400 volts paper tubular condenser
1 Paper tubular condenser, 0.1 mf., 400 volts.
1 Paper tubular condenser, 0.25 mf., 400 volts
1 Paper tubular condenser, 0.01 mf., 400 volts
1 Mica fixed condenser, .001 mf.
1 Mica fixed condenser, .006 mf.
1 Mica fixed condenser, .0001 mf.
1 Carbon resistor, 3-megohms, ½ watt.
2 Carbon resistors, ¼ megohm, 1 watt.
2 Carbon resistors, 75,000 ohms, 1 watt.

CROWE NAME PLATE & MFG. CO.

2 Pointer knobs with "volume" plates
1 "Front-O-Panel" airplane dial, No. 525

Brush Development Co.

1 set Type A crystal headphones
1 Brush crystal head-phone matching unit

RCA

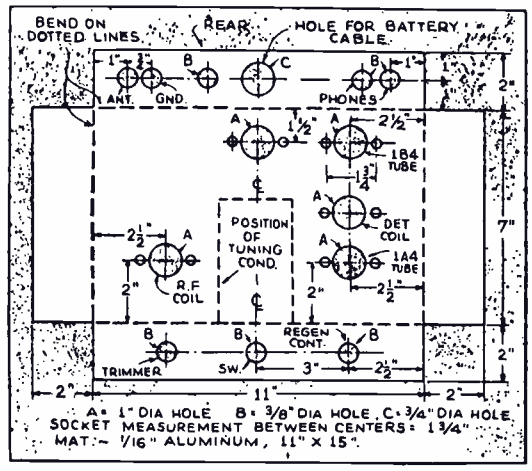
1A4, 1B4 and 1F4 tubes.

ELECTRAD

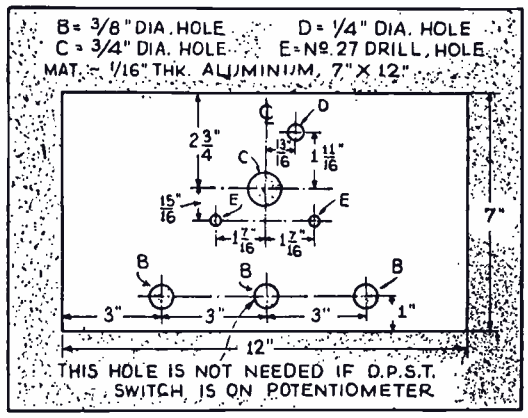
1 Potentiometer with D.P.S.T. switch; 50,000 ohms

INSULINE CORP. OF AMERICA

1 5-prong bakelite socket
1 7x12 inch electralloy or aluminum panel
1 7x11x2 inch electralloy chassis
1 20 ohm filament rheostat
1 D.P.S.T. switch, toggle type or may be on potentiometer (see above)
1 5-wire battery cable
2 Tip-jacks for head-phones



Chassis drilling layout.



Front panel drilling plan.

Television Flashes from Europe

(*Continued from page* 602)

and photo at the right show the very latest Telefunken projector-type television receiver, the sound issuing from the grille just below the lens. Images as large as 3 by 4 feet are projected on a screen, supported on a moveable pedestal. The diagram shows how an adjustable lens is placed in front of the cathode ray tube. The main feature of this newest television receiver is a special cathode ray tube, which is operated at 20,000 volts potential. This new tube has an optically corrected flat bottom, while the inside screen is of convex shape. Theoretically, this scheme for obtaining large images sounds very logical, but due to the very high voltage it is a question what the life of the tube might be. The photo shows the Telefunken large size television receiver in its final makeup ready to be marketed. The pictures reproduced are extremely brilliant.

Short Waves and Long Raves

(*Continued from page* 613)

phones on top of it. In front of speaker is license and a switch for throwing phones from monitor to speaker; on right of monitor is the key.

At the left you'll see a rather large card; this is 2½ times the length and width of a regular QSL card. This I have also photographed to the actual size of a regular card and after having used up my present supply, will make these on either a velvet or semi-matte surface card.

P. A. Donaldson, W8PIF,
768 Frederick St.,
McKees Rocks, Pa.

One Year's Subscription to
SHORT WAVE & TELEVISION
FREE
for the "Best" Station Photo

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

Let's "Listen In" With Joe Miller

(*Continued from page* 620)

PLM—the Java fone on 12.29 mc, was heard once at 7:30 a.m. and PLE, on 18.83 mc, heard at 6:40 a.m.

It is to be regretted that henceforth, snaring one of these DX catches will not earn a prized veri, due to the no-verification ruling by the N.E.I. Radio Government, effective Jan. 1, 1937.

Australia

The new VK6ME is yet to be reported, tho it is expected to be on at any time. This station, to be located at Perth, will give Western Australia a voice in the world of DX. VK8XT, on 8.63 mc., Cloncurry, tests with VK8SC on 6.96 mc., Fridays at 4 a.m. VK8XT is really VJI. This from John De Myer. On Sundays from 6:30 a.m., VK8SC, called the "*Flying Doctor Station*," presents a half-hour program. Ashley Walcott reports a veri of VK8SC. Located at Port Hedland, W. Australia, and using 200 watts, this station is operated by the *Australian Aerial Medical Service* and is used to contact 5 watt stations in the "sheep country" of W. Australia, on ranches of a million or more acres!

A doctor is sent by plane from Port Hedland to the station calling for medical aid. Interesting! VK8XT's QRA is Box 103, Cloncurry, QLDS, Australia. VK9MI, the "*S.S. Kanimbla*" operates on 49.98 meters, almost daily from 8-8:30 a.m.

Japan

A flock of new stations are being "lined-up" in Japan, to operate on the regular SW "BC" channels. First to make themselves known are JZI, 9.53 mc., and JZK, 15.16 mc., which operate Monday and Thursday from 4-5 p.m. Ashley Walcott also forwards dope on JZJ, 11.80 mc., heard once from 9 p.m. - 2 a.m. testing. Also, JZI often relays JOAK early mornings till 7:45 a.m. JVI, 13.56 mc., was heard phoning one morning at 6:50 a.m. JVD, 15.86 mc., also, at 12:30 a.m.

Hong Kong

ZBW, operating on 9.53 mc., for some time now, often takes an excursion down to 15.19 mc., and operates on the same "sked" as the other ZBW.

Africans

OPL, 20.04 mc., the Belgian Congo station at Leopoldville, has been heard here at 7:55 a.m., phoning Belgium. Try for this FB "DX" catch, located just to the HF side of the powerful DHZ, on 20.02 mc.

VQG, 19.62 mc., the Nairobi, Kenya Colony phone, operated by the same company that owns VQ7LO, was heard at 8 a.m. in contact with GAU. This African operates from about 7:30-8:30 a.m. and always look for GAU first. VQG is never heard strong here.

Algiers, on 8.96 mc., continues daily traffic with Paris, most often heard in early morning from 12:30 a.m. up to as late as 2:45 a.m. Side band secrecy is used and voice is heard, very much distorted to insure privacy.

Portugal

CSW, the new station at Lisbon, is being well heard daily, from 4-6 p.m. and often later, to 7 p.m. The frequency has been frequently changed, but adheres quite closely to 9.93 mc., of late.

In answer to several queries, QRA is EMISORA NACIONAL, LISBON, PORTUGAL.

Spanish Morocco

EA9AH, 7.02 mc., listed as Radio Tetuan, is being heard quite regularly near midnight, with a powerful signal that overrides all "CW" QRM. This station sends a handsome QSL card. Eddie Schmeichel, Chicago, also reports EA9AL on about 7.03 mc., heard at midnight. Watch the "40 meter band" around midnight for these Africans. *These operate both as*

broadcasters of war news, and as amateurs.

China Verifies!

In September we heard two new Chinese commercials, on 9.08 and 9.285 mc., and the other day, we received verification, as in the letter shown herewith. These were located at Hangkow and Shanghai, respectively. The calls in the veri are XPC and XPK, but which is Shanghai, etc., we do not know! This is the first known veri of these two new stations.

XGW, 10.42 mc., Shanghai, is becoming very active of late, and is being heard by a number of our best DXers, including Ed Goss, Huby Fey, Eddie Schmeichel and John DeMyer. Time heard ranges from 1-5 a.m. Heard here at 4:20 a.m., ditto Ed Goss. Watch for XPC and XPK around 5-6 a.m! These two phone one another quite often. XOJ, 15.80 mc. phoned JVE, 15.66 mc., at 12:10 a.m. and 6:20 a.m., inverted speech.

Italian Africans

The Italians are keeping up regular communications between their Colonies and Rome, and can be easily "logged" if one is a regular tuner. IUC, 11.955 mc., Addis Ababa, still phones quite often around midnight, and IUG, 15.45 mc., is often heard between 7-10 a.m., phoning IAC, on 17.75 mc. IDU, Eritrea, now being heard between 11:30 a.m. and 12 noon with a good signal, also reported at this time by Ashley Walcott and Huby Fey. ITK, 16.385 mc., Mogadiscio, Italian Somaliland, is occasionally heard near 6-7 a.m.

IUG, heard very "FB" (Fine business) here at 9:10 a.m. with usual contact station IAC, 17.75 mc., at Coltano, Italy. IUG called IDU at 9:15 a.m. after contact with IAC. Try for all of these now, they're very active, and all fine DX catches!

John DeMyer, Charles Miller, Eddie Schmeichel, Pierre Portmann, Huby Fey, all among our leading American DXers, have "cleaned up" on above stations, using the data given in previous issues. Very FB, OMs., and our sincere "congrats" on your accomplishments!

Indo-China

Philco Radio, 11.71 mc., located at Saigon, is on daily from about 5:30-9:30 a.m. daily, and was heard well by Eddie Schmeichel at 6:30 a.m.

Ashley Walcott received a very interesting letter of verification of this DX catch. The letter was written by a Philco engineer from Philadelphia, who is in charge of the station. No call was assigned at the time of writing, September 29, and the station was yet awaiting its license! Xmtr was built from ordinary Philco receiver parts, high voltage condensers and Xmting tubes! Try for this rare 'un, and if you are lucky enuf to "land" it, write your report to "Philco Radio," Etablissements Boy-Landry, 211-213, Rue Catinat, Saigon, Indo-China.

Asiatics

VWY2, the Poona, Indian phone, on 17.545 mc., was again heard at 7:55 a.m., in contact with London in scrambled speech. This Asiatic catch is very easily heard, as signal always rates R7-9 here! VWY2 usually phones GAU, 18.62 mc., and sometimes GBU, 12.29 mc., when GAU is being used to contact VQG at same time.

RIO, the U.S.S.R. phone at Bakou, on 10.17 mc., has been simply pounding in around midnight, and one can't help hearing this etheric "pile-driver," if one tunes at all! Eddie Schmeichel reports new Siberians on 10.35 mc. and 9.40 mc. at midnight, both loud. Also one on 11.50 mc. at midnight, too. Siberian on 10.35 mc. heard here also at 1:15 a.m.

RKR, Novosibirsk, 12.86 mc., was heard at 1:27 a.m., with a woman phoning.

Try for FZR, 16.25 mc., at Saigon, Indo-China, which phones FTK, 15.88 mc., often at 8:30-9 a.m. A good signal, FZR! Most recently, FZR was heard FB at 7:40 a.m., calling *"Allo Paree, allo Paree, ici Saigon"*!

KAY, Manila, 14.98 mc., phoned DFB, 17.52 mc., at 7:25 a.m. Both good here.

Try for OER2, 6.07 mc., in Vienna, now, as OER2 was best heard last winter at this time. Try from 5-6 p.m. on Saturdays, they come in FB! Also plug CT2AJ, 4.00 mc., Azores, on Wednesday and Saturdays, 5-7 p.m. Best bet 6-7 p.m., just at the HF end of the 80 meter amateur band. A FB DX catch!

Ham Stardust

20 meters is *the* band! Within the last month, (Nov.) we have heard more real DX on 20, than we've heard in a long time! The South African phones have literally "pounded" in, and our log of Africans has grown to surprising proportions!

ZU6P, 14070 kc., seems to be most consistent, and uses several other frequencies, all in the LF (low frequency) side of the band.

ZT6AL, 14380, ZUIT, 14385, ZS4J, 14370, ZEIJT, 14400, ZEIJR, 14275, ZS2X, 14380, ZS6AJ, 14040, ZS1AA, 14065 kcs, have all been "logged," within a week or so, between hours of 11 p.m.-1 a.m.! However, the Africans died as quickly as they came, and are only occasionally heard now.

Charlie Miller was certainly effusive in his thanks for our tip to try for the South African hams! He heard a pile of 'em and one we didn't heard, ZT6W! Some going! Eddie Schmeichel also "cleaned up!"

