TELEVISION IN NEW YORK

RADIO NEWS AND SHORT WAVE RADIO

February

SHORT WAVE TIME TABLE

Special Features in this Issue:

- "Hi-Fi" Receiver
- Television Course
- New Set Tester
- Antenna ABC's
- "Ham" X'mitter
- Service Sales

And Other Interesting Articles

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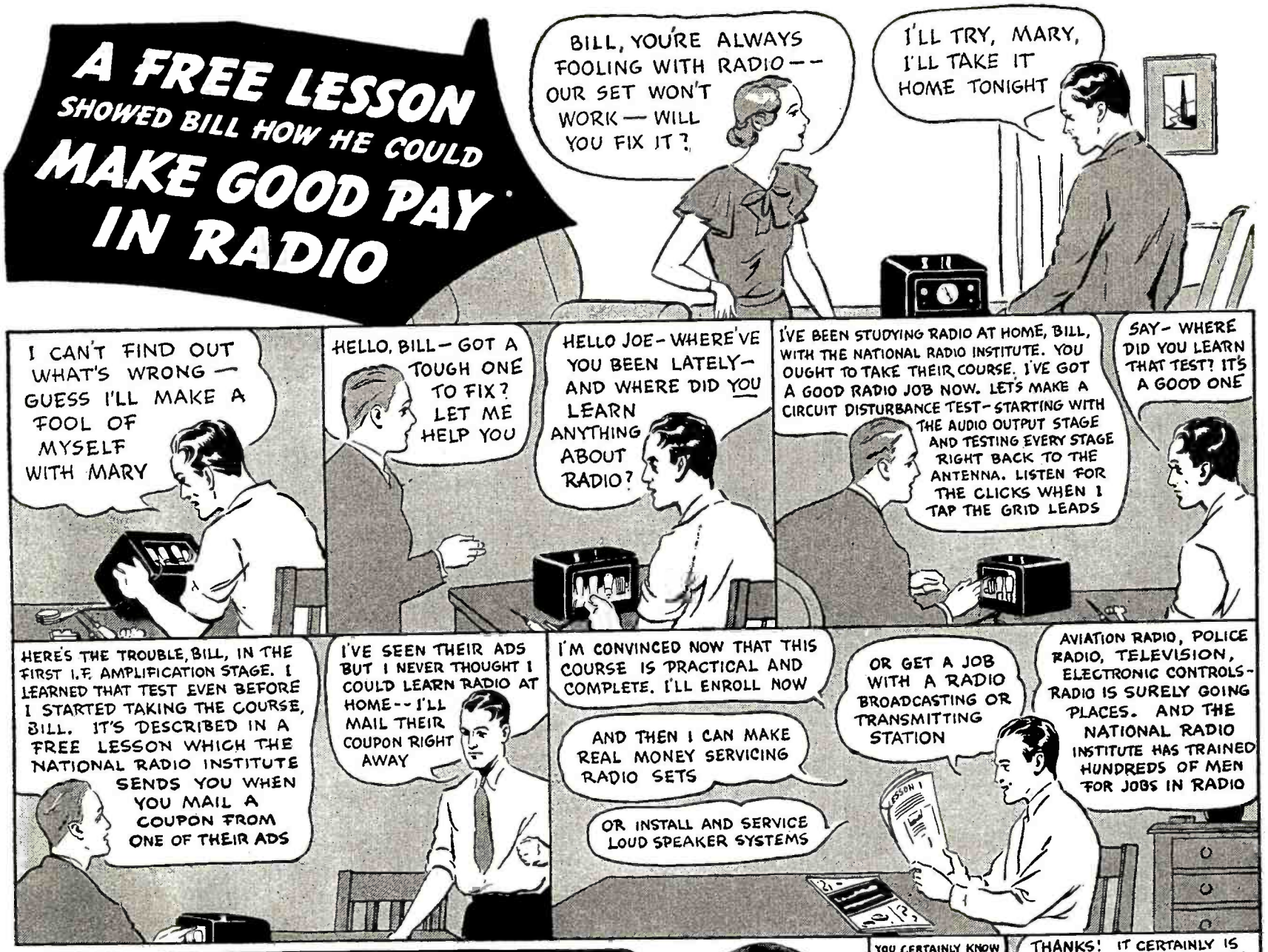


I will send you a Lesson on Radio Servicing Tips FREE

TO SHOW HOW PRACTICAL IT IS TO TRAIN AT HOME FOR GOOD JOBS IN RADIO

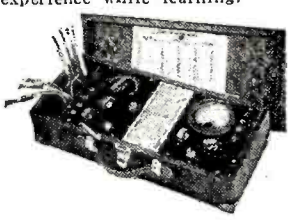
Do you want to make more money? I'm sure I can train you at home in your spare time for a good Radio Job. I'll send you a sample lesson FREE. Examine it, read it, see for yourself how easy it is to understand even if you've never had technical experience or training.

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

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

Many Make $5, $10, $15 a Week Extra in Spare Time While Learning

Almost every neighborhood needs a good spare time serviceman. The day you enroll I start sending you Extra Money Job Sheets. They show you how to do Radio repair jobs, how to cash in quickly. Throughout your training I send you plans and ideas that have made good spare time money—from $200 to $500 a year—for hundreds of fellows. I send you special Radio equipment, show you how to conduct experiments, build circuits illustrating important Radio principles. My training gives you practical Radio experience while learning.



I Give You a Professional Servicing Instrument

Here is the instrument every Radio expert needs and wants—an All-Wave, All-Purpose, Set Servicing Instrument. It contains everything necessary to measure A.C. and D.C. voltages and current; test tubes, resistance; adjust and align any set, old or new. It satisfies your needs for professional servicing after you graduate—can help you make extra money servicing sets while training.

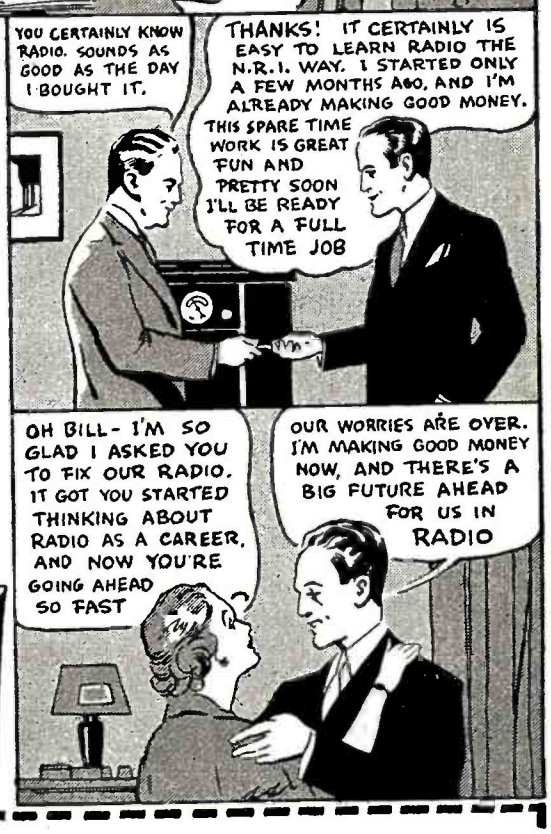
Get My Lesson and 64-Page Book FREE—Mail Coupon

In addition to my Sample Lesson, I will send you my 64-page Book, "Rich Rewards in Radio." Both are free to any fellow over 16 years old. My book points out Radio's spare time and full time opportunities and those coming in Television; tells about my Training in Radio and Television; shows my Money Back Agreement; shows you letters from men I trained, telling what they are doing, earning. Find out what Radio offers YOU! MAIL THE COUPON in an envelope, or paste it on a penny postcard—NOW!

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

J. E. SMITH
President
National Radio Institute
Established 1914

The man who has directed the home study training of more men for the Radio Industry than any other man in America.



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

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

Name ..... *Age* .....

Address .....

City ..... *State* 14X-1

RADIO NEWS

Vol. XIX, February, 1938, No. 8

Edited by LAURENCE MARSHAM COCKADAY

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JOHN H. POTTS
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Next Month

GERARD J. KELLEY presents to home constructors the latest development of his laboratory—a 3-tube tuner which by the flip of a switch brings in any one of six broadcast stations with superb quality of reproduction. Self-powered from the a.c. line, it is intended primarily for use ahead of an existing amplifier, which may be the audio system of another receiver. It may be located up to 30 feet distant from the amplifier, making it ideal for built-in installations, P. A. work, or arm-chair tuning. Its cost is low and its construction well within the ability of the average radio enthusiast.

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"EVEN AS YOU AND I"

A widely-known manufacturer of radio equipment, apparently enjoying a "busman's holiday," submits the following record of one evening's indulgence, which he labels "The Log of a Methodical Radio Fan" or "Why Some People Go to the Movies":

THE fan is seated before his radio with a hopeful expression on his face. Starts in at the upper end of the dial.

550 KC: Bad luck the first trial. Seem to be about a dozen stations on this wave length so tries:

560 KC: Chatter about a gelatine.

570 KC: Here's couple of rough necks engaging in a verbal dog-fight. Next tries:

580 KC: Particularly vile brand of jazz with a background of heterodyne howl.

Getting Started

590 KC: Three politicians talking about Supreme Court, tenant farmers and other so-called downtrodden units of our population.

600 KC: This wavelength sounds promising, listens a moment but is disgusted to hear a fiddler playing a Russian Barcarole that would sink the boat.

610 KC: Fine assortment of heterodyne squeals.

620 KC: Ditto.

630 KC: Ditto.

640 KC: Ditto.

650 KC: A female monologue about Dishwashing.

660 KC: Another female monologue—this time about her husband's many faults.

670 KC: Ditto.

680 KC: Ditto.

690 KC: Canadian Station. A country boy is speaking about hogs way down on the farm.

700 KC: Husband and wife in a daily misunderstanding.

Not So Good!

710 KC: Fairly good orchestra badly mixed with station in the background effectively spoiling an otherwise good program.

720 KC: A blues singer and rotten at that.

730 KC: A fine assortment of heterodyne squeals, etc.

740 KC: Same scrap between husband and wife as on 700 KC.

Time: 7:30 p.m.
Date: Any night.

750 KC: A jazz singer, male, and awful.

760 KC: Howls, Howls, Howls.

770 KC: Ditto.

780 KC: Ditto.

790 KC: Chatter about a gelatine same as on 560 KC.

800 KC: Ditto.

810 KC: A female announcer giving results of a coffee contest.

820 KC: A "Way down in the cellar" bass heterodyne.

Still Expectant

830 KC: Same as 810.

840 KC: Just a racket.

850 KC: A worse racket.

860 KC: Some more racket.

870 KC: Still more racket.

880 KC: A blues singer, with a background of French Folk Songs from another station or maybe it was Spanish.

890 KC: A Spanish foreign station heterodynes with a couple of American Stations.

900 KC: Only four stations on this frequency.

910 KC: Jazz ♯$%&(*?♯%&

920 KC: A soprano solo heterodynes with a blues singer background.

930 KC: A female crooner.

950 KC: Just a howl.

960 KC: A political speaker with a particularly hoarse and distressing voice.

970 KC: A male voice singing a Spanish Jazz Song to the accompaniment of a guitar the tune of which was a continuous repetition of a musical theme, repeated over and over.

Hope Grows Faint

980 KC: At last a good orchestra but ruined by bad fading.

990 KC: A howl.

1000 KC: A worse howl.

1010 KC: A still worse howl.

1020 KC: A heterodyne howl and a so-called popular dance number.

1030 KC: Dance orchestra being embellished by a sax player that would give a listener a bad case of heebie-jeebies.

1040 KC: Only three stations here.

1050 KC: Just a noise.

1060 KC: A couple of Caucasian boys trying to talk like colored boys.

1070 KC: Local Station. A couple of Caucasian boys this time chattering about their recent doings among the boy-scouts.

1080 KC: Same

1090 KC: Howl. Howl. Howl.

Discouraged

1100 KC: We are down among the real squeals now.

1110 KC: A fine assortment of heterodyne squeals.

1120 KC: Another squeal.

1130 KC: Nothing.

1140 KC: A fine soprano ruined by heterodyne.

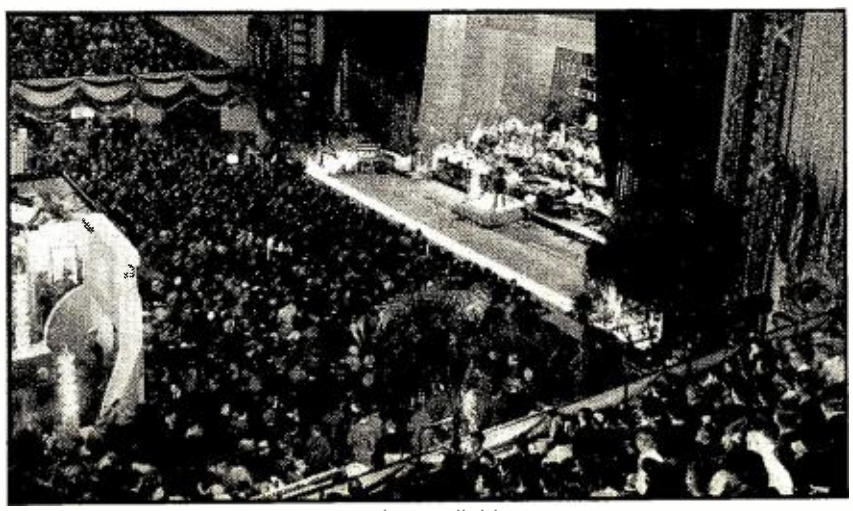
1150 KC: A fair orchestra spoiled by two competing stations in the background.

1160 KC: Ditto.

(*Turn to page* 512)

BROADCASTING DRAWS LARGER CROWDS YEARLY

In spite of many controversial letters to the Editor for and against our scheme of broadcasting, studio facilities have had to be enlarged enormously and radio sets for listening are being sold in increasing quantities. Some people say that American broadcasting is spoiled by advertising and heterodyne squeals, but most commend it highly.



Pages From A Serviceman's DIARY

THE PADDED COVER FOR PROTECTING RECEIVERS

Very handy accessary for the serviceman is a quilt tailored so that it can slip over a radio console for protecting it against scratches during delivery. Our serviceman tells the story of how it went for a ride in "Cleopatra".

MONDAY — Three calls already on the hook, so I plodded out to the garage to get out the old gas chariot. Gee, but it was cold! Tried to kick away a stone in front of the garage door but it didn't budge. Not so good for my toe, and I walked around a little until it stopped hurting. Pried the stone from the frozen ground and swung the door open. The garage is only a small portable steel affair with no heat, of course, so it seems even colder inside than out.

Pushed hopefully on the starter button and heard the engine go "Unh-Unh-Unh-clunk." Sounds bad! Tried again. "Unh-clunk." Hopeless! No use running the battery down any further. The old truck had been starting pretty well with the thin SAE-20 oil, but now that it's really cold, the same old trouble comes back. It seems the auto industry has as much difficulty with cold-weather starting as our radio gang once had with static.

Sputter! Pop! Bang!

Ran back to the shop and got Jerry. Together we pushed the truck out into the street. He got behind and shoved while I threw her into high gear as soon as it got rolling good. It caught hold with a sputter and a bang. Hurrah, we're off!

Took the farthest call first so I could get the engine warmed up and give the battery a little encouragement. Pulled up before the home of the richest people in town (though you'd never think it from the appearance of the home). It is a frame house, of simple, Colonial type, well kept but not at all spectacular. Owned by a woman doctor who can, and does, cuss more artistically than any army sergeant I ever heard. I'd like to report some examples, since most servicemen could use them to advantage, but some mama's boy might be shocked so we'll have to pass it up. The six servants—male or female, she calls them by their last names—hop to it pronto when she speaks up. She demands and gets full value in everything she buys. Though she has contributed a fortune to a foundation for social welfare, she economizes in ways you and I perhaps would not consider.

She breezed into the room and let loose before I could get out a polite "Good Morning."

"I want to move this radio into town," she said, precisely. "There is nothing wrong but I want to be certain I won't have any trouble with it during the few months it is away from here."

I checked the voltages, tubes and filter-condensers on this Stromberg-Carlson 78. Found two tubes down a little so replaced them and reported to her.

"Now," she said, "I understand you have a padded cover for the radio. I want to borrow it." She turned to her chauffeur. "Stubbs," she ordered, "Get out Cleopatra. The radio is going to town."

Padded Cell Next?

Stubbs went one way and I the other. We have a padded quilt, tailored to slip over the top of consoles for delivering sets. It gives complete protection against scratches. When not on a set, it comes in handy in keeping a chassis just pulled for repair from hitting against midgets when you shoot around a corner.

I wondered who Cleopatra was. Sounded like a glorified edition of the Powerful Katinka, or maybe a horse. But any time any human being could carry that set 30 blocks, let alone 30 miles, I wanted to stick around and watch. But it was none of my business so I didn't like to ask her.

I covered the set, then went outside and found Stubbs seated in a Rolls-Royce town car.

Cleopatra An Amazon?

"Where the deuce is Cleopatra?" I asked him. "Show me the dame who can carry this set a block and I'll quit the business and take up tiddledy-winks."

"I'm sitting in Cleopatra now," he answered. "The doctor and her sister have each got town cars which are exactly alike. Now that her sister is staying with us, they had to name the cars so I wouldn't get balled up."

"What do they call the other one —Anthony?" I asked.

"Yes," he answered, sort of surprised. "How did you guess?"

"Easy," I told him. "I had a friend in Sweden named Anthony who married a woman named Cleopatra. Maybe the doctor knew them, too."

"You don't look Swedish," he said, a little doubtfully. "And the doctor ain't never been in Sweden."

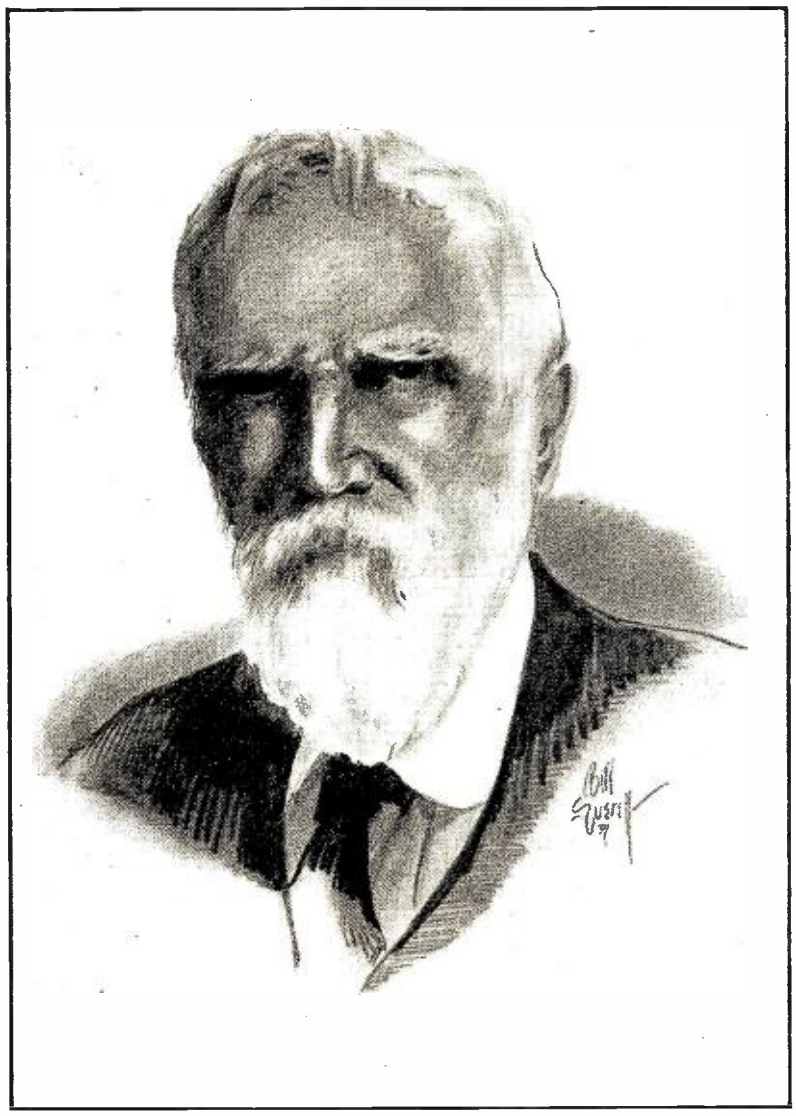
Swedish and Scotch!

"Neither have I," I told him. "And I haven't any Swedish blood in me either, but I'm going to have some Scotch in me before the day's over if it doesn't get a little warmer." (I'll bet he's still trying to trace that circuit).

I'd like to see the traffic cops on Fifth Avenue when Cleopatra rolls by with the Stromberg in the tonneau. But—back to work.

(*Turn to page* 497)

THESE records from an anonymous serviceman's diary should be of decided interest to veteran servicemen, as well as to those whose experience in the service field is more limited. Written by a man who "knows his stuff," and shot with an occasional outcropping of humor, these items provide many hints not found in text books. More of these pages will appear from time to time.



A LIBERAL EDUCATION IN RADIO

"I am rather reluctant to tell the world what progress in communications I have seen in my long life. Few realize that it is only a little over 100 years ago that we began to cover our country with a maze of railroad tracks. Then the telegraphs began to spread their networks—followed by the telephone with the human voice substituted for dots and dashes. And now we are living in the age of the greatest miracle of all—radio. People may well ask, "How can radio's message travel around the world in less time than the speaker's voice will cross the room? How can it deliberately take a circular course unguided by any conductor?" How fortunate it is that the country has an army of amateurs, experimenters and engineers who have done public service over and over again. It is for these operators and inventors that the staff of RADIO NEWS *is working—and these are eager students in the every day business of radio development. Their text book is* RADIO NEWS. *Things they experiment with and find out about the short waves and television become tomorrow's radio miracles. R. N., as they call it affectionately, is their Teacher."*

T. O'Conor Sloane

Educator, author, many books on electrical engineering and scientific subjects.

Radio News

Volume XIX February, 1938 Number 8

Firing the "Opening Guns" of

TELEVISION

In The New York Area

THE year 1938 will go down in history as the date-line of the start of television in America. Regular sight-and-sound programs, once on the air, will be followed by a demand for television receivers that will be country wide in scope. Movies at home, complete shows, sporting events—wouldn't anyone like to "see" them as well as "hear"? The answer is definitely "Yes."

By **L. M. Cockaday**

A DEFINITE "go ahead signal" has been sounded throughout the television industry, here in America. No more stalling and waiting for the new art of sight-and-sound to blossom forth "full blown" but an immediate "get going" policy seems to be the order of the day. New allocations of frequencies in the ultra-high-frequency spectrum have been made by the F.C.C.; and television organizations, large and small, are conducting researches both in all technical phases and in program technique with a single idea in mind—to put on regular television programs as soon as this can be successfully accomplished! This is distinctly in line with RADIO NEWS' policy on television—get our thousands of Short-Wave experimenters interested in building television sets and actually receiving pictures! A wealth of technical information and data on field coverage will be at once available to the television broadcasters. The interest these experimenters will create will be tremendous. But,—television programs must be regularly on the air!

N.B.C. Activities

The National Broadcasting Company, with its powerful transmitter already installed in the Empire State Building, is now working with various civic groups interested in visual programs, working out ideas of programs for demonstrating the added zest, power, and interest there will be in television for the American looker and listener-in. Already it has been demonstrated by that organization how television can successfully broadcast shows of real interest right into the home. They have broadcast, to mention just one variety, complete fashion shows showing new wearing apparel and styles in millinery and shoes. Think what this will mean to the lady of the household and to the clothing business when such broadcasts are regularly received in every household.

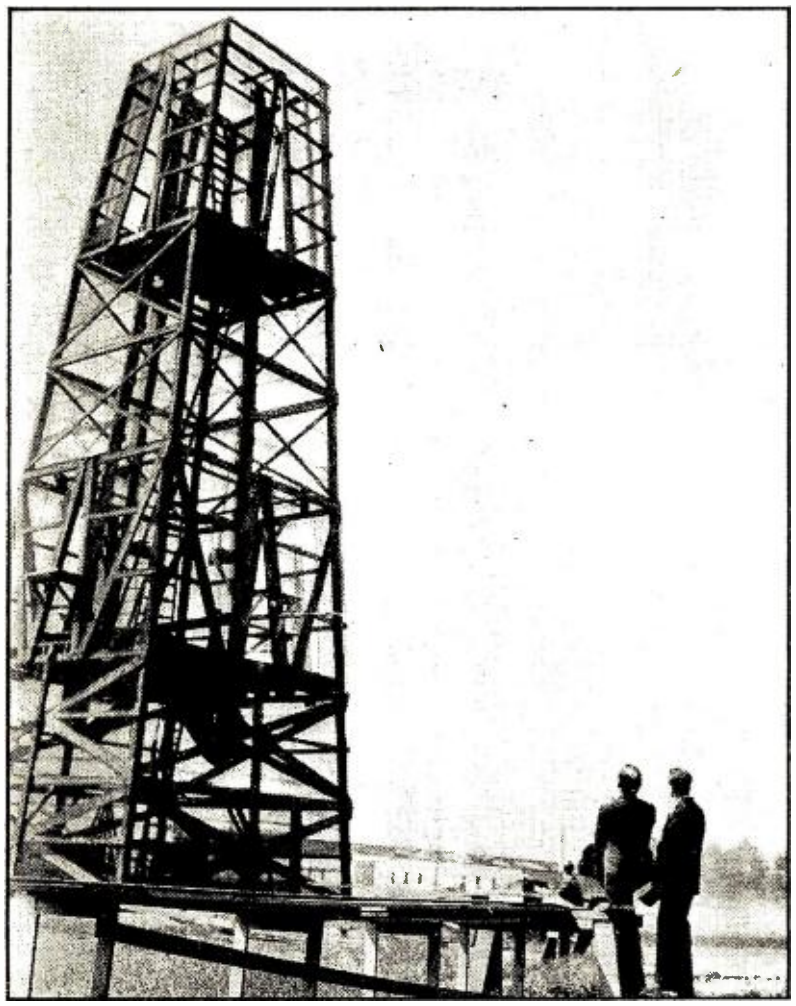
It is our personal knowledge that Lenox R. Lohr, President of N.B.C., and his staff of experts are pressing an active campaign to demonstrate television in the various fields where it is felt it could be successfully applied as a regular service. In the latter part of 1937, nine television broadcasts were made over a three-day period, especially to enlist the interest of amateur radio enthusiasts who were invited by Mr. Lohr to witness the transmissions and receptions. To state that their interest was aroused would be classed as "painting the lily." Observers on the amateur bands, during the week following these demonstrations, noted that amateurs in the eastern part of the United States *talked about nothing else but television* and how they could be the first to build the necessary receivers and engage in the first public home receptions.

PROGRAM MONITORING AT THE EMPIRE STATE

Here's how a television monitoring control room looks in operation. Each operator has a complete receiver (see cathode ray tubes, upper left) which shows any irregularity in the transmitted picture that needs correction.

The Experimenter

With this new idea of getting amateurs and experimenters interested in this new field to the extent of building their own sets and entering into



OIL BOOM?

No, it's not an oil derrick, but what we believe will be the start of a television boom around New York! CBS had this "electrical" model of the Chrysler tower built to test television antennas for their new station.

actual television experimentation, RCA has reversed its early policy of not inviting cooperation in these tests and has actually placed on the market three new type television tubes, now made available especially for the experimental constructor of television sets.

It is also understood on good authority that N.B.C., under the guidance of the former president of Yale, Dr. J. R. Angell, is arranging a series of educational broadcasts in which television will be used in direct instruction of students at a New York University. This series, of course, is experimental and is in line with N.B.C's program of finding out how widely television can be used successfully. The same organization is also planning a series of programs with sight-and-sound to demonstrate the uses of television in both military and peace-time use to the forces of our government. A number of these broadcasts actually may be on the air as this issue of the magazine is being read.

C.B.S. Plans

Improvement in the television antennas of the Empire State transmitter have been completed so that it will have even wider coverage than before. The coaxial cable from New York to Philadelphia is now in working order and a broadcast between New York and that city has been demonstrated by a large American communications company.

Other organizations, too, are quickly getting in line for early regular television broadcasts. The C.B.S. powerful television station in the Chrysler Building, and its huge studios in the Grand Central Building, are nearing completion. Their initial broadcasts will start in a month or two, with regular programs to be initiated in June or possibly earlier.

A television news service was demonstrated in the early part of December, utilizing the Peck television system with transmissions from the Hotel Lincoln in New York City and with the receiving apparatus set up in Jack Dempsey's restaurant, well known to after-theatre diners in New York. The interest aroused in the news service was such that plans are being considered for a number of installations elsewhere.

Don Lee System on the West Coast

Out on the West Coast, the broadcasting of television programs during 1937 by the Don Lee Broadcasting System in Los Angeles is already well known to RADIO NEWS readers. Louis A. Weiss, general manager of the system, made known the fact that in 1938 his organization would transmit regular Mutual System sight-and-sound shows over the television station W6XAO, simultaneously with their transmission over the regular broadcast network. The television equipment and apparatus of this station takes on a new form in which the television camera and the camera control unit are completely mobile so that they can be used in any of the company's studios or to pick up outdoor scenes as desired. This station is now daily on the air with broadcast programs as well as special programs on Saturday, Sunday and holidays. A considerable number of lookers-in have already constructed cathode-ray television receivers for picking up the Don Lee programs according to designs of the Don Lee engineers. These experimenters are located in a radius approximately 20 to 25 miles from the station in Los Angeles. The design for this type of receiver was published in an exclusive article in RADIO NEWS of May, 1937. The receivers are giving good service daily. One of the most advanced of these experimenters is Roger Howell of Long Beach, who is getting such fine reception results that he has demonstrated his images to the city manager, the press and other of his city's officials. Other experimenters can do the same. Now that regular programs are starting, RADIO NEWS is publishing a complete series of television lessons, the third lesson of which appears this month. Experimenters, set builders, and servicemen are urged to study these to become familiar with the technique so they will be ready to successfully engage in the great activities which are bound to follow this development.

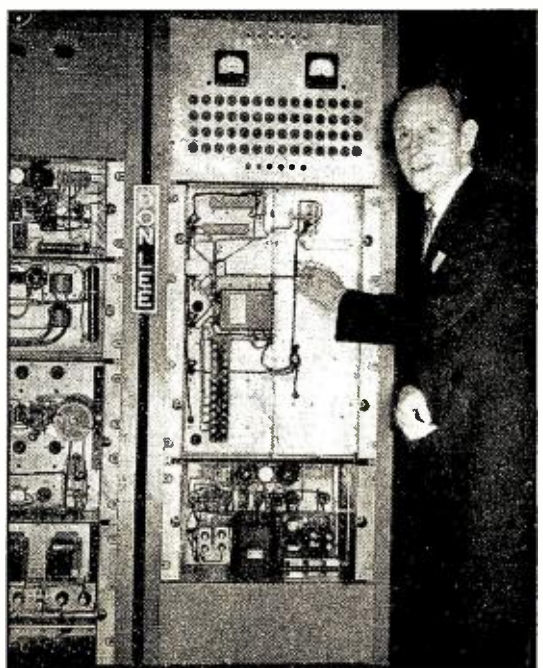
Television's New Start

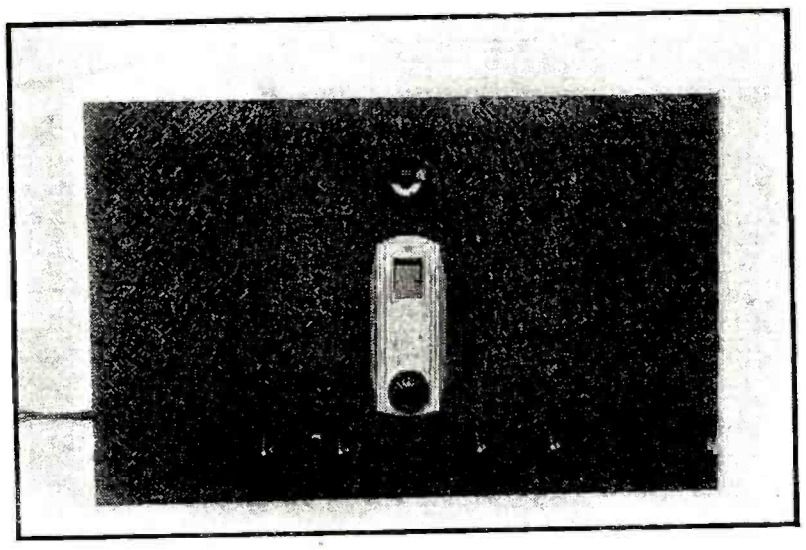
This new "start" in television, now that the technical advances of the actual picture transmission and reception have been worked out so satisfactorily, will have the effect of opening up the field to individual experimentation and should go a long way in ironing out some of the remaining technical difficulties. There are, however, other problems still confronting a satisfactory nation-wide commercial television service. Among these are 1. Availability of television receivers; 2. The problem of national distribution of programs; 3. The economic situation; 4. The considerable problems of specialized

(*Turn to page* 507))

IN THE WEST

Harry R. Lubcke, Director of Television of the Don Lee Broadcasting System, poses with the new transmitter which is now on the air regularly with television broadcasts.





A SET FOR EXACTING LISTENERS

Professional in appearance, this severely simple panel layout is stripped of gaudy trimmings and places all necessary controls in their logical position. It is of the proper size for rack-and-panel mounting.

The Radio News Hi-Fi "9"

By Raymond P. Adams

THIS story will describe the design and construction of what we feel to be an ideal instrument for the reception of high-fidelity local broadcasts—a set built for the person who is primarily concerned in the pick-up and wide-range reproduction of programs transmitted by stations operating in his metropolitan area; and for the broadcast engineer, the spot-recording technician, the man who is unable to invest in a modern all-wave, variable-selectivity superheterodyne, and the person who requires an extra set which will afford the wide-band reception which more sensitive, sharply-tuned receivers cannot supply.

Tuned R.F. Circuit

Our receiver is a tuned r.f. band-pass job, which employs nine tubes, as shown in Figure 1, below.

It features r.f. coupling adjustable to a practical extent to maintaining a substantially flat top under all conditions. A novel detector circuit is followed by an audio system of unusually high quality.

The conventional antenna stage precedes a second r.f. stage whose tuned three-coil input circuit provides the band-passing desired.

Band-pass Coils

T2 is a standard r.f. transformer. T3 an T4 are special band-pass coils. These three coils are unshielded and are inductively and otherwise coupled, T3 being placed between T2 and T4 (Fig. 4). Three-point control of band width is afforded by means of a switching arrangement (Figure 2). With the band-width control switch, SW1, in position 1, R20 is connected across the first tuned circuit to broaden its response. Coupling between T2, T3 and T4 is at maximum, aided by R21 and C17 in parallel, and optimum acceptance results, with good adjacent channel selectivity.

In position 2, R20 is cut out, the three second-stage inductances remain in maximum inductive relationship, and C17 and R21 are shorted to ground. Here band width narrows to approximately 15 kc. with an increase in selectivity. For normal high-fidelity reception we have an ideal band-pass condition.