An amusing experience occurred last week, when we happened to tune in on a local DXing ham, W2HUQ. He was giving a list of DX phones heard on 20 meters, so naturally we took pen in hand and jotted the dope down. About half-way through, we awoke to the realization that we were copying our own data, a list of which we had given to our friend, Ed. Berliant W2JEH!

Watch 20 meters now, in afternoons, between 2-5 p.m. Africa comes in FB, around December, January, during day.

PK1MX, 14090 kc., was heard well here at 6:55 a.m. VS2AK heard on 14335 kc. at 6 a.m. by Huby Fey. FB! Huby also heard PK4BR. CN8AA was also logged by Huby, here also, on LF side of the band, 7 p.m. Eddie Schmeichel logged VU7FY, 14385 kc., at 6:40 a.m. SU1KG on 14040 comes in FB here in afternoons—2-5 p.m.

On the 10 meter ham band, DX has been fairly good. Out West in Chicago, Eddie Schmeichel had done some notable DXing, having logged ZSIH, ZU6P, K7PQ, VK2GU, and a Jap, J2IS! Our total on 10, due to limited daytime tuning, is ZU6P, which came in very fine, R8, and steady!

Having received several inquiries re obtaining amateur addresses, we advise writing to Radio Amateur Call Book, Inc., 608 So. Dearborn St., Chicago, Ill.

QSLs have again begun to come in and our total received lately follows: YBG (2), VK2OG, VK4BS, ZE1JR, VK2OJ, VK5HL, VK2QK, SU1KG, ZSS, VK3HL, VK5KG, VK3ZZ, ZS2N, ITK, CR7AA, VK2ABG, VP7NA, VK6MW, XOJ, XPC, XPK, YDC, VK2QH.

We wish to thank Ted Moore of VK2ABG for his fine letter and information. Ted is a regular reader of our articles in SWC. Also special thanks to Lawrie Williams of Port Elizabeth, South Africa, and to I. Bjargmundsson, of Reykjavik, Iceland, two more of our DXing friends and readers, in foreign climes. It's nice to hear from the boys, no matter where they be, hi!

Good luck and good hunting to all our DXing friends!

JOE MILLER.

World-Wide S-W Review

(*Continued from page* 611)

The single tube superregenerator is coupled through an A.F. transformer to an A.F. amplifier to increase the volume to the desired amount.

The coil details and values of parts can be determined experimentally by following the sizes used for other circuits on this page, this month and in previous issues.

A 1937 Transmitter

(*Continued from page* 619)

windings is used and the other one can either be left idle or run to the pilot light.

In this particular transmitter we used a heavy-duty type 80 tube together with choke input in the filter system, in order to limit the output voltage to a value of around 425 to 450 volts.

An 83 mercury vapor tube was not used because of the higher voltage it would provide and also because of the noise which it created in the 5-meter receiver when the 5-meter transmitter was being operated. The two filter choke coils are rated at 11 henries at 300 ma. current carrying capacity. While the transformer is only rated at 250 ma., these chokes were used because they were designed as companion units to the transformer and, of course, there is no danger of over-load because they are rated at 300 ma. and the total current required by either of the transmitters is not in excess of 250 ma.

For the filter condensers we used 8 mf. electrolytic condenser with a 500 volt peak rating. Two of these were connected in series in each section, resulting in 4 mf. capacity with a working voltage of well over 800, thus allowing a good "safety factor."

With the use of two filter chokes and the condenser arrangement shown in the diagram, absolutely pure D.C. is obtained at 250 mills and, of course, the note of the transmitter is extremely pure. The output of the filter system is loaded with a 25,000 ohm, 50-watt wire-wound resistor in order to prevent voltage surges and improve regulation.

This complete 80 to 5 meter transmitter should make an ideal arrangement for the "Ham" who wishes a *desk-type* transmitter, neatly constructed and business like in appearance. Its 40 watts output on all these bands will surely enable him to work every part of the globe, inasmuch as all bands can be covered. On 10 and 20 meters it is possible to contact the most remote points on the earth under favorable conditions and on 80 and 5 meters all "local" work may be accomplished with absolute satisfaction. At any time, of course, the builder may add a more powerful amplifier to this transmitter and mount the complete unit on top of the present cabinet. Possibly, in the near future, we will work out some sort of an amplifier arrangement which can be added to this transmitter by those who desire more powerful output, and describe it in this magazine.

Parts List

KENYON
1—No. T-246 power transformer (for rating, see text)
2—type T-166 filter chokes (see text)
CORNELL-DUBILIER
4—8 mf. 500 volt electrolytic condensers
ELECTRAD
1—25,000, 50-watt wire-wound resistor
PAR METAL
1—7x19x⅛ inch crackle finish steel panel.
1—2x11x17 inch crackle finish steel chassis
1—26 inch standard relay cabinet, crackle finish
MISCELLANEOUS
2—toggle switches
3—4 prong wafer sockets
RCA
1—type 83-V. or 1 type 80 rectifier tube.

Cutting Chassis Holes in a Jiffy!

(*Continued from page* 619)

the head of the punch—once, twice, or certainly not more than three times—and presto! you have an absolutely perfect hole. By actual timing, a 1⅜-inch hole for a standard octal socket is made in seven seconds!

It is impossible for the two halves of the punch to "shear." The tool is made of hardened steel and cuts through aluminum, steel and the various alloys used for radio chassis without the slightest difficulty.

Of course, one punch makes only one size hole. Five punches are obtainable, to

make holes ¾, ⅞, 1 3/16, 1¼ and 1⅜ inches in diameter. After a little practice, you can join the radio golfer's club by "making a hole in one," that is, with only one blow of the hammer.

Meter holes, long considered an awful nuisance job, are a little too large to be punched out conveniently by hand, but an adjustable circle cutter, held in an ordinary brace, does the dirty work quickly and neatly. Cutters of this kind have been used in other mechanical fields for years, but very few radio men seem to know about them.

Figure 2 illustrates the best and simplest method of using this valuable tool. The whole trick is to clamp the panel or chassis securely to the table, with a piece of scrap lumber underneath to stiffen it and to take the center drill. Let the board overhang the table a bit, so that the latter clears through.

The cutter of this circle maker is really a hardened lathe tool, and slices through and aluminum and thin steel as if they were so much cheese (well, very old and stale cheese!). With the brace held carefully in a vertical position, so that the cutter scribes evenly, two- and three-inch holes for the standard sizes of radio meters can be made in about a minute.

It is a good idea to cut trial holes in scrap pieces of wood, to make sure of the size of the hole. This is particularly desirable with two-inch panel meters, as these have very small flanges and their holes must be cut quite accurately.

The tool shown in Figure 2 makes holes from ¾ to 8 inches in diameter, which is quite a range. Incidentally, this is a disc cutter as well as a circle cutter. The discs that come out of the holes are very useful for a variety of purposes in the radio "shack."

The third useful gadget for the constructor is the rivet and eyelet punch set shown in Figure 3. For making a neat and truly professional job of fastening tube sockets, connector lugs, mounting brackets and all manner of small parts, this tool has no equal. It consists merely of an anvil and a specially formed heading rod, and requires no mechanical skill at all. One light blow of the hammer and the eyelet or rivet is permanently closed.

For making portable receivers, transmitters and transceivers, this tool is absolutely indispensable. Nut-and-bolt fastening just doesn't hold together in the field, especially in cold weather. The writer has seen transceivers taken from an ordinarily warm house into a car; in half an hour it rattled like a can full of pebbles. Eyeletting wherever possible, plus new, strong lockwashers, eliminated the trouble entirely.

Photos courtesy Insuline Corp. of America

The Spectrumatic Tuning Indicator

(*Continued from page* 610)

fered a low impedance to the flow of the 60-cycle alternating current and allowed the pilot light to burn brightly, when a station was properly tuned, AVC applied to the grid of the triode limited the current through Winding "A". The core was no longer saturated and Winding "B" offered a high impedance to the flow of current. The pilot light, therefore, burned dimly.

This device was more satisfactory than the tuning meter but since it took its actuating voltage from AVC, its response was necessarily different for signals of different strengths.

The following year several improvements were made on this fundamental circuit. The actuating voltage was taken from the audio diode rather than AVC. Since the AVC was designed to keep the voltage at the audio diode a constant, regardless of signal strength, the operation of the tunalite was independent of signal strength within extremely wide limits. Its response was practically a constant for signal strengths from less than 10 microvolts to more than 1,000,000 microvolts. It was also found that it was not necessary to return the triode plate winding to positive B. Since a transformer action is present between Windings "A" and "B," alternating current is applied to the plate of the triode. The triode rectifies the alternating current, thus furnishing the direct current required to saturate the core. With these changes, the action of the circuit, Figure 2, is essentially the same as that of Figure 1.

In response to the ever increasing demand for beauty, in line and color, Midwest engineers have developed this circuit shown in Figure 3. With this circuit the beautiful escutcheon and control panel is literally painted with light, suffusing and blending in a symphony of color.

In the spectrum of light there are three primary colors—red, green and yellow. By using two groups of pilot lights, some red and some green, and with a yellow translucent scale, Midwest brings into play all of these primary colors. In the circuit shown in Figure 3, pilot lights marked No. 1 are green in color and pilot lights marked No. 2 are red in color. To the fundamental circuit, in No. 1 and No. 2, an additional winding marked "C" has been added. Pilot light No. 1 still functions the same as the former circuits. However, due to the alternating current flowing in winding "B," an alternating voltage is also generated in winding "C." When the core is saturated and pilot light No. 1 is bright, the transformer is working inefficiently and pilot lights No. 2 are dim. As the station is tuned in, pilot light No. 1 dims, the transformer becomes efficient, a higher voltage is generated in winding "C" and the pilot lights No. 2 become bright. Thus, a flow of color through all of the rainbow shades is accomplished. This circuit, as formerly explained is still *independent of signal strength* and requires no adjustment for different signal strengths. It operates from the audio diode, which is the most selective point in a set and gives a positive and sharp indication of accurate tuning. It presents a very beautiful effect and it can be observed without removing the eyes from the dial calibration. It is sturdy, dependable and quick acting.

This article has been prepared from data supplied by courtesy of Midwest Radio Corp. (Mr. Smith is a member of the Engineering Dept.)

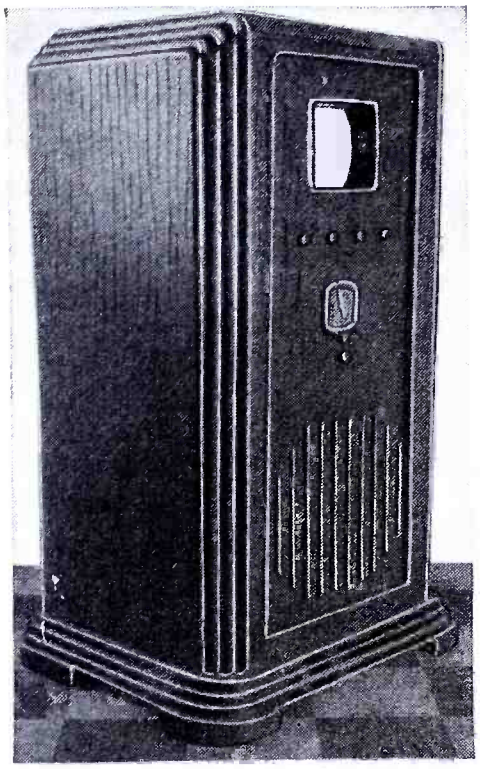
RADIO INSTRUCTION

Television Course

(*Continued from page* 605)

Photo on Tape Helps to Explain Action

Probably the best way to understand how television overcame this obstacle is

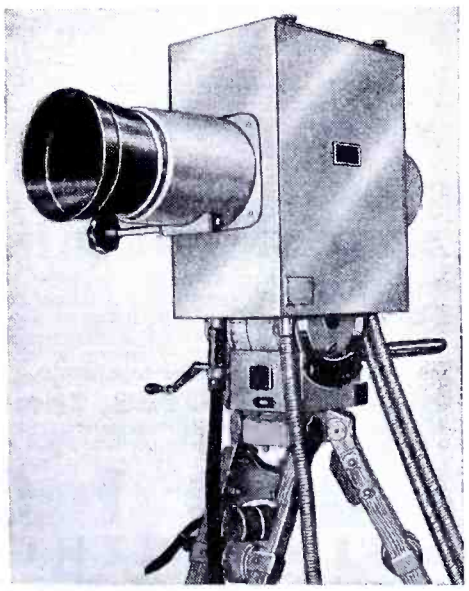


(©) 1936 by Farnsworth Telev. Inc.

Front view Farnsworth Television receiver.

by means of a very simple experiment that anyone can try. Wrap a piece of tape around a piece of board. Upon this tape, on one side of the board, paste a picture. Cut through the picture between the different pieces of tape.

Now if the tape is unwrapped, it is seen that the picture pasted on the tape, no longer has height and breadth, but is "taken apart" so that it is in a single line or strip of tape. Looking at a single strip of this tape two things are at once apparent: (1) if it were possible to transmit in some way the varying degrees of light and shade on this tape, and then duplicate these varying degrees of light and shade on another piece of tape, it would be possible to transmit a picture:



Camera used by Fernseh in Germany. This television pick-up camera used in Germany uses a Farnsworth image dissector tube.

RADIO INSTRUCTION

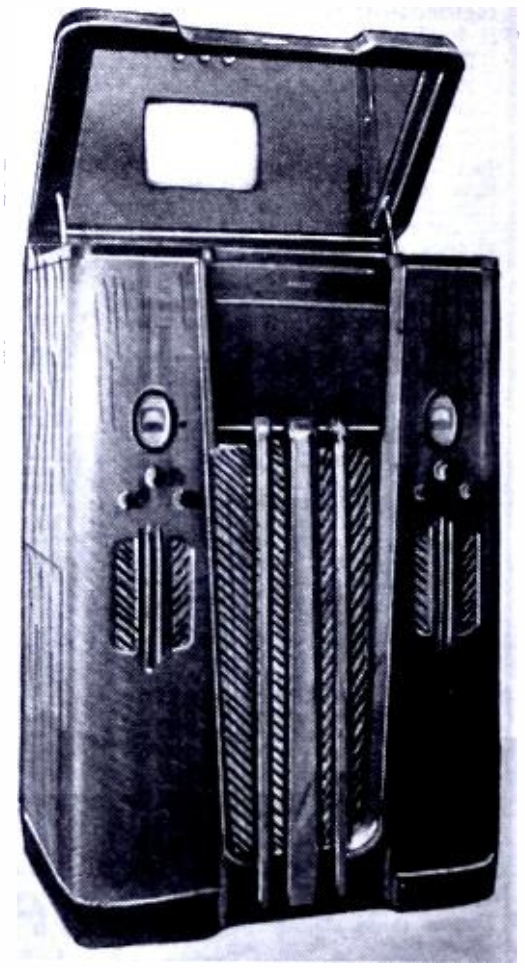
(2) if the second tape with these varying degrees of light and shade upon it were wrapped about another board in exactly the same manner as was the first, then the picture would be duplicated.

Now, by means of television it is possible to pick up and transmit the varying degrees of light and shade, and the photo-electric principle, which will be described later, makes this possible. It is also apparent that the second tape must exactly duplicate the first. And it will also be seen that the finer the tape, the better the picture will be.

This is the basic principle behind television. The first problem was to reduce intensity, length, and breadth; to simply length and intensity; and then reassemble it into intensity, length and breadth again. But in television all this must be done with a rapidity that gives the illusion of motion.

Scanning

The breaking up of a picture having



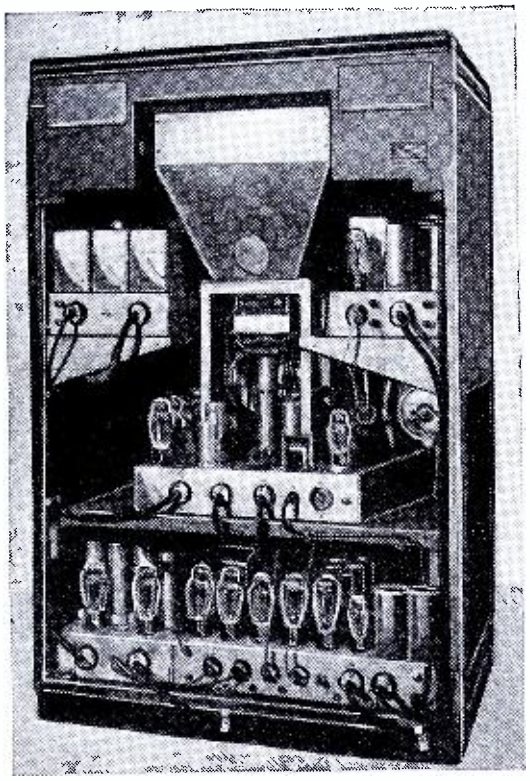
Front view of Philco television receiver.

length and breadth, into lines having only length, is known as *scanning*. And scanning is one of the big problems of television. This scanning may be done either *mechanically* or *electrically*. Scanning will be the subject of a future article. At this time, however, it may be said that basically all television may be regarded as going back to the work of a German scientist, Nipkow, in 1884.

The basic principle behind the photo-electric cell is probably known to all. This is also one of the basic principles behind all television. Certain metal surfaces, when properly prepared, have the property of emitting electrons when light falls upon these surfaces, and, if proper conductors are provided, a current is set up; this current being proportional to, and varying with, the amount of light. Briefly, it will be seen that varying degrees of light and shadow may be translated into a respectively varying current. Thus, if a line of tape as outlined previously, were exposed to a photo-electric cell, the current would vary as there was light or shadow on the tape. In this way, it will

be seen, the varying degrees of light and shadow on the tape could be not only measured, but transmitted.

In the next lesson various systems of television using *mechanical scanning* will be taken up.



Rear view of Philco Televisor.

The New "Super Pro" Hammarlund

(*Continued from page* 615)

times the input, only 11.5 kc. With the band-width control at maximum width or actually at minimum selectivity, at 10 times the input, a 25 kc. band-width is available.

The signal-to-noise ratio on 14 megacycles of this improved model is only 8 db (decibels) at .7 microvolt input with 30% modulation at 400 cycles.

The sensitivity is so great and the receiver noise-level so low, that weak signal reception is only limited by the noise-pick-up by the antenna system. Real *high fidelity* is also available from this model, for from 50 to 10,000 cycles we have a level of plus or minus 2 db; or minus 2 db at 50 cycles and plus 1 db at 10,000 cycles and at 30 cycles it is 3.6 db.

The image ratio at 14 megacycles is 1600 to 1; at 1000 kilocycles it is 316,000 to 1.

The receiver which covers five ranges of from 2.5 to 5; 5 to 10, and 10 to 20 megacycles, and from 540 to 1160 and 1160 to 2500 kilocycles uses the following tubes—two 6K7's in two tuned R.F. stages; a 6J7 as a frequency oscillator; a 6L7 first detector; three 6D6's in 465 kc. I.F. stages; a 6B7 as a combination 4th I.F. amplifier and diode second detector; a 6C6 low-frequency beat oscillator; a 6B7 for AVC; a 6C5 as a resistance-coupled audio frequency amplifier; a 6F6 as a class "A" driver; and two 6F6's operated as triode class "AB." The 2 remaining tubes are a 523 and an 80.

(In the next article Mr. Lewis will tell about other interesting features of the "Super Pro.")

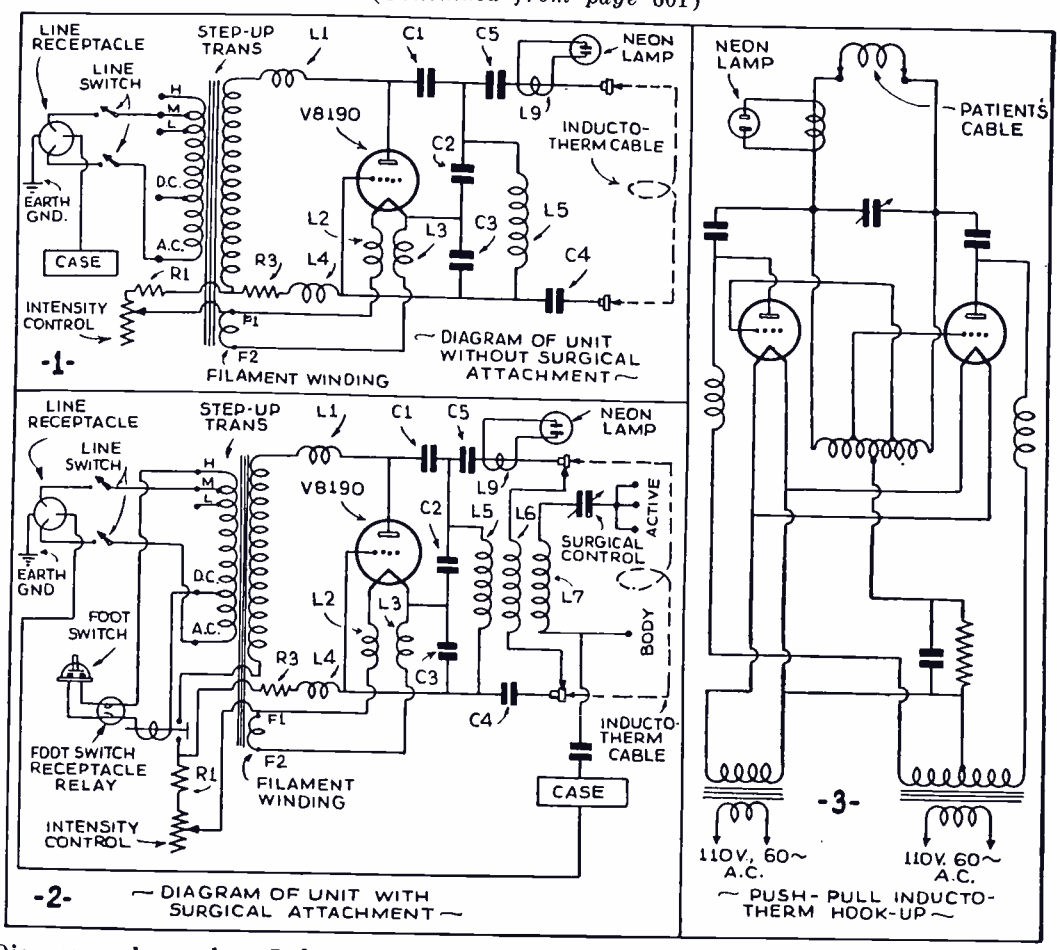
This article has been prepared from data supplied by courtesy of Hammarlund Mfg. Co., Inc.

Don't miss that "March" Number—Full of NEW Sets and Circuits!

RADIO INSTRUCTION

S-W Diathermy—Fact or Fancy?

(Continued from page 601)



Diagrams above show Inductotherm, single-tube oscillator with and without surgical attachment (radio knife); third diagram shows push-pull Inductotherm hookup. In this type machine the high frequency electromagnetic field is produced within a coil formed by wrapping one or more turns of the insulated H.F. cable about the neck, arm or leg. In other cases a "disc" electrode, containing several turns of cable, is placed near the part of the body to be treated.

through the electrodes. Another type of machine operates on the well-known *spark-gap* principle and uses a modified form of quenched gap.

No one has apparently so far tried the oscillating arc—many arc-type radio transmitters have been built and in fact still are used for commercial work. Whether the arc would be stable enough on such low waves as 6 meters and waves in this general region, has still to be determined. One advantage of the arc type oscillator would be its low cost and eventually we will probably see a machine of this type make its way to the market.

The ultra short waves are condensed in an electrified field between two electrodes, and if a body is placed between them, the high frequency oscillations are carried through the thin, fat, muscle and bone in a *direct line!* The ordinary diathermic field sets up currents which travel over the easiest and shortest path between the electrodes, passing in a circuitous manner through the skin, blood vessels and lymphatics, causing a fair degree of heat. With U.S.W. diathermy bone is as thorly affected as the skin.

Results of Tests on "Live" Subjects

Dr. Coulter and Mr. Carter described experiments to prove that living human muscles deeply placed in the body can be adequately heated by this method. These tests were carried out on a group of forty medical students who volunteered for this purpose at Northwestern University, Chicago. By the use of a special electric thermometer (*thermocouple*) which was made up in the form of an enlarged hypodermic needle *inserted two inches deep in the muscle,* the exact temperature rises were recorded after the application of the short waves. The average rise in the muscle was about 6° F., with the instrument registering in some cases as high as 106 F°. *The wave lengths made no difference. They used 6, 12, 15, 18 and 24 meter waves with the same effect.*

In describing the successful application of radio short waves on 370 cases of various infections including carbuncles, boils, felons and abscesses, Dr. Egan said that by this new development, many operations and unsightly scars could be obviated. The increase in local circulation, brought about by the short waves, speeds the internal healing forces of the body so that the spread of infection is rapidly "localized" and a speedy recovery is effected.