Push-pull Detector

With SW1 in position 3, R20 remains out of circuit, T3 is shorted, T2 and T4 are returned directly to ground, and coupling in second-stage components is simply between T2 and T4. Maximum selectivity is obtained—but modulation acceptance

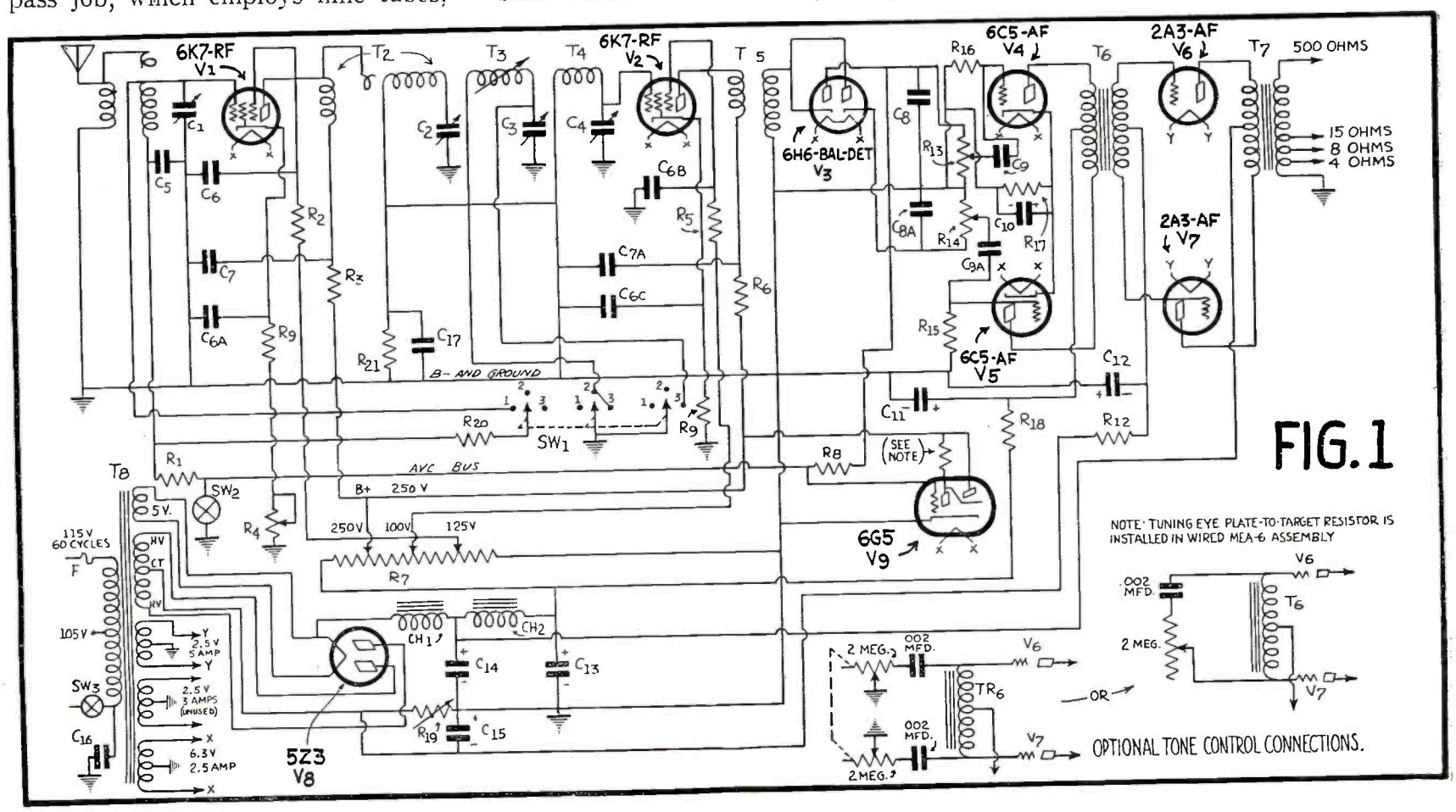
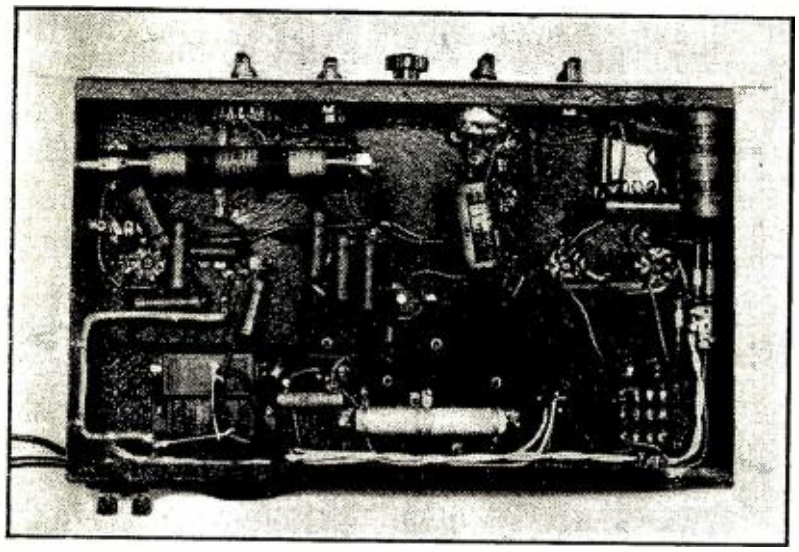


FIG. 1



UNDERNEATH THE CHASSIS

The generous size makes assembly and wiring easy and gives proper circuit isolation. The band-pass r.f. transformers are shown at the upper left.

still remains sufficient for good reception of most programs.

T5 is an untuned transformer coupling the second r.f. tube to the diode detector.

The 6H6 detector is connected as a voltage doubler, as shown in Fig. 3, to permit true push-pull feed to the 6C5's. By this improved method the tube delivers full output to each push-pull first audio grid—and not halved voltage, as would be normally the case where a single tube drives two tubes in push-pull.

The dual-section volume control is placed in the effective diode load, the d.c. load resistance thereby remaining high with respect to the a.c. load resistance, minimizing distortion at high modulation percentages.

High-Quality Audio

R4 is the sensitivity control. It also carries the a.v.c. switch, and when the control arm is to extreme left, V1 bias is at minimum, V1 gain at maximum, and a.v.c. is in operation. Throwing the knob slightly to the right closes the switch, shorting the a.v.c. bus to ground. Further adjustments to the right decrease V1 gain by increasing the bias on this tube.

The push-pull 6C5 first audio stage drives a pair of 2A3's in Class AB to 12-watt distortionless output. Driver and output transformers have been very carefully selected and permit truly wide-range amplification.

The coils should be acquired as a matched kit. The four-gang condenser is made available by the manufacturer of the inductances — and might well be secured at the time of the purchase of the complete kit.

Drill the panel and chassis to layout specifications, shown in Figures 5 and 6. The layout is of course applicable only to the parts specified.

Secure a chassis with a bottom plate, as the band-pass coil system, below chassis, must not pick up signals directly.

Mount the sockets, turning each for short leads to associated components, then the power unit, filter, chokes, driver and output transformers, voltage divider and odds and ends. More detailed layout instructions should not be necessary; the photographs are amply illustrative.

Wiring the Set

Mount T2 against the side wall as shown in the under-chassis photo. Unsolder the terminal connection of one band-pass coil, then cut away the wider extension of the coil form until the winding is spaced equidistant from each end. This forms T3. Place T4 so that, in line with T2, it will be just far enough away from the latter to permit T3 to slip in between them. Bring the T3 leads out to the selectivity switch, then securely tape the three coils together where they meet.

Connect a flexible lead the grid terminal of T1, bring this lead up through the shield can and out on top, shielding that portion running from can to condenser stator.

Return all audio grounding leads to one chassis point; and similarly, single-point the grounding for each r.f. and the detector stage. Bring by-pass condenser-grounding resistor and variable condenser rotor returns directly to associated points. Gangs 1, 2, 3 and 4 of the variable condenser, for instance, to the ground point common to T2, 3 and 4 coupling capacity chassis connection.

Care in Aligning

Keep leads short and direct. Shield the two leads from T1 to SW1 and the antenna lead from T1 to the antenna binding post.

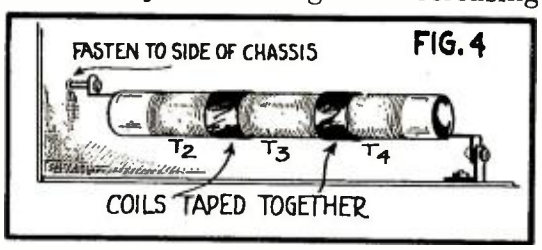
With the set operating, adjust screen taps along the divider until screen voltages, read at the sockets, are approximately 100, then adjust the 1000-ohm Truvolt until the grid bias is minus 62 volts for 2A3's or minus 68 volts for 45's.

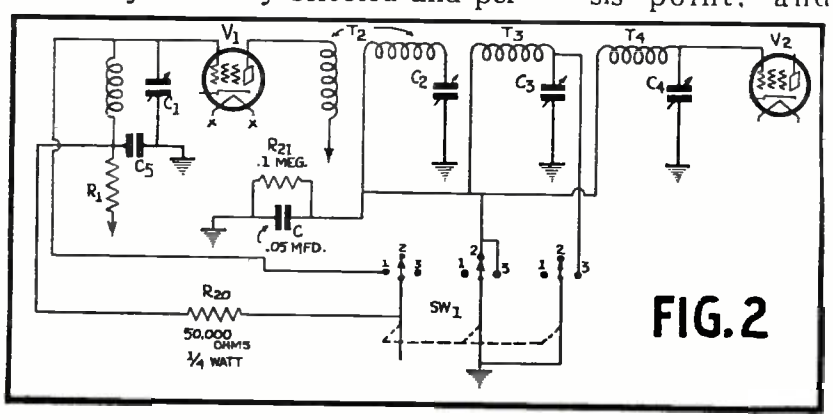
With SW1 at position 3, carefully align T1, T2 and T4 at the usual high, low and medium-frequency points. This is done, of course, by varying the variable condenser trimmers and by bending the outside rotor plates. Turn SW1 to position 2 and similarly align the T3 circuit. If all this has been carefully done, a wide, even band-pass will be indicated, showing a negligible double dip in the flat top at resonance. In position 1, a wider pass will be in evidence, similarly flat.

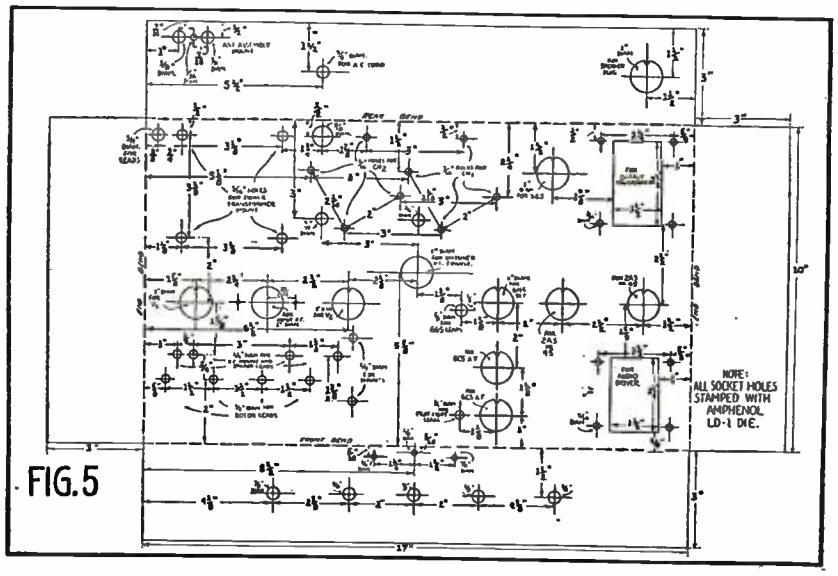
Checking Balance

Choose a 6H6 with similar diode sections, as determined by emission reading. Also, check the dual potentiometer at various settings to make certain the two sections are reasonably similar.

Lack of similarly in the diode sections cannot be corrected but, for all practical purposes, balance for both tube and dual control may be obtained by increasing or decreasing







the first a.f. grid resistors, equalization being indicated when there is no change in volume level with the capacity C10 either in or out of circuit.

Shields are provided for the r.f. tubes so that either glass or metal tubes may be employed. For the metal types, simple control-grid cap shields should suffice.

Use Good Speaker

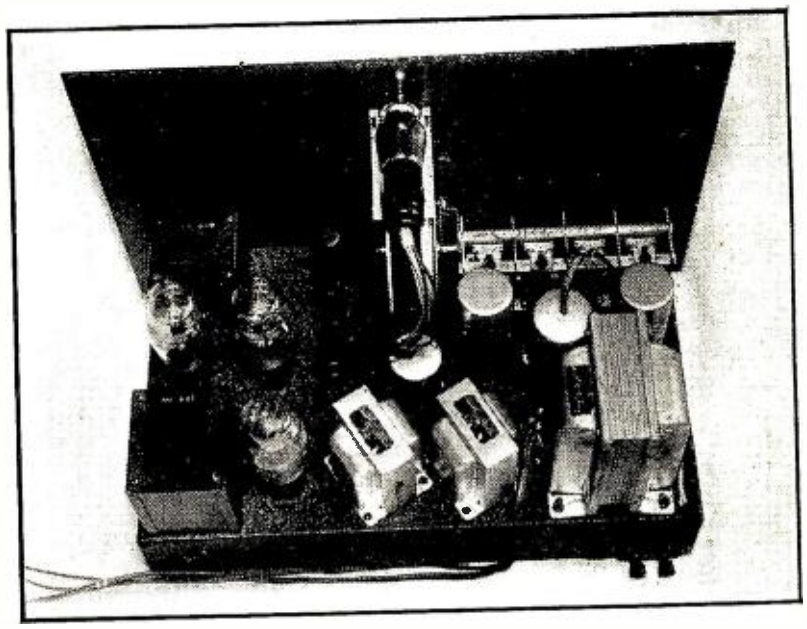
A high-fidelity speaker of high quality should of course be used. It should have its own field supply or be of the permanent-magnet, dynamic type, and able to handle at least 12 watts output.

May we say, in closing, that a high-fidelity receiver such as this one must be wide-range designed from end to end; and readers contemplating construction of a similar job should prepare to recreate it wholly and not simply in part.

If sharp noise peaks are heard—remember that these are extremely high in frequency and that their presence goes more or less to prove the wide acceptance and hi-fi nature.

Parts List

C1, C2, C3, C4—Miller four-gang variable condensers, type 2104, each section .000365 mfd. Note: Obtainable with T1, T2, T3, T4 and T5, as a matched kit.
C5—Aerovox tubular paper condenser, type 284, .05 mfd., 200 v.
C6, C6a, C6b, C6c—Aerovox tubular paper cendensers, type 284, .1 mfd., 200 v.
C7, C7a—Aerovox tubular paper condensers type 484, .1 mfd., 400 v.
C8, C8a—Aerovox mica condensers, type 1468, .0005 mfd.
C9, C9a—Aerovox tubular condensers, type 484, .05 mfd., 400 v.
C10—Aerovox electrolytic condenser, type PR25, 5 mfd., 25 v.
C11—Aerovox electrolytic condenser, type PB5, 4 mfd., 450 v.
C12, C13, C14—Aerovox electrolytic condensers, type PB5, 8 mfd., 450 vs.
C15—Aerovox electrolytic condenser, type PB100, 10 mfd., 100 v.
C16—Aerovox tubular paper condenser, type 684, .05 mfd., 600 v.
Ch1—Stancor filter choke, type RC-1400
Ch2—Stancor smoothing choke, type RC-1420
R1—Continental carbon resistor, type M-5, .1 meg., ½ watt
R2, R5—Continental carbon resistor, type M-5, 500 ohms, ½ watt
R4—Electrad potentiometer with switch, 30,000 ohms, taper left, high gain —left position
R3, R6—Continental carbon resistor, type M-5, 2000 ohms, ½ watt
R7 — Electrad wire-wound resistor, 30,000 ohms, 50 watts (Truvolt)
R8—Continental carbon resistor, type M-5, 2 meg., ½ watt
R9—Continental carbon resistor, type M-5, 1000 ohms, ½ watt
R10, R11, R21—Continental carbon resistors, type M-5, .1 meg., ½ watt
R12—Continental carbon resistor, 100,000 ohms, 1 watt
R13, R14—Electrad 874T or Yaxley N-N dual potentiometer, ½ meg. each section
R15, R16 — Continental carbon resistors, type M-5, 1 megohm, ½ watt
R17—Continental carbon resistor, 1300 ohms, 3 watts
R18—Continental carbon resistor, 10,000 ohms, 3 watts
R19 — Electrad Truvolt wire-wound resistor, 1000 ohms, 10 watts, one slider
R20—Continental carbon resistor, 50,000 ohms, ½ watt
SW1—Yaxley rotary switch, type 3263-J
SW2—Switch (on R4)
SW3—Toggle switch, S.P.S.T. (or switch on tone potentiometer)
T1—J. W. Miller shielded antenna coil, type 242A
T2—J. W. Miller unshielded r.f. coil, type 241
T3, T4—J W. Miller b.f. unshielded bandpass coils, type 241
T5—J. W. Miller shielded untuned coil, type 242
T6—Amertran Silcor a.f. transformer, type J-751, p.p triodes to p.p. Class AB 2A3's
T7—Amertran Silcor output transformer, type J-875, p.p 2A3's to 4, 8, 15 and 500 ohms
T8—Stancor power transformer, type RP-3002
Eby two-post antenna B.P. assembly, type A-G
Eby two-post speaker B.P. assembly.
4 Crowe knobs, type 284
1 National dial with No. 3 scale, type H
Chassis 17 by 10 by 3 inches, with bottom cover
Recommended panel for rack mounting —standard 12¼ x 19 inch
14 ⅜-inch rubber grommets; four-inch length of ¼-inch fenoline or similar rod, machine screws and nuts
3 lengths of tubing, each ¾ inch long with ¼-inch hole, for variable condenser stand-off
1 National Union 6G5, 6H6, 2 6K7's, 2 6C5's, 2 2A3's, 5Z3 tubes
2 ICA tube shields, type for 58's
2 Amphenol type tube shield bases for use with retainer ring mounted sockets (Ordinary shield bases will not do unless the hole is made wide enough to permit insertion of metal tube base.)



REAR VIEW SHOWING PARTS LAYOUT

Note the husky transformers and chokes, designed to give long, dependable service. Induction hum is avoided by wide spacing of parts and complete shielding.

Australian Radio Convention

Sydney, New South Wales—During the final celebration period of Australia's 150th anniversary there will be a "World Radio Convention" at Sydney commencing Monday, April 4 to Thursday, April 14, 1938. The Institution of Radio Engineers of Australia extends a cordial invitation to all their oversea friends to visit their country.

Station KTSM Joins NBC Network

El Paso, Texas.—This city and its surrounding territory will join the regular audience of the National Broadcasting Company next spring when station KTSM, owned by the Tri-State Broadcasting Co. becomes a member of the Pacific supplementary group, available to either the Blue or Red Networks.

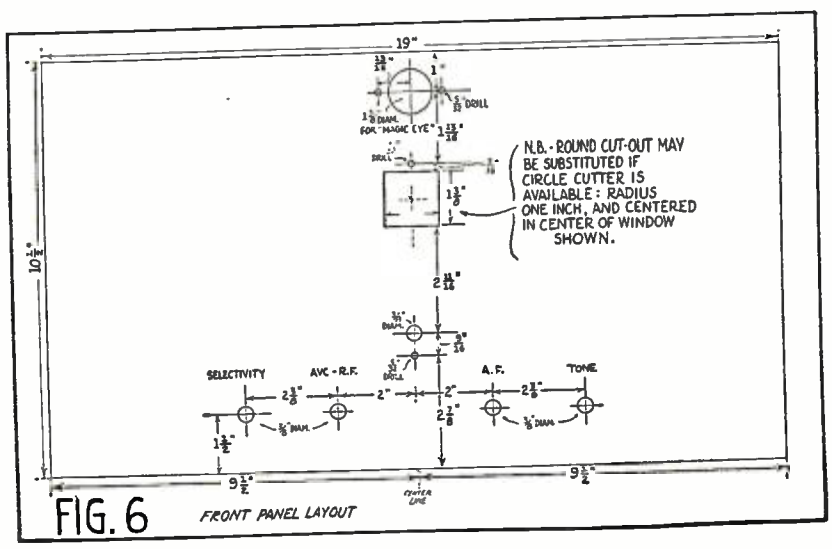


FIG. 6 FRONT PANEL LAYOUT

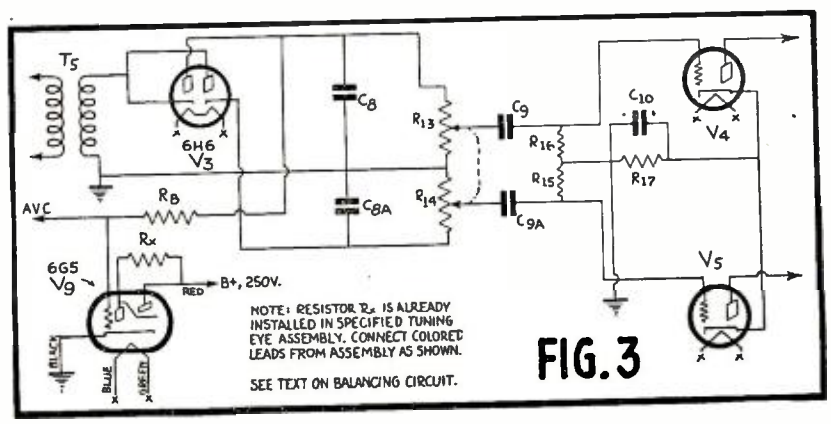
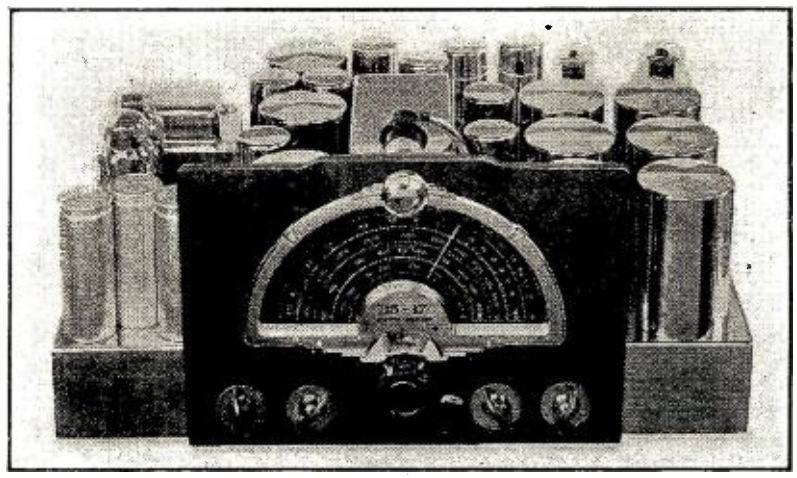


FIG. 3

A New Receiver With
15 TUBES
Functioning as 17
(McMurdo Silver All-Wave "15-17")

By McMurdo Silver



COMBINES APPEARANCE WITH ABILITY

Impressive though it is in its full chromium finish, its operating features are even more so with excellent band-spreading and volume, selectivity and tone fully variable to meet the requirements or preferences of the operator.

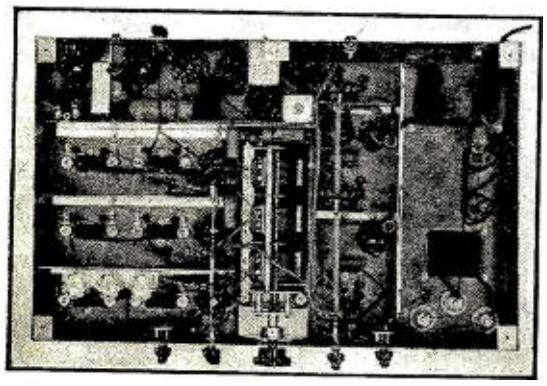
THOSE who have owned and operated superheterodynes of the 1931-32 vintage, practically all of which employed a low intermediate-frequency, of approximately 175 kc., will remember that they were so excessively sharp in tuning that they seriously impaired tone quality. When the all-wave receiver began to replace the older broadcast-band receivers, extreme selectivity became hard to attain, because a high i.f. had to be used for short-wave reception in order to avoid image interference. The result is that the average radio receiver today will actually separate stations spaced 10 kc. apart only under most favorable conditions.

THE new "15-17" all-wave receiver herein described provides not only selectivity actually better than that of the older 175 kc. i.f. amplifier receivers, but variable selectivity as well. It tunes continuously from 565 to 9.4 meters, a total frequency range of 530 to 32,000 kc. This range is covered using quite low values of gang tuning condenser in order to provide the high L/C tuning ratios necessary to maximum r.f. amplification.

Its fifteen tubes are used in the circuit of Figure 1. One 6K7 is a stabilized-regenerative tuned r.f. amplifier. Following are a 6L7 noiseless first detector; 6J7 electron coupled, voltage and temperature stabilized oscillator; two 6K7 i.f. amplifiers in the new "Tri-Band" i.f. amplifier; 6K7 tuned a.v.c. amplifier and 6H6 a.v.c. rectifier; 6J5 infinite impedance second detector; 6J5 audio-beat oscillator; 6J5 tuned-audio driver stage; two 6L6 beam-power tubes in the 20-watt power output amplifier and two 5Z3 rectifiers. A new 15-inch Jensen-Silver speaker and the super-fine audio system of the famous Masterpiece V and Masterpiece VI give the "15-17" really superb tone.

BELOW DECK

Clean-cut layout and thorough shielding make their important contribution to extremely high gain with complete stability.



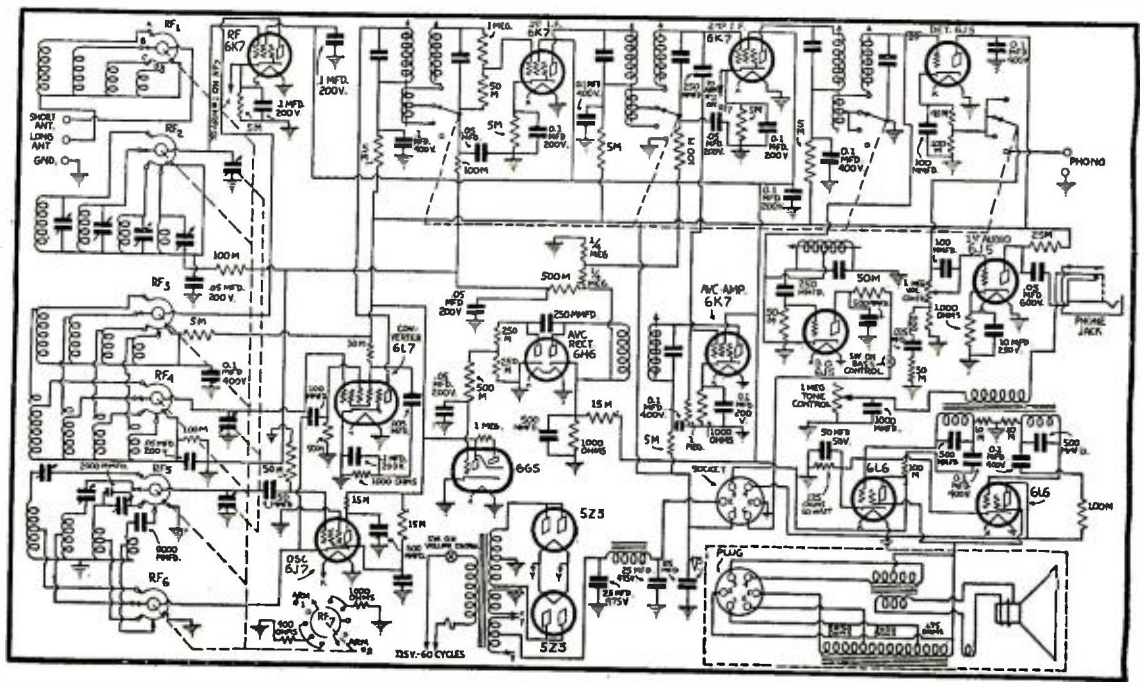
A total of twelve r.f. transformers, in four groups of three, cover the tuning ranges of 530 to 1650 kc., 1600 to 5500 kc., 5300 to 12,500 kc. and 12,000 to 32,000 kc. The tuned r.f. transformer coupling the 6K7 r.f. amplifier to the 6L7 first detector presents to the 6K7 plate circuit the high impedance necessary to obtain the stabilized-regenerative amplification which must increase with signal frequency if it is to equalize gain and selectivity throughout the range of 530 to 32,000 kc. Measurement indicates that at 13 meters as much gain is had as in the 200 to 550 meter band.

High "Q" Coils

There is nothing new about the first detector and oscillator, they are the same circuits as in the Masterpiece V and VI. It is in the 472 kc. "Tri-Band" i.f. amplifier that most of the selectivity of the "15-17" is obtained. This is accomplished through use of new Litz coils (measuring Q-205) wound upon a newly developed high-permeability powdered r.f. iron core. Six such coils in the three dual-tuned transformers gave several times more amplification than could possibly be used. At the considerably lower level actually desired, stability was accompanied with complete freedom from noise. This 2-stage amplifier gave a selectivity curve 3 kc. broad on its intelligence-carrying "nose", falling off steeply to a total width of only 15 kc. at 10,000 times resonant input. At 20 kc. band width the measure of rejection for unwanted stations but 10 kc. away from a desired station was 30,000 times; for stations only 5 kc. away from resonance, rejection was 1,000 times. For broadcast and amateur DX telephone reception this is everything that can ever be asked.

Variable Selectivity

Tone, with such selectivity cannot provide high. (*Turn to page* 510)



Important Points in Designing a SET TESTER

THE author, as Service Engineer of the Supreme Instruments Corporation, is well qualified to discuss the problems and point out the solutions in set-tester design. Servicemen, who regularly use such apparatus, will find many points in this discussion that will be helpful toward a complete understanding of its use. Others, who would want to build a set tester, will glean useful information that will help them in their own designs.

By Sam'l C. Milbourne

(*Part Two*)

THE design of the ohmmeter circuit is probably the most difficult assignment. To arrange the switch system so that all ranges are available from one master selector switch is no easy job. However, this has been done and the ohmmeter circuit including switching arrangements is shown in Figure 7. Figure 8 shows a simplified ohmmeter circuit using pin jacks instead of a rotary switch, but keeping the same values and general circuit as in Figure 7.

This resistance measuring circuit uses the meter primarily as a voltmeter with the current passing through the meter calibrated on an "Ohms" scale instead of a "Volts" or "Mils." scale. Shunts are used to obtain the different sensitivities required for each range and to this extent the ohmmeter circuit resembles current measuring circuits in which shunts are usually required.

Ohmmeter Design

Using the values indicated in Figure 8, and assuming an average battery potential of 1.4 volts, we can determine, by different applications of Ohm's law, that the variable shunt rheostat should be set at a position so that the total of the used portion and the fixed 610 ohm resistor total 1400 ohms when the rheostat is adjusted to "Zero Ohms" with the lowest range terminals short circuited. Under these conditions, the effective internal resistance of the network is 3.5 ohms for the lowest range and decimultiples of this value for the higher ranges.

The 2 and 20-megohm ranges are powered from a miniature "power pack." The internal resistance of the tube which is used as a rectifier tube must be taken into account when determining the multiplier resistance values required for the higher ranges. Since the internal resistance value of a vacuum tube is not a constant value, but varies with varying loads, it cannot be expected that the higher ranges will be as accurate as those powered with a battery. However, they are well within tolerance.

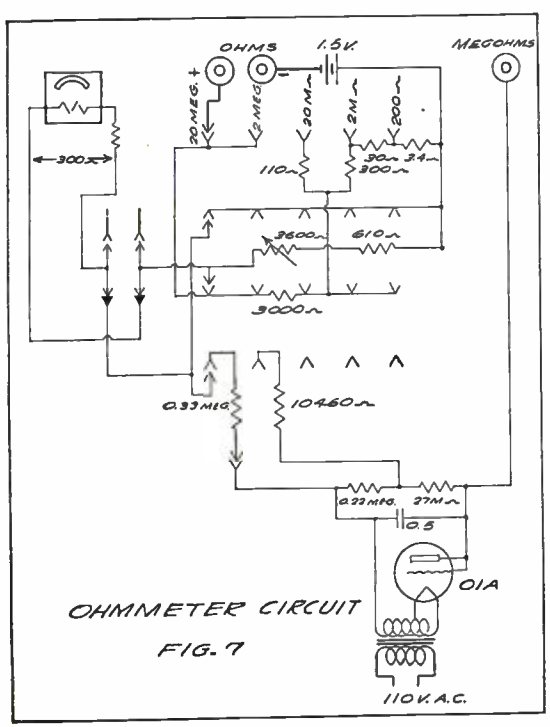
To eliminate the necessity for using a separate a.c. moving-vane type meter (which would not be satisfactory for output measurements) it has been customary for us to use one d.c. movement meter for both d.c. and a.c. functions, rectifying the alternating current by means of a copper-oxide rectifier when making tests involving a.c. potentials.

The normal type of a.c. voltmeter has a non-linear scale, tending to crowd the markings towards one end of the scale. With Supreme's Iso-grad circuit, the indications are perfectly linear and depend upon the use of a capacitor-resistor multiplier network. Variation in a.c. potential measurements from a linear scale is caused by the "current density" characteristic of instrument rectifiers and this is what must be compensated together with some means of minimizing changes due to temperature and humidity. Since the d.c. output of our instrument rectifier is pulsating in characteristic, the meter will read average values by the ratio of 1:1.11 so that the external circuit must also be so arranged as to increase the current flowing through the meter to give readings equivalent to d.c. values of a.c. voltages.

Due to the length of the discussion required to bring out the various factors necessary to design this circuit correctly and because this explanation has been printed several times before, we shall only deal in a general way with this circuit.

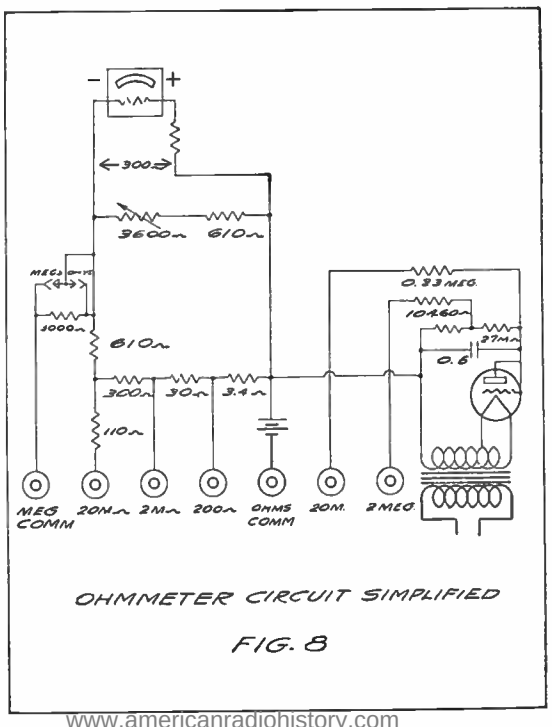
Offsetting Losses

To allow more current to flow through the rectifier (to offset the loss in the rectifier) additional parallel capacitance was introduced across the normal d.c. voltage multiplier resistors, see Figure 9. It was found advantageous to minimize the effect of the instrument rectifier current density characteristic by using a series capacitor as a multiplier reactor for the low range, instead of utilizing a multiplier resistor-capacitor unit. This results in an impedance circuit wherein the potential developed across the capacitor is 90 degrees out of phase with the resulting (*Turn to page* 487)



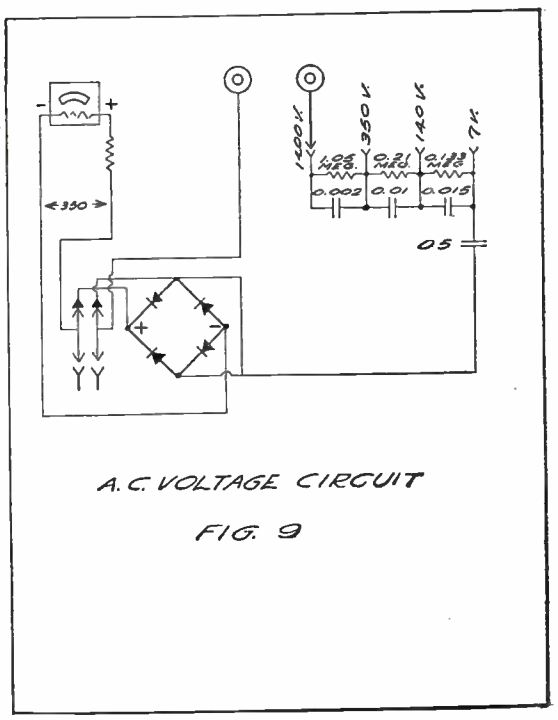
OHMMETER CIRCUIT

FIG. 7



OHMMETER CIRCUIT SIMPLIFIED

FIG. 8



A.C. VOLTAGE CIRCUIT

FIG. 9

Service-

This Month:

How QRV gets results: One-man shop . . . Displaying remote control . . . New condensers . . . Speaker sales board . . . Chassis jack . . . Approved cord sets . . . SERVICING: RCA, Crosley, De Wald, Echophone, Stromberg-Carlson and Zenith

ONE OF OUR BEST RADIO SHOPS

Figure 1. The busy shop of QRV Radio Service, as shown above, is well equipped to handle any radio job. Those gigantic horns are parked on the ceiling only when not out on a P. A. job.