In some of the cases that came for these treatments, the infection was so far advanced that the knife had to be used. But according to Dr. Egan, by using short wave therapy in conjunction with surgery, he was able to effect a much more speedy recovery than heretofore, and there was no resultant scars. Dr. Egan pointed out that if the cases came early enough, no surgery would have had to be used in any of his series. More than sixty of these cases, Dr. Egan asserted, were cured of their infection in one treatment.

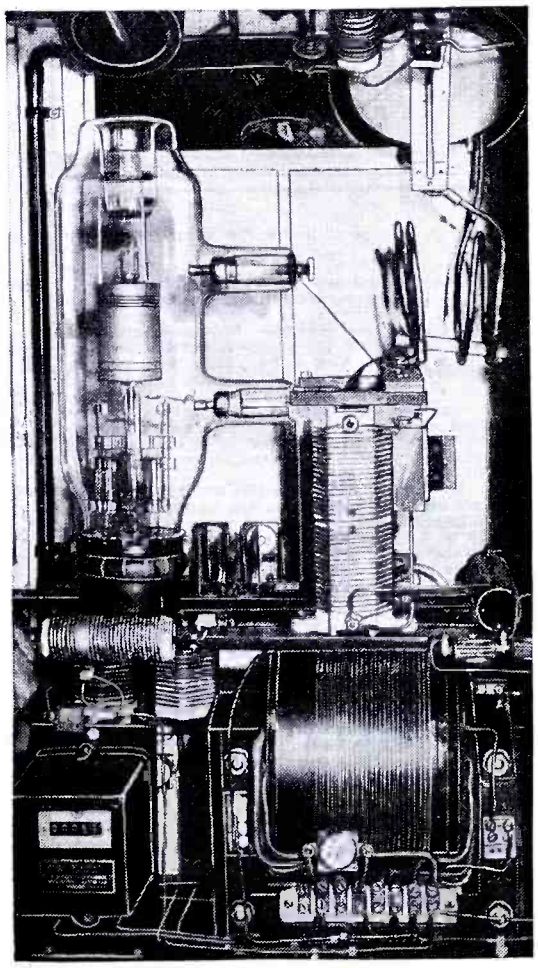
Bursitis Treated Successfully by S-W's

Those interested in the study of short-wave diathermy will find very interesting two important articles—one entitled, "New Multiple Wave Oscillator for Medical Use," by Dr. Pierre Rigaux, in the August, 1935 issue; a second article is entitled, "Human Ills Cured by Short Waves," by H. Winfield Secor.

In the later article the researches of Dr. W. R. Whitney, of the General Electric Co.'s Research Staff, in the successful application of short-wave diathermy for the treatment of *bursitis* is discussed.

This is a rather infrequent malady which has been found extremely difficult to treat, and the patient often finds difficulty in raising his hands above the head. In one of the cases treated experimentally by Dr. Whitney, the high-frequency field was applied by laying several turns of a coiled insulated cable carrying the H.F. current against the shoulder. The bursitis is due to an abnormal condition of a bursa, which is a small closed sac and many of which are found in the human body. Some of these, under abnormal health conditions, were shown by X-rays to contain certain calcareous deposits. One of the most painful ailments is caused by lime deposits in the large bursa which lies in the shoulder. Until recently one of the principal treatments for this ailment was the surgical removal of the deposits, in order to free the patient of a stiff shoulder.

In Dr. Whitney's experimental treatment of a bad case of bursitis, in which the patient could not raise the arm above the head, excellent results were obtained with a wavelength of 24.9 meters or 12 megacycles. The high-frequency oscillator employing two thyratron tubes yielding about 160 watts of r.f. energy. In one case of bursitis the pain subsided considerably after a half-hour's treatment by this method. X-ray pictures were taken before, during, and after the treatments, so that the results obtained were accurately checked—there was no guesswork. After three treatments of one hour each, 90 per cent of the calcareous deposits had disappeared, but other treatments were administered during the month to make sure that the treatment was complete. X-ray pictures taken during the treatments showed the calcareous deposit spreading out and disappearing. One remarkable case treated by Dr. Whitney in the laboratory was a chronic bursitis and the X-ray pictures showed a dense calcareous deposit. At the end of a month's treatment the patient was using the afflicted arm to drive a car, and after another month only a trace of the deposit was visible to the X-ray.



Interior view of 6-meter S-W Diathermy machine, known as the Ultratherm. This is an imported German machine, and uses a 650-watt oscillator tube. It has a "counter" which totals the number of hours the machine is in service.

Short-Wave Therapy Relieves Hiccups

Dr. E. Weissenberg points out in *Medizinische Klinik*, Berlin, that hiccups may develop in the course of encephalitic processes, influenza, abdominal disorders and after laparotomies. The author says that hiccups usually yield rapidly to treatment with short waves. He describes six cases in which the hiccups had persisted for from several hours to two weeks, and in five of which the hiccups were counteracted by weak doses of short waves applied to the occiput, the epigastric region or the cervical sympathetic. He thinks that although the mechanism of the treatment is not fully explained, the possibility of the removal of a symptom that greatly impairs the general condition justifies a trial with short-wave therapy in cases of persistent hiccups.

Short Waves and Television

By Dr. Lee de Forest, Ph.D., Sc.D.

(*Continued from page* 597)

simplicity of and relatively few adjustments.

Obviously the ancient scanning disk, mirror drum, mirror screw—none such can fill this bill. New mechanisms exist which can, and will.

It remains then for the sapient directors to recall their engineers from their *blind-alley* and to set them out upon the logically sensible track. The sooner this is done the earlier may we expect to see Television in the Home.

Girl Operators, Attention!

Listen "YL's" and "XYL's"!! Why not send the Editor a good photo of your "Rig"—and don't forget yourself. A separate photo of yourself will do, with a "clear" photo of that station! $5.00 for best "YL" photo.—Editor. See page 649 March issue for details.

10 & 20 Meter Transmitter

(*Continued from page* 617)

multiplying arrangement. With a 40-meter crystal *quadrupling* is possible. The output of the first *beam* tube on 10 meters is sufficient to fully excite the second *beam* tube, which is the driver for the *final amplifier*. The output of the second *beam* tube on 10 meters is in the order of 25 watts with the voltages specified. That is about 450 volts on the plate.

Higher voltage on the plate of this tube will increase the output considerably, and apparently does not in any way endanger the life of the tube. This 25 watts of output on 10 meters from the driver stage is just sufficient to excite the push-pull final amplifier with maximum rated input to the tube, under the CW telegraph specification. For radio phone operation, however, the excitation is not quite sufficient and the input to the final should be reduced somewhat. This is, of course, when using a 40-meter crystal and quadrupling in the first stage. If a 20-meter crystal is used and the voltage to the driver tube increased to about 500, there will be sufficient excitation for full input on either phone or CW.

Plug-in Coils Give Flexibility

Plug-in coils are used throughout in order to simplify changing from one band to the other. The coupling between the frequency multiplier and driver stage is accomplished through a 35 mmf. condenser. This is set at maximum capacity. A fixed condenser having a capacity of around 50 mmf. can be used here and will serve just as well.

The output of the driver is *link-coupled* to the final amplifier. This is really the only satisfactory method of coupling a single-ended amplifier to a push-pull stage. In order that the input circuit to the final amplifier will be symmetrical, we have employed shunt grid feed. In other words, two R.F. chokes connected in series are shunted across the coil of the grid return taken from the midpoint. If we attempted to tap the plug-in coil, most certainly there would be an unsymmetrical condition, because an ordinary receiver coil form is employed and the leads are not of even length. If a coil similar to the plate coil of the final amplifier is employed, the center-tapped method may be employed with equal satisfaction. Both the input and output circuits of the final amplifier are tuned with split-stator condensers. However, neither of the rotors is grounded. The amplifier appeared to be slightly easier to excite with the rotors left *floating* than with them grounded.

Automatic Bias Employed

We have shown *Automatic bias* throughout the entire transmitter. No separate batteries are used, although a single 22½ or 45 volt battery might be employed in the final amplifier grid circuit, in order to limit the plate current of the tubes, should the crystal fail to oscillate during some period while the plate voltage was applied to the final amplifier. Bias for the first tetrode is supplied by the 5,000 ohm wire-wound variable resistor connected in the cathode circuit. This is about the only logical way to obtain bias with this tube, inasmuch as the grid is connected directly to the cathode of the 6C5. In the second tetrode, grid-bias is furnished by a grid-leak of 20,000 ohms. Under all conditions this particular stage operates at the output frequency not as a doubler; it will not have sufficient power-output to excite the final amplifier.

Only two meters are employed in the circuit. The one on the left-hand side on the front edge of the panel is a zero to three hundred ma. meter, permanently connected in the plate circuit of the final amplifier. The other is a zero to one hundred ma. meter, and alongside of it we have four single closed-circuit jacks for reading—oscillator plate current, frequency multiplier plate current, driver plate current, and final amplifier grid current. In tuning up this transmitter, the B voltage to the

driver in the final amplifier should not be applied. The zero to one hundred meter should be plugged into the plate circuit of the frequency multiplier with B voltage applied to the 6C5 oscillator and the 807 multiplier. The oscillator cathode condenser should be rotated until the plate current of the 807 is maximum. Then this oscillator cathode condenser should be reduced in capacity just slightly, so that the crystal will commence oscillating the next time the voltage is applied. Then if the coil data has been followed carefully the harmonic, which ever one you wish to use, will be found at about half the capacity of the 50 mmf. plate tuning condenser in the frequency multiplier circuit. It is best to use a neon tube when searching for the fourth harmonic, inasmuch as the dip is very slight and can be easily passed over.

The next adjustment, of course, is plugging the meter into the 807 driver and applying plate voltage to it, tuning the plate circuit of this tube for lowest plate current. Then the adjustments of the oscillator and multiplier may be touched up slightly, in order to provide maximum excitation for the driver as evidenced by lowest plate current.

The next move is to plug the meter into the grid circuit of the final amplifier. With the B voltage *off* and the key closed, rotate the grid tuning condenser of the final amplifier until grid current is shown. A readjustment of the driver condenser may be necessary simultaneously with the adjustment of the grid circuit in order to obtain maximum grid current. At this point, the plate condenser of the final amplifier should be rotated and with the neutralizing condenser set at minimum capacity there will be a decided *bump* in grid current as the plate circuit comes into resonance with the grid circuit. Adjust the neutralizing condensers simultaneously, with equal capacity, until rotating the plate condenser *very slowly* has absolutely no effect on the grid current at the point of resonance.

The next operation is to apply the high voltage and tune the plate circuit of the amplifier to resonance, as indicated by minimum plate current, and then couple the antenna. Some 225 to 250 ma. at 1,000 volts is sufficient plate input for CW to the 808 tubes. While at 1,000 volts, the plate current for the RK-37's should be about 200 ma. The 808's may be operated at 1,500 volts, providing the grid current for CW can be brought up to about 45 ma. This can be easily done if we are only working on the second harmonic of the crystal frequency and, of course, with 1,500 volts at 225 mills, (ma.) we will have in the order of 200 to 225 watts out-put, and on either 10 to 20 meters this transmitter will compete with even these so-called 1 kw. "Ham" rigs.

Parts List for the 10 and 20 Meter Transmitter

CORNELL-DUBILIER
8—.001 mf. 1,000 v. mica condensers
2—.01 mf. 1,000 v. mica condensers
1—.001 mf. 5,000 v. mica condensers

CARDWELL
1—140 mmf. Trim-Air condensers
2—50 mmf. Trim-Air condensers
1—split stator, Midway 50 mmf. per section, single-spaced
1—split stator, NP-35-GD, 35 mmf. per section
2—Trim-Air neutralizing condensers, ZS-4-SS 4 mmf.