HOW QRV SUCCEEDS

FACED with the bitterest type of cut-throat competition, how can a shop devoted exclusively to radio maintain a high standard of workmanship, list prices on tubes and materials, and a rate for labor which assures good earnings to its employees? In an interview exclusively for RADIO NEWS, J. A. Erhard, owner of QRV Radio Service, tells us the methods, both business and technical, which he has found successful in actual practice over a period of fourteen years.

Located on the fourth floor of a midtown office building in New York City, the prohibitive overhead of ground-floor is avoided. Further, both the office and shop are quiet, since the shop is at the rear of the building, well above and away from street noise. An important point, since hum, distortion and sputtering noises in receivers are often masked by a high noise level. Often the serviceman may not detect such troubles in a noisy shop though they become immediately evident when the set is returned to the customer.

Indexing Records Pays

"When a customer phones in for service," Mr. Erhard explained, "I pull out the drawer at my right which contains a complete card-index record of all customers, type of receiver, and work done. As soon as he gives his name I ask him if he is still living at such-and-such an address. Naturally he is pleased to know we remember him, particularly when the set hasn't been serviced for a long period. This personal touch is a vital factor in keeping old customers and, through their recommendations, in getting new ones. If he is a new customer we try to find out how he learned about us. In that way, we can check up on our advertising and other points we should know about."

The photograph, Figure 2, shows Mr. Erhard in action with his handy index.

"The data on the call slip is then transferred to a job ticket," Mr. Erhard resumed, "which is so devised that the serviceman need only check each operation performed. This saves a lot of scribbling which takes time and is often hard to read. There is of course a space for special notations, if needed."

"What do you about the customer who wants an estimate on the cost of repairing his set?" I interrupted.

The Doctor's Method

"We can't give an estimate until we make a diagnosis. For the diagnosis, there is a flat rate of $1.25. In some cases, of course, we have to take the set to the shop and fix it temporarily in order to make certain the diagnosis is correct and includes all troubles present. In any event, if the customer decides not to have the set repaired by us, he gets the set back in exactly the same condition in which we found it and pays only for the diagnosis."

"What is your charge for a service call?" I asked.

"We have no flat rate for a call. The average charge is about $2.50 but it depends entirely upon the amount of work done and time required. For shop work, the rate is $2.00 per hour."

"How do you handle intermittent 'faders'?"

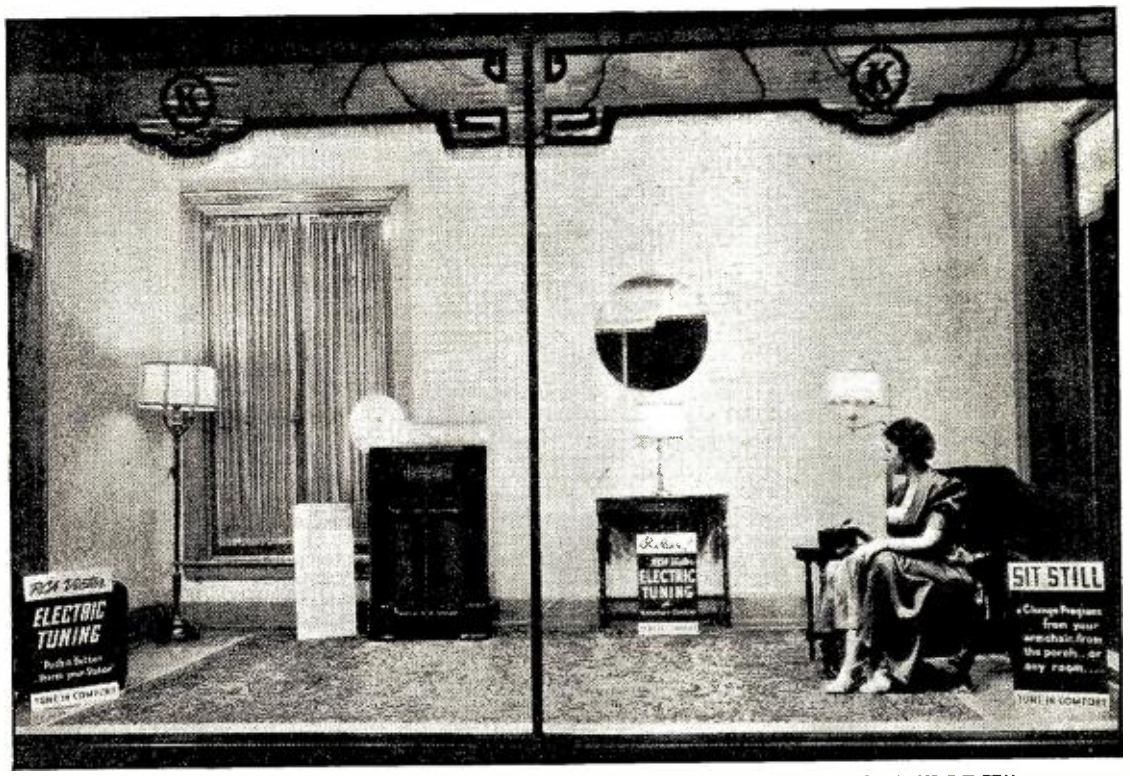
"First, we check carefully the installation in the customer's home. Then the set is brought in to the shop and placed on operating test for a few hours or until the trouble shows up. When it does, the tubes are checked. If they are not at fault, all of the bypass condensers are given a breakdown test with 600 volts d.c. If these are okay, we then start a process of elimination by circuits. For instance, we cut out the audio section and operate the set into an external amplifier. If the trouble disappears, we know it is something in the audio circuit. If not, we work back stage-by-stage through the r.f. and i.f. sections. By this system, we avoid the danger of unknowingly correcting the trouble."

HOW AN EXPERT HANDLES CALLS FOR SERVICE

Figure 2. QRV means "Are you ready?" and J. A. Erhard, owner of QRV Radio Service, is shown in action demonstrating that he is ready. The handy card-index system in the drawer reveals immediately all needed data regarding the customer's radio and previous work done.

Sales

By John H. Potts
Service Editor



YOUR WINDOW CAN NOW SHOW "TUNING IN COMFORT"

This attractive dealer window display conveys well the home atmosphere and the advantages of receiver operation by remote control.

"How about side-lines?"

"We do some public-address work, but we try to stick as closely as possible to straight service work. You see, we also do wholesale radio servicing for department stores so we cannot enter into competition with such customers by stocking and pushing receiver sales. But we sell and install master antenna systems and line filters both for receivers and electrical appliances. In short, anything which will lead to better radio performance. Our employees are not high-pressure salesmen, though. We pay no commissions on tube sales, nor do the men receive a salary. Each one works on a straight profit-sharing plan based entirely on the profits on his own jobs. That some men have stayed with us up to 12 years shows that this plan is fair to all concerned."

Up-to-date Equipment

We strolled into the shop section, which adjoins the office. Though the business was established in 1923, our photograph, Figure 1, shows that QRV has kept pace with the times by installing up-to-date equipment. The large test panel is of course not new, but good meters never become obsolete. Above the panel a speaker with a universal field coil enables tests of any set without bringing in the speaker. By the large chassis on the bench, there is a Supreme analyzer and farther down we find a new model RCA signal generator with a built in electronic frequency modulator. This is employed with the large 3-inch RCA cathode-ray oscillograph upon which it rests. At the far end of the bench, a new Weston tube checker is located.

Not visible in the photograph are a 600-volt d.c. motor generator used for condenser tests and a shop-built vacuum tube voltmeter. Fastened to the ceiling are the large P.A. speakers employed for outside work.

Everything in Place

All special tools, tubes and other equipment are kept in the steel lockers opposite the work bench. There is a place for everything and everything in its place. Parts are kept in labeled steel drawers shown at the right (Figure 1) and beneath the test bench we find a complete set of Rider's Manuals.

Spotlessly Clean!

Both the office and the service shop are spotlessly clean and orderly. It is too bad that most customers seldom see the place which really constitutes a model of careful and efficient design.

Mr. Erhard has found that men who are trained operators of transmitters make excellent servicemen. Since the earliest days of radio broadcasting, he himself has devoted considerable time to key-thumping and is of course familiar with all the vagaries of modern short-wave transmitting apparatus.

The price schedules which are in force at QRV have proved workable in their particular territory. For others, modifications may be necessary. Since they must rely entirely on service and not sales of radios and other apparatus, for revenue, no special offers to attract trade are feasible.

Salesmen, Ahoy!

That big RAE-79 chassis reposing on the Work Bench in Figure 1 belongs to a radio star whose yearly income runs well into six figures. The receiver is six years old. Nuf said!

A New Feature

STARTING this month we plan to present in each issue in this department a personal interview with the proprietor of a successful radio shop, giving in detail concrete facts regarding his methods of meeting difficulties which confront every sales and service business. No "blah," no idle theories, but hard, common-sense ideas which have actually been put in practise and have proved workable and profitable over a substantial period. Also his technical short-cuts which save time and make possible a better job with less effort. We'll ask straight-from-the-shoulder questions regarding the things we think you want to know and we'll check up on the answers, too! Collectively, we believe this series of interviews will represent a cross-section of the best business and technical practises which should prove a rich source of constructive ideas for all who make their living from radio.

THIS MONTH'S SERVICE BENCH

A SERVICE shop need not cost a lot of money in order to be neat, attractive and efficient. The photographs (Figure 3 and 4) show what W. L. Ford of Oak Park, Illinois accomplished at an expenditure of less than fifty dollars, exclusive of stock and equipment. And he had it built by a carpenter too. As shown, there is a place for everything and everything is in its place. Located in a corner of a garage office, with a good window at the left for display purposes, the entire shop measures only 8 x 11 feet. Mr. Ford writes:

"The counter in the foreground is used as a postal sub-station operated in conjunction with the service shop. At the time the pictures were taken, I did not have a lot of stock. However, now my inventory of parts will run about two thousand dollars.

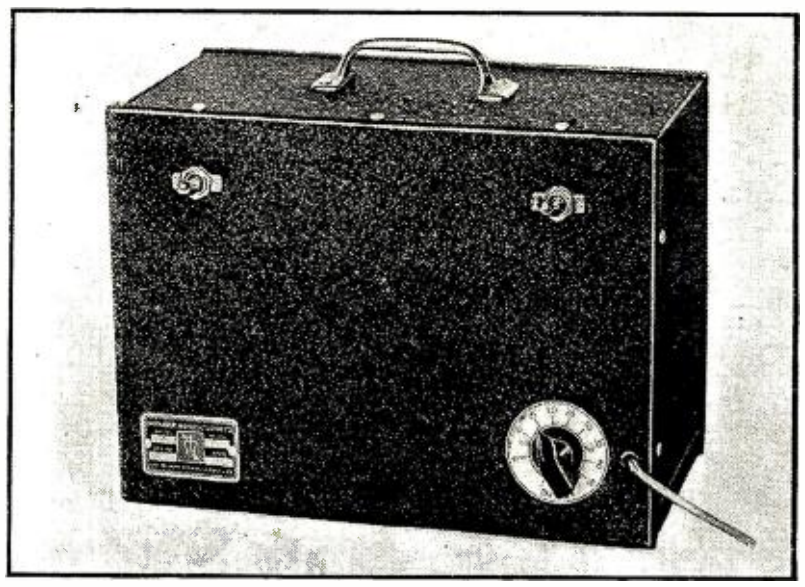
"The shop is permanent or portable as the tube checker, analyzer, oscillator or test speaker may be caught on the fly when leaving for a

(*Turn to page* 486)

New Unit Saves Time in SET Alignment

(Multivibrator Model 20)

By John H. Potts



THE MULTIVIBRATOR HARMONIC GENERATOR

Figure 1. As simple in use as it is in appearance, this test unit permits precise alignment of receivers in less time and with less skill. About one minute is required to check every portion of very range of an all-wave receiver for sensitivity and correct alignment.

A NEW test instrument, designed to simplify and speed up the testing and aligning of modern radio receivers, has recently been introduced to the trade by the Monarch Manufacturing Company. This device, the Monarch Model 20 Multivibrator, generates a 400-cycle test signal so rich in harmonics that frequencies up to the 50,000th harmonic may be usefully employed. It is already in use on the production lines of some large manufacturers and, once its features become better known, will undoubtedly also be adopted by many service organizations.

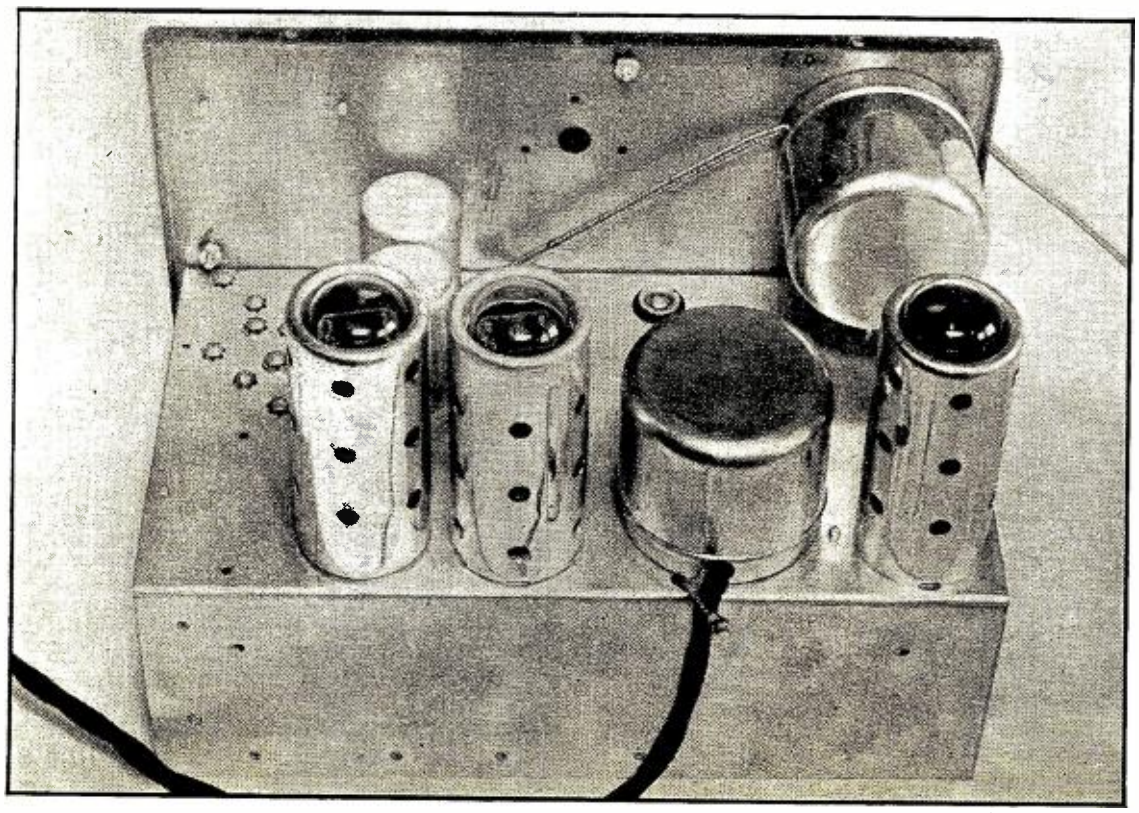
Simplifies Work

This multivibrator consists fundamentally of a two-tube resistance-coupled amplifier, the output of which is fed back into the grid of the first tube. This causes oscillation at a frequency depending upon the values of the circuit constants employed. Since the chosen fundamental frequency is 400 *cycles*, the harmonics are so closely spaced that they appear as a signal at every point in the i.f. and r.f. ranges up to 20 megacycles. When connected to a receiver, one can swing quickly over each band and locate immediately dead or weak spots, or cross-overs, at any part of a band simply by noting the variation in signal strength at different parts of the bands. The gang condenser need no longer be rocked back and forth while adjusting the oscillator padders, interaction between tuned circuits while making adjustments will not affect the alignment accuracy.

Completely Shielded

As shown in Figure 2, the apparatus is very carefully shielded. The two shielded tubes at the left are type 37's forming the 400-cycle multivibrator, while the one at the right is a type 84 rectifier for the power supply circuit. Beneath the chassis, a 955 acorn tube is installed with a compensating network which tends to keep the harmonic amplitude uniform. The output circuit of the 955 is coupled to an impedance adjusting transformer, thence to a shielded attenuator to which the output cable is attached. Both the line supply filter and the power cord are shielded. Figure 1 shows the attenuator control at the lower right and the "on-off" switch directly above it. At the upper left is a switch to change the type of output coupling. This is normally thrown to the left except for frequencies above 15 megacycles. The output range is from 0 to 200 microvolts.

FIGURE 2. WITH THE OVERALL SHIELD REMOVED



Easy to Operate

In operation, the i.f. amplifier of the receiver under test is first aligned with the cathode-ray oscilloscope to assure proper band-pass characteristics and the oscillator trimmer adjusted for each band. This latter operation is done with a calibrated signal generator, in order that the dial pointer may correspond with the scale. The multivibrator may then be connected directly to the receiver input, or through a dummy antenna and all other trimmers and padders adjusted for maximum reading on the output meter.

Fine Checks

When the alignment is completed the sensitivity may be checked with a signal generator, though in production testing a little experience will indicate what multivibrator setting corresponds to the required sensitivity and this last test (*Turn to page* 506)

See Them AT YOUR DEALER'S

(New Radio Products)

Dual-Channel P. A. System

The Amplitone Products Co. announced a 32-watt dual channel amplifier. It features a three position electronic mixer with individual controls, output level indicator, master tone control, frequency response of plus or minus 2db, 30 to 10,000 cycles, and multi-tapped output.

Special Pickups

The Brush Development Company are producing three vibration pickups types VP-1, VP-5 and DP-1. They are of typical piezo-electric Rochelle salt crystal design, and are applicable to the study of noises and vibrations in various industrial applications. Literature describing these crystal devices is available upon request.

Specialists in Recording Equipment

The Universal Microphone Company's new 1938 professional recording machine includes a playback pick-up mount, incorporated in the main assembly of the recorder together with wiper bars. In addition there is an adjustable and illuminated microscope with .006 inch spaced hair lines. This is mounted on a slide bar assembly and will move with the cutting head, thus enabling the cutting action to be observed at all times.

8-Tube Radio-Phono Combination

The General Electric Company recently announced their new model F88, radio-phonograph combination. The attractive console, shown in the illustration, houses an 8-tube radio set with cathode-ray tuning indicator

DEMONSTRATES NEWEST "MICRO-WAVE" TRANSMITTER

O. B. Hanson, shown here, with NBC's latest development, which can be used to transmit programs from any location without wires or cables. This is what Mr. Hanson terms a "mobile" radio pick-up.

and advanced tuning features; and the phonograph equipment which can play 10 and 12 inch records. The phonograph apparatus is equipped with an automatic shut-off, crystal pickup and the motor is rubber mounted.

Automatic Tuning for Eight Stations

This is a new 6-tube push-button automatic tuning table model receiver made by the Howard Radio Company. It incorporates eight stations, one of them a police band and it is equipped with a tone control and magic eye. The copper plated chassis is mounted in an attractive two-position cabinet, which can be used as top-tuner or in a horizontal position as illustrated. The touch button

tuning is easily set and station selection can be changed at will by the owner.

New Quartz Crystal Unit

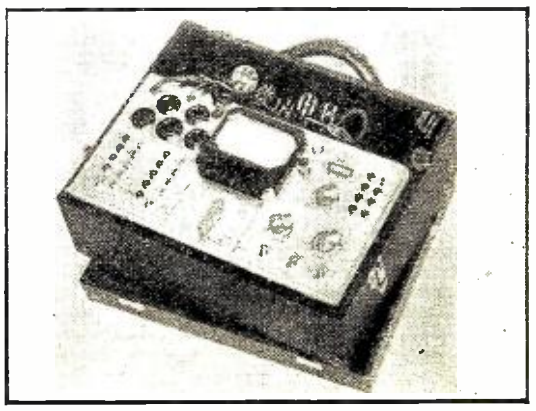
The B5 crystal unit, just announced by the Bliley Electric Company is a unique type designed particularly for the 40 and 20 meter amateur bands. Its smaller size permits considerably higher electrode pressure, giving improved mechanical stability. This new crystal has even higher activity than the well known LD2 type. The maximum temperature coefficient is rated at 4 cycles per mc. per degree Centigrade for the 40-meter type and even less than that for the 20-meter crystal. This improved design will be especially appreciated by amateurs working the

10 and 20 meter bands, making possible greater stability with fewer frequency multiplying stages.

A DeLuxe Set Tester

The Triplett Electrical Instrument Company has recently introduced a new set tester incorporating six d.c. ranges from 10 to 2000 volts at a resistance of 25,000 ohms-per-volt for all ranges. The same ranges are also available for a.c. measurements at 1000 ohms-per-volt. Six current ranges, from ¼ to 500 ma. d.c., and three from 1 to 20 amps., are provided. Five ohmmeter ranges with maximum scale readings of 500, 20,-

(*Turn to page* 512)



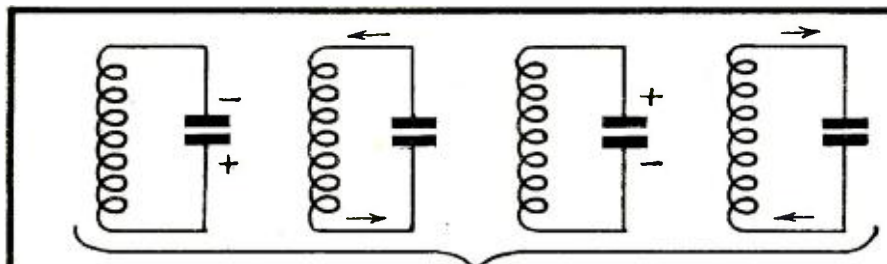


FIG. 7

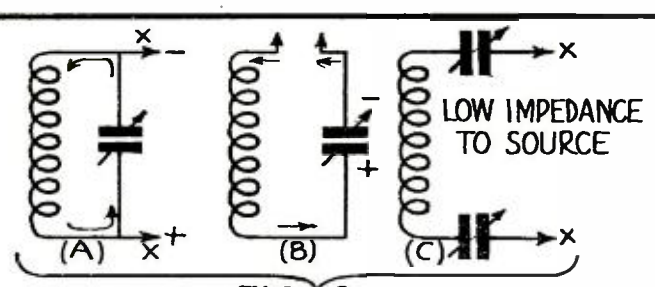


FIG. 8

The A, B, C's of
ANTENNA DESIGN
(Impedance Matching)

By I. Queen

(Part Three)

IT has been shown previously how the current and voltage feeder systems cannot be used on even harmonics. It is possible, however, by tuning the feeders to work them at these harmonics. Let us first review the theory of tuning circuits:

Figure 7 shows successive instants of an oscillating circuit a quarter of a cycle apart. The r.f. energy is stored first in the condenser and then in the coil. We can compare the system with a spring to which a weight is fastened. Because of the reactance of the coil and condenser electrons will accumulate on the condenser placing a high voltage across its plates. If we make a connection to the above circuit as in Figure 8A we have what is known as a parallel-resonant circuit. A high voltage is available to the exterior circuit but little current, because the electrons are moving from one condenser plate through the inductance to the other plate each time. As the condenser is tuned, at resonance with a given frequency this circuit presents a higher impedance to the source XX. (With no losses it would approach infinity).

If we made the connection as in Figure 8B we find that the voltage produced by the capacity neutralizes

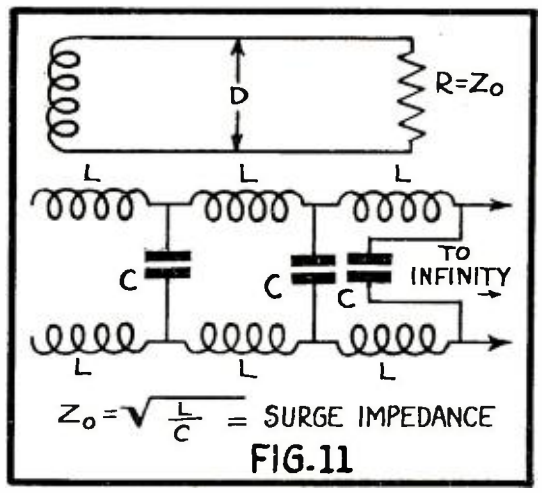


FIG. 11

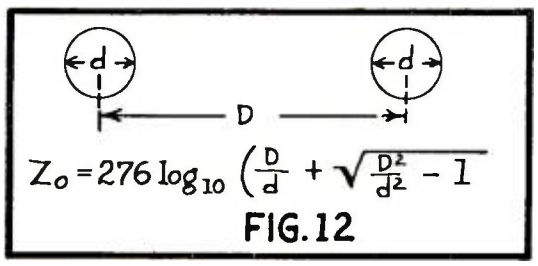


FIG. 12

that of the inductance since they are out of phase. As the condenser is rotated toward resonance, the impedance approaches zero (assuming no losses). This latter is a series-resonant circuit. A large current and little voltage is available at XX. The circuit may take the form of 8C which balances the line.

Coming back to our discussion of tuned feeders, the circuit of Figure 4 (Part 2) can be tuned to resonance by using series tuning if we are on an odd harmonic. We have a low impedance coupling coil and the condensers are rotated so that they balance the effect of the coil, wholly or partly, depending upon the length of the feeders. Suppose we wish to operate on an even harmonic, the second let us say. The set end of the feeders is presented with a voltage loop just as at the center of the radiator. We can then solve the problem by using parallel tuning (Figure 9). The three condensers are left in the circuit but the series capacitors are left at maximum (for minimum effect) and the other condenser rotated towards maximum (for maximum effect). From the diagram we see that we have a voltage loop at both ends of the coil so that care must be taken against possible losses, r.f. burns, etc. Also we note that the reading of the r.f. ammeters (if near the condensers) will be at a minimum and we may have to read the final

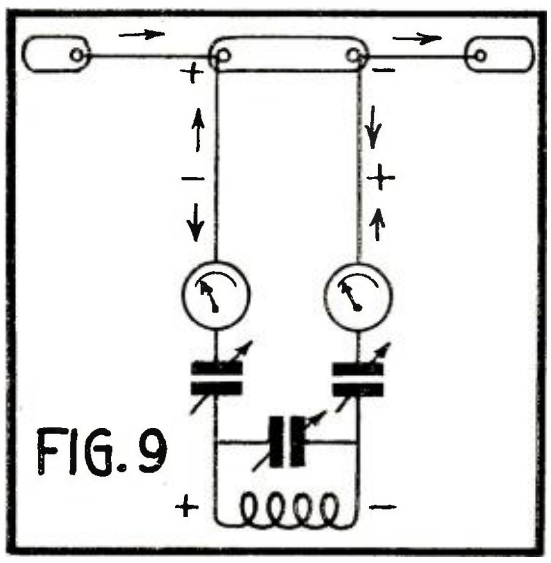


FIG. 9

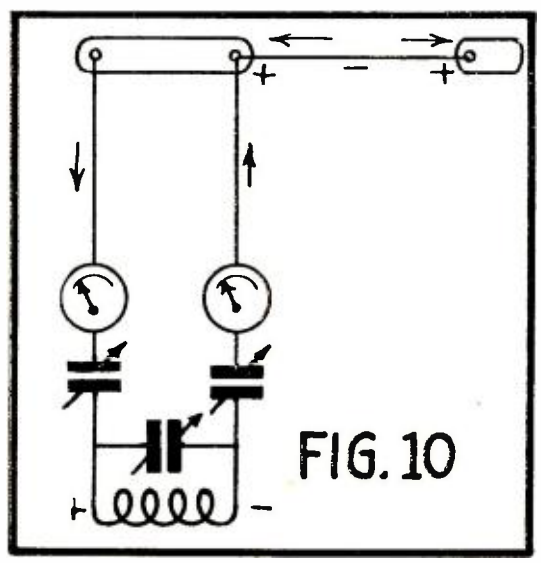


FIG. 10

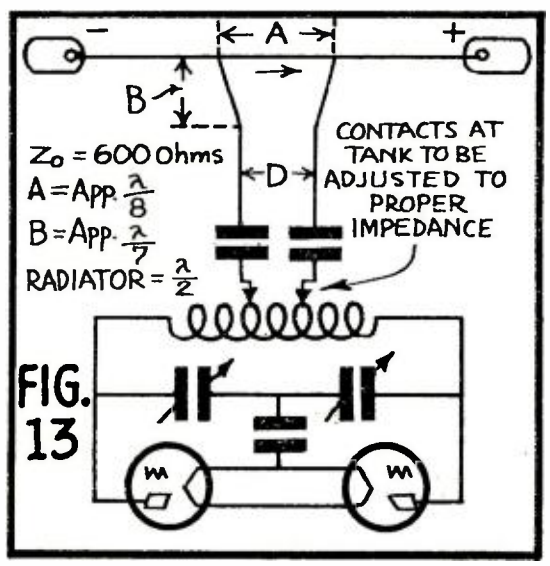


FIG. 13

plate meter to determine maximum loading of the antenna. We should also note that the currents on the radiator are IN PHASE. The field patterns of such an antenna will be taken up in part 4. We may consider the entire system as two voltage-fed Hertz antennae in parallel.

Using a "Zepp"

In the same manner we can use the "Zepp" on even harmonics. Our feeders can be a quarter-wave for the fundamental and series tuning will work on all odd harmonics. At these frequencies the radiator end of the feeders is at a voltage loop as usual and a current loop appears at the coupling coil. The conditions are different on even harmonics. For instance, on the second harmonic a voltage loop will appear (Figure 5) on the set end. (The feeders are a half-wave long for this frequency). To effectively transfer energy we must use parallel tuning to obtain a high impedance at this end. This applies on all even harmonics.

On the higher harmonics it frequently happens that the length of the feeders is approximately both an even and an odd multiple of a quarter wavelength. Since series tuning has the effect of decreasing the electrical length and parallel tuning increases the length we see that we may use either type of tuning. It is always preferable to use series tuning to avoid the high potentials on the coil in the station.

Untuned Feeders

So far we have made use of standing waves on our feeders which may really be considered a continuation of the antenna, except that they do not radiate. The following systems eliminate these standing waves and so do not have to be tuned or measured to an exact length. It can be shown that every system of two parallel wires has a certain "surge" impedance. This is the value the system would have if the wires were of infinite length. We must disregard losses, of course. This is easy to understand since twice the

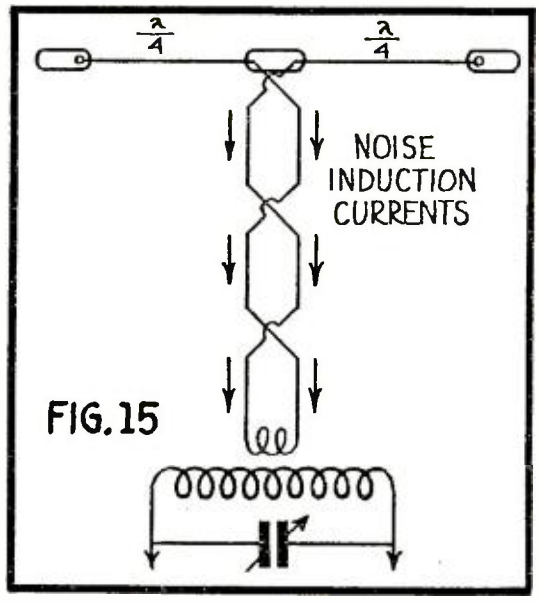


FIG. 15

line length would give us twice the inductance and also twice the capacity. Since these effects are opposite it does not matter how long the line is. In electrical dimensions the formula for surge impedance is given in Figure 11 where L is the inductance and C is the capacity between unit lengths of the wires. Figure 12 shows how the value may be obtained when the diameter and spacing of the feeders are known.

Constant Impedance

If we had such an infinite line, then, its impedance would equal the above, and since an infinite line can have no reflections, we would have no standing waves. If now we should cut off any number of units of length from this line and terminate it with a resistance equal to its surge value, it makes no difference to the line since the terminating impedance is still the same as before and we will still have no reflections from the line. Under these conditions maximum power will be transferred to the terminating resistance. The surge impedance of the line will not vary with either frequency or length, providing the length of the line is great compared to the wavelength.

In Figure 13 we have a transmission line carrying power from the tank coil to the radiator. We do not connect the line to the center of the Hertz since a half-wave radiator like this has an impedance of only about 75 ohms at the center. From the previous formula, we see that it is difficult to obtain such a low value in a spaced pair transmission line. A convenient value is 600 ohms and this has been accepted as standard. For this value the ratio $\frac{D}{d}$ is equal to about 75.

Balancing Lines

Since we know that the impedance of a half-wave Hertz increases as we approach the ends, we connect the ends of the line away from the center. For this type of radiator, the above constants will match the 600-ohm line. The lines are balanced by connecting them an equal distance from the center of the antenna. They then have an equal but opposite voltage on them (to ground) and will have neither standing waves nor radiation losses. The efficiency is much higher than in the case of the tuned feeders. Also the line can be any convenient length and no tuning is necessary.

The "J" Antenna

Along the "Y" section only a gradual change of the characteristic impedance of the wires takes place (distance between wires increases gradually) and each point may be considered as being unmatched by only an infinitely small amount from that next to it. A disadvantage is that the "Y" section of the feeder may radiate because of the separation of the wires. If the above untuned feeders were to be used in conjunction with a vertical radiator it would complicate matters to connect the feeders to the center of the half-wave antenna. To simplify this connection the following may be used instead. In Figure 13A is shown a full-wave antenna with one half-wave folded over for non-radiation. The feeders can be connected to the folded-over part. There can be considered to be really two half-wave antennas in series. In this way, (*Turn to page* 506)

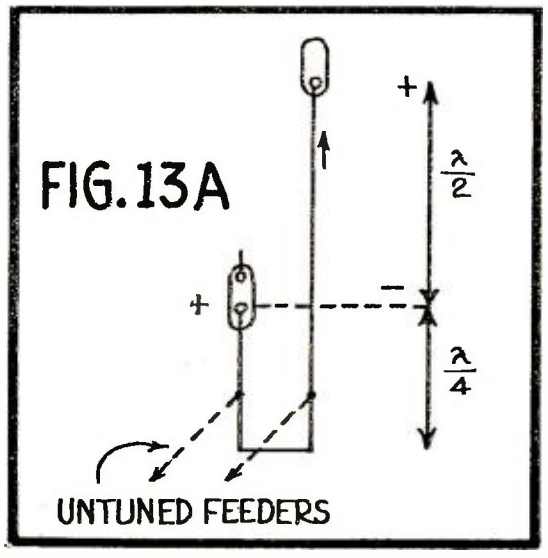


FIG. 13A

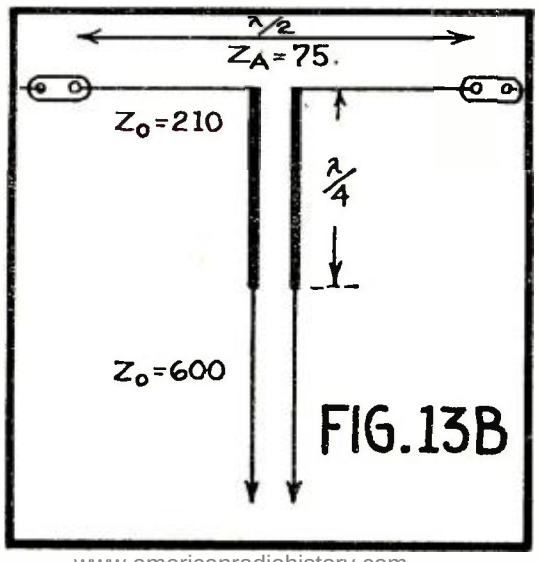


FIG. 13B

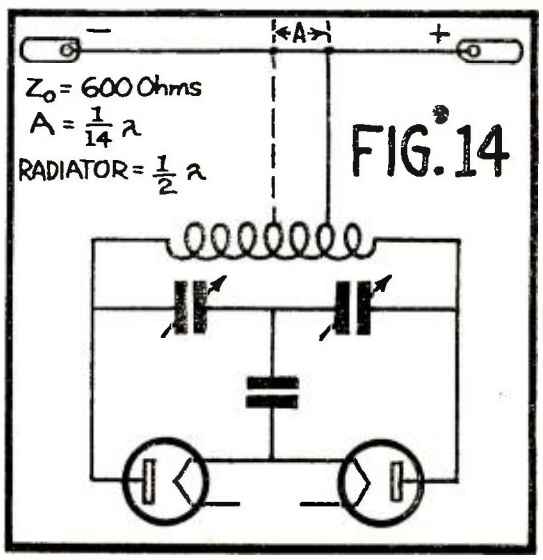
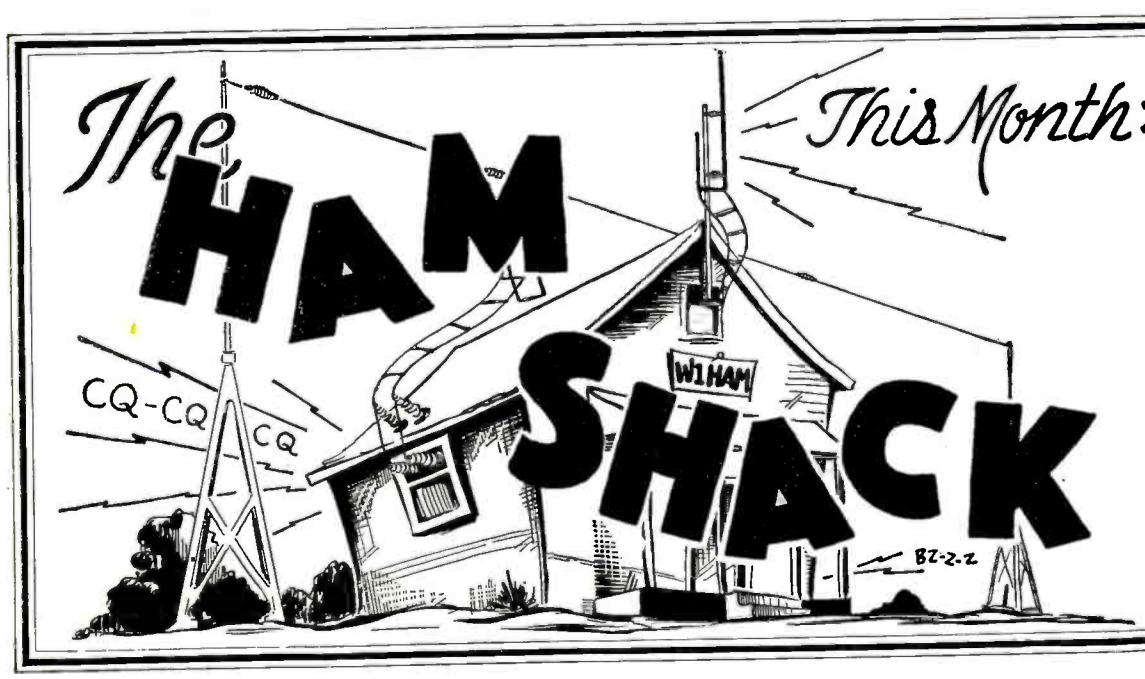


FIG. 14



This Month:

- Final Amplifier
- High Power—Low Power
- Unit Assembly
- Recording Programs
- R. M. A. Convention

Conducted by
E. M. Walker
Editor for Amateur Activities

150-Watt

FINAL Amplifier

for 10-20 Meters

IN the September and October, 1937, issues of RADIO NEWS we described in this department a low-powered transmitter using a 6C5 oscillator, an 802 buffer doubler and a pair of 807s in parallel in the final amplifier. This unit proved so satisfactory as an auxiliary transmitter at the writer's station, working alongside the half-kilowatt unit, that it was decided to construct an amplifier stage that would raise the input up to about 150 watts. This was done with the idea of making greater use of the lower-powered transmitter on the higher-frequency bands.

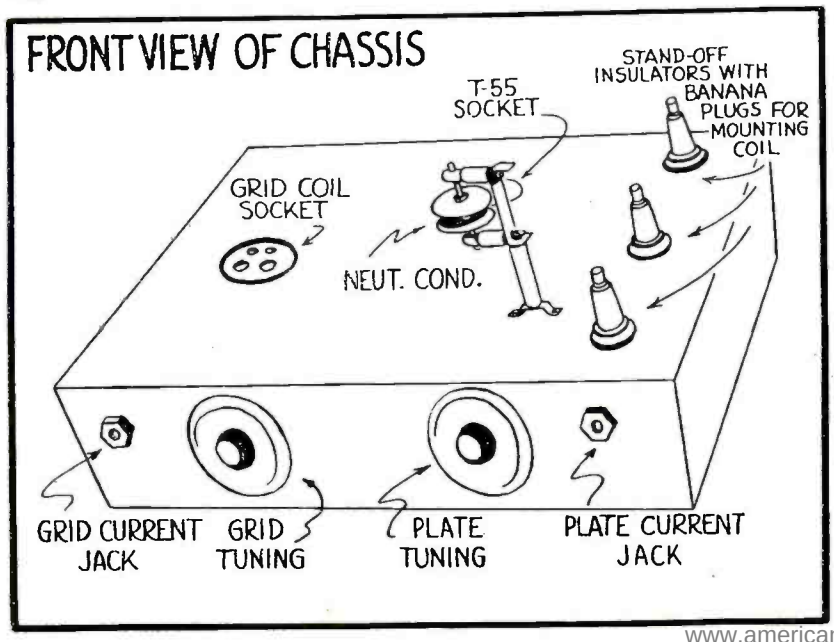
WHY we chose to make greater use of the low-powered transmitter at W2MW probably needs some explanation, in view of the fact a more powerful rig was available. The principal reason was: tests showed (when comparative reports were requested between the signal from the transmitter with the 807's and the unit using a 150-T in the final amplifier with slightly better than 500 watts input) reports seldom differed more than one "R" between the two. This was particularly true on 10 and 20 meters. On the lower frequencies, while the little transmitter performed almost as well as the larger one under minimum QRM conditions, the 80 watts input could not "fight" QRM as well as the more powerful one. On 10 and 20 meters the little unit was almost as good a "QRM fighter" as the big one.

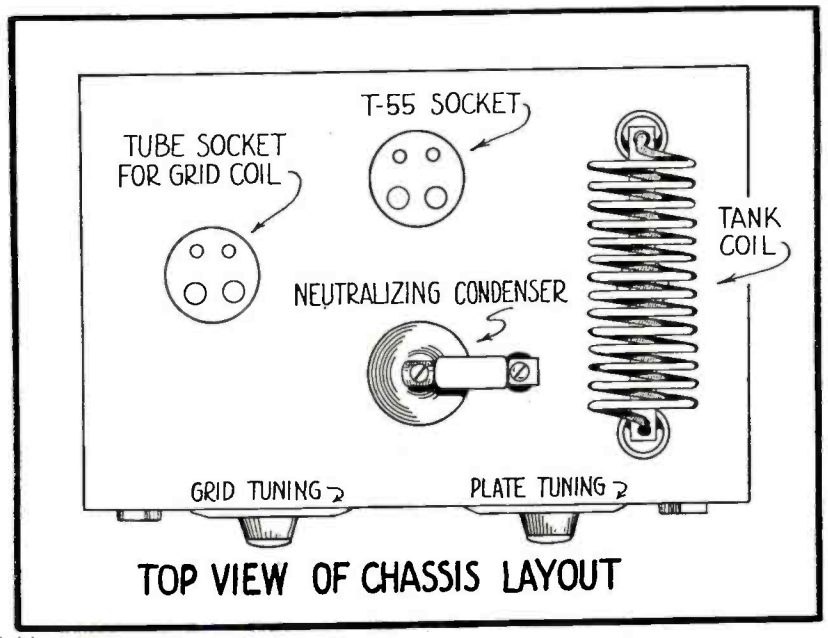
Power and Frequency

This being the case, it was reasoned: Why burn so many kilowatts (actually the line drain with the big unit for all filament and plate supplies is a shade over 2 kilowatts) when lower power seemed to produce the same results. Whether or not there is anything to the theory that high power at ultra-high frequences sometimes "burns" through the heaviside layer or not, it happened on more than one occasion that the report on 10 meters with the little transmitter was better than with the big one!

Accordingly we decided to construct a medium-powered amplifier for 10 and 20 meters that was well within the driving power available from the 807 amplifier. Only equipment on hand was used. The tube selected was a T-55, because we had a spare. Designing the amplifier around this tube, it was laid out on a chassis 10 inches long, 7 inches wide and 3¾ inches high. The deep chassis facilitated mounting the grid-and-plate tuning condensers below the chassis, and the tube, coils and neutralizing condenser on top This arrangement affords an ideal electrical layout in that it isolates the plate-and-grid circuits, resulting in making the amplifier very easy to neutralize.

The whole unit may be assembled in two to three hours. Standard parts are used throughout. While there is nothing particularly unusual about the schematic diagram, one new feature is the use of combination cathode and grid-leak bias for the grid of the T-55. This arrangement has a number of advantages, particularly when operating at high frequencies. The cathode bias resistor of 200 ohms provides sufficient bias to the grid so that when excitation is taken off the grid, the plate current will not jump to high proportions and damage the tube. It will be noted a by-pass condenser of 2 mfds. is connected across the cathode resistor. This is necessary when the amplifier is to be plate-modulated, to provide an audio





¶ A Department for the amateur operator to help him keep up-to-date

by-pass. Without it, quality will be impaired. However, if the amplifier is to be used for c.w., it is not necessary.

A 5000-ohm grid leak provides the additional necessary bias. This resistor is equipped with a variable tap, thus facilitating the adjustment of grid bias in accordance with the tube manufacturer's specifications. In the case of the T-55 with 1500 volts applied to the plate, it should be between minus 180 and minus 200 volts.

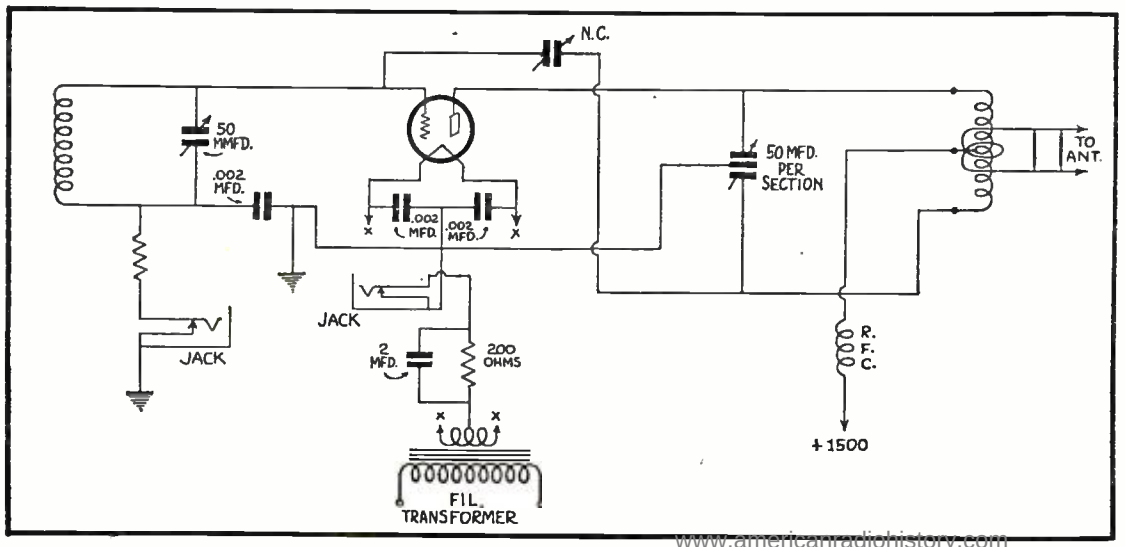
Parts Layout

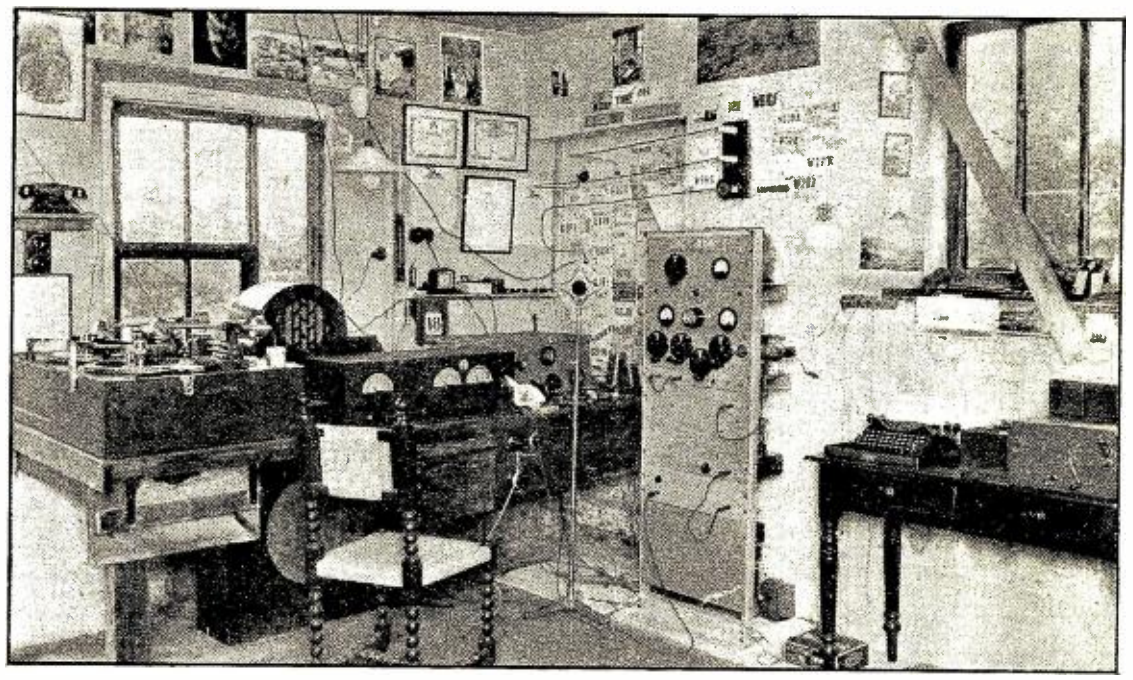
The parts, as laid out on the chassis, follow the schematic diagram almost exactly. Atop the chassis at the left center is the grid coil, wound on a standard tube-base form with its socket mounted through the chassis. Next, almost in the center of the chassis and slightly to the front, is the neutralizing condenser. The socket for the T-55 is mounted directly behind this. At the right, mounted across the chassis, are the three lead-through insulators, equipped with banana jacks for the coil. The grid-tuning condenser is mounted under the chassis near the grid coil. The plate-tuning condenser which is a split-stator unit having 50 mmfds. per section, is mounted directly under the tank coil. Both the grid and plate condensers are mounted on half-inch stand-off insulators to insulate them from the chassis.

Making Short Leads

This arrangement of parts facilitates short leads, which are essential to efficient operation on 10 meters. All other component parts, such as by-pass condensers and resistors, are mounted under the chassis. Two jacks are mounted on the front of the chassis: one in the grid circuit for measuring grid current and one in the plate circuit for measuring plate current. Four lead-through porcelain insulators are mounted on the back of the chassis, for filament and plate connections. Because of the ca-

(*Turn to page* 500)





"ALL THE BEST TO YOU"

That's how G6BW, whose radio station is pictured above, signs off with a station he has contacted on the 10-meter phone band. His frequency is 28,268 kc.

British Amateur Records Programs *from America*

By Robert Ames

THE ability to record received programs from overseas is one of the features of the experimental amateur transmitting and receiving station of Captain Ben Wallich, of White Orchard, Churchill, Somerset, England. The station's call is G6BW and the transmitter operates at present on 28 mc.

"Ben," as he is affectionately called by his many amateur friends all over the world, is well-known in England in radio circles. He was for some time with the BBC and his present experiments with long-distance transmission and reception are his favorite hobby.

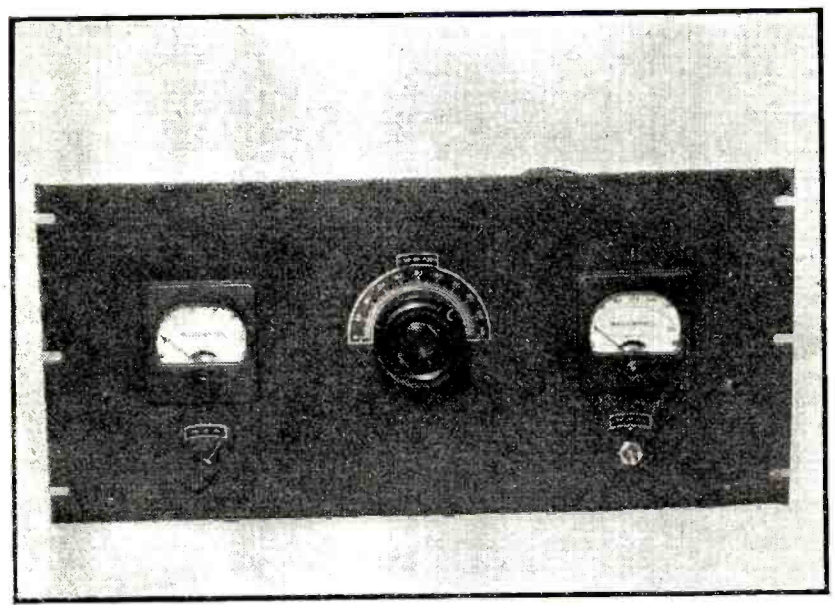
Looking at the photograph above there will be seen, at the left, the high-fidelity recording and play-back apparatus. On the right of this is an RME-69 receiver with a DB-20 preselector, and a loudspeaker in the background. On the same table, at the extreme right, is the high-fidelity amplifying apparatus. The 10-meter transmitter is shown centrally located, with its grey panels, tuning control meters, etc. At the right, on the table, are his files, typewriter and portable disc reproducer.

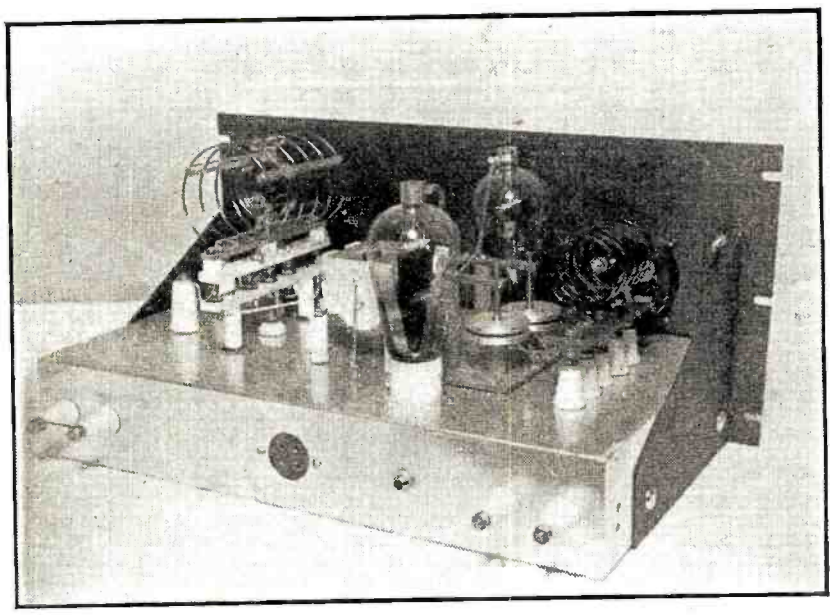
Captain Wallich has held two-way radio-phone communication with every continent from his home at Churchill and has recorded the voices not only of hundreds of his radio amateur friends in foreign countries but he also has recorded complete broadcast programs from commercial broadcasts in the United States and other countries.

The station is one of the most consistent of DX'ers; its signals being heard regularly throughout all of our seven American districts. The station's QSL card is a prize highly valued by those American amateurs fortunate enough to make a two-way contact with "Captain Ben."

RMA Convention and Radio Parts Show in June

Washington, D. C.—The annual RMA convention and National Radio Parts Show will be held together again next June at the Stevens Hotel in Chicago. The convention, membership meetings and annual industry banquet will be held June 7 and 8.





FRONT AND REAR VIEWS OF THE 112-WATT R.F. FINAL STAGE

The Radio News

"10-80" X'MITTER

for "Progressive" Construction

THIS installment of the RADIO NEWS "10-80" transmitter series describes the third step in the development of the complete transmitter. Referring to Figure 1 of the first article, the general changes from step 1 and 2 to the present step 3 may be quickly assimilated. The low-power r.f. unit A is moved down from the top position on the rack to the center. No changes are necessary in this unit.

The power supply chassis is now completed with the addition of the 750-volt power unit D, making a complete dual power unit BD. This is placed in the bottom of the rack. Comparison of the circuit and photograph of the complete dual power unit as shown herewith, with Figure 3 and its accompanying photo in the first article will indicate the construction and wiring of unit BD.

THIS transmitter, called the R. N. "Progressive" transmitter in the two previous installments, has been renamed to avoid confusion with the excellent "Progressive" transmitter put out in kit form by the General Transformer Company and associated manufacturers.

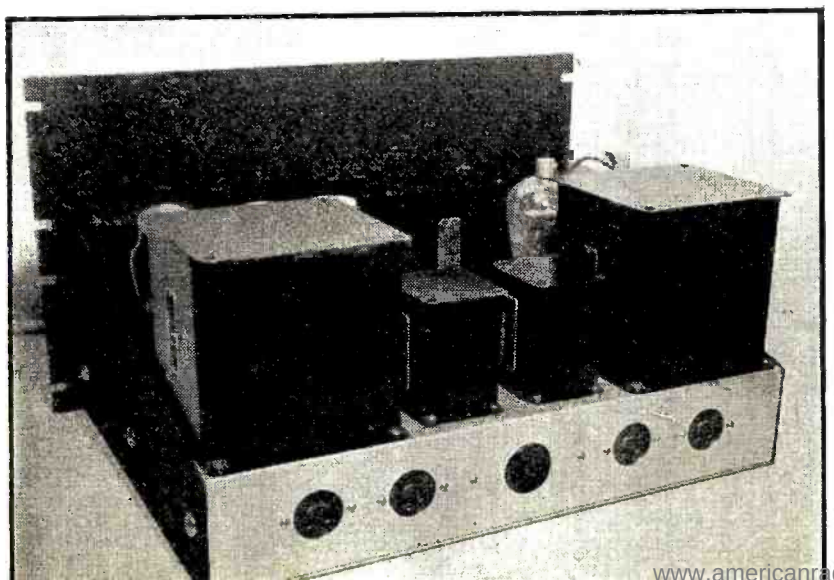
By Chester Watzel
and Willard Bohlen

(Part Three)

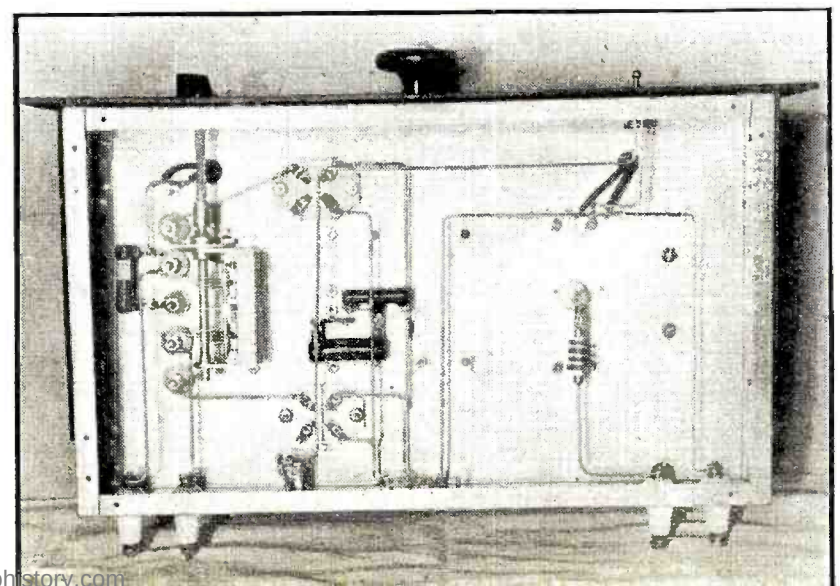
The power transformer (T3) has a tapped primary, the terminals of which are marked "hi" and "lo." With the connection made to the "lo" terminal, the d.c. voltage delivered to the final amplifier under load will be approximately 600. For normal operation of the T20's, the connection should be made to the "hi" terminal and when so connected will provide approximately 750 volts, which is the normal operating voltage for the T20's.

The remote control socket, which formerly controlled only the B plus lead of unit B, now controls also the a.c. lead to the plate transformer of unit D. If a remote control switch is not employed a shorting plug such as is shown in the diagram should be plugged into the remote control socket.

THE DUAL POWER SUPPLY



BOTTOM VIEW R. F. FINAL



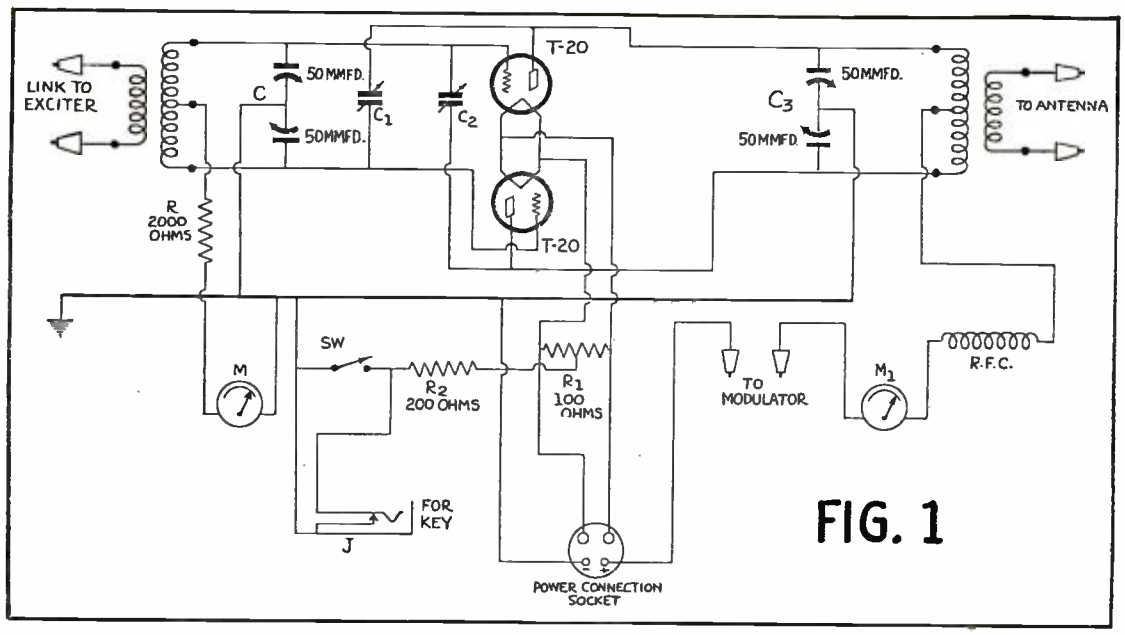


FIG. 1

SCHEMATIC CIRCUIT OF THE T-20 AMPLIFIER

Unit E, the "high"-power T-20 r.f. unit, now occupies the place of honor at the top of the rack in step 3. This is a conventional push-pull stage with a tuned-grid input circuit. This grid circuit is link coupled to the 807 output circuit and therefore occupies the space at the right of the chassis (rear view) directly over the 807 stage. The tuning condenser C of the grid circuit mounts under the chassis, a small bracket holding it in position. An extension shaft places the grid-tuning knob directly under the grid meter on the panel. A toggle switch SW in the filament center tap lead balances the grid tuning knob at the other end of the panel.

The Coils Used

Five type 478J jack type feed-through insulators, spaced an inch apart, mount the plug-in grid coils. Small strips of Victron, each with five type 401 banana plugs, support the individual coils. The 10- and 20-meter grid coils are air wound. Because of their relatively large size the 40- and 80- meter coils are wound on Hammarlund type TCF coil forms with the two ends cut off. These forms are bolted to the Victron strip. The resulting construction is both low-loss and sturdy. The coil photograph illustrates clearly the construction of these coils.

Data on these coil windings will be found in the coil chart; also on a revised 80-meter plate coil for the 807 using this solid type of construction. This latter data is a revision of that given in the coil chart of the first article (December issue).

Condenser Mounting

The neutralizing condensers C1 and C2 are of the familiar disc type, Mycalex insulated. The upper plates are connected to the plate-condenser stators, while the lower plates run to lugs placed under the tops of the end jacks of the grid coil. These latter two leads are, of course, crossed.

The plate-tuning condenser C3 is mounted above the chassis on four type CI-31 insulators. The frame of this condenser should be grounded direct to the chassis from a single point. An extension shaft permits control of this condenser by means of the wheel on the panel. Bushings should be employed to bring both the grid and plate tuning condenser extension shafts through the panel.

The Final Tank

The plate coils for the T20 stage, in contrast to those used in the other circuits, are commercially built, being of the Coto BTVL series. The 10-, 20- and 40-meter coils all hit the bands with the size condenser specified for the plate circuit. The 80-meter coil, however, is too small to hit eighty meters with such a small tuning condenser, this condenser size having been chosen for maximum efficiency on 10 meters rather than 80. Fortunately the standard 160BTVL coil is of the correct size to cover 80 meters in this particular unit. If the rig is to be used extensively for 80-meter phone work it might be preferable to use the standard 80BTVL coil, and increase the tuning capacity of this circuit. This can be done by connecting a Hammarlund type MTC-100-B across the present condenser (stator to stator), switching it out for 10- and 20-meter operation. This extra condenser may be mounted on the panel with stand-off insulators, placing it directly above the present condenser. The shaft of this extra condenser need not be extended through the panel, it being set once so that the 80-meter band may be covered with the main plate tuning condenser.

Antenna Coupling

No antenna tuning equipment is included in this final stage, due to the diversity of antennas employed by the amateurs for various bands. The present variable links on the plate coils should match reasonably well to various untuned two-wire feed lines from 70 to about 500 ohms impedance. Correct adjustment of the link will be indicated when the plate current of the T20's runs 150 ma. at resonance.

For use with antennas requiring tuned feeders a separate antenna unit should be employed, link coupled to the plate tank. Tuned feeders are usually necessary on the lower frequency bands due to the difficulty in finding room at many locations for a half-wave antenna. The type antenna employed and length of feeders will dictate the particular arrangement of antenna coupling required. A single coil of sufficient size, with the number of turns variable by means of a shorting link, plus a pair of variable condensers can usually be made to tune any antenna.

The Antenna Unit

Referring to step 4, as illustrated in the first article, it will be seen that room has been left at the top of the audio rack for an (*Turn to page* 508)

THE DUAL POWER SUPPLY CIRCUIT

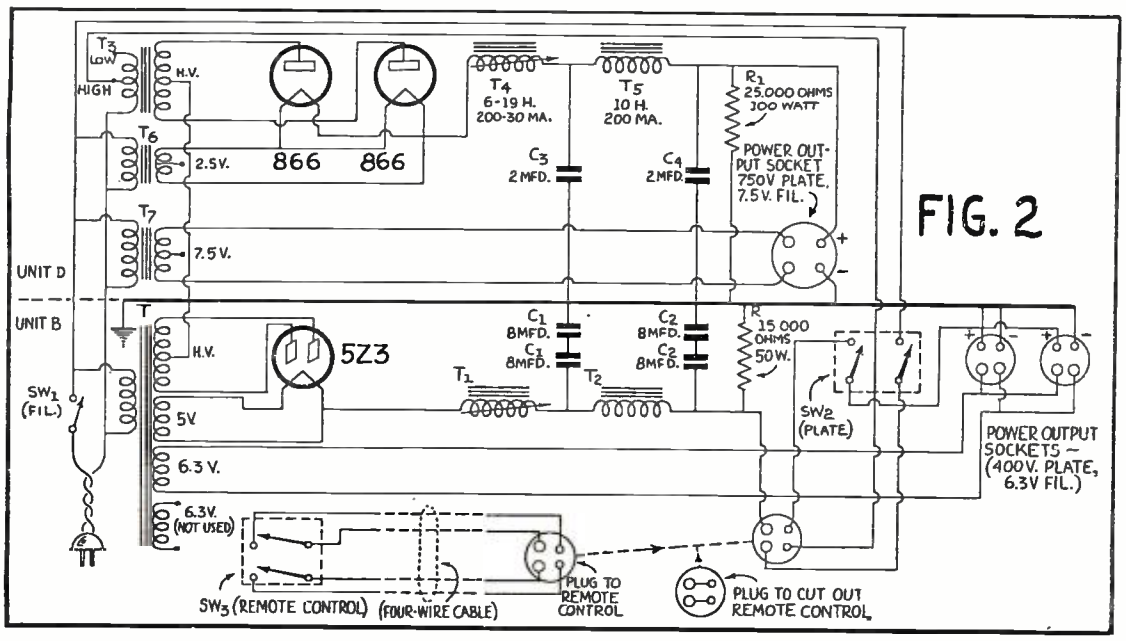


FIG. 2

The RADIO WORKSHOP

Items of interest for beginners, experimenters and radio constructors.