BUD
1—octal Ceramic socket
3—5 prong ceramic sockets
6—4 prong ceramic sockets
4—stand-off insulators
1—feed-through insulator
8—4 prong 1¼ in. small coil forms
1—2½ in. ceramic coil form
3—2.5 mh. R.F. chokes
1—5 mh. R.F. choke to carry at least 300 ma.
5—single closed-circuit jacks
2—phone plugs. For key and meter

ELECTRAD
1—100,000 ohm 10 watt vitreous enameled resistor
1—5,000 ohm 25 watt vitreous enameled resistor, one slider
3—20,000 ohm 25 watt vitreous enameled resistors
1—2,500 ohm 25 watt vitreous enameled resistor
1—10,000 ohm 25 watt vitreous enameled resistor
1—50 ohm center-tapped resistor

TRIPLETT
1—0-100 ma. meter small bakelite case
1—0-300 ma. meter small bakelite case

PAR METAL
1—11x17x3 in. black crackled finish chassis
1—7x17x$\frac{1}{16}$ in. panel, for shield

TUBES
1—6C5
2—807's
2—RCA 808's or 2-RK 37's

Coil Data

OSC—40 m. crystal—10 turns No. 20 D.S.C. spaced dia of wire.
20 m. crystal—4 turns No. 20 D.S.C. spaced dia of wire.
For 20 meter operation—
Multiplier 8 turns No. 20 D.S.C. spaced dia of wire
Driver 8 turns No. 20 D.S.C. spaced dia of wire
Final amp. grid 12 turns No. 20 D.S.C. spaced dia of wire.
Final amp. plate 14 turns No. 12 bare spaced dia of wire 2½ in. form
For 10 meter operation—
Multiplier 3 turns No. 18 spaced dia of wire
Driver 4 turns No. 18 spaced dia of wire.
Final Amp. Grid 7 turns No. 18 spaced dia of wire
Final Amp. Plate 8 turns ¼ in. copper tubing spaced to length of 3¼ in. and 2½ in. diameter.

When To Listen In

(*Continued from page* 628)

5:30-10 or 11 a.m. HS8PJ at Bangkok, Siam, broadcasts on Monday from 8-10 a.m. on 19.02 mc., and on Thursday on 9.35 mc. at the same hour.

AUSTRALIA

● VK3LR at Melbourne on 9.58 mc. broadcasts daily from 3:15-8:30 and 8:45-9:45 a.m. daily except Sunday. On Friday there is an additional broadcast from 10 p.m. to 2 a.m.

VK3ME at Melbourne on 9.51 mc. broadcasts daily except Sunday from 4-7 a.m. VK2ME at Sydney on 9.59 mc. is on the air Sundays from 1-3 and 5-11 a.m. VK6-ME at Perth, West Australia, on 9.59 mc. is reported testing from 5-9 a.m.

AROUND THE RADIO WORLD

● THIS is the title of the series of broadcasts given by Frank Andrews on Station KFI at Los Angeles, Cal., each Sunday morning at 1 a.m. (EST) On these programs Mr. Andrews gives the latest information about short-wave stations, including schedules and new stations reported to him. Listeners should make a point of tuning in this program. KFI operates on 640 kc. It has a power output of 50 kw.

How NBC Anniversary Program Provided Greatest Short Wave Thrills

(*Continued from page* 599)

and was then routed to the main control room of Station WBZ in Boston. There it was put on the air over WBZ's fifty-kilowatt transmitter at Millis, Massachusetts.

Aboard the New Haven Railroad streamliner *The Comet*, engineers installed special receivers attunded to station WBZ. Announcers aboard the train wore earphones wired to these receivers to listen to German announcers speaking in English. As the announcers aboard *The Comet* sent their greetings to Germany, their voices were *short-waved* from the American train to more special receivers installed along *The Comet's* route. These receivers picked up the signal and sent it by special wire line to the master control room at WBZ, Boston. From Boston more special wire lines carried the program to the Radio City *master control room*, and then to RCA Communications at Rocky Point, where the engineers fed the voices of *The Comet* announcers to one of their transoceanic transmitters, which flung it back across the Atlantic to Berlin!

In Berlin the *Reichs Rundfunk* picked up the short-wave voice from Rocky Point, Long Island, and then "fed it out" on another of Berlin's short-wave stations. German engineers aboard the Hamburg-Berlin streamlined train then picked up the voices of the NBC announcers and the German announcers heard the greetings from America on earphones.

While the voices of the American announcers and the German announcers traveled more than 8,000 miles, they were able to speak to each other instantaneusly.

A Voice From the "Black Pit"

At the conclusion of the *two-way* streamline train conversation, the locale of the program leaped to Pittsburgh where a description of what happens at the bottom of the "black pit" was given. The "black pit" was the Carnegie Institute *model coal mine.* Several miners were interviewed on their mining experiences. For this portion of the program the (Blue) network was reversed into the master control room of Station KDKA. The pick-up from the Carnegie Mine was sent along special wire lines to KDKA'S Control Room and then fed into NBC networks.

New York's *Fifth Avenue* was next on the list. The NBC streamline mobile unit No. 2, a "broadcasting station on wheels," sped up the world-famous avenue as an announcer described *Radio City*, bedecked with flags and banners in honor of the Tenth Anniversary Week. The program from the mobile unit was *short-waved* from the "radio station on wheels" and received atop the RCA Building—then sent to the Radio City *master control room*, and finally routed to the network.

Micro-Waves Do Their Bit!

From New York, the program made another cross-country leap to Chicago. Listeners were taken right into the track as the announcer rode a bicycle and interviewed the riders. The Chicago announcer was equipped with a special short-wave pack-set. The signal from the "pack set" was picked up at the side of the track and "fed" into the Chicago *control room* and into the nationwide network.

The next two pickups on the program came from branches of America's armed forces. The first originated outside of Washington, D. C. featuring a description of U. S. Army reconnaisance cars in action. The network announcer, was stationed in one of the armored cars and his voice was *short-waved* to a receiving point located at Fort Myers. From Fort Myers the program traveled into the main control room of Station WMAL, in Washington, and then into the network.

From Washington the program swung to the Coast Guard Cutter *Ponchartrain*, cruising on its patrol in Long Island Sound. Aboard the *Ponchartrain* an announcer described the rolling waters of the Sound and interviewed the boat's captain on his experiences. The program from the Cutter was *short-waved* to Rocky Point, Long Island, fed into the Radio City *control room* and again onto the networks.

Micro-Wave In Tunnel

Leaving the water, the program traveled under the earth again. This time it came from a microphone in New York's *Midtown Tunnel.*

The announcer, speaking from under the mud of the Hudson, was equipped with a special micro-wave transmitter. Describing the general activity in the tunnel, the signal from the micro-wave set was picked up by engineers at the mouth of the tunnel and then sent to the Radio City *control room* and to the networks.

As soon as the announcer in the Midtown Tunnel concluded, the entire network was reversed to San Francisco, atop the new *Oakland Bay-San Francisco Bridge.* The announcer on the bridge spoke into another short-wave transmitter, which was picked up at NBC headquarters in the "Golden Gate City" and again broadcast into the transcontinental network.

After a description of the Golden Gate and the bridge, the biggest ever built, the announcer turned the program over to an NBC unit in a U.S. Navy plane, flying with a squadron of fighting "ships" over San Diego, California, the West Coast Naval Base. From San Francisco the networks were reversed into San Diego. The announcer aboard the Navy plane spoke into a *short-wave* transmitter, which was picked up on the ground and fed into the network. At the conclusion of the program the entire squadron of planes saluted the Tenth Anniversary of NBC with a *power dive.* This dive was relayed by parabolic microphones placed on the ground.

Short Wave Scouts

(*Continued from page* 612)

W2XE, 6,120 kc., Atlantic Broadcasting Co., New York City.
W3XAU, 6,060 kc., Atlantic Broadcasting Co., Philadelphia, Pa.
W3XAU. 9,590 kc., Atlantic Broadcasting Co. Philadelphia, Pa.
W3XAL, 6,100 kc., National Broadcasting Co., Boundbrook, N.J.
W3XAL, 17,780 kc., National Broadcasting Co., Boundbrook, N.J.
W4XB, 6,040 kc., Isle of Dreams B.C., Miami, Fla.
W8XK, 6,140 kc., Pioneer Relay B. Station, Pittsburgh, Pa.
W8XK, 11,870 kc., Pioneer Relay B. Station, Pittsburgh, Pa.
W8XK, 15,210 kc., Pioneer Relay B. Station, Pittsburgh, Pa.
W8XAL, 6,060 kc., Crosley Radio Corp., Cincinnati, Ohio.
W9XAA, 6,080 kc., S.W. Voice of Labor, Chicago, Ill.
W9XF, 6,100 kc., National Broadcasting Co., Chicago, Ill.
W9XBS, 6,425 kc., National Broadcasting Co., Chicago, Ill.
KWO, 15,415 kc., Transpacific Comm. Co., Dixon, Cal.
KWU, 15,355 kc., Transpacific Comm. Co., Dixon, Cal.

Foreign Short Wave Stations

CANADA

CJRX, 11,720 kc., James Richardson & Sons, Winnipeg, Man., Can.
CJRO, 6,150 kc., James Richardson & Sons, Winnipeg, Man., Can.
CRCX. 6,090 kc., Canadian Radio Comm., Bowmanville, Ont., Can.
VE9DN, 6,005 kc., Canadian Marconi Co., Drummondville, Que., Canada.

WEST INDIES

COCO, 6,010 kc., Havana, Cuba.
COCH, 9,428 kc., General Broadcasting Co., Havana, Cuba.
COCD, 6,130 kc., La Voz del Aire, Havana, Cuba.
CO9JQ, 8,668 kc., Camaguey, Cuba.
HIZ, 6,316 kc., Trujillo City, Dom. Rep.
HIX, 5,980 kc., Trujillo City, Dom. Rep.
HI1A, 6,185 kc., La Voz del Yaque, Santiago, De Los Caballeros, Dom. Rep.

CENTRAL AMERICA

XEFT, 6,120 kc., La Voz de Veracruz, Vera Cruz, Mexico.
XECR, 7,380 kc., Mexico City, Mexico.
XEBT, 6,000 kc., El Buen Tono, Mexico City, Mexico.
HP5B, 6,030 kc.. Radio Club Miramar, Panama City, Panama.
HP5J, 9,590 kc., La Voz de Panama, Panama City, Panama.
TG2X, 5,940 kc., La Voz de la Policia Nac., Guatemala City, Guatemala.
TGF 14,485 kc., Tropical Radio Telegraph Co., Guatemala City, Guatemala.
TIGPH, 5,830 kc., Alma Tica, San Jose, Costa Rica.
TIRCC, 6,550 kc., Radioemisora Catolica Costarricense, San Jose, Costa Rica.
TIPG 6,410 kc., La Voz de la Victor, San Jose, Costa Rica.
TI8WS, 7,550 kc., Ecos del Pacifico, Puntarenas, Costa Rica.

SOUTH AMERICA

PRF5, 9,501 kc., S.W. Radiotelephone Station, Rio de Janeiro, Brazil.
LSX, 10,350 kc., Transradio International, Buenos Aires, Argentina.
OAX4G, 6,235, Lima, Peru.
OAX4D, 5,780 kc., All American Cables, Lima, Peru.
OCJ-2, 14,860 kc., All American Cables, Lima, Peru.
HC2RL, 6,660 kc., Quinta Piedad, Guayaquil, Ecuador.
HCJB, 8,214 kc., La Voz de Los Andes, Quito, Ecuador.
HC2ET, 4,600 kc., Radiodifusora del Diario, Guayaquil, Ecuador.
HCK, 5,885 kc., Radiodifusora del Estado, Quito, Ecuador.
HJ1ABE. 6,115 kc., La Voz de Los Laboratorios Fuentes, Cartagena, Colombia.
HJ1ABD, 7,281 kc., Ondas de la Heroica, Cartagena, Colombia.
HJ3ABH, 6,012 kc., La Voz de la Victor, Bogota, Colombia.
HJ4ABA, 11,710 kc., Ecos de la Montana, Medellin, Colombia.
HJ4ABC, 6,451 kc., Ecos del Combeima, Ibague, Colombia.
HJ5ABE, 14,100 kc., Cia. Radiodifusora Colombiana, Cali, Colombia.
YV3RC, 6,150 kc., Radiodifusora, Venezuela, Caracas, Venezuela.
YV5RMO, 5,850 kc., Ecos del Caribe, Maracaibo, Venezuela.
YV6RV, 6,520 kc., La Voz de Carabobo, Valencia, Venezuela.
YV1ORSC, 5,720 kc.. La Voz del Tachira, San Cristobal, Venezuela.