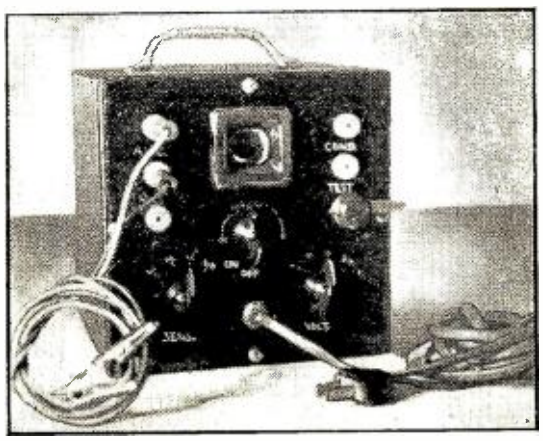
Conducted by William C. Dorf

Several Instruments in One

This instrument can be employed for several testing and measuring applications. It can be used for testing condensers, especially the low-voltage types, for checking automatic volume control circuits, as an output meter, for continuity tests, etc. The circuit consists of a power supply, bleeder resistor, a 6H6 double-diode tube and a 6E5 tuning-indicator tube. The 6E5 tube is connected in the conventional manner, except the grid resistors are made variable and a rheostat is placed in the cathode circuit to control the angle width of the eye. The 6H6 is the rectifier and the bleeder is tapped to provide different operating voltages.

The accompanying diagram and operating photograph shows the circuit and panel layout. To test condensers, adjust the shadow or shaded angle until the angle is zero; then connect the condenser to the binding posts as indicated. Select the proper voltage and press the test button. If the condenser is good, the shadow will open and close once. A leaky condenser will cause the eye to open and close periodically. Whether this indicates a bad condenser depends upon the capacity of the condenser. Large condensers have a slower period than small ones. Testing a number of condensers known to be good will give a basis for determining what the indications will be for leaky condensers of a given capacity. The eye will stay open for a shorted condenser. However, an opened condenser will not show any indication. When the test button is released, the shadow will over-lap which indicates the discharge of the condenser. Inspection of the condenser testing circuit will show that the charging resistors also act as the discharging resistors.

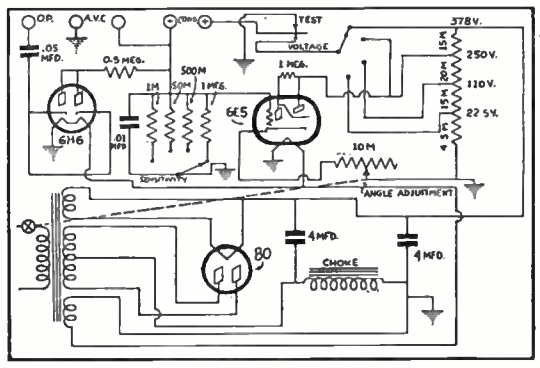
To test electrolytic condensers, the polarities must be observed. Sometimes the eye will not close completely. If the shadow shows about 45 degrees or over, the power factor of the condenser is unsatisfactory for practical use and the condenser should be discarded.



The 2000 ohm resistor is for testing condensers greater than 2 mfd.; for condensers smaller than 2 mfd. the 50,000, 500,000 or 1 megohm resistors can be used, depending upon the capacity of the condenser.

In testing automatic volume control systems the sensitivity switch should be on the 1 megohm resistor. Using the lower values will affect the a.v.c. circuit in the radio set. Any one of the four resistors can be used on the output circuit. The proper resistor will depend upon the output to be measured.

The condenser binding posts can also be used for continuity. The sensitivity will



depend upon the voltage applied and the setting of the sensitivity switch. Many other applications will become apparent to the user as he familiarizes himself with the instrument.

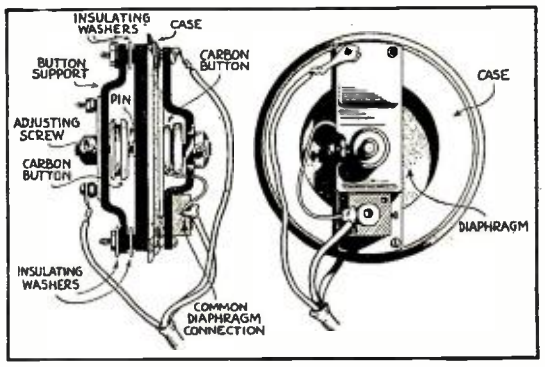
The .01 mfd. condenser across the grid resistors is used to delay the motion of the shadow for testing small condensers. It also acts as a filter, consequently the outline of the angle is more definite when used as an output tester.

NORMAN LEE,
San Francisco, Calif.

Homemade Double-Button Microphone

The double-button microphone, shown in the illustration herewith, is made from two old telephone transmitters. It has proven very successful for voice transmission and has been in use over the past year with a 2A3 type Thordarson amplifier for Bingo game announcements and other affairs. No trouble should be encountered in its construction and there should be no difficulty in obtaining these old phone units. The large mail-order houses stock inexpensive microphone buttons similar to those used in the transmitter.

A reference to the drawing will show the detailed construction of the mike. One transmitter is left intact, the button and support of the other unit is removed from the case and attached to the diaphragm of the mike under construction. The driving pin of the button is securely fastened to the diaphragm by means of nuts which are turned far enough on the pin to allow a short part of the threaded end to extend. Both driving



pins are then connected by a dual nut which is made by taking nuts that will fit the driving pins and soldering them together, back to back. The original diaphragm in the microphone is rather heavy and it may be found advisable to make a lighter unit from a piece of aluminum.

The microphone button supports are fastened to the hard rubber case by means of machine screws, but care must be taken to insulate the supports from each other. To accommodate these screws, holes are drilled through the case and the bolts passed through, allowing the distance from the diaphragm to the microphone button and support to be regulated by locking nuts on the screws. This makes the connection of the driving pins easier.

A rubber gasket is used for damping the microphone diaphragm. Be sure that the carbon granules are in good condition as excessive current will cause them to pack tightly. The buttons can be taken apart and repacked with new carbon granules. They should be adjusted so that the current flowing through them does not differ by more than 5 or 6 mills.

P. M. OHLINGER
Portsmouth, Iowa

An Idea for the "Hams"

Inexpensive neon-sign stand-off insulators have been successfully used for mounting transmission lines, lead-ins, and in some cases for mounting parts on the transmitter. These insulators are obtainable in various heights from approximately 1 to 4 inches. Some types can be adjusted for height and other styles have tricky mountings which permit the insulators to be turned at various angles

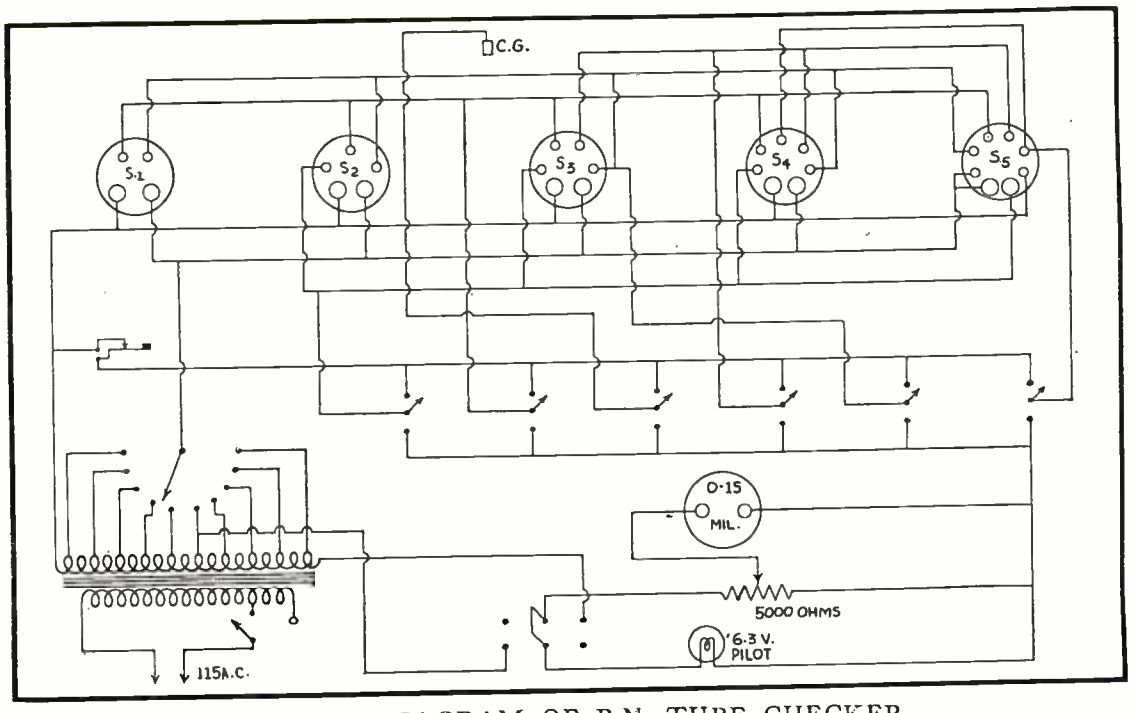
and otherwise adjusted. These insulators can be obtained from a neon-sign dealer.

Modernizing the R. N. Tube Checker

Recently I completed building the Radio News tube tester originally described in the July 1934 issue of the magazine. In order to bring this instrument up-to-date so that it can test the octal base tubes that have been produced since the advent of this instrument, I made the following simple revisions which I am sure will be of interest to the readers who have built this checker and also experimenters who are in need of such an instrument.

The original current measuring circuit used an 0 to 50 ma. meter with a s.p.d.t. push-button switch and two resistors, one a shunt and the other a multiplier. Instead of this system, I am employing an 0 to 15 ma. meter that I had on hand, with a 5000-ohm wire-wound volume control as a variable shunt. To test different tubes the shunt is set at various points according to a chart made up from a set of good tubes. The reading of the tube under test is then compared with that on the chart to determine its condition. To adapt the tester for octal base type tubes it is not necessary to add any switches; simply include the additional octal socket as shown. The panel layout has been changed slightly from the original design. For those who are building the tester for the first time, it is advisable to wire the sockets and the switch bank first and be sure to wire the filament transformer and filament switch together before placing them on the panel. The whole outfit cost less than $6.00 and it has proven very successful.

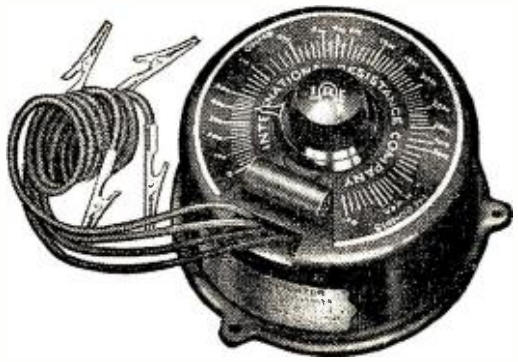
J. TOSSE,
Minneapolis, Minn.



CIRCUIT DIAGRAM OF R.N. TUBE CHECKER

Utility Instrument for Servicemen and Experimenters

The new IRC resistance analyzer and indicator with a direct-reading calibrated dial is continuously variable from 0 to 1.0 megohm. Among its many uses are: voltmeter multiplier, resistance or volume control analyzer for the measurement and determination of resistance values by either substitution or voltage measurement method, determination of the proper control or resistance value for best results in almost any radio circuit, etc. etc. A complete instruction manual prepared by IRC engineers and furnished with each instrument gives detailed information as to its use in a wide variety of work. The analyzer is controlled by a single knob. Electrically, it consists of two sections, the first comprising a heavy duty, wire wound rheostat type element from 0 to 30,000 ohms. The second section is a specially designed metallized type resistance element similar to that employed in IRC metallized type volume controls. Its range is from 30,000 ohms to 1 megohm.

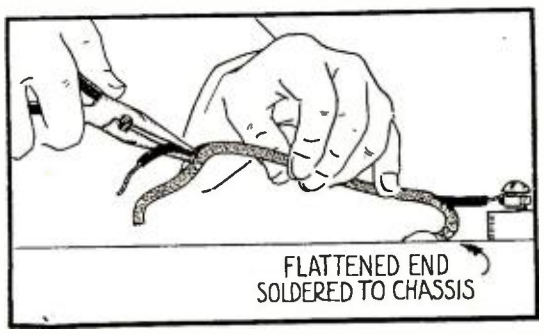


Hints on Shielded Wire

Here are a couple of practical kinks on fastening shielded wire, which should prove useful to the serviceman as well as the experimenter who builds his own.

Shielded wire used in most factory sets simply runs from terminal to terminal with the shielding pushed back or cut back to prevent grounding the terminal. The shield is then soldered to the chassis, and this is not an easy job, as it is made difficult by the fact that this method does not provide a great deal of overhanging shielding for fastening and then there is the closeness of the rubber insulated wire with the heat from the hot iron damaging the insulation. If the heat does not ruin the insulation it may open it and create a condition where leakage or breakdown could occur in the future.

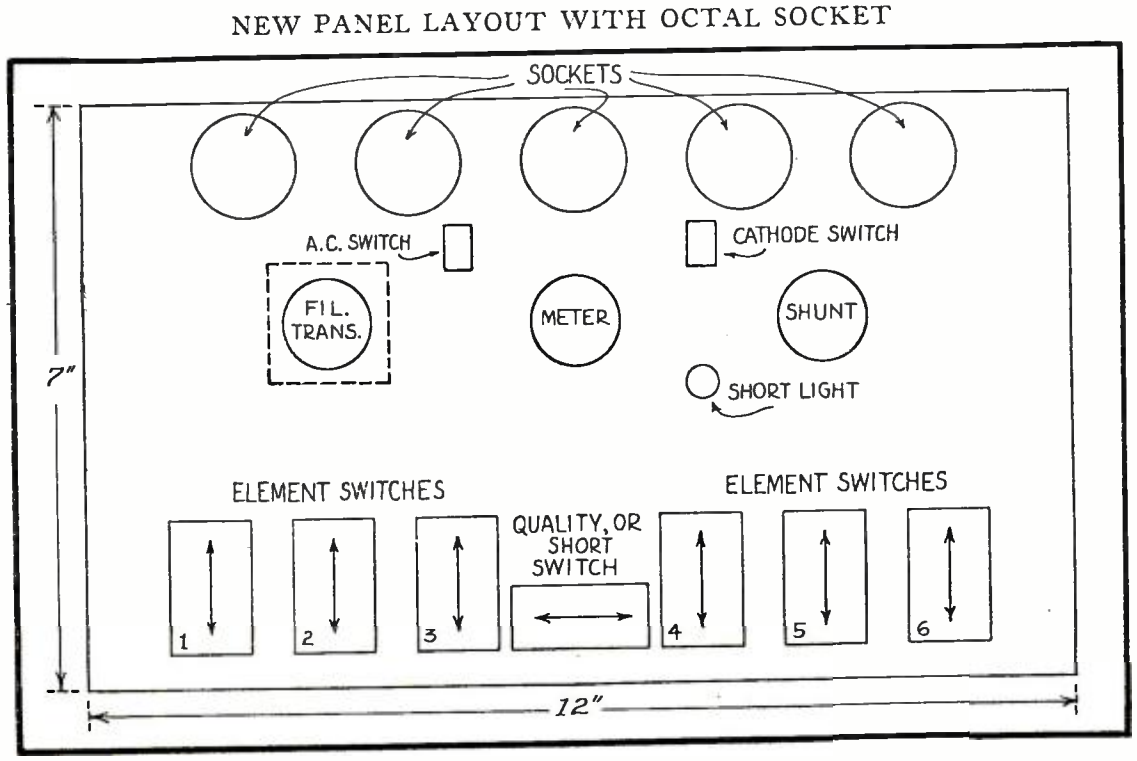
I accomplished the job of fastening the shielding in an easier and better way, in the following manner.



Simply cut the wire to the length needed, then punch a hole through the shield an inch or two from the end with a sharp punch or ice pick. Shove in the points of your needle-nose pliers and pull out the wire as illustrated in the drawing. The use of the pliers will enlarge the hole to about twice the size of the wire inside the shield. Flatten that portion of the

(*Turn to page* 512)

NEW PANEL LAYOUT WITH OCTAL SOCKET



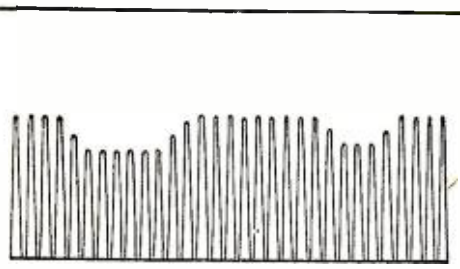


FIG. 11

FIG. 10

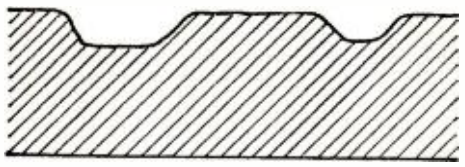


FIG. 12

Practical Lessons in TELEVISION

(Lesson Two: Receiving a Picture—Scanning)

Start This Series Now!

IN Lesson One was described the method of transmitting a picture facsimile by the telephoto method. This lesson describes a telephoto method of receiving a picture and then goes on to the principles of consecutive scanning used in television. Radio experimenters, service men, and amateurs should follow this series of lessons carefully, as it will give them a clear understanding of the technique employed in television. This new art which is now starting to blossom out in America will have wide application as soon as the experimenter begins to awake more active interest and take part in the experiments.

By F. L. Sprayberry

WE have now completed the study of the facsimile transmission apparatus and are ready to inspect the receiving equipment. All of the equipment described up to the amplifier input may be regarded as a sort of "microphone" which translates picture tone values into an electrical equivalent.

The picture signal that we have in Lesson 1 arrives on wire lines at the receiving equipment at the input of an audio amplifier to compensate for the loss it may have experienced during transit and the same type of band-pass filter is used (1200-2600 cycles) followed by a rectifier-detector system. Any type of detector might be used which would result in the true reproduction of the original picture component. With a diode detector, the original signal current wave would look graphically as in Figure 10 before detection, and as in Figure 11 after detection. This detected wave is, of course, filtered to eliminate the 2400 cycle pulses allowing the picture component as in Figure 12 to remain.

The apparatus shown in Figure 13 is used for the reception of the picture or rather the "synthetic" assembling or reconstruction of the picture from the received signal. This apparatus is strikingly like the transmitting apparatus. The rectified picture signal is fed to a single-reed, light-gate or valve and the intensity of current moves this reed in front of an aperture allowing more or less light to pass through it.

The picture receiving cylinder or drum carries a regular photographic sensitive paper and in turning under the light beam is more or less exposed to the light. In the complete system from transmitter to receiver every grade or tone value of the original picture is translated into corresponding current intensity values, which are in turn translated into corresponding exposure values on the receiving sensitive paper so that an exact reproduction of the original picture is possible.

Obviously both the transmitting and receiving cylinders must be driven at precisely the same speed so that the reproduced picture will be an exact duplicate of the transmitted one. The speeds of the two cylinders are kept identical, independently, by means of precisely designed and adjusted apparatus for motor speed control.

The time required to transmit one picture with this equipment is determined by the length of the picture along the cylinder. It can scan the picture at the rate of 1 inch-per-minute along the cylinder axis—a 14 inch maximum size picture requiring 14 minutes for transmission.

In the preceding explanation we have given a complete system for translating any picture into an electrical signal and then reconstructing the picture again at a receiving point. This was explained in detail so that we will have a basis on which all of television is constructed—*a picture or scene being dissected into small areas for transmission*. Each of these areas has a tone or grade value between

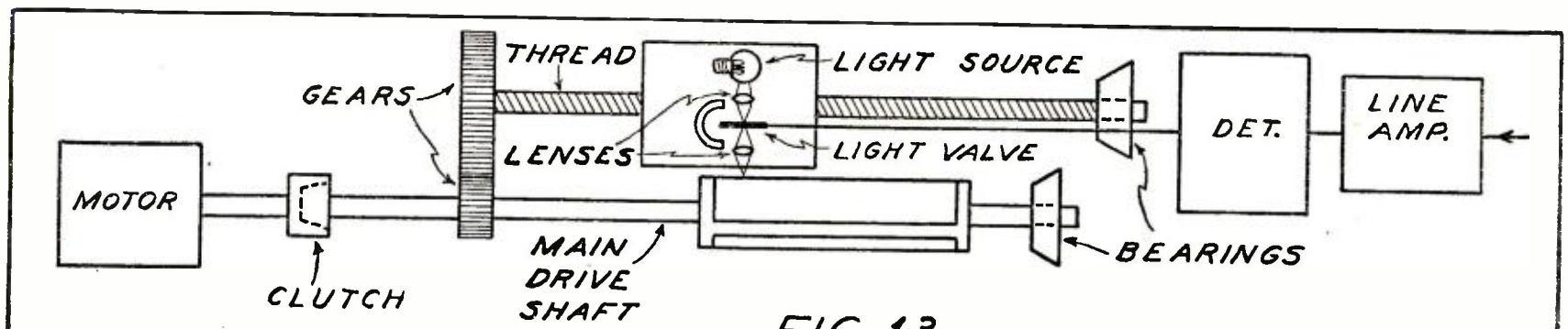


FIG. 13.

and including black and white and each individual area has an average tone value which must be uniform throughout. It should be obvious that the smaller this "elementary area" the greater will be the detail of the picture.

When printed in a half-tone a picture must consist of a group of elementary areas in a complete mosaic of the picture. There is no way to control the tone of ink as it is pressed on the paper. It will always print its complete density or full value, such as for black ink it will make the paper completely black where it touches. For this reason, to obtain variations in tone value for a picture, the size of each dot of ink must vary in accordance with the tone value of the picture. You can notice this in any newspaper or other half-tone.

Television consists in dissecting pictures very rapidly and in rapid succession, and reconstructing them in very much the same general manner as described. We can imagine the new problems which will be involved when we attempt to dissect a picture ordinarily requiring up to 14 minutes at the rate of 24 complete pictures per second!

The Flying Disc

It is quite natural that television should at first grow out of the Nipkow mechanical system. In television, we have no permanent copy of the pictures being transmitted and hence we must look at it as it is being transmitted and received. For this reason, the picture must be received or reconstructed on a flat or nearly-flat surface.

By means of appropriate apparatus we can project any subject, picture, or film on a flat surface and then rapidly dissect this surface by means of picking up grades or tones of illumination to be transmitted as equivalent electrical impulses. This may be done by a simple mechanical system as diagramed in Figure 14. An object "A" is placed in a flood lit area and a lens "B" is used to converge reflected rays from the object onto a circular disc called a Nipkow disc in honor of its inventor. This disc is usually made of aluminum and is about 2 ft. 6 inches in diameter. The disc is solid $\frac{1}{16}$ inch aluminum except for a series of "pin holes" approximately .04 inch in diameter in regular order about the edge of the disc. There are exactly 60 holes in this disc and they are usually spaced around the circumference of the disc —one every 6 degrees or 1½ inches. Rather than being on the same circle about the disc, each hole is displaced along the radius of the disc by almost its diameter. A path along the disc connecting the holes would therefore form a spiral—not a circle.

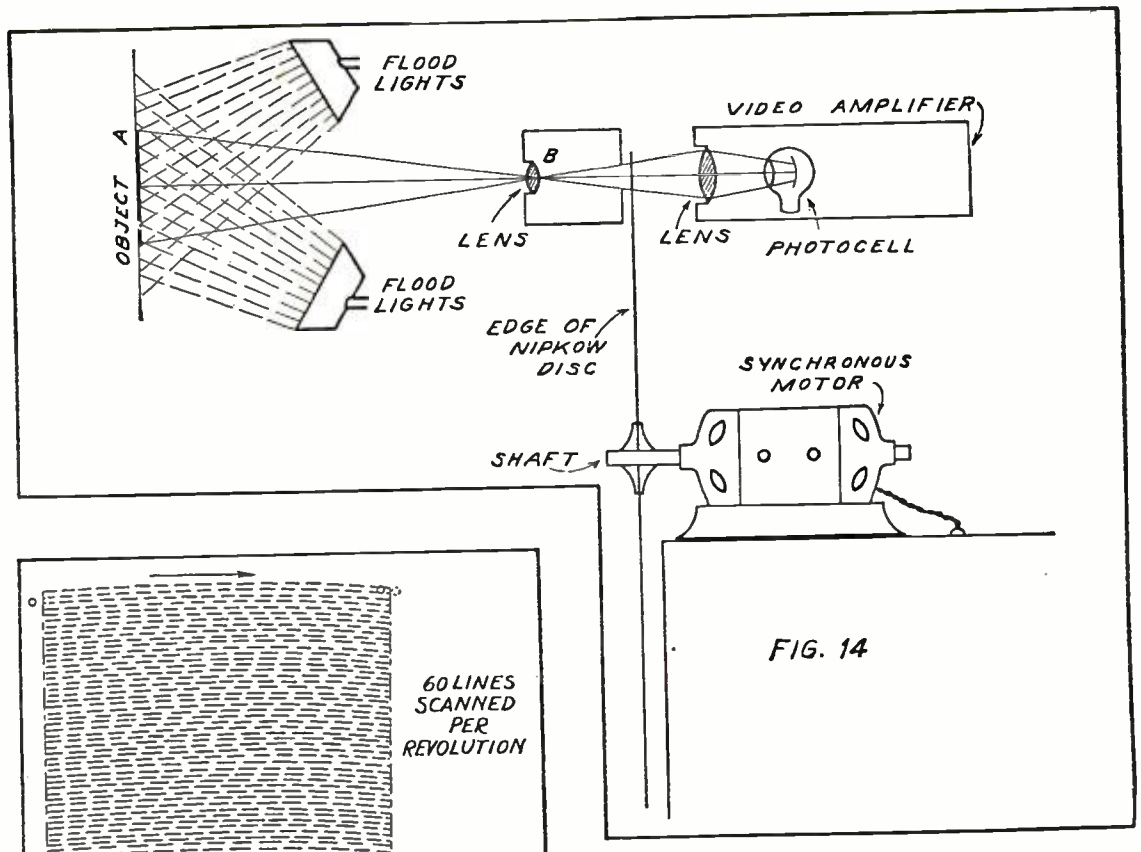


FIG. 14

FIG. 17

Disc Details

A detailed view of the entire disc is shown in Figure 15 and a magnified view of a section of it is shown in Figure 16. Here a section of the top portion of the disc is shown where the two ends of the spiral pattern formed by the holes come together. The approximate rectangle shown in dotted lines is the area covered by the holes in one revolution of the disc, one hole at a time.

How It Works

To magnify this situation still more as in Figure 17, we have the actual paths traced by each hole starting from the top of the area. The disc is moving to the right—clockwise—and we see the first hole just about to emerge from the right side while the next one to the left of the area is just about to enter the area. In moving just a small fraction until they are in the positions shown in the dotted circles, the first one has left the area and the second one has just entered. When this one has moved across the area describing an arc, as indicated by the dotted line, a third one enters the area. At no time is there more than one hole in the arc and in succession they cover the entire area in one revolution of the disc.

Now the paths of the holes are made to slightly overlap so that the area between two holes will be covered with adequate illumination. If we assumed each hole to stop at the exact top of the area these relative positions would look as in Figure 18. The holes being .025 inch in diameter with only .02 inch between their centers, they will overlap somewhat as shown. This greatly enlarged view shows just how the holes overlap each other.

So that the angle at which the light approaches the holes may not be critical they are "beveled" as shown by the greatly enlarged view of a section through the disc at Figure 19. The holes are so small that they prac-

(*Turn to next page*)

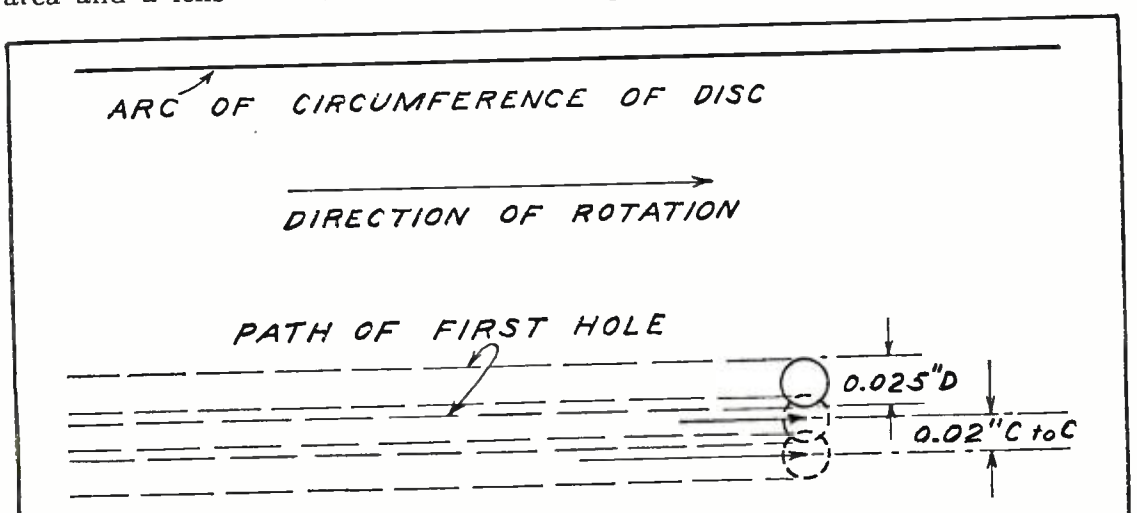


FIG. 18

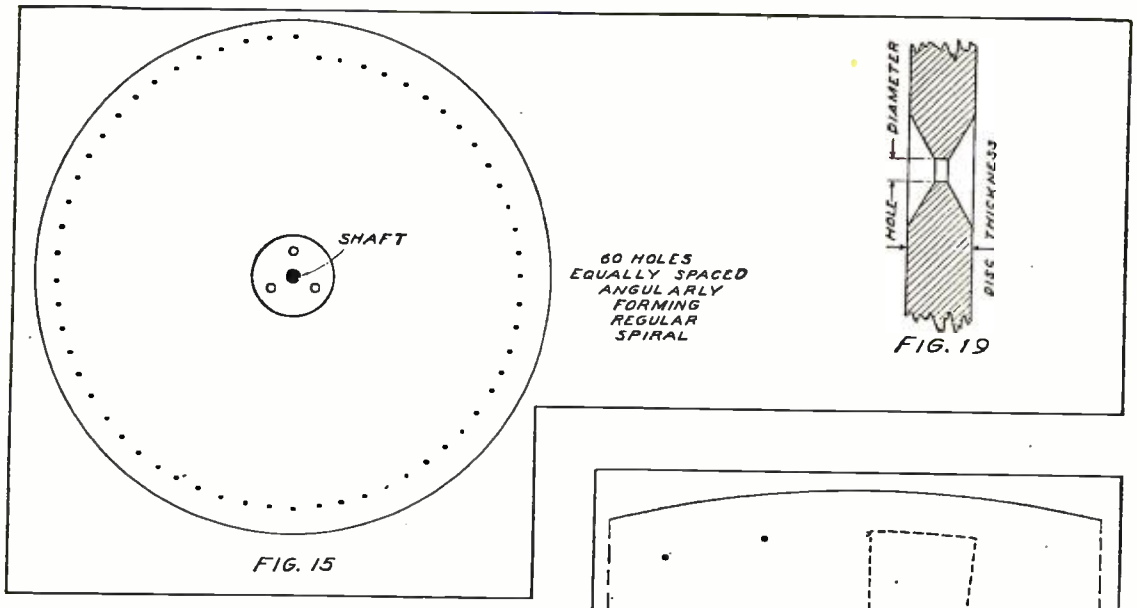


FIG. 15 FIG. 19

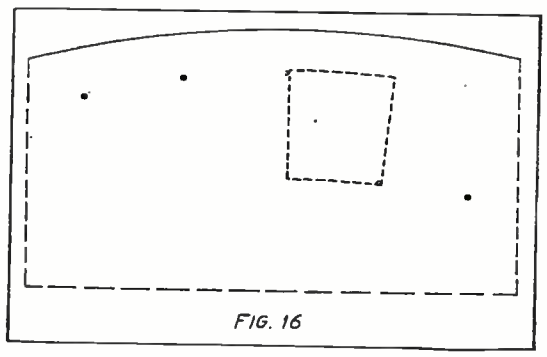


FIG. 16

tically form a tube in the disc of some length. Thus if the light approaches the disc at an angle only slightly off of the perpendicular, much of it will be cut off. In looking through a gun barrel or mailing tube we must allow the light to come straight to our eyes. However, light from a picture must come from various directions because of the size of its area and hence the holes in the disc must be beveled.

Lens Projects Image

Again referring to Figure 14, let us assume that the disc is driven at 15 revolutions per second by means of a "direct drive" synchronous motor.

The object is projected on the disc by means of the first lens to the left, and as the holes pass through the projected area, they allow light to pass through, corresponding exactly to the amount of light falling on the disc. Thus light values will be projected onto the photo-cell cathode and a current flow corresponding to this light intensity will flow.

For each picture in one revolution of the disc, the light from only one hole at a time is projected onto the disc and the changes of light value across the picture for each of the 60 lines or arcs down the picture will be simulated by changes in current flow in the photo-cell. Instead of the light traveling slowly across the picture, we have the aperture through which the light is reflected, passing very rapidly through the projected area allowing only one spot at a time to fall on the photo-cell.

Picture Elements

The width of the picture area is 1½ inches—corresponding to about 60 diameters of the holes considering the overlapping—giving the opportunity of changing the amount of light this many times for each scanned arc across the projected image. If the picture detail required more light changes in this space, the light value would be forced to vary before the hole moved its own diameter. This would destroy its original light value as the photo-cell may only respond to one light value at a time. This, therefore, limits the maximum detail obtainable across the picture. In a given space in a half-tone print we have an opportunity to place only one dot of the correct size and the diameter or area of this space limits the detail of the picture. As we go down the picture we have only 60 opportunities to perform this action, making a total of 60 across times 60 down or 3600 in all. The light may not change more than this number of times and still be effective on the photo-cell for one revolution of the disc on one picture. In rotating 15 times per second the whole process must be repeated this many times. This means that for one second, there can be a total number of effective light intensity variations amounting to 3600 x 15 or 54,000. Although the photo-cell can respond completely to many more changes in light value than this per second, let us investigate just why this would serve no purpose in this case.

Drawing your attention to Figure 20, where we have a greatly enlarged view of the flying disc apertures and picture segments for study, note that at A the picture line contains such detail that several dark and light spaces are projected on the aperture at one time. The photo-cell cannot respond to these individual light areas as it will pick up only the average light from the entire area of the aperture. Thus in passing over this section as a new dark area enters, another dark area leaves, and as a light area enters, another light area leaves, making the average light value practically constant. In fact, a graph of the percentage of available light from the entire aperture would be a slightly wavy line due to only a small increase or decrease in total light as the aperture travels across this picture section. This is shown A1.

Picture Detail

Now at B the picture gradation or detail is less, the dark and light spaces being more widely separated. As the aperture passes over this section, the dark space practically cuts off the light, while in a light space the light may come through practically 100%. Thus for less actual picture detail the system can respond much more fully. Note that at B1 where this light percentage is plotted, the variations are complete from zero to 100% of the available light.

Best Conditions

Any less detail than this, such as at C, will be picked up in the same way—that is, a maximum amount of light variation will be produced. This is why any amount of detail above 60 areas across the picture area will be increasingly less effective on the photo-cell. (*Turn to page* 497)

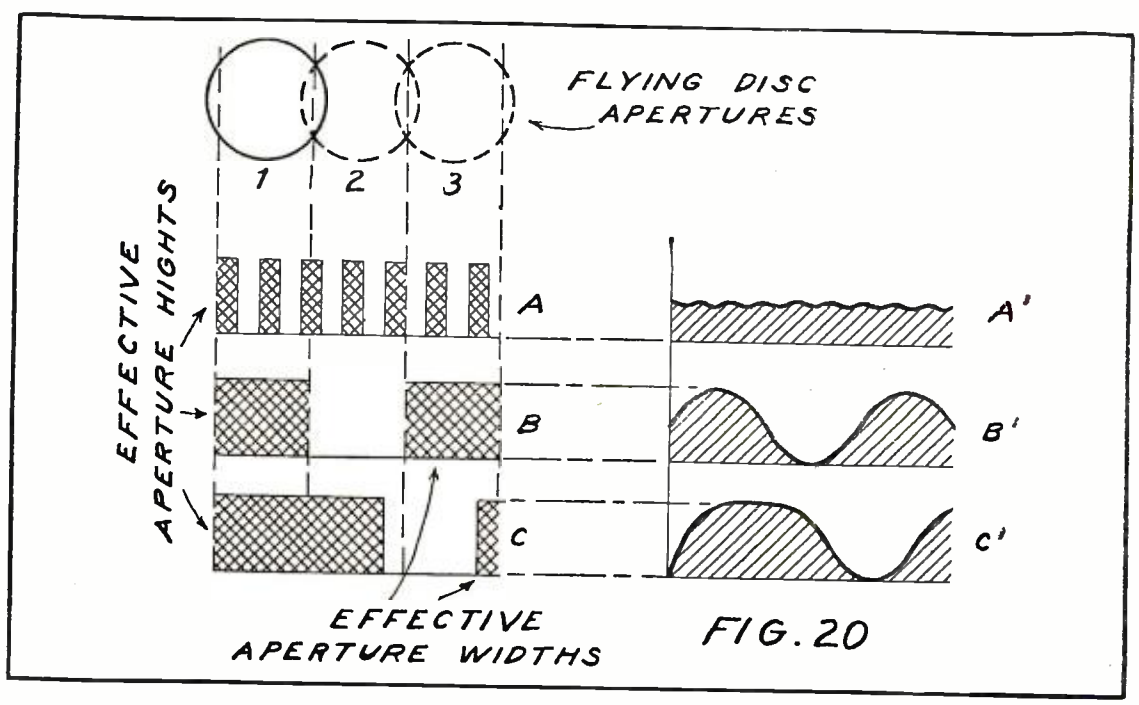
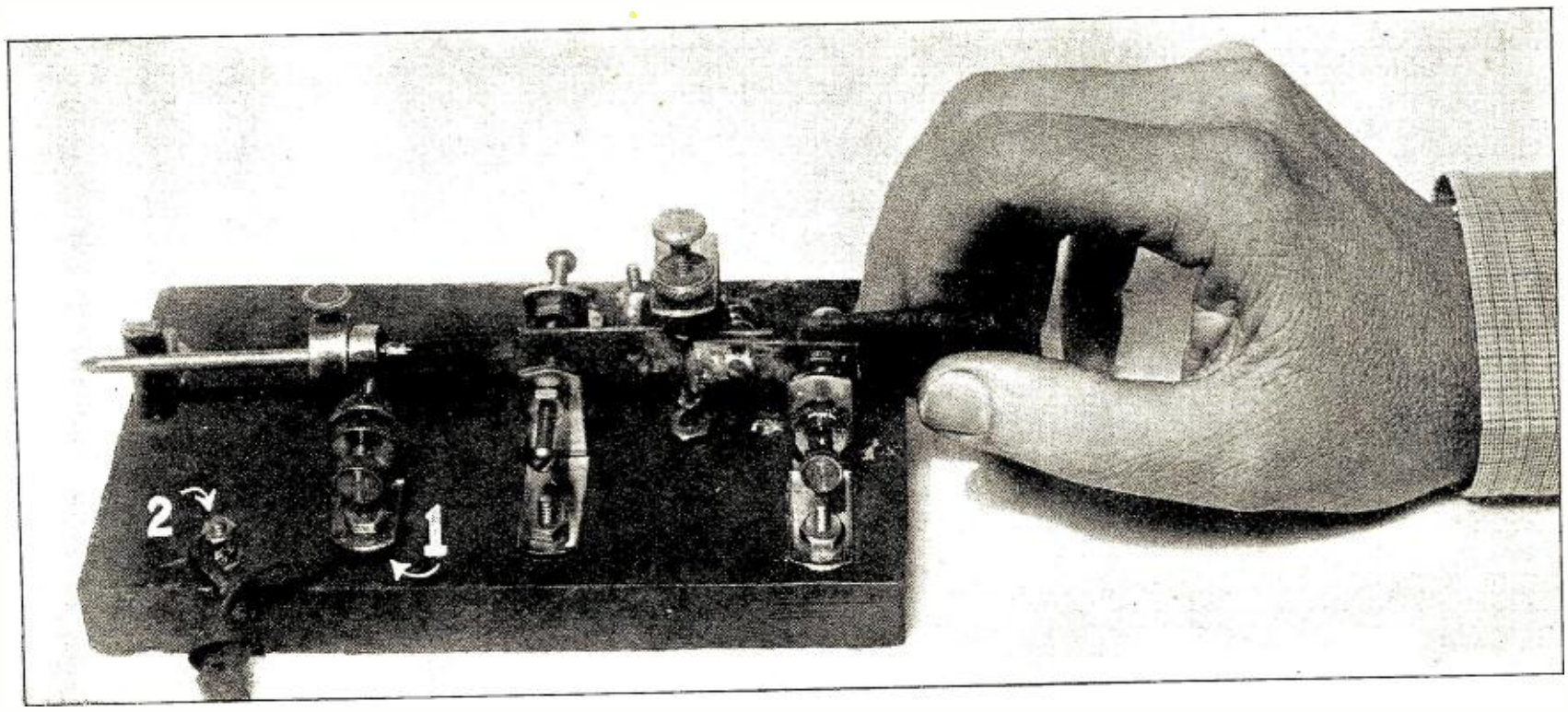


FIG. 20



Build Your Own

SPEED KEY

(Construction Details)

IT has been my experience that there are many "Hams" who would like to try their fist with an automatic speed key, but hesitate because they are not sure that they could acquire that certain rhythmic style of operation, which the speed artists say you have to be born with, in order to successfully operate this type of transmitting key. Any amateur after a little practice can catch on to the fine points for correct operation. Constant practice and the mechanical design of this type of key are the combination that makes for tireless rhythmic keying.

By W2EAF

PRESENTED herewith are complete constructional details for making a home-made automatic speed key that any amateur can put together within a couple hours' time. Besides its professional appearance it offers a number of features that will be obvious to the new man who has just received his ticket and the experienced amateur. The total cost of parts for constructing this key comes to less than $2.00. It may look difficult at first to assemble, but it is really simple. Besides the will to do the job, the only tools you need are a screwdriver, pair of pliers, hacksaw, and soldering iron. The major parts of hardware used in the instrument consist of inexpensive brass angles and machine screws. A couple of nails, some improvised hardware, and the U band contactor, collar and weight, which are obtainable from any telegrapher's accessory store, comprise the remaining parts of the instrument.

Wooden Base

The first thing to do is to prepare the wooden base, the measurements of which are 3½ inches wide by 6⅜ inches long by ¾ inch thick. This wooden stand or base can be made from a good grade of pine, white wood or a piece of hardwood. The latter wood will provide a better appearance and more solid base. There are nine holes to be drilled in the base, all of them to take a 6/32 machine screw. For this job use a No. 27 bit which will make a slightly oversize hole but it will simplify mounting the various parts. When the drilling job is completed, sandpaper the block and give it a couple of coats of black enamel paint. The layout of the holes can be approximated from the illustration. The only precaution to follow when spotting the holes is to be sure that the contact and adjustment posts are in line with the suspension assembly.

For clarification the terms given to the different mountings, adjustment screws, dash and dot contacts etc., are outlined here in the order of their mounting. First there is the key or handle, then the key bar made up of a piece of brass bar or band, a small piece of hacksaw blade and a nail. The first mounting on the left is the dash contactor. The two 1-inch angles, fastened together and mounted on the right side of the instrument, comprise part of the suspension assembly, set into this mounting is the suspension pin. Following this is a spring, then the two angles with their adjusting screws for the key bar stops. Then on the left there is the dot contactor post, then a binding post and at the end of the block mounted in the center is the governor control post. The remaining parts consist of the U band contactor, collar and speed weight.

Assembly Details

As mentioned previously, cheap brass angles are used for mounting the various parts. There are five angles 1 by 1 inch, and one angle ¾ by ¾ inch. These angles are obtainable from any 5 and 10 cent store. The governor post mounted at the end of the stand is cut and bent from a piece of $\frac{1}{16}$ inch brass rod. This angle is ¼ inch wide, 1 inch high with a ½ inch base.

A leather insert is pressed and glued on the side of this angle as shown in the (*Turn to page* 511)

BROADCASTING STATIONS IN THE U. S.

Alphabetically by Call Letters, Location, Frequency and Power

Compiled by John M. Borst

Call	Location	Kc.	Kw.
KABC	San Antonio, Texas	1420	0.1-0.25
KABR	Aberdeen, S. Dak.	1420	0.1
KADA	Ada, Okla.	1200	0.1
KALB	*Alexandria, La. (0.25 kw. day)	1210	0.1
KALE	Portland, Oregon	1300	0.5
KAND	Corsicana, Texas	1310	0.1
KANS	Wichita, Kansas	1210	0.1
KARK	Little Rock, Ark.	890	0.5-1.0
KARM	Fresno, Calif. (C.P.)	1310	0.1
KASA	Elk City, Okla.	1210	0.1
KAST	Astoria, Oregon	1370	0.1
KATE	Albert Lea, Minn. (C.P.)	1420	0.25
KAWM	Gallup, N. Mexico	1500	0.1
KBIX	Muskogee, Okla.	1500	0.1
KBPS	Portland, Oregon	1420	0.1
KBST	Big Spring, Texas	1500	0.1
KBTM	Jonesboro, Ark.	1200	0.1
KCKN	Kansas City, Kansas	1310	0.1
KCMC	Texarkana, Texas	1420	0.1-0.25
KCMO	Kansas City, Mo.	1370	0.1
KCRC	Enid, Okla.	1360	0.25
KCRJ	*Jerome, Arizona (0.25 kw. day)	1310	0.1
KDAL	Duluth, Minn.	1500	0.1
KDB	Santa Barbara, Calif.	1500	0.1-0.25
KDFN	Casper, Wyo.	1440	0.5
KDKA	Pittsburgh, Pa.	980	50.0
KDLR	Devils Lake, N. Dak.	1210	0.1
KDNC	Lewistown, Mont. (C.P.)	1200	0.1-0.25
KDON	Monterey, Calif.	1210	0.1
KDTH	Dubuque, Iowa (C.P.)	1340	0.5
KDYL	*Salt Lake City, Utah (5.0 kw. day)	1290	1.0
KECA	Los Angeles, Calif.	1430	1.0-5.0
KEEN	Seattle, Wash.	1370	0.1
KEHE	Los Angeles, Calif.	780	1.0-5.0
KELA	Centralia, Wash. (C.P.)	1440	0.5
KELD	N. of Eldorado, Ark.	1370	0.1
KELO	Sioux Falls, S. Dak.	1200	0.1
KERN	Bakersfield, Calif.	1370	0.1
KEUB	Price, Utah	1420	0.1
KEX	Portland, Oregon	1180	5.0
KFAB	Lincoln, Nebr.	770	10.0
KFAC	Los Angeles, Calif.	1300	1.0
KFAM	St. Cloud, Minn. (C.P.)	1420	0.1
KFBB	Great Falls, Mont.	1280	1.0-5.0
KFBI	Abilene, Kansas	1050	5.0
KFBK	*Sacramento, Calif. (10.0 kw.)	1490	5.0
KFDM	Beaumont, Texas	560	0.5-1.0
KFDY	Brookings, S. Dak.	780	1.0
KFEL	Denver, Colo.	920	0.5
KFEQ	St. Joseph, Mo.	680	2.5
KFGQ	Boone, Iowa	1370	0.1
KFH	Wichita, Kansas	1300	1.0-5.0
KFI	Los Angeles, Calif.	640	50.0
KFIO	Spokane, Wash.	1120	0.1
KFIZ	Fond du Lac, Wisc.	1420	0.1
KFJB	Marshalltown, Iowa	1200	0.1-0.25
KFJI	Klamath Falls, Oregon	1210	0.1
KFJM	Grand Forks, N. Dak.	1410	0.5-1.0
KFJZ	Fort Worth, Texas	1370	0.1-0.25
KFKA	Greeley, Colo.	880	0.5-1.0
KFKU	Lawrence, Kansas	1220	1.0-5.0
KFNF	Shenandoah, Iowa	890	0.5-1.0
KFOR	Lincoln, Nebr.	1210	0.1-0.25
KFOX	*Long Beach, Calif. (5.0 kw. day)	1250	1.0
KFPL	Doublin, Texas	1310	0.1-0.25
KFPW	Ft. Smith, Ark.	1210	0.1
KFPY	Spokane, Wash.	890	1.0-5.0
KFQD	Anchorage, Alaska	780	0.25
KFRC	San Francisco, Calif.	610	1.0-5.0
KFRO	Longview, Texas	1370	0.1-0.25
KFRU	Columbia, Mo.	630	0.5-1.0
KFSD	San Diego, Calif.	600	1.0
KFSG	Los Angeles, Calif.	1120	0.5-2.5
KFUO	Clayton, Mo.	550	0.5-1.0
KFVD	Los Angeles, Calif.	1000	1.0
KFVS	Cape Girardeau, Mo.	1210	0.1-0.25
KFWB	Hollywood, Calif.	950	1.0-5.0
KFXD	Nampa, Idaho	1200	0.1-0.25
KFXJ	Grand Junction, Colo.	1200	0.1-0.25
KFXM	San Bernardino, Calif.	1210	0.1
KFXR	Oklahoma City, Okla.	1310	0.1-0.25
KFYO	Lubbock, Texas	1310	0.1-0.25
KFYR	Bismarck, N. Dak.	550	1.0-5.0
KGA	Spokane, Wash.	1470	5.0
KGAR	Tucson, Ariz.	1370	0.1-0.25
KGB	San Diego, Calif.	1330	1.0
KGBU	*Ketchikan, Alaska (1.0 kw.)	900	0.5
KGBX	Springfield, Mo.	1230	0.5
KGCA	Decorah, Iowa	1270	0.1
KGCI	Coeur d'Alene, Id. (C.P.)	1200	0.1
KGCU	Mandan, N. Dak.	1240	0.25
KGCX	Wolf Point, Mont.	1450	1.0
KGDE	Fergus Falls, Minn.	1200	0.1-0.25
KGDM	Stockton, Calif.	1100	1.0
KGDY	Huron, S. Dak.	1340	0.25
KGEK	Sterling, Colo.	1200	0.1
KGER	Long Beach, Calif.	1360	1.0
KGEZ	Kalispell, Mont.	1310	0.1
KGFF	Shawnee, Okla.	1420	0.1-0.25
KGFI	Brownsville, Texas	1500	0.1-0.25
KGFJ	Los Angeles, Calif.	1200	0.1
KGFL	Boswell, N. Mexico	1370	0.1
KGFW	Kearney, Nebr.	1310	0.1-0.25
KGFX	Pierre, S. Dak.	630	0.2
KGGC	San Francisco, Calif.	1420	0.1
KGGF	Coffeyville, Kansas	1010	1.0
KGGM	Albuquerque, N. Mexico	1230	1.0
KGHF	Pueblo, Colo.	1320	0.5
KGHI	Little Rock, Ark.	1200	0.1-0.25
KGHL	Billings, Mont.	780	1.0-5.0
KGIR	Butte, Mont.	1340	1.0-2.5
KGIW	Alamosa, Colo.	1420	0.1
KGKB	Tyler, Texas	1500	0.1-0.25
KGKL	San Angelo, Texas	1370	0.1-0.25
KGKO	Wichita Falls, Texas	570	0.25-1.5
KGKY	Scottsbluff, Nebr.	1500	0.1-0.20
KGLO	Mason City, Iowa	1210	0.1-0.25
GNMB	Honolulu, Hawaii	1320	1.0
KGNC	Amarillo, Texas	1410	1.0-2.5
KGF	North Platte, Nebr.	1430	1.0
KGNO	Dodge City, Kansas	1340	0.25
KGO	San Francisco, Calif.	790	7.5
KGU	Honolulu, Hawaii	750	2.5
KGVL	Greenville, Texas (C.P.)	1200	0.1
KGVO	Missoula, Mont.	1260	1.0
KGW	Portland, Oregon	620	1.0-5.0
KGY	Olympia, Wash.	1210	0.1
KHBC	Hilo, Hawaii	1400	0.25
KHBG	Okmulgee, Okla. (C.P.)	1210	0.1
KHJ	Los Angeles, Calif.	900	1.0-5.0
KHQ	Spokane, Wash.	590	1.0-5.0
KHSL	Chico, Calif.	1260	0.25
KHUB	Watsonville, Calif.	1310	0.25
KICA	Clovis, N. Mexico	1370	0.1
KID	*Idaho Falls, Idaho (5.0 kw. day)	1320	0.5-1.0
KIDO	*Boise, Idaho (5.0 kw. day)	1350	1.0-2.5
KIDW	Lamar, Colo.	1420	0.1
KIEM	*Eureka, Calif. (1.0 kw. day)	1450	0.5
KIEV	Glendale, Calif.	850	0.25
KINY	*Juneau, Alaska (1430 kc. 0.25 kw.)	1310	0.1
KIRO	**Seattle, Wash. (710 kc. 1.0 kw.)	650	0.25
KIT	*Yakima, Wash. (1250 kc. 0.25 kw.-0.5 kw.)	1310	0.1-0.25
KIUL	Garden City, Kansas	1210	0.1
KIUN	Pecos, Texas	1420	0.1
KIUP	Durango, Colo.	1370	0.1
KJBS	San Francisco, Calif.	1070	0.5
KJR	Seattle, Wash.	970	5.0
KLAH	Carlsbad, N. Mexico	1210	0.1
KLBM	LaGrande, Oregon (C.P.)	1420	0.1-0.25
KLCN	Blytheville, Ark.	1290	0.1
KLO	Ogden, Utah	1400	0.5
KLPM	*Minot, N. Dak. (1360 kc. 0.5 kw. 1.0 kw.)	1240	0.25
KLRA	Little Rock, Ark.	1390	1.0-5.0
KLS	Oakland, Calif.	1280	0.25
KLUF	Galveston, Texas	1370	0.1
KLX	Oakland, Calif.	880	1.0
KLZ	Denver, Colo.	560	1.0-5.0
KMA	Shenandoah, Iowa	930	1.0-5.0
KMAC	San Antonio, Texas	1370	0.1-0.25
KMBC	Kansas City, Mo.	950	1.0-5.0
KMED	Medford, Oregon	1410	0.25
KMJ	Fresno, Calif.	580	1.0
KMLB	Monroe, La.	1200	0.1-0.25
KMMJ	Clay Center, Nebr.	740	1.0
KMO	Tacoma, Wash.	1330	1.0
KMOX	St. Louis, Mo.	1090	50.0
KMPC	Beverly Hills, Calif.	710	0.5
KMTR	Los Angeles, Calif.	570	1.0
KNEL	Brady, Texas	1500	0.1-0.25
KNET	Palestine, Texas	1420	0.1
KNOW	Austin, Texas	1500	0.1
KNX	Los Angeles, Calif. (C.P.)	1050	50.0
KOA	Denver, Colo.	830	50.0
KOAC	Corvallis, Oregon	550	1.0
KOAM	Pittsburg, Kansas (C.P.)	790	1.0
KOB	Albuquerque, N. Mex.	1180	10.0
KOBH	Rapid City, S. Dak.	1370	0.1-0.25
KOCA	Kilgore, Texas	1210	0.1-0.25
KOH	Reno, Nev.	1380	0.5
KOIL	Omaha, Nebr.	1260	1.0-5.0
KOIN	Portland, Oregon	940	1.0-5.0
KOKO	La Junta, Colo.	1370	0.1
KOL	Seattle, Wash.	1270	1.0-5.0
KOMA	Oklahoma City, Okla.	1480	5.0
KOMO	Seattle, Wash.	920	1.0-5.0
KONO	San Antonio, Texas	1370	0.1
KOOS	Marshfield, Oregon	1200	0.1-0.25
KORE	Eugene, Oregon	1420	0.1
KOTN	Pine Bluff, Ark.	1500	0.1
KOVC	*Valley City, N. Dak. (0.25 kw. day)	1500	0.1
KOY	Phoenix, Ariz.	1390	1.0
KPAC	Port Arthur, Texas	1260	0.5
KPDN	Pampa, Texas	1310	0.1
KPFA	Helena, Mont.	1210	0.1-0.25
KPLC	Lake Charles, La.	1500	0.1
KPLT	Paris, Texas	1500	0.25
KPMC	Bakersfield, Calif.	1550	1.0
KPO	San Francisco, Calif.	680	50.0
KPOF	Denver, Colo.	880	0.5
KPPC	Pasadena, Calif.	1210	0.1
KPQ	Wenatchee, Wash.	1500	0.1-0.25
KPRC	Houston, Texas	920	1.0-5.0
KQV	Pittsburgh, Pa.	1380	0.5
KQW	San Jose, Calif.	1010	1.0
KRBA	Lufkin, Texas (C.P.)	1310	0.1
KRBC	Abilene, Texas	1420	0.1-0.25
KRE	Berkeley, Calif.	1370	0.1-0.25
KRGV	Weslaco, Texas	1260	0.5-1.0
KRIS	Corpus Christi, Texas	1330	0.25-0.5
KRKD	Los Angeles, Calif.	1120	0.5-2.5
KRKO	Everett, Wash.	1370	0.05
KRLC	Lewiston, Idaho	1390	0.25
KRLD	Dallas, Texas	1040	10.0
KRLH	Midland, Texas	1420	0.1
KRMC	Jamestown, N. Dak.	1370	0.1-0.25
KRMD	Shreveport, La.	1310	0.1-0.25
KRNR	Roseburg, Oregon	1500	0.1-0.25
KRNT	Des Moines, Iowa	1320	1.0-5.0
KROC	Rochester, Minn.	1310	0.1-0.25
KROD	El Paso, Texas (C.P.)	1500	0.1
KROW	Oakland, Calif.	930	1.0
KROY	Sacramento, Calif.	1210	0.1
KRQA	Santa Fe, N. Mexico	1310	0.1
KRRV	Sherman, Texas	1310	0.25
KRSC	Seattle, Wash.	1120	0.25
KSAC	Manhattan, Kansas	580	0.5-1.0
KSAL	Salina, Kansas	1500	0.1-0.25
KSCJ	Sioux City, Iowa	1330	1.0-5.0
KSD	St. Louis, Mo.	550	1.0-5.0
KSEI	Pocatello, Idaho	900	0.25-1.0
KSFO	San Francisco, Calif.	560	1.0-5.0
KSL	Salt Lake City, Utah	1130	50.0
KSLM	Salem, Oregon	1370	0.1
KSO	Des Moines, Iowa	1430	0.5-2.5
KSOO	Sioux Falls, S. Dak.	1110	2.5
KSRO	Santa Rosa, Calif.	1310	0.25
KSTP	St. Paul, Minn.	1460	10.0-25.0
KSUB	Cedar City, Utah	1310	0.1
KSUN	Lowell, Ariz.	1200	0.1-0.25
KTAR	Phoenix, Ariz.	620	1.0
KTAT	Fort Worth, Texas	1240	1.0
KTBC	Austin, Texas (C.P.)	1120	1.0
KTBS	Shreveport, La.	1450	1.0
KTEM	Temple, Texas	1370	0.25
KTFI	**Twin Falls, Idaho (1.0 kw.)	1240	0.5-1.0
KTHS	**Hot Springs National Park, Ark. (1060 kc.)	1040	10.0
KTKC	Visalia, Calif.	1190	0.25
KTMS	Santa Barbara, Calif. (C.P.)	1220	0.5
KTOK	Oklahoma City, Okla	1370	0.1
KTRB	Modesto, Calif.	740	0.25
KTRH	Houston, Texas	1290	1.0-5.0
KTRI	Sioux City, Iowa (C.P.)	1420	0.1-0.25
KTSA	San Antonio, Texas	550	1.0-5.0
KTSM	El Paso, Texas	1310	0.1-0.25
KTUL	Tulsa, Okla.	1400	0.5-1.0
KTW	Seattle, Wash.	1220	1.0
KUJ	Walla Walla, Wash.	1370	0.1
KUMA	Yuma, Ariz.	1420	0.1
KUOA	Siloam Springs, Ark.	1260	5.0
KUSD	Vermillion, S. Dak.	890	0.5
KUTA	Salt Lake City, Utah (C.P.)	1500	0.1
KVCV	S. of Redding, Calif.	1200	0.1
KVEC	San Luis Obispo, Calif.	1200	0.25
KVGB	Great Bend, Kansas	1370	0.1
KVI	Tacoma, Wash.	570	1.0-5.0
KVOA	Tucson, Ariz.	1260	1.0
KVOD	Denver, Colo.	920	0.5
KVOE	Santa Ana, Calif.	1500	0.1
KVOL	Lafayette, La.	1310	0.1
KVOO	Tulsa, Okla.	1140	25.0
KVOR	Colorado Springs, Colo.	1270	1.0
KVOS	Bellingham, Wash.	1200	0.1
KVOX	Moorhead, Minn. (C.P.)	1310	0.1-0.25
KVRS	Rock Springs, Wyo. (C.P.)	1370	0.1-0.25
KVSO	Ardmore, Okla.	1210	0.1
KWBG	Hutchinson, Kansas	1420	0.1
KWG	Stockton, Calif.	1200	0.1
KWJJ	**Portland, Oregon (1040 kc.)	1060	0.5
KWK	St. Louis, Mo.	1350	1.0-5.0
KWKH	**Shreveport, La. (1100 kc.)	850	10.0
KWLC	Decorah, Iowa	1270	0.1
KWNO	Winona, Minn. (C.P.)	1200	0.25
KWOS	Jefferson City, Mo.	1310	0.1
KWSC	Pullman, Wash.	1220	1.0-5.0
KWLK	Longview, Wash. (C.P.)	780	0.25
KWTN	Watertown, S. Dak.	1210	0.1
KWTO	Springfield, Mo.	560	5.0
KWYO	Sheridan, Wyo.	1370	0.1-0.25
KXA	Seattle, Wash.	760	0.25-0.5
KXBY	Kansas City, Mo.	1530	1.0
KXL	Portland, Oregon	1420	0.1-0.25
KXO	El Centro, Calif.	1500	0.1
KXOK	St. Louis, Mo. (C.P.)	1250	1.0