EUROPE

DJA, 9,560 kc., Deutscher Kurzwellensender, Berlin, Germany.
DJB, 15,200 kc., Deutscher Kurzwellensender, Berlin, Germany.
DJC, 6,020 kc., Deutscher Kurzwellensender, Berlin, Germany.
DJD, 11,770 kc., Deutscher Kurzwellensender, Berlin, Germany.
DJE, 17,760 kc., Deutscher Kurzwellensender, Berlin, Germany.
DJN 9,540 kc., Deutscher Kurzwellensender, Berlin, Germany.
DIP, 14,410 kc., Deutscher Kurzwellensender, Berlin, Germany.
DIQ, 10,290 kc., Deutscher Kurzwellensender, Berlin, Germany.
PHI, 11 730 kc., Philips SW Station PHI, Hilversum, Holland.
PCJ. 15,220 kc., Philips Radio, Eindhoven, Holland.
FYA. 11,715 kc., Radio-Coloniale, Paris, France.
FYA. 11,880 kc., Radio-Coloniale, Paris, France.
FYA, 15,245 kc., Radio-Coloniale, Paris, France.
HBP. 7,797 kc., Radionations, Geneva, Switzerland.
HBL, 9,590 kc., Radionations, Geneva, Switzerland.
HBO, 11,390 kc., Radionations, Geneva, Switzerland.
HBJ. 14,540 kc., Radionations, Geneva, Switzerland.
2RO, 9,635 kc., Radio E.I.A.R., Rome, Italy.
2RO, 11,810 kc., Radio E.I.A.R., Rome, Italy.
IRM. 9,830 kc., Italo Radio, Rome, Italy.
IRJ, 13,104 kc., Italo Radio, Rome, Italy.
ORK, 10,330 kc., Radio Ruysselede, Ruysselede, Belgium.
EAQ, 9,860 kc., Transradio Espanola, Madrid, Spain.
HAS-3, 15,370 kc., Radiolabor, Budapest, Hungary.
HAT-4, 9,121 kc., Radiolabor, Budapest, Hungary.
CT1AA. 9,600 kc., Radio Colonial, Lisbon, Portugal.
RNE, 12,000 kc., Comite de Radiodiff. & Radiofic., Moscow, U.S.S.R.
RKI, 15,040 kc., Comite de Radiodiff. & Radiofic., Moscow, U.S.S.R.
RIM, 15,252 kc., Comite de Radiodiff. & Radiofic., Moscow, U.S.S.R.
HVJ, 15,110 kc., Radio Vaticano, Vatican City, Italy.

AUSTRALIA

VK2ME, 9,590 kc., Voice of Australia, Sidney Australia.
VK3ME, 9,510 kc., Amalgamated Wireless, Melbourne, Australia.
VK3LR, 9,580 kc., National Broadcasting Service, Melbourne, Australia.
VPD, 13,070 kc., Amalgamated Wireless, Suva, Fiji Islands.

ASIA

JVN, 10,660 kc., Kokusai-Denwa Kaisha Ltd., Tokyo, Japan.

CQ

● A visiting nephew while listening to W4DIJ tune in suddenly asked, "Say, Uncle, where is station C.Q. located?"—Roy J. Allison.

CQ

By blinking my search-light, I had a QSO with an airplane at night while he was flying towards New York City from Albany. We exchanged greetings and I gave him his whereabouts as 50 miles south of Albany.—Walter Juranic.

CQ

A local "Ham" wound a copper tubing coil for a TNT oscillator on an old pipe in the cellar. When he finished he found the pipe was part of the house plumbing system and he had to unwind the coil to get it off—Hil-Bill Orr, W2HCE, Bronxville, N.Y.

Book Review

The "Radio Antenna Handbook," 80 pages, by Frank C. Jones and W. W. Smith, under the direction of J. N. A. Hawkins. Paper covers; 6x9 inches; published by Radio, Ltd., Los Angeles, Calif.

This book fills a long-felt need for a practical reference book on antennas of all descriptions. The majority of all available antenna information has been compiled in condensed form and embodied into this valuable book. A brief review of the chapters will readily indicate its contents.

Chapter 1—"Antenna fundamentals," covering ground waves, sky waves, ionosphere, skip distance, and many other associated topics. Chap. 2—"Choice of an Antenna," explaining advantages and disadvantages of various systems. Chap. 3—"Methods of feeding antennas." This chapter goes into the various types of impedance matching networks, transformers, and feed-line construction. Chap. 4—"Coupling to the transmitter," covering the functions of the various antenna coupling arrangements. Chap. 5—Harmonic operation. Chap. 6—Directive antennas. Chap. 7—Receiving antennas. Chap. 8—Special antennas and miscellaneous tables. Chap. 9—"Supporting the antenna." This chapter deals with guy and guyless towers—methods, construction, and erection.

The book is profusely illustrated with diagrams, tables, and charts. All of the 80 pages contain valuable information on the most interesting of subjects—Antennas, and no space is taken up with advertising matter.—G.W.S.

RADIO OPERATING QUESTIONS AND ANSWERS, by Arthur R. Nilson and J. L. Hornung. Size 5¾x8¼ in., 428 pages, 104 illustrations, cloth bound. Published by the McGraw-Hill Publishing Co., New York, 1936.

This 6th edition of Nilson and Hornung's famous catechism of Radio Questions and Answers is more useful than ever, and many unusual everyday problems which the general theoretical textbooks do not even mention, are here covered in a very practical form. Every radio student, especially those expecting to take examinations for operators' licenses, whether experimental or commercial, should "sleep with this book."

Among the practical survey of radio problems, as the operator meets them, we find diagrams and discussions on Commercial Type Tube Transmitters, Spark Transmitters of the Ship Type, and also a section on Arc Transmitters, with practical questions and answers concerning their operation, with hookups, etc.

Important subjects not covered in many of the radio textbooks and included in this book are—Various Types of Commercial Receiving Apparatus, the Radio Compass, Storage Batteries, Motors and Generators, etc. One section deals with the *radio laws* and *traffic regulations* in question and answer form. This style of presentation is so completely worked out by the authors that most every ordinary question one could think of has been clearly and completely answered. Even broadcast station transmitters are diagrammed and discussed in "Q. and A." form. Such questions as—"How is the percentage of modulation of a broadcast transmitter checked?", are answered. The *decibel* is discussed at length so anyone can understand it. Of interest to every "Ham" and prospective "Ham," is the section dealing with Amateur Station operation; complete, with a discussion of the transmitter, amateur radio laws and regulations, etc. Aeronautical and Police Radio, Beacons, etc., are discussed in the final section of the book, with an Addenda which includes questions and answers on many practical radio topics.—H.W.S.

TELEVISION—Collected Addresses on the Future of the New Art. Size, 6x9 in., 452 pages, profusely illustrated, stiff paper covers. Published by the RCA Institutes Technical Press, New York, 1936.

One of the most complete books on television available today. It comprises a collection of some of the most important engineering and other articles and addresses on television which have so far appeared. Among the illustrious authors whose names and contributions appear in this book are—David Sarnoff, Dr. C. B. Jolliffe, E. W. Engstrom, Dr. V. K. Zworykin, D. W. Epstein, I. G. Maloff, and others. Any one at all interested in the technical aspects of modern television must not fail to read this book and have it at his elbow for constant reference. This very important handbook covers, (with complete mathematical formulas and diagrams, as well as photos when necessary) such important television subjects as The Propagation of Ultra-Short Wave Lengths and Field Strength Measurements on 6-Meter Waves, for example. A Study of Television Image Characteristics; Experimental Television Transmitting Apparatus; Cathode Ray Tube Receiver. Scanning is discussed in detail and the action taking place in the Zworykin Iconoscope is completely covered. An important paper covers the theory of the Electron Gun; another paper, The Cathode Ray Tube in Television Reception, is one you cannot afford to miss. Other important topics discussed are: Ultra-High Frequency Transmission, Urban Field Strength Survey—with tabulated data and maps showing field strength at 30 megacycle and higher frequency experimental transmissions. An excellent discussion on scanning sequence is included.—H.W.S.

Solving Power-Supply Problems

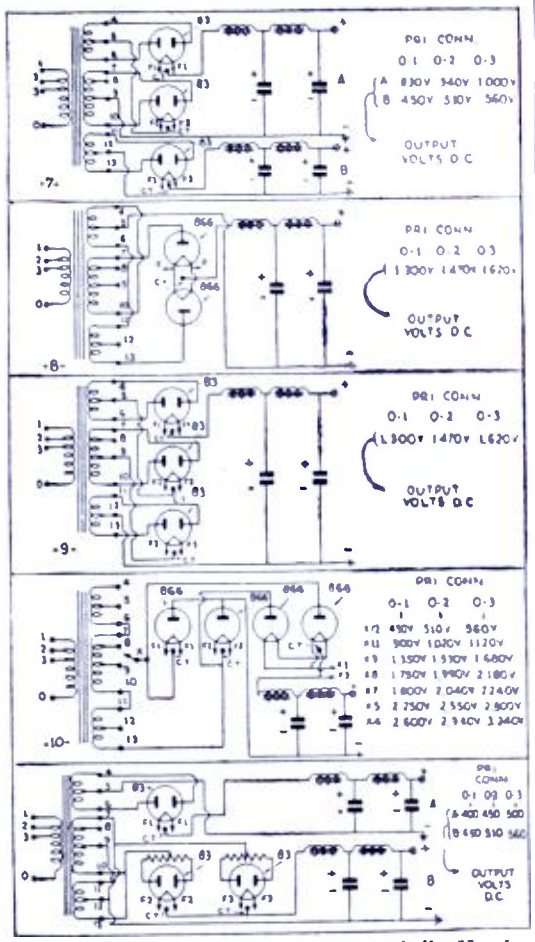
(Continued from page 616)

to a wide range of voltage demands with no wastage of power, and consequent lowering of the heat to be dissipated in the unit in which they are to be used, as well as reduction in cost of operation. This variable range of voltages is obtained with the lower-priced rectifying tubes in circuits possible only with a triple winding secondary.

Some of the more important uses of this transformer are shown in the schematic (Fig. 1) three separate D.C. supplies ranging from 400 to 560 volts may be obtained. By means of a primary tap these voltages may be varied approximately 12 per cent. This circuit will supply adequate power to three separate audio or R.F. units.

In applications where it is necessary to have a separate low voltage and a high voltage, the circuits shown in Fig. 2, utilizing two 866 tubes and a type 83, is not only economical but very practical for many uses in amateur transmitters and experimental circuits.

Fig. 3 shows a similar appplication with the exception that the high-voltage is obtained from three low-cost 83 type tubes in a *bridge* arrangement. The same voltages are also obtainable in Fig. 4. In this



More Interesting "Power-Supply" Hook-Ups

circuit the center tap of one of the high-voltage windings is connected to the filament of a type 83 tube, thereby forming a *series* connection.

By far the most versatile circuit is shown in Fig. 5. A single 83 is used for low voltage and two 866's connected for *full-wave rectification* supply the high voltage. Usually, when this circuit is used in existing equipment, two power transformers are required to accomplish what one will do with this new transformer.

Where higher voltages are desired the circuit in Fig. 6 may be used. This arrangement will supply a D.C. voltage as high as 1520 volts. In a circuit where such high voltages are used, it is common practice to supply a lower power stage with a lower voltage. This is obtained from a separate winding using a type 83 full-wave rectifier.

(Continued on page 653)

DX Conditions on the 10-Meter Band in 1936

Review of a Series of Tests by European Amateurs

● E. Fendler, a well-known German short-wave amateur, published in No. 7 of the "CB-MB" Magazine an interesting report which contained some valuable information on the DX conditions during the winter of 1935-36. This information was compiled from 50,000 individual reports from German amateurs interested in the 10-meter band. Each of these reports concerns itself with the observation of a single day in a certain locality of Germany.

We must now expect a much lower degree of wave reflection, or beam-bending and an extension of the silent zone (skip distance). However, it will be found quite difficult to ascertain the lowest wavelength which will afford the greatest satisfaction. This will probably make some lengthy experimenting necessary, since we have to expect a considerable increase in sun-spot activity.

The complete report on the numerous "logs," as supplied by the German amateurs concerning the transmission and reception results on the wave range between 10 and 10.7 meters, will be published after the scientists have finished their work. Until then, we must content ourselves with a few fundamental conclusions. This report which is given in the form of two charts should, as indicated before, not be taken as the last word in this matter, but rather as a preliminary contribution to the involved study on reception and transmission in the ultra short wave field during the winter of 1935-6.

The abbreviations given in chart 1 are as follows:

K (left) indicates traffic conditions from Germany in direction of New Zealand, Australia, Asia

W indicates traffic conditions from Germany in direction of North America

S indicates traffic conditions from Germany in direction of South America

K (right) indicates traffic conditions from Germany in direction of South Africa

While in former years the best hours for continental (European) traffic have been shortly before and after sunset, no uniform conclusions can be made this year. This change was particularly impressive in the transatlantic traffic, where the traffic conditions changed considerably with the various points of the compass, and also the time differences between the places of transmission and reception. Another noteworthy change of conditions has taken place, for example, with regard to the traffic to North Africa. During the past year North Africa was one of the best spots on the globe for effecting communication with Middle Europe; at the present time it is (for European amateurs) one of the least desirable points. This condition exists because the range of European ultra-short wave transmitters extended so far that North Africa is now considered as one of the shortest ranges which can be "bridged" with ease.