Call	Location	Kc.	Kw.
KXRO	Aberdeen, Wash.	1310	0.1-0.25
KXYZ	Houston, Texas	1440	1.0
KYA	San Francisco, Calif.	1230	1.0-5.0
KYOS	Merced, Calif.	1040	0.25
KYW	Philadelphia, Pa.	1020	10.0
WAAB	Boston, Mass.	1410	0.5-1.0
WAAF	Chicago, Ill.	920	1.0
WAAT	Jersey City, N. J.	940	0.5
WAAW	Omaha, Nebr.	660	0.5
WABC-WBOQ	New York, N. Y.	860	50.0
WABI	Bangor, Me.	1200	0.1-0.25
WABY	*Albany, N. Y. (0.25 kw. day)	1370	0.1
WACO	Waco, Texas	1420	0.1
WADC	Tallmadge, Ohio	1320	1.0-5.0
WAGA	Atlanta, Ga.	1450	0.5-1.0
WAGF	Dothan, Ala.	1370	0.25
WAGM	Presque Isle, Me.	1420	0.1
WAIM	Anderson, S. C.	1200	0.1
WAIR	Winston-Salem, N. C.	1250	0.25
WALA	Mobile, Ala.	1380	0.5-1.0
WALR	Zanesville, Ohio	1210	0.1
WAML	Laurel, Miss.	1310	0.1-0.25
WAPI	Birmingham, Ala.	1140	5.0
WAPO	Chattanooga, Tenn.	1420	0.1-0.25
WARD	Brooklyn, N. Y.	1400	0.5
WASH	Grand Rapids, Mich.	1270	0.5
WATL	Atlanta, Ga.	1370	0.1-0.25
WATR	*Waterbury, Conn. (1290 kc. 0.25 kw.)	1190	0.1
WAVE	Louisville, Ky.	940	1.0
WAWZ	Zarephath, N. J.	1350	0.5-1.0
WAYX	Waycross, Ga.	1200	0.1-0.25
WAZL	Hazleton, Pa.	1420	0.1
WBAA	West Lafayette, Ind.	890	0.5-1.0
WBAL	**Baltimore, Md. (760 kc. 2.5 kw.)	1060	10.0
WBAP	Fort Worth, Texas	800	50.0
WBAX	Wilkes-Barre, Pa.	1210	0.1
WBBC	Brooklyn, N. Y.	1400	0.5
WBBL	Richmond, Va.	1210	0.1
WBBM	Chicago, Ill.	770	50.0
WBBR	Brooklyn, N. Y.	1300	1.0
WBBZ	Ponca City, Okla.	1200	0.1-0.25
WBCM	Bay City, Mich.	1410	0.5-1.0
WBEN	Buffalo, N. Y.	900	1.0-5.0
WBEO	Marquette, Mich.	1310	0.1
WBHP	Huntsville, Ala.	1200	0.1
WBIG	Greensboro, N. C.	1440	1.0
WBIL	New York, N. Y.	1100	5.0
WBLK	Clarksburg, W. Va.	1370	0.1
WBLY	Lima, Ohio	1210	0.1
WBNO	New Orleans, La.	1200	0.1
WBNS	Columbus, Ohio	1430	0.5-1.0
WBNX	New York, N. Y.	1350	1.0
WBNY	Buffalo, N. Y.	1370	0.1-0.25
WBOQ-WABC	(See WABC-WBOQ)		
WBOW	Terre Haute, Ind.	1310	0.1-0.25
WBRB	Red Bank, N. J.	1210	0.1
WBRC	*Birmingham, Ala. (5.0 kw. day)	930	1.0
WBRE	Wilkes-Barre, Pa.	1310	0.1
WBRK	Pittsfield, Mass. (C.P.)	1310	0.1-0.25
WBRY	Waterbury, Conn.	1530	1.0
WBT	Charlotte, N. C.	1080	50.0
WBTM	Danville, Va.	1370	0.1-0.25
WBZ	Boston, Mass.	990	50.0
WBZA	Boston, Mass.	990	1.0
WCAD	Canton, N. Y.	1220	0.5
WCAE	Pittsburgh, Pa.	1220	1.0-5.0
WCAL	*Northfield, Minn. (760 5.0 kw. day)	1250	1.0-2.5
WCAM	Camden, N. J.	1280	0.5
WCAO	Baltimore, Md.	600	0.5-1.0
WCAP	Asbury Park, N. J.	1280	0.5
WCAT	Rapid City, S. Dak.	1200	0.1
WCAU	Philadelphia, Pa.	1170	50.0
WCAX	Burlington, Vt.	1200	0.1-0.25
WCAZ	Carthage, Ill.	1070	0.1
WCBA	Allentown, Pa.	1440	0.5
WCBD	Chicago, Ill.	1080	5.0
WCBM	Baltimore, Md.	1370	0.1-0.25
WCBS	*Springfield, Ill. (0.25 kw.)	1420	0.1
WCCO	Minneapolis, Minn.	810	50.0
WCFL	Chicago, Ill.	970	5.0
WCHS	Charleston, W. Va.	580	0.5-1.0
WCHV	Charlottesville, Va.	1420	0.1-0.25
WCKY	Covington, Ky.	1490	10.0
WCLE	Cleveland, Ohio	610	0.5
WCLO	Janesville, Wisc.	1200	0.1-0.25
WCLS	Joliet, Ill.	1310	0.1
WCMI	Ashland, Ky.	1310	0.1-0.25
WCNW	Brooklyn, N. Y.	1500	0.1-0.25
WCOA	*Pensacola, Fla. (1.0 kw. day)	1340	0.5
WCOC	*Meridian, Miss. (1.0 kw.)	880	0.5
WCOL	Columbus, Ohio	1210	0.1
WCOP	Boston, Mass.	1120	0.5
WCPO	Cincinnati, Ohio	1200	0.1-0.25
WCRW	Chicago, Ill.	1210	0.1
WCSC	Charleston, S. C.	1360	0.5-1.0
WCSH	Portland, Me.	940	1.0-2.5
WDAE	Tampa, Fla.	1220	1.0-5.0
WDAF	Kansas City, Mo.	610	1.0-5.0
WDAH	El Paso, Texas	1310	0.1-0.25
WDAS	Philadelphia, Pa.	1370	0.1-0.25
WDAY	Fargo, N. Dak.	940	1.0-5.0
WDBJ	Roanoke, Va.	930	1.0-5.0
WDBO	*Orlando, Fla. (5.0 kw. day)	580	1.0
WDEL	Wilmington, Del.	1120	0.25-0.5
WDEV	Waterbury, Vt.	550	0.5
WDGY	Minneapolis, Minn.	1180	1.0-5.0
WDNC	Durham, N. C.	1500	0.1
WDOD	Chattanooga, Tenn.	1280	1.0-5.0
WDRC	Hartford, Conn.	1330	1.0-5.0
WDSM	Superior, Wis. (C.P.)	1200	0.1
WDSU	New Orleans, La.	1250	1.0
WDWS	Champaign, Ill.	1370	0.1
WDZ	Tuscola, Ill.	1020	0.25
WEAF	New York, N. Y.	660	50.0
WEAN	Providence, R. I.	780	1.0
WEAU	Eau Claire, Wisc.	1050	1.0
WEBC	Duluth, Minn.	1290	1.0-5.0
WEBQ	Harrisburg, Ill.	1210	0.1-0.25
WEBR	Buffalo, N. Y.	1310	0.1-0.25
WEDC	Chicago, Ill.	1210	0.1
WEED	Nr. Rocky Mount, N. C.	1420	0.1-0.25
WEEI	Boston, Mass.	590	1.0-5.0
WEEU	Reading, Pa.	830	1.0
WELI	New Haven, Conn.	900	0.5
WELL	Battle Creek, Mich.	1420	0.1
WEMP	Milwaukee, Wisc.	1310	0.1
WENR	Chicago, Ill.	870	50.0
WEOA	Evansville, Ind.	1370	0.1-0.25
WESG	**Elmira, N. Y. (850 kc.)	1040	1.0
WEST	Easton, Pa.	1200	0.1-0.25
WEVD	New York. N. Y.	1300	1.0
WEW	St. Louis, Mo.	760	1.0
WEXL	Royal Oak, Mich.	1310	0.05
WFAA	Dallas, Texas	800	50.0
WFAB	New York, N. Y.	1300	1.0
WFAM	South Bend, Ind.	1200	0.1
WFAS	White Plains, N. Y.	1210	0.1
WFBC	Greenville, S. C.	1300	1.0-5.0
WFBG	Altoona, Pa.	1310	0.1
WFBL	Syracuse, N. Y.	1360	1.0-5.0
WFBM	Indianapolis, Ind.	1230	1.0-5.0
WFBR	Baltimore, Md.	1270	0.5-1.0
WFDF	Flint, Mich.	1310	0.1
WFEA	Manchester, N. H.	1340	0.5-1.0
WFIL	**Philadelphia, Pa. (1.0 kw. night)	560	0.5-1.0
WFLA	Clearwater, Fla.	620	1.0-5.0
WFMD	Frederick, Md.	900	0.5
WFOR	Hattiesburg, Miss.	1370	0.1
WFOY	St. Augustine, Fla.	1210	0.1-0.25
WFTC	Kinston, N. C.	1200	0.1-0.25
WGAL	Lancaster, Pa.	1500	0.1-0.25
WGAN	Portland, Me. (C.P.)	640	0.5
WGAR	Cleveland, Ohio	1450	0.5-1.0
WGBB	Freeport, N. Y.	1210	0.1
WGBF	Evansville, Ind.	630	0.5-1.0
WGBI	Scranton, Pa.	880	0.5-1.0
WGCM	Mississippi City, Miss.	1210	0.1-0.25
WGES	Chicago, Ill.	1360	0.5-1.0
WGH	**Newport News, Va. (0.1 kw. night)	1310	0.1-0.25
WGL	*Ft. Wayne, Ind. (0.25 kw. day)	1370	0.1
WGN	Chicago, Ill.	720	50.0
WGNY	Newburgh, N. Y.	1210	0.1
WGPC	Albany, Ga.	1420	0.1
WGR	Buffalo, N. Y.	550	1.0-5.0
WGRC	New Albany, Ind.	1370	0.25
WGRM	Grenada, Miss. (C.P.)	1210	0.1
WGST	Atlanta, Ga.	890	1.0-5.0
WGTM	Wilson, N. C.	1310	0.1
WGVA	Indianapolis, Ind. (C. P.)	1050	1.0
WGY	Schenectady, N. Y.	790	50.0
WHA	Madison, Wisc.	940	5.0
WHAL	Saginaw, Mich. (C.P.)	950	0.5
WHAM	Rochester, N. Y.	1150	50.0
WHAS	Louisville, Ky.	820	50.0
WHAT	Philadelphia, Pa.	1310	0.1
WHAZ	Troy, N. Y.	1300	1.0
WHB	Kansas City, Mo.	860	1.0
WHBB	Selma, Ala.	1500	0.1
WHBC	*Canton, Ohio (0.25 kw. day)	1200	0.1
WHBF	Rock Island, Ill.	1210	0.1-0.25
WHBI	Newark, N. J.	1250	1.0-2.5
WHBL	Sheboygan, Wisc.	1300	0.25
WHBQ	Memphis, Tenn.	1370	0.1
WHBU	Anderson, Ind.	1210	0.1-0.25
WHBY	Green Bay, Wisc.	1200	0.1-0.25
WHDF	Calumet, Mich.	1370	0.1-0.25
WHDH	Boston, Mass.	830	1.0
WHDL	Olean, N. Y.	1400	0.25
WHEB	Portsmouth, N. H.	740	0.25
WHEC	Rochester, N. Y.	1430	0.5-1.0
WHEF	Kosciusko, Miss.	1500	0.1-0.25
WHFC	Cicero, Ill.	1420	0.1-0.25
WHIO	Dayton, Ohio	1260	1.0-5.0
WHIP	Hammond, Ind. (C.P.)	1480	5.0
WHIS	Bluefield, W. Va.	1410	0.5-1.0
WHJB	Greensburg, Pa.	620	0.25
WHK	Cleveland, Ohio	1390	1.0-2.5
WHKC	Columbus, Ohio	640	0.5
WHLB	Virginia, Minn.	1370	0.1-0.25
WHN	New York, N. Y.	1010	1.0-5.0
WHO	**Des Moines, Iowa (night)	1000	50.0
WHOM	Jersey City, N. J.	1450	0.25
WHP	Harrisburg, Pa.	1430	0.5-1.0
WIBA	Madison, Wisc.	1280	1.0-5.0
WIBG	Glenside, Pa.	970	0.1
WIBM	Jackson, Mich.	1370	0.1-0.25
WIBU	Poynette, Wisc.	1210	0.1-0.25
WIBW	Topeka, Kansas	580	1.0-5.0
WIBX	Utica, N. Y.	1200	0.1-0.25
WICA	Ashtabula, Ohio (C.P.)	940	0.25
WICC	Bridgeport, Conn.	600	0.5-1.0
WIL	St. Louis, Mo.	1200	0.1-0.25
WILL	Urbana, Ill.	580	1.0
WILM	Wilmington, Del.	1420	0.1
WIND	Gary, Ind.	560	1.0-5.0
WINS	New York, N. Y.	1180	1.0
WIOD-WMBF	**Miami, Fla. (610 kc.)	1300	1.0
WIP	Philadelphia, Pa.	610	1.0
WIRE	Indianapolis, Ind.	1400	1.0-5.0
WIS	Columbia, S. C.	560	1.0-5.0
WISN	Milwaukee, Wisc.	1120	0.25-1.0
WJAC	Johnstown, Pa.	1310	0.1-0.25
WJAG	Norfolk, Nebr.	1060	1.0
WJAR	Providence, R. I.	890	1.0-5.0
WJAS	Pittsburgh, Pa.	1290	1.0-5.0
WJAX	Jacksonville, Fla.	900	1.0-5.0
WJBC	Bloomington, Ill.	1200	0.1-0.25
WJBK	Detroit, Mich.	1500	0.1-0.25
WJBL	Decatur, Ill.	1200	0.1
WJBO	Baton Rouge, La.	1120	0.5
WJBR	Gastonia, N. C.	1420	0.1
WJBW	New Orleans, La.	1200	0.1
WJBY	Gadsden, Ala.	1210	0.1-0.25
WJDX	*Jackson, Miss. (5.0 kw. day)	1270	1.0-2.5
WJEJ	Hagerstown, Md.	1210	0.05-0.1
WJIM	Lansing, Mich.	1210	0.1-0.25
WJJD	Chicago, Ill.	1130	20.0
WJMS	Ironwood, Mich.	1420	0.1
WJNO	West Palm Beach, Fla.	1200	0.1-0.25
WJR	Detroit, Mich.	750	50.0
WJRD	Tuscaloosa, Ala.	1200	0.25
WJSV	Washington, D. C.	1460	10.0
WJTN	Jamestown. N. Y.	1210	0.1-0.25
WJW	Akron, Ohio	1210	0.1-0.25
WJZ	New York, N. Y.	760	50.0
WKAQ	San Juan, Puerto Rico	1240	1.0
WKAT	Miami Beach, Fla. (C.P.)	1500	0.1
WKAR	East Lansing, Mich.	850	1.0
WKBB	East Dubuque, Ill.	1500	0.1-0.25
WKBH	La Crosse, Wisc.	1380	1.0
WKBN	Youngstown, Ohio	570	0.5
WKBO	Harrisburg, Pa.	1200	0.1-0.25
WKBV	Richmond, Ind.	1500	0.1
WKBW	Buffalo, N. Y.	1480	5.0
WKBZ	Muskegon, Mich.	1500	0.1-0.25
WKEU	Griffin, Ga.	1500	0.1
WKOK	Sunbury, Pa.	1210	0.1
WKRC	Cincinnati, Ohio	550	0.5
WKY	Oklahoma City, Okla.	900	1.0-5.0
WKZO	*Kalamazoo, Mich. (0.25-1.0 kw.)	590	1.0
WLAC	Nashville, Tenn.	1470	5.0
WLAK	Lakeland, Fla.	1310	0.1
WLAP	Lexington, Ky.	1420	0.1-0.25
WLAW	Lawrence, Mass. (C.P.)	680	1.0
WLB	*Minneapolis. Minn. (760 kc. 5.0 kw. day)	1250	1.0
WLBC	Muncie, Ind.	1310	0.1-0.25
WLBL	Stevens Point, Wisc.	900	5.0
WLBZ	Bangor, Me.	620	0.5-1.0
WLEU	Erie, Pa.	1420	0.1-0.25
WLLH	Lowell, Mass.	1370	0.1-0.25
WLMU	Middlesboro. Ky. (C.P.)	1210	0.1-0.25
WLNH	Laconia, N. H.	1310	0.1
WLS	Chicago, Ill.	870	50.0
WLTH	Brooklyn, N. Y.	1400	0.5
WLVA	Lynchburg, Va.	1200	0.1-0.25
WLW	**Cincinnati, Ohio (500.0 kw.)	700	50.0
WMAL	Washington, D. C.	630	0.25-0.5
WMAQ	Chicago, Ill.	670	50.0
WMAS	Springfield, Mass.	1420	0.1-0.25
WMAZ	Macon, Ga.	1180	1.0
WMBC	Detroit, Mich.	1420	0.1-0.25
WMBD	Peoria, Ill.	1440	1.0-5.0
WMBF-WIOD	(See WIOD-WMBF)		
WMBG	Richmond, Va.	1350	0.5
WMBH	Joplin, Mo.	1420	0.1-0.25
WMBI	Chicago, Ill.	1080	5.0
WMBO	*Auburn, N. Y. (0.25 kw. day)	1310	0.1
WMBQ	Brooklyn, N. Y.	1500	0.1
WMBR	Jacksonville, Fla.	1370	0.1-0.25
WMBS	Uniontown, Pa.	1420	0.25
WMC	Memphis, Tenn.	780	1.0-5.0
WMCA	New York, N. Y.	570	1.0
WMEX	Boston, Mass.	1500	0.1-0.25
WMFD	Wilmington, N. C.	1370	0.1
WMFF	Plattsburg, N. Y.	1310	0.1-0.25
WMFG	Hibbing, Minn.	1210	0.1-0.25
WMFJ	Daytona Beach, Fla.	1420	0.1
WMFO	Decatur, Ala.	1370	0.1
WMFR	High Point, N. C.	1200	0.1
WMIN	St. Paul, Minn.	1370	0.1-0.25
WMMN	Fairmont, W. Va.	890	0.5-1.0
WMPC	Lapeer, Mich.	1200	0.1-0.25
WMPS	Memphis, Tenn.	1430	0.5-1.0
WMSD	Sheffield, Ala.	1420	0.1
WMT	Cedar Rapids, Iowa	600	1.0-5.0
WNAC	Boston, Mass.	1230	1.0-5.0
WNAD	Norman, Okla.	1010	1.0
WNAX	Yankton, S. Dak.	570	1.0-5.0
WNBC	*New Britain, Conn. (1.0 kw. day)	1380	0.25
WNBF	Binghamton, N. Y.	1500	0.1-0.25
WNBH	New Bedford, Mass.	1310	0.1-0.25
WNBR	Memphis, Tenn.	1430	0.5-1.0
WNBX	**Springfield, Vt. (0.5-1.0 kw.)	1260	1.0
WNBZ	Saranac Lake, N. Y.	1290	0.1
WNEL	San Juan, Puerto Rico	1290	1.0-2.5
WNEW	New York, N. Y.	1250	1.0-2.5
WNLC	New London, Conn.	1500	0.1
WNOX	Knoxville, Tenn.	1010	1.0-5.0
WNYC	New York, N. Y.	810	1.0
WOAI	San Antonio, Texas	1190	50.0
WOC	Davenport, Iowa	1370	0.1-0.25
WOI	Ames, Iowa	640	5.0
WOKO	Albany, N. Y.	1430	0.5-1.0
WOL	*Washington, D. C. (1230 kc. 1.0 kw.)	1310	0.1
WOLS	Florence, S. C. (C.P.)	1200	0.1
WOMT	Manitowoc, Wisc.	1210	0.1
WOMI	Owensboro, Ky. (C.P.)	1500	0.1
WOOD	Grand Rapids, Mich.	1270	0.5
WOPI	Bristol, Tenn.	1500	0.1

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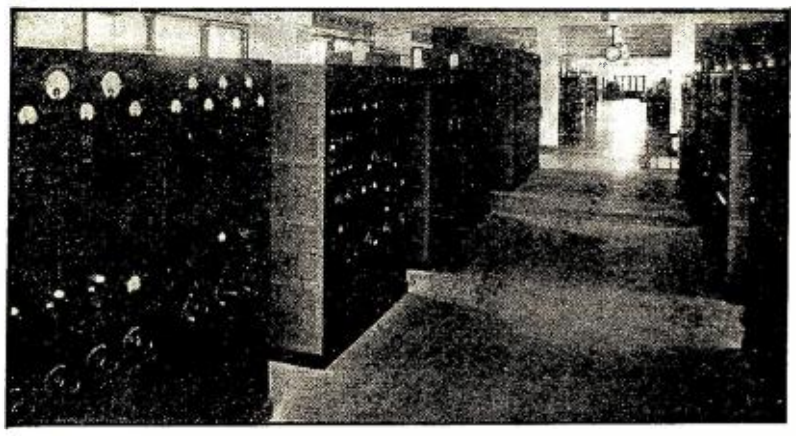


JAPANESE SHORT-WAVE STATIONS

The Nazaki transmitter hall, showing transmitters used on the various wavelengths of the "JZ" series.

The DX for SHORT

Conducted by

THE Fifty-ninth installment of the DX Corner for Short-Wave contains the World Short-Wave Time-Table for 24-hour use all over the world and Official Observers' reports of stations heard this month. Consult these two items regularly and make your all-wave set pay big dividends!

Credit Where It Is Due

AGAIN, we have a good "star" list of short-wave Listening Post Observers as follows: Alfred, Moore, Fleming, Welper, Shamleffer, Myers, Viganello, Diez, Eder. Congratulations to these members for their fine reports and thanks from all readers for the hard work they have put in getting the material.

Reports of Listening Post Observers and Other Short-Wave Readers of the DX Corner

LISTED in the following columns is this month's consolidated reports of short-wave stations heard by our wide-world listening posts. Each item is credited with the Observer's surname. This allows our readers to note who obtained the information. If any of our readers can supply Actual Time Schedules, Correct Wavelengths, Correct Frequencies and any other Important Information (in paragraphs as recommended), the DX Editor, as well as our readers, will be grateful for the information. On the other hand, readers seeing these reports can try their skill in pulling in the stations logged and in trying to get complete information on these transmissions. The report for this month, containing the best information available to date, follows:

EUROPE

TFJ, Reykjavik, Iceland, 12235 kc., Sunday 1:30 p.m., (Kruger); Sunday 1:40-2:30 p.m., (Hartzell, Welper, Alfred, Eder, Fleming, Noyes).

PCJ, Huizen, Holland, 9590 kc., signed 11:45 p.m., desires reports (Staley); Tuesday 1:30-3 p.m. and Thursday 7-10 p.m., 15220 kc., Tuesday 4:30-6 a.m. and Wednesday 8-11 a.m. (L. F. Gallagher, Eder, Unger); Sunday 8-9 p.m. (Alfred, Moore, Welper, Wollenschlager, Hartzell, Shamleffer, Coover, Fleming, Sibbin). Slogan: "The Happy Station."

PHI, Huizen, Holland, 11730 kc., Sunday 8-9:30 p.m. (Alfred); 17770 kc. (Pierce); signs 11:45 a.m. (Mott); daily 7:30-9:30 p.m. (from veri). (Sporn, Fleming, Bauer, Maroney, Lindner).

OLR4A, Prague, Czechoslovakia, 11840 kc., 8 p.m. (L. F. Gallagher, Eder); Monday and Thursday 7-8:40 p.m., Saturday 4 p.m. (Noyes, Shamleffer); daily 2:30-4:30 p.m. (Fleming); Monday and Thursday 8-10 p.m. (schedule changed) (Unger); schedule not changed (Dressler, Myers, Welper, Ashton); three-toned horn used. (Ruiz, Patrick, Coover, Noyes).

OLR3A, Prague, Czechoslovakia, 9550 kc. (Eder); Tuesday 3:45-4:30 p.m. (Shamleffer); daily 8-10:30 p.m. (Dressler).

LZA, Sofia, Bulgaria, 14975 kc., 4 p.m. (L. F. Gallagher); 14910 kc. (Eder); 14920 kc. (Bird, D'Orsay); daily 4-4:35 p.m. (from veri). (Sporn, Diez). Slogan: "Radio Garata."

HAS3, Budapest, Hungary, 15370 kc., daily 9-10 p.m. (from veri). (Sporn, Eder).

HAT4, Budapest, Hungary, 9120 kc. (Eder); signed 8 p.m. (Unger); Sunday 7-8 p.m. (Welper); gong for announcement (Mott, Sporn); Saturday 6-7 p.m. and Wednesday and Sunday 7-8 p.m. (from announcement). (Shamleffer, Fleming, Noyes).

ORK, Ruysselede, Belgium, 10330 kc., daily 1:30-3 p.m. (Fleming, Dressler, Eder, Hartzell).

SPD, Warsaw, Poland, 11500 kc., requests reports (Bird); daily 6-7 p.m. (Hartzell, Shamleffer, Scala); 11535 kc., Sunday 7-8 p.m. (Staniek, Bauer, Eder).

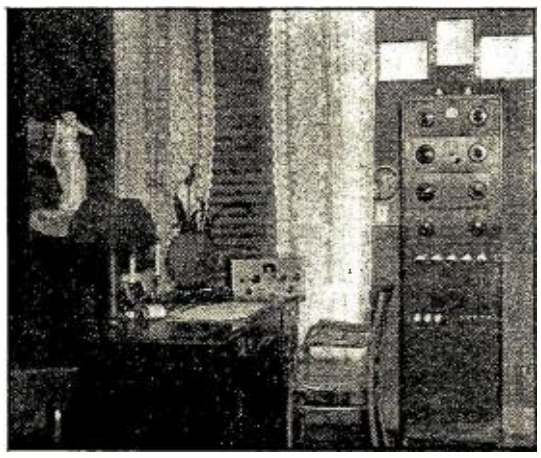
SPW, Warsaw, Poland, 13635 kc., 6-7 p.m. on Wednesday (Blanchard); requests reports (Bird, Mott, Shamleffer, Scala); daily 12:30-1:30 p.m. (from veri) (Sporn); daily 6-7 p.m. and Sunday 7-8 p.m. (Staniek, Shamleffer, Maroney, Eder).

SBG, Motala, Sweden, 15150 kc., testing 3 p.m. (Bird); daily 1:20-2:05 a.m. (Moore); correct call is SBP (from veri) (Magnuson, Jensen); 6060 kc., 1:30 p.m. (Sporn); requests reports (Maroney); Sunday 7-8:30 p.m. (Dressler).

OZF, Skamlebaek, Denmark, 9520 kc., signs 6:45 p.m. (Eder); daily 2-6:15 p.m. (Bird, Atherton, Hartzell). Address: Mail and Telegraph Dept., Technical Division, No. 32 Bernstorffagade, Copenhagen.

"Radio Salamanca," Salamanca, Spain, 10370 kc., daily 8:55-10 p.m., single bugle call used (Etzkorn, Eder, Unger); 9720 kc. (Magnuson, Mott, D'Orsay); daily 7-8:45 p.m. (Alfred, Moore, Hock, Shamleffer, Scala, Ruiz, Harris, Coover, Fleming, Betances, Hartzell, Meyers). Slogan: "Radio Nacionale."

EAR, Madrid, Spain, 9480 kc. (Eder); daily 10-11 p.m. (Welper); 7:30 p.m. (Lindner); irregularly 7:30-9:30 p.m. (Alfred, N. C. Smith, Wollenschlager); Monday, Wednesday and Thursday

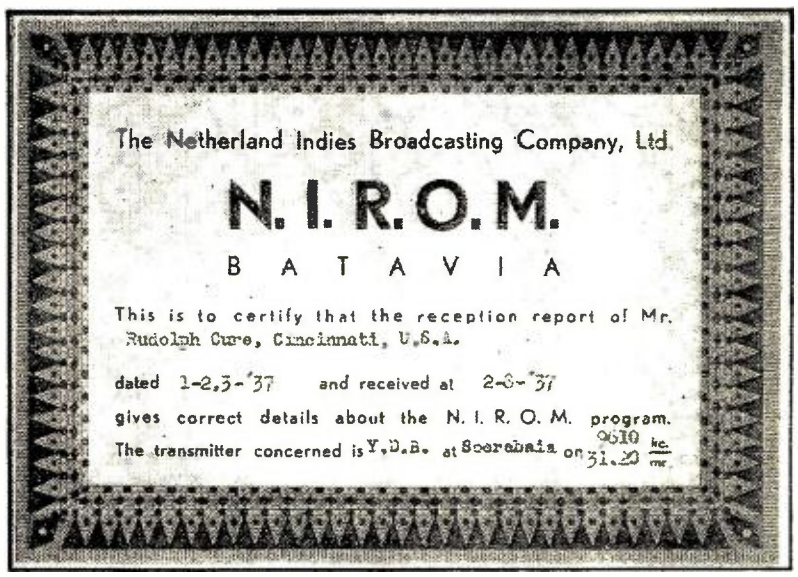


FINLAND ON THE MAP

Mr. M. R. Grenholm, a short-wave listener in Finland, is the owner of this fine DX Corner. This listener believes in a good power amplifier as the photograph shows.

Corner *the* WAVES

L. M. Cockaday



7:30-9:30 p.m. (Mott, Coover, Shamleffer, Cindel). Address: P. O. Box No. 931.

EAQ, Madrid, Spain, 9860 kc. (Eder); 9800 kc., irregularly 5:30-7:30 p.m. (Alfred); 10:20 p.m. (Wacker); Sunday 9:30-10:30 p.m. (Harris).

"Radio Requete," Madrid, Spain, 13940 kc., Saturday 10-10:30 p.m. (Fleming); 7200 kc., 5 p.m. (Betances).

TPA3, Pontoise, France, 11885 kc. (D'Orsay, Ruiz); daily 3-6 p.m. (Jensen); 10 p.m. (L. F. Gallagher); 12020 kc. (Diez, Fleming, Eder); daily 2-5 a.m. (Pierce).

"Radio Liberte," Bruyeres, France, 9520 kc. (Eder); 6:45 p.m. (Atherton). Address: 10 Avenue de la Liberte, Becon les Bruyeres (from veri).

TPA4, Pontoise, France, 11720 kc., 11:30 p.m. (Shamleffer); daily 6-12 p.m. (Unger, Ashton, Ruiz); 12100 kc. (L. F. Gallagher, Coover); 11830 kc. (Diez, Fleming). Slogan: "Radio Coloniale."

RAN, Moscow, U.S.S.R., 9600 kc., heard 8-9 p.m., "Moscow Calling," (L. F. Gallagher, Eder), daily 7-9:10 p.m., (from ann.), (Noyes, Unger, Alfred, N. E. Smith, Welper, Wollenschlager, Sporn, Shamleffer, Fleming, Adkins, Pierce).

RKI, Moscow, U.S.S.R., 15,080 kc., daily 7-9:10 p.m., (from ann.), (Noyes, Bird), 7700 kc., (D'Orsay, Unger), 7530 kc., (Alfred), 15,090 kc., (Jensen), 15,040 kc., heard 11:30 p.m.-11 a.m., (Dressler, Eder), 15,750 kc., daily 10 p.m.-1 a.m., (Fleming), 7510 kc., (Herzog).

RNE, Moscow, U.S.S.R., 12,000 kc., daily at 10:15 p.m., (from ann.), (Noyes), heard 11:30 p.m., (Shamleffer), daily 10:15-11:30 p.m. and irregularly, Sundays 4-5 p.m., (Alfred, Moore, Mott, Sporn), irregularly 9-12 p.m. (Fleming, Adkins, Eder).

GSB, Daventry, England, 9510 kc., (Honda), heard 9-11 p.m., (L. F. Gallagher, Eder, Redmond, Wardman, Wollenschlager), daily 6:20-8:30 p.m., (Dressler), heard Tuesday 3:45 p.m., (Shamleffer, Coover), 9500 kc., daily 3:15-5:25 a.m., 12:20-6 p.m., (Self, Fleming, Pierce).

GSD, Daventry, England, 11,770 kc., (Honda), heard 6 p.m.-1:30 a.m., (L. F. Gallagher, Redmond, Wardman, Wollenschlager, Ashton, Jensen, Dressler), 11,750 kc., heard Tuesday 3:45 p.m., (Shamleffer, Coover), daily 3:15-5:25 a.m., 10:45 a.m.-12 noon, and 12:20-3:50 p.m., and 6:20-8:30 p.m., and 9-11 p.m., (Self, Fleming, Herzog, Eder, Harley, Pierce).

GSF, Daventry, England, 15,140 kc., heard 8-11 p.m., (L. F. Gallagher, Wollenschlager, Jensen), 15,150 kc., daily 9:15-12 a.m. and 4:05-6 p.m., (Self), daily 3-6 a.m., (Fleming, Shamleffer, Eder).

GSG, Daventry, England, 17,790 kc., heard 9-10 a.m., (L. F. Gallagher), daily 2-4 a.m. and 5:45-9 a.m., (Dressler, Eder, Wollenschlager, Jensen), 17,890 kc., (Diez) daily 4:05-6 p.m., (Self, Herzog, Shamleffer).

GSI, Daventry, England, 15,260 kc., heard 7 p.m., (L. F. Gallagher, Redmond, Jensen), heard Tuesday 3:45 p.m., (Shamleffer), daily 12:20-3:50 p.m., (Self), daily 3-6 a.m. and 11:30 a.m.-4 p.m., (Fleming).

GSH, Daventry, England, 21,470 kc., daily from 9:30 a.m., (Pierce), daily 5:45-9 a.m. and 9:15-12 a.m., (Dressler, Self, Eder).

GSO, Daventry, England, 15,180 kc., heard 11:30-12 a.m., (L. F. Gallagher, Wollenschlager, Jensen), daily 2-4 a.m., (Dressler), daily 3:15-5:25 a.m., 5:45-8:55 a.m. and 4:05-6 p.m., (Self, Fleming, Harley).

DJC, Zeesen, Germany, 6020 kc., daily midnight-4:20 p.m. and 4:50-11 p.m., (Self), daily 10:40 a.m.-4:30 p.m., (Fleming, Herzog).

DJL, Zeesen, Germany, 15,110 kc., (Eder), daily 4:50-10:45 p.m., (Alfred), daily 12:05-2 a.m., (Dressler, Wollenschlager, Jensen, Self, Fleming, Shamleffer, Wittig, Harley).

DJR, Zeesen, Germany, 15,340 kc., (Eder, Wollenschlager, Jensen), heard 9 p.m., (L. F. Gallagher, Diez), heard midnight-4:30 p.m., (Self), daily 8-9 a.m., (Fleming).

DJA, Zeesen, Germany, 9560 kc., heard 8-9 p.m., (L. F. Gallagher, Eder), daily 4:50-10:45 p.m., (Alfred, Myers, Pierce), daily 12:05-11 a.m., (Dressler, Wollenschlager, Wacker, Diez, Self, Fleming).

DJB, Zeesen, Germany, 15,200 kc., heard 8:30 p.m., (L. F. Gallagher), 15,230 kc., (Eder), daily 4:50-10:45 p.m., (Alfred, Redmond), daily 12:05-11 a.m., (Dressler, Wacker, Jensen, Self, Fleming).

DJD, Zeesen, Germany, 11,775 kc., heard 6-10 p.m., (L. F. Gallagher, Eder), heard Wednesday 4 p.m., (Shamleffer), daily 4:50-10:45 p.m., (Alfred, Wardman, Myers, Wollenschlager, Ashton, Jensen, Coover, Diez), daily midnight-4:20 p.m., (Self), daily 10:40 a.m.-4:30 p.m. (Fleming).

DJE, Zeesen, Germany, 17,760 kc., (Eder, D'Orsay), irregularly 3:30-5 p.m., (Alfred, Jensen), daily midnight-11 a.m., (Self).

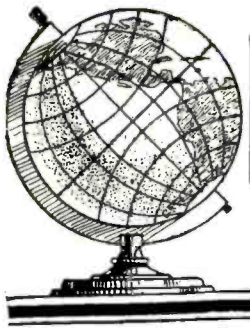
DJN, Zeesen, Germany, 9,540 kc., (Eder), daily 4:50-10:45 p.m., (Alfred, Pierce), daily 12:05-11 a.m., (Dressler, Wollenschlager, Diez, Self, Fleming).

DJP, Zeesen, Germany, 11,850 kc., (Eder), heard Tuesday 7-9

(*Turn to page* 484)

"VERI" FROM EAST INDIES

Observer Rudolph Kure, of Cincinnati, sends in this verification from YDB, Soerabaia. Look for this station.



WORLD SHORT WAVE TIME-TABLE

Compiled by LAURENCE M. COCKADAY

Hours of transmission for the World's Short Wave Broadcast Stations

FILL IN LOCAL TIME											
8	9	10	11	M	1	2	3	4	5	6	7
01	02	03	04	05	06	07	08	09	10	11	12

HOURS OF TRANSMISSION											
									D	D	D
											XS
									D	D	D
							D	D	D	D	D
D											
											S
				D	D	D	D	D	D	D	D
D											
											D
D	D	D		D	D	D	D	D	D	D	D
										D	D
										D	D
							S	S			
D	D	D		D	D	D	D	D	D	D	D
	S	S	D	D	D		AM	D	D	D	D
							D	D	D	D	D
				D	D						
									XS		
				D	D					S	S
D	D										
				S	S	S	S	S	D	D	S
										V	
						D	D	D			
D	D										
									D	D	D
				D	D						
D	D	D									
D	D	D	D				D	D	D		
D	D	D	D								
D		D	D	D							
D	D	D				XS	XS	D	D	D	D
D	D										
D	D	D	D								
								K	K		K
D	D	D	D								
D											
D						I					
D											
D	D										
D	D	D	D	Sa							
				M							
								XS	XS	XS	
		Th									
					S	S	S		S	S	S
AP	Z										
D	D	D									
D	D	D									
			I	I	D	I	XS	XS	XS	XS	XS
D	D	I									
D	D	D	D	D						XS	XS
D	D	D		D	D	D	D	D	D	D	D
D	D	D	D								D
G	G	G									
D	D	D	D	D							
D	D	D		D	D	D	D	D	D	D	D
D	D	D	D								
	S	S	D	D	D		AM	D	D	D	D
D	D	D	D	D							
D	D	D					D	D	D		
C	C	C									
								XS	XS	XS	
X	X	M	M								
D	D	D	D							D	D
D	D	D	D	D							D
D	D	D									
D	D										

Wavelength Meters	Call Letters	Frequency Kc.	City Country
13.93	W8XK	21540	Pittsburgh, Pa.
13.93	GSJ	21530	Daventry, England
13.94	W2XE	21520	New York, N. Y.
13.97	GSH	21470	Daventry, England
15.77	HS8PJ	19020	Bangkok, Siam
16.86	GSG	17790	Daventry, England
16.87	W3XAL	17780	Bound Brook, N. J.
16.88	PHI	17770	Huizen, Holland
16.89	W2XE	17760	New York, N. Y.
16.89	DJE	17760	Zeesen, Germany
19.56	DJR	15340	Zeesen, Germany
19.57	W2XAD	15330	Schenectady, N. Y.
19.60	GSP	15310	Daventry, England
19.62	LRU	15290	Buenos Aires, Arg.
19.63	DJQ	15280	Zeesen, Germany
19.65	W2XE	15270	New York, N. Y.
19.66	GSI	15260	Daventry, England
19.68	TPA2	15243	Pontoise, France
19.70	OLR5A	15230	Podebrady, Czech.
19.71	PCJ	15220	Huizen, Holland
19.72	W8XK	15210	Pittsburgh, Pa.
19.74	DJB	15200	Zeesen, Germany
19.75	ZBW4	15190	Hong Kong, China
19.76	GSO	15180	Daventry, England
19.79	JZK	15160	Nazaki, Japan
19.82	GSF	15140	Daventry, England
19.84	HVJ	15121	Vatican City
19.85	DJL	15110	Zeesen, Germany
19.88	RKI	15090	Moscow, U.S.S.R.
20.04	LZA	14970	Sofia, Bulgaria
22.16	SPW	13653	Warsaw, Poland
24.52	TFJ	12235	Reykjavik, Iceland
25.00	RV59(RNE)	12000	Moscow, U.S.S.R.
25.24	TPA3	11885	Pontoise, France
25.27	W8XK	11870	Pittsburgh, Pa.
25.34	OLR4A	11840	Podebrady, Czech.
25.36	W9XAA	11830	Chicago, Ill.
25.40	I2RO4	11810	Rome, Italy
25.42	OER2	11800	Vienna. Austria
25.42	JZJ	11800	Nazaki, Japan
25.45	W1XAL	11790	Boston, Mass.
25.49	DJD	11770	Zeesen, Germany
25.53	GSD	11750	Daventry, England
25.58	CJRX	11730	Winnipeg, Canada
25.60	TPA4	11720	Pontoise, France
25.62	HJ4ABA	11710	Medellin, Colombia
25.63	SBG	11705	Motala, Sweden
25.64	HP5A	11700	Panama, Pana.
26.01	SPD	11535	Warsaw, Poland
26.24	COCX	11435	Havana, Cuba
26.60	HIN	11280	Trujillo, D. R.
27.17	CSW	11040	Lisbon, Portugal
29.04	ORK	10330	Ruysselede, Belgium
30.18	CSW	9940	Lisbon, Portugal
30.43	EAQ	9860	Madrid, Spain
31.00	CQN	9677	Macao, Asia
31.06	LRX	9660	Buenos Aires, Argentina
31.09	YNLF	9650	Managua, Nicaragua
31.09	CT1AA	9650	Lisbon, Portugal
31.10	HH3W	9645	Port-au-Prince, Haiti
31.14	I2RO	9635	Rome, Italy
31.25	RAN	9600	Moscow, U.S.S.R.
31.25	HJ1ABP	9600	Cartagena, Colombia
31.27	HBL	9595	Geneva, Switzerland
31.28	VK6ME	9590	Perth. Australia
31.28	W3XAU	9590	Philadelphia, Pa.
31.28	VK2ME	9590	Sydney. Australia
31.28	PCJ	9590	Huizen, Holland
31.28	HP5J	9590	Panama City, Pana.
31.32	GSC	9580	Daventry, England
31.32	VK3LR	9580	Lyndhurst, Australia
31.33	HJ2ABC	9575	Cucuta, Colombia
31.35	W1XK	9570	Millis, Mass.
31.38	DJA	9560	Zeesen, Germany
31.40	TIPG	9559	San Jose, C. R.
31.42	OLR3A	9550	Podebrady, Czech.
31.42	XEFT	9550	Veracruz, Mexico
31.45	DJN	9540	Zeesen, Germany
31.48	W2XAF	9530	Schenectady, N. Y.
31.48	LKJ1	9530	Jeloy, Norway
31.49	ZBW3	9525	Hong Kong, China
31.51	OAX4J	9520	Lima, Peru
31.55	GSB	9510	Daventry, England
31.55	HJU	9510	Buenaventura, Colom.
31.55	VK3ME	9510	Melbourne, Australia
31.58	PRF5	9500	Rio de Janeiro, Brazil
31.68	HJ1ABE	9500	Cartagena, Colombia
31.82	COCH	9428	Havana, Cuba
32.09	HS8PJ	9350	Bangkok, Siam
32.88	HAT4	9125	Budapest, Hungary
33.32	COBZ	9030	Havana, Cuba
34.62	COJK	8665	Camaguey, Cuba
38.48	HBP	7797	Geneva, Switzerland
43.48	HI3C	6900	La Romana, D. R.