The above mentioned changes in the range of the silent-zone (skip distance) are given in chart 2, which shows the average extension of the zone of silence in kilometers. (1 mile equal to about 1.6 kilometers) This, of course, is with regard to Europe and the time given in both tables is Middle European Time (MEZ); this means that the average difference between EST and MEZ time is 6 hours.

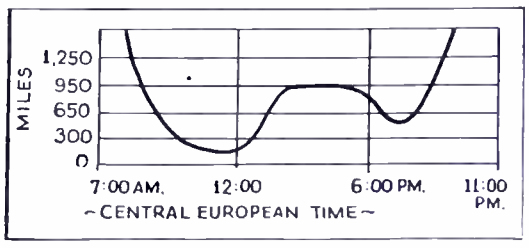
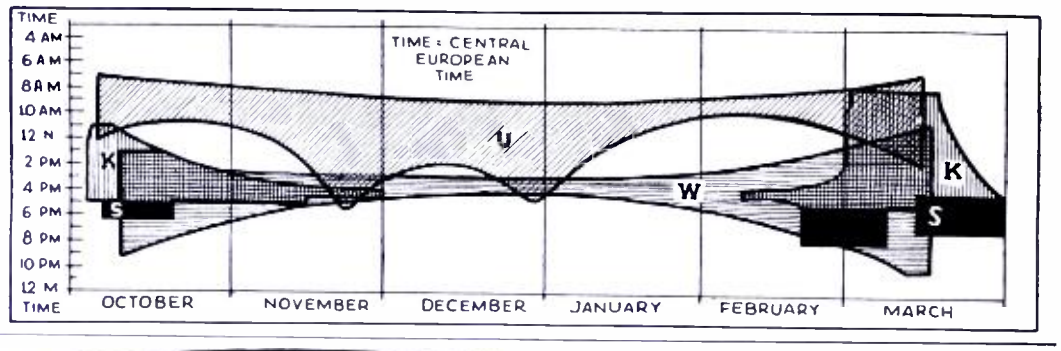


Chart above shows average range of the zone of silence in miles, for different hours of the day with 10-meter waves.

→

Various changes in the skip distance for different 10-meter beams, extending over a period of several months.



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53. POLYIRON COIL DATA SHEET 536. Complete catalog descriptions, specifications, prices and performance curves and circuits showing applications of the entire line of Polyiron radio components made by the Aladdin Radio Industries, Inc., are given in this folder.

57. RIBBON MICROPHONES AND HOW TO USE THEM. How do your phone signals sound to the fellow at the receiving end? If they sound as though you're talking with a bunch of marbles in your mouth, the chances are a good microphone, properly hooked up, would help "to beat the band." This folder describes the Amperite Velocity Ribbon Microphone and gives information and circuit diagrams on how to connect up the microphone.

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The Editors Want

articles describing in detail television receivers on which short-wave experimenters may pick up the television images being broadcast by the RCA Station, atop the Empire State Bldg., in New York City, on about 5 meters, and also those being broadcast from the Don Lee Station on a similar wavelength in California. All articles accepted and published will be paid for at regular space rates. Send outline of article and what photos or diagrams available to: The Editor, Short Wave and Television, 99 Hudson St., New York, N.Y.

Power Supply Problems

(*Continued from page* 649)

The circuit of Fig. 7 is ideal for those whose pocketbooks are limited. A glance shows two of the high voltage windings connected in series. For rectification two type 83 tubes are connected in tandem. Low voltage is obtained from the other winding with another 83 tube. When it is not desired to utilize the low voltage, the three windings may be connected in series. When used as shown in Fig. 8, with two 866 tubes, voltages ranging from 1300 to 1620 are procurable.

A still cheaper method of obtaining the same voltages is shown in Fig. 9. There the outputs of three type 83 tubes are connected in series. In this circuit it is essential that the filament transformer supplying the 83 tubes be adequately insulated to withstand the high voltages.

Perhaps surpassing all the other circuits shown is the application indicated in Fig. 10. In this circuit 21 different voltages are available. For transmitter requirements there is sufficient power available to supply anything from a five-watter up to a 500-watt rig. In addition to this a separate low-voltage supply may be taken off of the secondary winding marked 4, 5 and 6, when the high-voltage requirements are not over 2240 volts.

For circuits requiring exceptionally high current where the voltage requirement does not exceed 560 volts, the circuits shown in Fig. 11 is admirably suited.

This article has been prepared from data supplied by courtesy of Kenyon Transformer Co.

Alphabetical List of S-W Stations

(*Continued from page* 625)

CALL	FREQ.	CALL	FREQ.
TPA4	11.72	**W3XAL**	17.78
TYA	12.22	**W3XAL**	6.10
TYB	12.25	**W3XAU**	9.59
TYF	14.64	**W3XAU**	6.06
VE9BJ	6.09 mc.	**W3XL**	17.31 mc
VE9BK	4.79	**W4XB**	6.04
VE9CA	6.03	**W4XCA**	31.60
VE9CS	6.07	**W8XAL**	6.06
VE9DR	6.01	**W8XK**	21.54
VE9HX	6.13	**W8XK**	15.21
VIZ3	11.56	**W8XK**	11.87
VK2ME	9.59	**W8XK**	6.14
VK3LR	9.58	**W8XWJ**	31.60
VK3ME	9.51	**W9XAA**	11.83
VK6ME	9.59	**W9XAA**	6.08
VLJ	9.76	**W9XBS**	6.43
VLK	10.52	**W9XF**	6.10
VLZ2	9.76	**XBJQ**	11.20
VPD	13.08	**XEBT**	5.99
VPD2	9.54	**XECR**	7.38
VP3MR	6.01	**XEFT**	6.12
VQ7LO	6.08	**XEME**	8.19
VRR4	11.60	**XEUW**	6.02
VUB	9.57	**XEWI**	11.9
VUC	6.11	**XEXA**	6.17
VWY	8.98	**XGM**	17.65
VWY2	17.51	**XGOX**	6.85
WCN	5.08	**XGW**	10.42
WKA	21.06	**YBG**	10.43
WKF	19.22	**YDA**	6.04
WKK	21.42	**YDA**	3.04
WKN	19.82	**YDB**	9.65
WLA	18.34	**YDB**	11.86
WLK	16.27	**YDC**	15.15
WMA	13.39	**YNA**	14.49
WMF	14.47	**YNLF**	9.65
WMN	14.59	**YVC**	13.35
WNA	9.17	**YVQ**	6.67
WNB	10.68	**YVR**	18.30
WNC	15.06	**YVR**	9.15
WND	4.10	**YV1RE**	6.36
WOA	6.76	**YV2RC**	5.80
WOB	5.85	**YV3RC**	6.16
WOF	14.47	**YV5RMO**	5.85
WOQ	16.27	**YV6RV**	6.52
WOK	10.55	**YV8RB**	5.90
WON	9.87	**YV9RC**	6.40
WOO	17.62	**YV10RSC**	5.72
WOO	12.84	**YV11RB**	6.55
WOO	8.56	**YV12RM**	6.30
WOO	4.75	**ZBW2**	6.09
WOO	4.27	**ZBW3**	9.53
W1XAL	15.25	**ZBW4**	15.19
W1XAL	11.79	**ZBW5**	17.76
W1XAL	6.04	**ZFA**	5.03
W1XK	9.57	**ZFB**	10.06
W2XAD	15.33	**ZGE**	6.13
W2XAF	9.53	**ZHI**	6.02
W2XE	21.52	**ZHJ**	7.63
W2XE	17.76	**ZLT2**	7.39
W2XE	15.27	**ZLT4**	11.05
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W2XE	6.12	**ZTJ**	6.10

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12—26	6—56	3—35-51	3—77	2—10
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Any Two Tubes $1.00

1 D 7	25 A 6	6 A 6	6 A 8
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This Pack will supply 2.5 volt Filament voltage. Pure Rectified D.C. 350 volts at 80 MILS 6 AMPS for Filament.

Same Pack supplies 6-7 tubes at 6.3 volts..$2.95
Same Pack supplies 8-9 tubes at 6.3 volts.. 3.39
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Complete Kit $2.49

with wiring diagram and drilled chassis less tube, unwired. Wiring 50c extra AD-201. 80-Rectifier tube extra 34c. Shipping weight, 12 lbs.

Nationally Known 6½ inch Dynamic Speakers

1500 ohms. Output transformer to match 38, 12A7, 71A, 43, 45, 2A5, 47, 59, 53 tubes, etc. Shipping weight 6 lbs. AD 600, AD-600 Speaker complete..... **89c**

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10¼ inch, available in the following sizes: 1000, 1500, 2000 ohm field coils. Brand new, less output transformers.

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OUTPUT TRANSFORMERS, extra PP 45-2A3 extra..... **25c**

OUTPUT TRANSFORMERS, single pentode, extra..... **39c**

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AD 1313, $1.49, less Turn Table
110-125 Volts, 25 cycle

These motors are 25 cycle. But by connecting windings in parallel, will operate on 60 cycles.

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5,000, 25,000, 50,000, 100,000 ohm

The most handy size used by the radio experimenters at a give away price..... **25c**

THE GREATEST AMPLIFIER BARGAIN EVER OFFERED

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Yaxley Band-Changing Switch

Designed especially for all-wave sets. Heavy silver plated contacts. Consists of six 2-gang decks—12 gangs in all. Three positions. Excellent for short-wave as well as for analysers. List price $4.32. Ship. wt., 1 lb. **No. AD-111** ..... .29

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Crosley Battery Sets—6 Volt—5 tube with dynamic speaker, Brand new 3.95
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KOLSTER 250 tube power amplifier with 12" 25 watt speaker, wired ready to use, factory sealed cases. Less tubes..... **4.95**
Shipping weight—60 lbs. Makes a fine P. A. System.

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These units may be used for replacement in many of the nationally advertised receivers on the market. Fiber installation and wire wound, 10 popular sizes..... .59

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Consists of 10 popular size volume controls, ranging from 5,000 to 1 meg. Some with switches, some without. This kit comprises the products of well-known manufacturers. 10 for..... 1.39

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Small, compact units designed for use in AC-DC midget sets. Will pass 60 mils.
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YOUR PRICE..... **25c**

2½ MH. Short Wave R. F. Choke

These low loss Chokes Pie Wound on Isolantite forms are used in every S. W. Set. **15c**
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Two & Three-Gang Midget Tuning Condensers

Midget variable condenser cap. .000365 MFD

3 gang has ⅜" shaft
2 gang has ¼"—⅜" shaft
AD113—3 gang..... **59c**
AD113A—2 gang.....

Bandspread Variable Condensers

Available with 13 plates, (.0003 mf); 17 plates, (.000365 mf); 23 plates, (.0005 mf); 46 plates, (.001 mf). For short-wave bandspread receivers as well as for standard broadcast and long-wave receivers. Ship. wt. 2 lbs.
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Variable Condensers—each..... **25c**

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Manufactured by General Electric. A well designed transformer. Has 6.3 volt filament winding. Designed for 110-125 volts. 50-60 c., A.C. Specifications 6.3 V., 2½ amp.; 5 V. 2 amps. for fil. of 80 tube; 750 V., C.T., 75 mils. for plate current. Ship. wt., 5 lbs.; also available in 2½ V.

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8 MFD.....25c
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12 MFD.....38c
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Canned-Type By Pass Condensers

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1.0-200 V.....15c
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4 MFD.-200 V.....15c
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8-8 MFD.-200 V...35c
4-8 MFD.-200 V...29c
8 MFD.-600 V.....19c

By Pass Condensers

.01-.005-600 V...$0.03
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.01-600 V..... .04
.1-600 V..... .05
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Mershon Wet Electrolytic

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1000 volt test, 600 working volts. Available in the following sizes:

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.0007 .0001 .003
.001 .0002 .00025
.002 .0003

Special price while they last.
In lots of 100.....$0.95
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AD1311

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Same as the AD 716 KIT 50 assorted ⅛, ½, and 1 Watt RMA Coded Resistors. **65c**
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Voltage Divider assortment of 10 wire wound on porcelain or isolantite tubing, vitreous enameled. All new perfect merchandise. **43c**
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Kit of 100 Assorted ⅛, ½, and 1 Watt Resistors
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RESISTOR KIT..... **$1.29**

25 Resistor Assortment

This kit contains just one-half of the 716A Kit and is a selection of the ⅛, ½ and 1 Watt coded Resistors.
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18" Adj. Magnetic Speaker for Bat. or Elec. Sets $1.95 Reg. $15.00. Special

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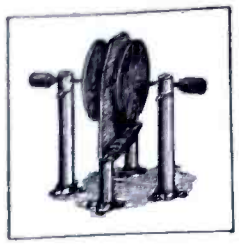
58 MARKET STREET Dept. S-2 NEWARK, N. J.

New Ultra-high Frequency Tuning Condenser



● THIS new Bud condenser is ideal for use in either a split or conventional tank circuit tuning above 56 megacycles. It also may be easily adapted for use in a parallel plate oscillator. These ultra-high frequency condensers are constructed of aluminum plates with highly polished surfaces. The two round plates are 2⅛ in. in diameter and ⅛ in. thick with rounded edges to minimize corona effect. Both plates are mounted on Isolantite pillars, and very long threaded shafts attached to these plates make possible an exceptionally wide range of capacity variation. The center plate is also mounted on Isolantite pillars, but is fixed in position.

This article has been prepared from data supplied by courtesy of Bud Radio, Inc., No. 597.

Ranger Cadets of Baltimore—

Short Wave Radio Corps.

Editor, Short Wave & Television:

I have read some of the letters which appear in the "fan" column and find them very interesting. Should this one appear, I want to say that I would enjoy corresponding with other Radio Clubs. I represent the Ranger Cadets of Baltimore Short Wave Radio Corps under the Supervision of the American International Academy, Inc. We are going to build our station which will be a large one for South American work. This is not a correspondence organization but regular enlisted members who are working on many different kinds of work. Must say *Short Wave & Television* is educational as *it started all our beginners and keeps us up to date as well!* Trusting that you will publish this letter, I am,

Yours gratefully,
Set Wreckor Standing By,
H. J. Keilholtz,
First Captain in charge.
73 and no QRM.
1605 Jackson Street,
Baltimore, Md.

WAKE UP! FELLOWS!

$20.00 Prize Monthly for Best Set

● **THE editors are looking for "new" receiving circuits—from 1 to 5 tubes preferably. A $20.00 monthly prize will be awarded to the best short-wave receiver submitted. The closing date for each contest is 75 days preceding date of issue (Jan. 15 for the April issue, etc.). In the event of a tie, an equal prize will be given to each contestant so tieing. Address all entries to: Editor, SHORT WAVE and TELEVISION, 99 Hudson St., New York City.**

Money for Your Ideas!!

● **THE editors are looking for good articles describing the detailed construction of improved SHORT-WAVE RECEIVERS suitable for either "Ham" or "Fan" reception, or both. Other short-wave apparatus is also of interest. If you have a new and novel circuit, be sure to send a description and sketch of it to the Editor, and we shall be glad to give you a prompt opinion as to whether or not we would be interested in an article on the subject. All articles accepted and published will be paid for at regular rates.**

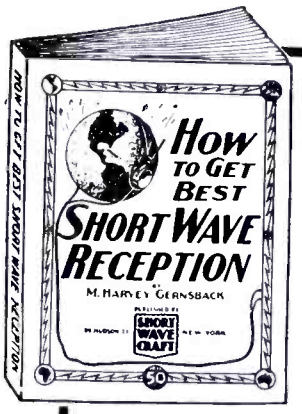
If you submit an article, finished diagram drawings are not necessary, but the photo should be clear and as large as possible.

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.)

Here are the Six BEST SHORT-WAVE RADIO BOOKS!

Without doubt you will have to go a long way to buy better books on short waves than you find on this page. Each book is written by a well-known authority on short waves . . . each book has been carefully illustrated with photographs and diagrams to make the study of this field of radio much simpler. The volumes on this page are **the finest books on short-waves which are published anywhere today.** Order one or more copies today . . . find out for yourself how fine they are. Prices are postpaid.



How to Get Best Short-Wave Reception

By M. HARVEY GERNSBACK

This book tells you everything you ever wanted to know about short-wave reception.

The author, a professional radio listener and radio fan for many years, gives you his long experience in radio reception and all that goes with it.

Why is one radio listener enabled to pull in stations from all over the globe, even small 100 watters, 10,000 miles away, and why is it that the next fellow, with a much better and more expensive equipment, can only pull in the powerful stations that any child can get without much ado?

The reason is intimate knowledge of short waves and how they behave. Here are the chapters of this new book:

1. What are Short Waves and what can the listener hear on a short-wave receiver or converter?
2. How to tune and when to listen in on the short waves.
3. How to identify short-wave stations.
4. Seasonal changes in short-wave reception.
5. Types of receivers for short-wave reception.
6. Aerial systems for short-wave receivers.
7. Verifications from short-wave stations.

The book makes excellent reading matter. There are many tricks in short-wave reception that even some of the "old-timers" do not know. Be sure to get it.

40 Illustrations, 72 Pages. Stiff, flexible covers **50c**

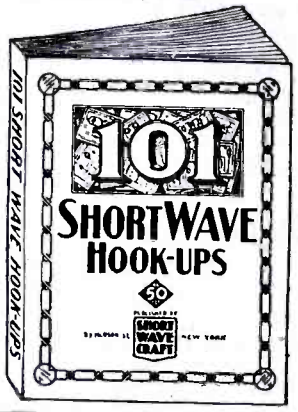
101 SHORT-WAVE HOOKUPS

Compiled by the Editors of SHORT WAVE & TELEVISION

EACH and every hook-up and diagram illustrated is also accompanied by a thorough explanation of what this particular hook-up accomplishes, what parts are required, coil-winding information, values of resistors, etc., in fact, everything you want to know in order to build the set or to look up the data required.

To be sure, all of the important sets which have appeared in print during the past five years are in this valuable book. Sets such as the Doerle, Dinsmore, the "19" Twinplex, Oscillodyne, Denton "Stand-by," Megadyne Triplex 2, "Globe-Trotter," 2-Tube Superhet, Minidyne, "Loop" Receiver, "Doerle" 2-tube Battery, "Doerle" 3-tube Battery, "Doerle" 2-tube A.C., "Doerle" 3-tube A.C. Doerle "Signal Gripper," Duo R.F. 4-tube Receiver, The Sargent 9-33 Tapped Coil Receiver, Globe-Girdler 7, The 2-Tube "Champ"—2 Tubes Equal 3, Ham-Band "2-Tube Pee-Wee" Wyeth All-Way 6, Denton Economy 3, 2-Tube "Regenerative-Oscillodyne" will be found here, with full descriptions. In many cases, we have also included a picture hook-up for those who do not wish to follow the regular symbolic hook-up, but wish to have a regular wiring diagram.

This is a very handy volume, especially for those "fans" who wish to study the best sets in the short-wave art, from one tube up to ten tubes.



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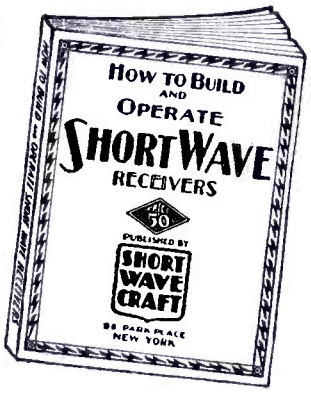
HOW TO BUILD AND OPERATE SHORT-WAVE RECEIVERS

THIS is the best and most up-to-date book on the subject. It is edited and prepared by the editors of SHORT WAVE & TELEVISION, and contains a wealth of material on the building and operation, not only of typical short-wave receivers, but short-wave converters as well. Dozens of short-wave sets are found in this book, which contains hundreds of illustrations; actual photographs of sets built, hookups and diagrams galore.

This book is sold only at a ridiculously low price because it is our aim to put this valuable work into the hands of every short-wave enthusiast.

We know that if you are at all interested in short waves you will not wish to do without this book. It is a most important and timely radio publication.



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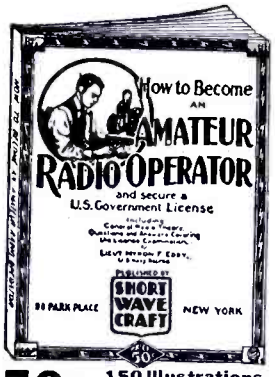

WE chose Lieut. Myron F. Eddy to write this book because his experience in the amateur field has made him pre-eminent in this line. For many years he was instructor of radio telegraphy at the R.C.A. Institute. He is a member of the I.R.E. (Institute of Radio Engineers), also the Veteran Wireless Operators' Association.

If you intend to become a licensed code operator, if you wish to take up phone work eventually—this is the book you must get.

Partial List of Contents

Ways of learning the code. A system of sending and receiving with necessary drill words is supplied so that you may work with approved methods. Concise authoritative definitions of radio terms, units and laws, brief descriptions of commonly used pieces of radio equipment. This chapter gives the working terminology of the radio operator. Graphic symbols are used to indicate the various parts of radio circuits. General radio theory particularly as it applies to the beginner. The electron theory is briefly given, then waves—their creation, propagation and reception. Fundamental laws of electric circuits, particularly those used in radio are explained next and typical basic circuits are analysed. Descriptions of modern receivers that are being used with success by amateurs. You are told how to build and operate these sets. Amateur transmitters. Diagrams with specifications are furnished so construction is made easy. Power equipment that may be used with transmitters and receivers, rectifiers, filters, batteries, etc. Regulations that apply to amateur operators. Appendix which contains the International "Q" signals, conversion tables for reference purposes, etc.

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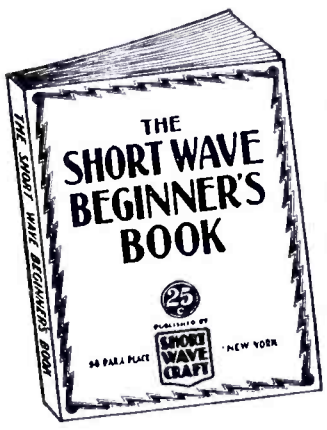
THE SHORT-WAVE BEGINNER'S BOOK



HERE is a book that solves your short wave problems—leading you in easy stages from the simplest fundamentals to the present stage of the art as it is known today. It is the only low-priced reference book on short waves for the beginner.

The book is profusely illustrated—it is not "technical." It has no mathematics and no technical jargon.

It also gives you a tremendous amount of important information, such as time conversion tables, all about aerials, noise elimination, all about radio tubes, data on coil winding and other subjects.

Partial List of Contents

Getting Started in Short Waves—the fundamentals of electricity. Symbols, the Short Hand of Radio—how to read schematic diagrams. Short Wave Coils—various types and kinds in making them.

Short Wave Aerials—the points that determine a good aerial from an inefficient one.

The Transposed Lead-in for reducing Static.

The Beginner's Short-Wave Receiver—a simple one tube set that anyone can build.

How to Tune the Short-Wave Set—telling the important points to get good results.

Audio Amplifiers for S-W Receivers.

Learning the Code—for greater enjoyment with the S-W set.

Wave length to Kilocycle Chart.

Wire Chart—to assist in the construction of coils.

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TEN MOST POPULAR SHORT-WAVE RECEIVERS

—HOW TO MAKE AND WORK THEM

THE editors of SHORT WAVE & TELEVISION have selected ten outstanding short-wave receivers and these are described in the new volume. Each receiver is fully illustrated with a complete layout, pictorial representation, photographs of the set complete, hookup and all worth-while specifications. Everything from the simplest one-tube set to a 5-tube T. R. F. receiver is presented. Complete lists of parts are given to make each set complete. You are shown how to operate the receiver to its maximum efficiency.

CONTENTS

The Doerle 2-Tube Receiver That Reaches the 12,500 Mile Mark, by Walter C. Doerle.

2-R.F. Pentode S-W Receiver having two stages of Tuned Radio Frequency, by Clifford E. Denton and H. W. Secor.

My de Luxe S-W Receiver, by Edward G. Ingram.

The Binneweg 2-Tube 12,000 Mile DX Receiver, by A. Binneweg, Jr.

Build a Short-Wave Receiver in your "Brief-Case," by Hugo Gernsback and Clifford E. Denton.

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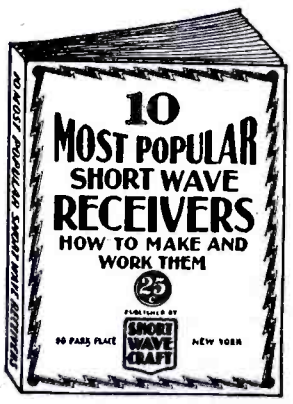
The S-W PENTODE-4, by H. G. Cisin, M. E.

Louis Martin's Idea of A GOOD S-W RECEIVER, by Louis Martin.



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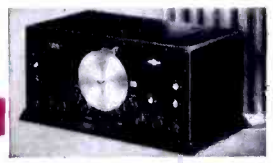

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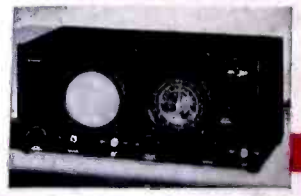

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