EASTERN STANDARD TIME											
8	9	10	11	N	1	2	3	4	5	6	7
GREENWICH MEAN TIME											
13	14	15	16	17	18	19	20	21	22	23	00

HOURS OF TRANSMISSION											
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W	W	W									
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				D		D	D	D			
								I	I	D	D
D				D	D	D	D	I	I	D	I
	XS	XS	XS	XS	XS	XS	XS	XS	Sa	Sa	
D							D	D	D		
							S	D	D	D	
		D	D	D	D	D	D	D	D	D	D
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				D							D
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									Sa	Sa	
				D	D	D	D	D	D	D	I
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		S	S	D	S						D
										D	D
XS								D		D	D
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D	D	D						D	D	D	D
D	D			D	D					D	D
						D	D	D			D
				C	C						
					D	D		XS	XS		
	D		X	X		S	S	S	D	XS	XS
D	D	D	D	D	D	D	D	D	D	D	D
Th	Th										
										Sa	V
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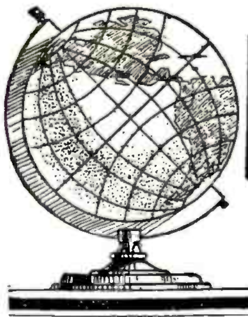
									Sa	Sa	
				D	D						D



WORLD SHORT WAVE TIME-TABLE

(Continued from the Previous Page)

Hours of transmission for the World's Short Wave Broadcast Stations

												FILL IN LOCAL TIME															
8	9	10	11	M	1	2	3	4	5	6	7	EASTERN STANDARD TIME				8	9	10	11	N	1	2	3	4	5	6	7
01	02	03	04	05	06	07	08	09	10	11	12	GREENWICH MEAN TIME				13	14	15	16	17	18	19	20	21	22	23	00
HOURS OF TRANSMISSION												Wave-length Meters	Call Letters	Frequency Kc.	City Country	HOURS OF TRANSMISSION											
										XS	XS	43.99	XGOX	6820	Nanking, China	D	D	XS									
AC							D					44.14	HIH	6796	San Pedro, D. R.					AC	AC			S			AC
D	D	I	I									44.71	TIEP	6710	San Jose, Costa Rica										I	D	D
	T	T	T									45.22	HC2RL	6635	Guayaquil, Ecuador										S	S	S
			Sa	Sa								45.25	HIT	6630	Trujillo, D. R.					XS	XS					D	D
	Th	Th	Th									45.34	PRADO	6618	Riobamba, Ecuador		T	T									
												45.80	HI4D	6550	Trujillo, D. R.				XS	XS	XS			XS	XS	XS	XS
D	D											46.01	YV4RA	6520	Valencia, Venezuela				D	D	D				D	D	D
D	I											46.08	HIL	6510	Trujillo, D. R.											D	D
												46.66	HI1S	6430	Puerto Plata, D. R.					D	D					D	D
D	D	D	I	I	I							46.85	YV5RH	6400	Caracas, Venezuela										D	D	D
												46.91	HI8Q	6395	Trujillo, D. R.				D	D	D				D	D	D
D	D	D									D	47.10	YV5RF	6375	Caracas, Venezuela				D	D	D				D	D	D
D	D	D	D									47.12	YV1RH	6360	Maracaibo, Venezuela												D
D	D										D	47.24	HRP1	6350	San Pedro Sula, Honduras					D	D					D	D
I	I	I										47.62	YV4RD	6300	Maracay, Venezuela												
XS	XS											47.77	HIG	6280	Trujillo, D. R.												XS
	D	D										47.77	COHB	6280	Sancti Spiritus, Cuba		D			D				D	D		
D	D											48.05	HIN	6243	Trujillo, D. R.					D	D						D
XS	XS	XS										48.11	HRD	6235	La Ceiba, Honduras									S	S		
L	L	L										48.15	OAX4G	6230	Lima, Peru												L
AM												48.19	HJ1ABH	6225	Cienaga, Colombia												AM
D	XS	XS		S								48.39	COKG	6200	Santiago, Cuba										D		
D	D	I	I	I								48.50	HI1A	6185	Santiago, D. R.				D	D	D						D
D	D	D		D								48.62	OAX1A	6170	Chiclayo, Peru												
D	D	D										48.70	XEXA	6160	Mexico, D. F. Mexico												D
										XS	XS	48.70	VPB	6160	Colombo, Ceylon	XS	XC	V	V	Sa							
D	D	D	D									48.70	CJRO	6160	Winnipeg, Canada											D	D
D	D	D										48.72	YV5RD	6158	Caracas, Venezuela				D	D	D			D	D	D	D
			Sa	Sa								48.78	VE9CL	6150	Winnipeg, Canada												
D	D											48.78	HJ2ABA	6150	Tunja, Colombia						D						D
	D	D	D									48.78	HJ5ABC	6150	Cali, Colombia				D	S	S						
		D	D	D								48.86	W8XK	6140	Pittsburgh, Pa.												
								D	D	D		48.88	CR7AA	6137	Lourenzo Marques, A.					D	D	D	D				
												48.94	LKJI	6130	Jeloy, Norway				D	D	D	D	D	D			
D	D	D									X	48.94	VE9HX	6130	Halifax, N. S.	X	X	X	X	X	F	F	SF	D	D	D	D
D	D	D	D	D	D							48.94	COCD	6130	Havana, Cuba												D
D	D	D	XS									48.96	HJ3ABX	6122	Bogota, Colombia			XS	XS	D	D				XS	D	D
D	D	D										49.00	HJ1ABB	6120	Barranquilla, Colom.				D	D					D	D	D
					D	D		S	S	S	D	49.18	YTC	6100	Belgrade, Yugoslavia	XS					D	D	D	D	D		
	D	D	D	D								49.18	W3XAL	6100	Bound Brook, N. J.												
			XSa	XS								49.18	W9XF	6100	Chicago, Ill.												
D			XS	XS			XS	D	XS	XS		49.20	ZTJ (JB)	6098	Johannesburg, Africa	S	D	D	D	D	D	D	D	Sa			
D	D	D	D									49.20	HJ4ABE	6097	Medellin, Colombia		D	D	D	D					D	D	D
			Sa									49.26	CRCX	6090	Toronto, Canada				S	D	D	D	D	D	D	D	D
XS	XS	XS										49.30	HJ5ABD	6085	Cali, Colombia												N
XS	XS	D										49.31	HJ3ABF	6084	Bogota, Colombia				D								XS
									X	X		49.32	VQ7LO	6083	Nairobi, Kenya, Afr.	E	E		U	U	U	XC			XS	XS	
D	D	XS	XS									49.34	HP5F	6080	Colon, Panama					S	D	XS		S	S		D
D	D	D	D							D	D	49.34	W9XAA	6080	Chicago, Ill.	D	D	D	D	D	D	D	D	D	D	D	D
											XS	49.34	ZHJ	6080	Penang, S. S.	XS											
D	D											49.42	YV1RE	6070	Maracaibo, Venez.				D	D					D	D	D
D	D											49.46	SBG	6065	Motala, Sweden											D	D
			D	D	D					XS	XS	49.50	W8XAL	6060	Cincinnati, Ohio	D	D	D	D	D	D	D	D	D	D	D	D
D	D	I										49.50	W3XAU	6060	Philadelphia, Pa.												
												49.59	HJ3ABD	6050	Bogota, Colombia					D						D	D
D	D	D										49.59	HI9B	6050	Trujillo, D. R.					D						D	D
	D											49.63	HJ3ABI	6045	Bogota, Colombia												
XS	XS	XS		Sa								49.65	HJ1ABG	6042	Barranquilla, Colom.					XS	XS	S				XS	XS
D		F										49.67	W1XAL	6040	Boston, Mass.												D
							D	D	D	D		49.67	YDA	6040	Tandjong Priok, Java												
D	D	D										49.75	HP5B	6030	Panama City, Panama					D				I			D
D	D	D	D		I							49.79	HJIABJ	6025	Santa Marta, Colombia					D							D
D	D	D										49.83	DJC	6020	Zeesen, Germany			D	D	D	D	D	D	D	D	D	D
D	D	D	D	D								49.83	XEUW	6020	Veracruz, Mexico	D	D	D	D	D	D	D	D	D	D	D	D
E	XS	XS	XS									49.88	XEWI	6015	Mexico, D. F., Mexico								C		I		E
D	D	D	I									49.90	HJ3ABH	6012	Bogota, Colombia				D	D	D	D		S	S	D	D
			Sa	Sa								49.92	COCO	6010	Havana, Cuba		D	D	D	D				D	D	D	
												49.96	CFCX	6005	Montreal, Canada	D	D	D	D	D	D				Sa		
D											D	49.96	HP5K	6005	Colon, Panama	D				D						D	D
D	D	D	D	D								50.00	XEBT	6000	Mexico, D. F., Mexico			D	D	D	D	D	D	D	D	D	D
Z	Z	Z									S	50.17	HIX	5980	Trujillo, D. R.	S	S	S		D	D			D	D		
D	D	D										50.25	HJN	5970	Bogota, Colombia				D								
									S			50.26	HVJ	5969	Vatican City							D					
XSa	D	Sa	Sa									50.50	TG2X	5940	Guatemala City, Gua.												
XS	XS											50.72	HH2S	5915	Port-au-Prince, Haiti						D						
D	D	S	S									50.76	HRN	5910	Tegucigalpa, Honduras					D		S	S	S	D	D	D
D	D											50.85	YV3RA	5900	Barquisimeto, Venez.					D						D	D
D	D											51.15	HI1J	5865	San Pedro, D. R.					D	D	D				D	D
D	D											51.46	TIGPH	5830	Alma Tica, Costa Rica					D	D					D	D
D	D	D									D	51.72	YV5RC	5800	Caracas, Venezuela	D	S	S	D	D	D	D	S	D	D	D	D
	AH	AH	AH									51.90	OAX4D	5780	Lima, Peru		AN	AN	AN								

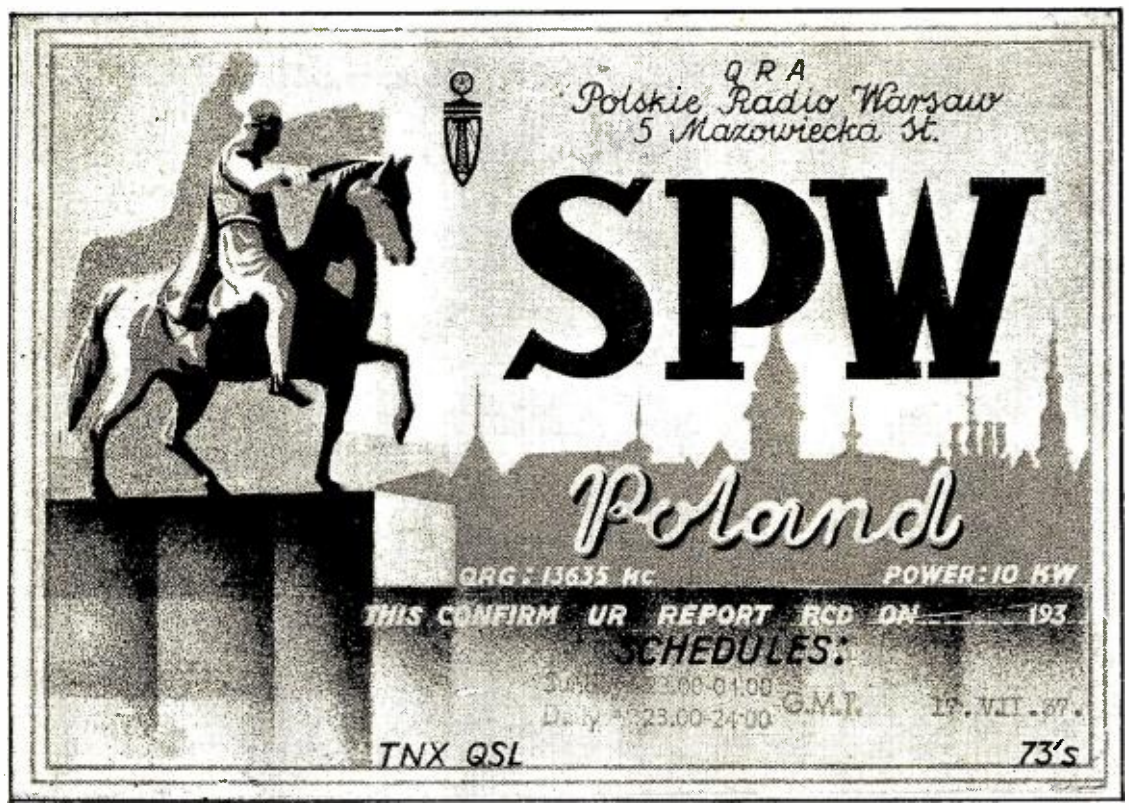
List of Symbols

A—Tuesday, Wednesday, Thursday
B—Saturday, Sunday
C—Monday, Wednesday, Friday
D—Daily
E—Tuesday, Thursday
F—Friday
H—Sunday, Monday, Wednesday, Friday
G—Tuesday, Thursday, Saturday
I—Irregularly

J—Sunday, Tuesday, Wednesday
K—Monday, Friday
L—Wednesday, Saturday
M—Monday
S—Sunday
N—Tuesday, Wednesday
P—Except Tuesday, Wednesday
Q—Sunday, Monday, Tuesday
R—Sunday, Wednesday, Saturday

SF—Sunday, Friday
T—Tuesday
Th—Thursday
U—Sunday, Monday, Thursday
V—Sunday, Wednesday
W—Wednesday
Z—Tuesday, Friday
AC—Monday, Thursday, Saturday
AH—Monday, Wednesday, Saturday

AM—Monday, Thursday
AN—Tuesday, Saturday
AP—Monday, Thursday, Friday
Sa—Saturday
X—Except Saturday, Sunday
XC—Except Tuesday, Thursday, Sunday
XS—Except Sunday
XSa—Except Saturday
XW—Except Wednesday



AN ATTRACTIVE CARD

Two of our readers of RADIO NEWS *sent in separate verifications of SPW, as printed above. They are Enrique Aguiar, of Cuba, and Observer P. L. Stiles, of England. The card is printed in bright blue and black.*

The DX Corner (Short Waves)

(*Continued from page* 481)

p.m., (Shamleffer), heard 9-11 p.m., (Sahlback, Welper), daily 5:15-10:45 p.m., (Dressler, Wollenschlager, Coover, Diez), 11,885 kc., (Fleming).

CSW, Lisbon, Portugal, 9940 kc., (Eder), daily 6-8 p.m., (Alfred, Beard). Slogan: "Emisora Nacional."

CT1AA, Lisbon, Portugal, 9650 kc., (Eder), desires reports, Tuesday, Thursday, and Saturday 4-7 p.m., (Unger), 9665 kc., (Alfred, Dressler); call letters changed to CS2AA, (from ann.), McGowan, Diez, Hendry). Address: Radio Colonial.

HBL, Geneva, Switzerland, 11,400 kc., 2-2:15 p.m., 9340 kc., 2:30-2:45 p.m., 7:30-7:45 p.m., and 8-8:15 p.m., (from veri), (Blanchard, Eder, Atherton, Shamleffer, Coover); beginning Dec. 19—Saturday 6:45-9:00 p.m., (Fleming, Bauer).

HBJ, Geneva, Switzerland, 14,535 kc., heard 3:45-6 p.m., (Staley, Jensen), Saturday 6:45-9 p.m., (until Dec. 12), (Fleming).

HBO, Geneva, Switzerland, 11,402 kc., (Atherton), heard Wednesday 6:15 p.m., (Shamleffer), Friday 2-2:15 p.m., until Dec. 12—Saturday 6:45-9 p.m., (Fleming, Dressler).

OCEANIA

VK6ME, Perth, Australia, 9590 kc., (Eder); daily 6-8 a.m. (Alfred, Hendry, Pierce).

VL3LR, Lyndhurst, Australia, 9580 kc., (Eder); daily 5-8 a.m. (Alfred); Sunday 3-7:30 a.m.; Monday, Thursday, Friday 9:45 p.m.-2 a.m. and 3:00-8:30 a.m., Saturday 9:45 p.m.-2:15 a.m. and 3:30-9 a.m. (Markuson, Wacker, Hendry, Lindner, Pierce).

VK3ME, Melbourne, Australia, 9500 kc. (Eder, D'Orsay); 9510 kc. 6 a.m.; church chimes and cuckoo calls and bells on the hour (Mott); daily 4-7 a.m., (Alfred, Myers, Pierce, Hartzell, Dressler, Hendry, Fleming).

VPD2, Suva, Fiji Islands, 9520 kc., (Eder, Welper); 9540 kc., Monday and Saturday, 5:30-7 a.m., (Alfred); daily 4-7 a.m., (Sibbin).

KZRM, Manila, Philippine Islands, 9570 kc., 9 a.m. and 5 p.m. (Kruger, Moore).

VK2ME, Sydney, Australia, 9590 kc., Sunday 6-7 a.m. (Dressler, Lindner).

VK9MI, M. V. Kanimbla, Australian Coast, 11,710 kc. and 6010 kc. (Regular broadcasting from ship); on irregularly 7-8 a.m. (Sibbin). Address: Messrs. McIlmaith, McEacham, Ltd., Melbourne, Australia.

AFRICA

CR7BH, Lourenzo Marques, Mozambique, 11,700 kc., Signs Sunday 5 a.m. (Ruiz); 11,710 kc., daily 9:30-11 a.m. (from announcement); (Pierce).

IUC, Addis Ababa, Ethiopia, 15,500 kc., daily 11:05-11:35 a.m. (Sporn).

EA9AH, Tetuan, Spanish Morocco, 14,070 kc., 10:45 p.m. and 1 a.m., (Eder); 14,050 kc., (D'Orsay), 14,030 kc., daily 4:45-9:30 p.m., (from veri); (Alfred, Magnuson); 13,997.5 kc., (Hock, Jensen); 14,100 kc., (Ruiz, Fleming, Bauer, Noyes). Address: P. O. Box No. 124.

EAJ43, Tenerife, Canary Islands, 10,370 kc., 7:20-8 p.m., (Bird); daily 3-5:30 p.m., (Alfred, Wacker). Slogan: "Radio Club Tenerife." Address: P. O. Box No. 225.

ZTJ, Johannesburg, Transvaal Protectorate, S. Africa, 9606 kc., 11:45 p.m.-1 a.m., (Magnuson); bugle call at sign off (Welper, Hartzell); 9660 kc., reports requested. Clock strikes 7 times at midnight (Alfred, Moore, Umstead, Poll, Pierce); 6097 kc., (Hock, Eder, Poll); daily except Saturday, 11:40 p.m.-12:45 a.m. (Harris); starts with bugle call, (Shamleffer, Herzog, Atherton, Pierce).

ASIA

JIB, Taiwan, Japan, 10,535 kc., (D'Orsay); daily 6:15-7:25 a.m., (Moore); 9-10:30 a.m. (Schrock).

JZJ, Nazaki, Japan, 11,800 kc., (D'Orsay); daily 4:30-5:30 p.m. and 8-9 a.m., (Hondo, Alfred); 11:45 p.m.-12:10 a.m. (Moore); Sunday 1-1:30 p.m., weekdays 3:45-4 p.m. (Welper, Dressler, Jensen, Harris, Coover, Diez, Self, Fleming, Herzog, Hendry, Pierce, Myers, Beard).

JFAK, Taihsku, Japan, 9625 kc., 9-9:45 a.m., (Kruger); 5-11 a.m., (woman announcer); (Moore); 4-5 a.m., (Honda, Fleming, Eder); daily 4-9:50 a.m., (Pierce).

JZK, Nazaki, Japan, 15,160 kc., (Eder, O'Orsay); daily 4:30-5:30 p.m. and 8-9 a.m., (Honda); daily 12:30-1:30 a.m., (Alfred, Redmond, Moore); 3:45-4 p.m. (Welper, Pierce); daily 3-4 p.m., (Mott, Dressler, Wollenschlager,

(*Turn to page* 502)

MICHIGAN LISTENING POST

This is the apparatus with which Charles W. Martin, of Jackson, covers the short-wave bands. RADIO NEWS *is like a "Bible" to him for short-wave data.*

SERVICE—SALES

(*Continued from page* 463)

hurryup service call. The only thing that cannot be moved is the test panel in the center, which is a homemade affair incorporating a separate ohmmeter with ranges up to 20 megohms, output meter, separate a.c. and d.c. voltmeter and a milliammeter for current readings up to 750 ma. A "B" supply is likewise included.

"All equipment is indirectly lighted

COSTS LITTLE, LOOKS GOOD
Figure 3. J. L. Ford's attractive service shop shown above costs less than fifty dollars, less equipment.

which is easy on the eyes. Occasionally, of course, I use a small desk lamp to peer into remote corners of a chassis.

"Note that the Rider's Manuals and technical books are right up front in plain sight. My customers know what they are and get a big kick out of seeing a schematic diagram of their own receivers.

"I believe that my display of equipment has brought me more service work than all my other advertising combined."

THE DAY'S WORK

QRV. had a rather interesting "fader" in the Bench when we visited the shop. It was a

Radiola R10

Checks of all condensers, resistors and tubes revealed no cause for fading. When an external amplifier was connected to the detector, however, the fading stopped. Trouble was located in two components, the r.f. choke in the detector circuit and the output transformer.

Here are some more—

Crosley 609

Poor sensitivity—adjust position of r.f. coils for best results.

De Wald 632

Inoperative—filaments don't light—probably only a burnt out pilot light.

Echophone C

Try a 56 in place of the 27 for better sensitivity and lower hum.

Zenith 240

If the set lacks "pep" and reproduction is distorted, check the back mounting bolt on the left. This may be screwed in so far that it shorts a bias resistor. The set is of course okay out of the cabinet.

Stromberg 64

Intermittent operation may be due to a defective first a.f. transformer.

N. U. Now Makes Condensers

A new line of condensers has just been introduced by National Union. Both electrolytic and paper types are included and special features are emphasized which will be of interest to all servicemen.

In manufacturing electrolytics, N. U. reports that a new compound, resinous in character, has been incorporated. Their tests of these new condensers show that they stand up for years under exaggerated conditions of heat, cold and high humidity without the need for a wax covering and without changing capacity or peak voltage rating. Adjustable metal lugs are provided for cardboard types for ease in mounting.

The tubular paper condensers are of the non-inductive type, wax-dipped to avoid moisture penetration. Foil ends and leads are carefully soldered and well anchored.

"Hard-to-get" Service Tools.

We've just looked over the new 1938 Philco parts catalog and find

(*Turn to page* 498)

SHOW YOUR EQUIPMENT!
Figure 4. A close-up view of J. L. Ford's shop. Mr. Ford keeps his portable equipment in full view and finds it attracts trade. This shop does double-duty, since it is also a postal sub-station.

Set Tester

(*Continued from page* 461)

potential developed across the meter and rectifier. This further results in an impedance which changes only slightly by changes in rectifier resistance due to varying loads, as the capacitive reactance is the governing factor, being a value several times that of the rectifier resistance.

The ranges are adjusted and calibrated by applying a known voltage to each range in turn, starting with the lowest range, the value of the applied potential usually being about 4/5ths full scale range value. The capacitors are then varied in value until the meter reads correctly at that point.

Accurate to 5%

The means employed for obtaining a uniform scale distribution for a.c. voltage indications are found to be accurate within 5% or better of full scale values which is generally accepted as being sufficient for all practical a.c. measuring purposes in servicing.

A normally closed toggle switch is connected across the a.c. input terminals of the instrument rectifier, as shown in Figure 9, to protect it against overload by electrical surges from transformers, capacitors and chokes. A fuse or other protective device cannot be used because the surges are more or less instantaneous and they can damage the rectifier before heating the fuse enough to open the circuit.

As the a.c. potential measuring circuits have a capacitor in series at all times, this circuit is ideal for the measurement of output potentials as it requires no external capacitor. It should be remembered that this circuit permits accurate measurements at but one frequency, the one for which it was designed. At other frequencies, indications are relative only.

Thus, we have described the actual laboratory design of the various circuits involved in the Supreme Model 541. It is hoped that this information will be the means of fostering a better understanding of the basic principles underlying the design of test instruments, for it is only through such knowledge that the service man will learn to use his test instruments to the best advantage.

Television News

London, England—It is reported that a television camera for aircraft use is being secretly tested by England and France, to project an image of enemy positions to the staff headquarters behind the lines.

RADIO PHYSICS COURSE

ALFRED A. GHIRARDI

Lesson 70, Meters

IN the *thermo-couple* ammeter or galvanometer, the sensitive element is a junction of two dissimilar metals. When two dissimilar metals are joined together and the junction heated, a voltage is generated which is proportional to the difference in temperature between the heated junction and the other ends of the wires. It is also true that when a current flows across the junction of two different metals, some heat is produced. With some combinations of metals, this effect is noticeable even with very weak currents.

Parts (A) and (B) of Figure 1 show two methods of using the principle of generating an e.m.f. by a thermo-couple, in connection with a D'Arsonval movement to measure current of any frequency. These instruments are used more particularly for measuring radio-frequency currents. The construction shown at (A) is employed where the amount of current to be measured is relatively small, usually not to exceed one half ampere. Two small wires of dissimilar metals are electrically welded together at the center. The radio-frequency current to be measured, passes in through one wire and out through the other, heating the wires and the junction. The remaining ends of the wires are connected through a calibrating resistor to the terminals of the moving coil of the instrument. The heating effect of the radio-frequency current passing through the junction of the dissimilar wires causes a direct current e.m.f. to be generated, which in turn results in a flow of direct current through the movable-coil circuit of the instrument, as shown in the illustration.

The heating effect is proportional to the square of the radio-frequency current being measured, whereas the voltage generated across the junction is proportional to the temperature. Therefore, the motion of the pointer over the scale will increase approximately proportionally to the square of the radio-frequency current passed through the thermo-couple. Because of these factors, the instrument has a scale which is crowded at the lower end and more open at the upper end. This makes it necessary to purchase instruments of such a capacity that the average current to be measured will cause a deflection over the "open part" of the scale. Radio-frequency ammeters of this type are not especially accurate below a quarter of the full scale range, because the divisions are crowded at the lower end.

Where the radio-frequency current to be measured exceeds approximately one half ampere, it is customary to use two dissimilar wires connected in parallel as far as the radio-frequency is concerned, but connected in series as far as the thermo-electric effect is concerned. This system of connections is shown at (B) of Figure 1. The heavy line represents one type of metal and the thin line another. Manganin and "Advance" wire are used. It will be noted that the voltage produced at the junction "A" is in the same direction as the voltage produced by junction "B", and they are in series so far as the d.c. path is concerned, so they add together. This

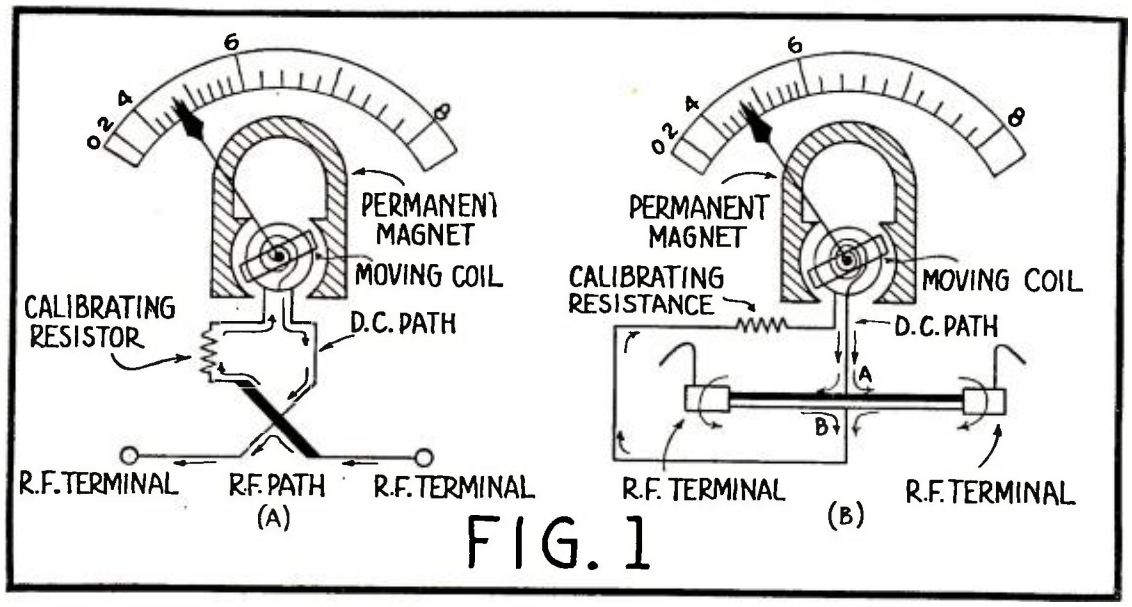


FIG. 1

The principle of operation of thermo-couple instruments. (A) Single thermo-couple instrument for measuring small currents. (B) Compound thermo-couple instrument for measuring larger currents.

results in not only a higher thermo-electric voltage, but also much greater current-carrying capacity.

Most thermo-couple instruments are designed for a d.c. voltage across the moving coil at full scale, of between 15 and 25 millivolts. In all cases they are calibrated by adjusting a small calibrating resistor connected in series with the moving coil. This permits of re-calibration of the meter without any need for the adjustment of the thermo-couple or moving coil.

The usual difficulty encountered with thermo-couple radio-frequency instruments is the burning up of the thermo-couples by current overload. This seldom results in any damage being done to the movement and the trouble can be corrected simply by replacing the damaged thermo-couple with a new one. Most manufacturers of instruments of this type will sell the thermo-couples separately so that the customer can make his own replacements. They are usually sealed in a vacuum in a glass tube.

When replacing the thermo-couples, it will usually be necessary to adjust the resistor connected in series with the moving coil in order to re-calibrate the instrument. Calibration can be made with 60-cycle current, as the reading of the instrument is the same on radio frequencies as it is at 60 cycles.

The range of a thermo-couple instrument can be changed by soldering a shunt made of a short piece of copper wire across the thermo-couple lugs. If it is necessary to double the capacity of the instrument, the pointer should be brought to full-scale reading by means of 60-cycle a.c. A shunt should then be soldered between the brass block carrying the thermo-couple, and adjusted so that the instrument reads one-half the full scale value. The current passing through the instrument then will be represented by the reading of the instrument multiplied by 2.

Shunts on radio-frequency instruments always should be as short as possible, and placed parallel and close to the thermo-couple. If they are placed outside the instrument case, the instrument will not read exactly the same on radio frequencies as it does on low frequencies.

Thermo-couple instruments can be used in d.c. circuits as well as in a.c. circuits of any frequency. The reading is not altered by the frequency of the current.

On the "Up"

Washington, D. C.—Exports of radio parts and accessories during the nine months ending September of this year totaled $6,390,761. compared with $4,438,405. in the same nine months' period last year.

CONTROL ROOM OF 2ZB, WELLINGTON, N. Z.

One of the four stations which constitute the New Zealand Government's National Network, this station opened in 1937, is modern in every respect and provides high-fidelity programs on 1120 kilocycles, with 1 kw. in the antenna.

THE DX CORNER

(*For Broadcast Waves*)

S. GORDON TAYLOR

REPORTS on broadcast band DX reception so far this season have, in general, been rather discouraging, as was to be expected. 1937 lies just about at the bottom of the DX cycle. The next few years, according to the now apparently confirmed theory of the influence of sun spots on the broadcast band reception, should show constant and radical improvement.

In general, the downward trend from 1932 to date has been somewhat offset by the constantly increasing power of both the United States and foreign stations, and the improvement in receiving equipment. This increased power and better receivers, plus the constantly improving conditions which we may expect, should result during the next five or six years in a brand of DX such as we have never known before. This improvement will probably not be marked until 1939 but from then on until about 1944 just watch the sparks fly!

DX CLUB CHANGE

WORD comes that Art Parfitt, Carl Eder and Harry M. Gordon have resigned their respective positions as president, secretary and BB editor of the Globe Circlers DX Club to become officers of the National Radio Club, the officers of which are as follows: Arthur J. Parfitt, President; Robert Weaver, Vice President; Carl Eder, Secretary; Harold Wagner, Treasurer; Harry M. Gordon, Editor-in-Chief; Robert Weaver, BB Editor; Anne Eder, Short-Wave Editor.

These officers have asked that their very best wishes be extended to all RADIO NEWS Listening Post Observers. In return, may we extend to these men our best wishes for the continued growth of the NRC under their guidance.

WPAX SPECIAL

MR. H. WIMPY, owner of WPAX, 1210 kc., Thomasville, Ga., writes that everyone reporting the frequency check which they are dedicating to RADIO NEWS Observers on January 12, 3:10-3:30 A.M., E.S.T., will receive a beautifully illustrated booklet describing Thomasville and vicinity. In addition to this, the most distant listener reporting within ten days after the broadcast will receive a 5-pound box of the famous Georgia paper shell pecans.

The winner of a similar prize offered in connection with the November frequency check program from this station was Dale Smith of Eugene, Oregon.

DX CALENDAR

BELOW are given lists of special DX broadcasts. The initials following an item indicate the organization to which the program is dedicated and where a RADIO NEWS special has been arranged for by an Observer, his name is given in the schedule.

Don't fail to tune in the RADIO NEWS specials on this list and as many others as possible—and above all, don't fail to report to each station tuned in, giving them as much information as you can concerning their signal strength, fading, quality,

etc. Where verifications are desired it is always desirable to enclose return postage.

Hours shown are Eastern Standard Time and are all a. m. unless otherwise indicated.

Day	Hour	Kc.	Call	State	Kw.	Club
			January			
2	2-4	1120	WJBO	La.	.5	R. News, Golson
6	2-3:30	1310	KWOS	Mo.	.1	R. News, Sahlbach
8	4:10-4:30	1500	WKBZ	Mich.	.1	R. News, Sahlbach
8	5:10-5:30	1200	KBTM	Ark.	.1	R. News, Sahlbach
8	5:30-5:50	1200	KFXD	Idaho	.1	R. News, Sahlbach
8	5:40-6	1410	KFJM	N. Dak.	.5	R. News Sahlbach
9	2-3	1420	WCHV	Va.	.1	UDXC
10	4:20-4:40	1370	KLUF	Texas	.1	R. News, Sahlbach
10	4:50-5:10	1420	KEUB	UTAH	.1	R. News, Sahlbach
10	5:50-6:10	1210	KGLO	Iowa	.1	R. News, Sahlbach
11	3:10-3:30	1260	KPAC	Texas	.5	R. News, Sahlbach
11	4:10-4:30	1370	KAST	Oregon	.1	UDXC
11	4:10-4:30	1360	KLMP	N. Dak.	1.	R. News, Sahlbach,
11	4:20-4:40	1310	KRMD	La.	.5	R. News Sahlbach
11	5-5:20	1370	KRMC	N. Dak.	.1	R. News, Sahlbach
11	5:40-6	1380	KQV	Penna.	.5	R. News, Sahlbach
11	5:50-6:10	1210	KLAH	N. Mex.	.1	R. News, Sahlbach
11	3:20-3:40	1430	WHEC	New York	.5	R. News, Sahlbach
12	3:10-3:30	1210	WPAX	Georgia	.1	R. News, Sahlbach
12	4:40-5	1500	KPLT	Texas	.25	R. News Sahlbach
12	5-5:20	1200	KFJB	Iowa	.1	R. News, Sahlbach
14	4-4:20	1210	KIUL	Kansas	.1	R. News, Sahlbach
14	5:30-5:50	1310	WLBC	Indiana	.1	R. News, Sahlbach
16	3-4	810	WCCO	Minn.	50.	IDA
16	5-6	1370	KOBH	S. Dak.	.1	UDXC
23	5-6	1120	CS2WA	Portugal	20.	UDXC
24	3-4	1150	WHAM	New York	50.	IDA
30	3-4	780	CHWK	Canada	.1	IDA
			February			
1	6-6:15	1420	WMBS	Penna.	.25	R. News, Sahlbach
6	2-4	1120	WJBO	La.	.5	R. News, Golson
6	3-4	1370	KWYO	Wyoming	.1	IDA
8	5:40-6:00	1200	WCAT	S. Dak.	.1	R. News, Sahlbach
9	3:40-4:00	1310	KAND	Texas	.1	R. News, Sahlbach
9	4:20-4:40	1430	KSO	Iowa	.5	R. News, Sahlbach
9	5:20-5:40	1370	KELD	Ark.	.1	R. News, Sahlbach
9	5:40-6:00	1420	KRBC	Texas	.1	R. News, Sahlbach
10	3:20-3:40	1370	WBLK	W. Va.	.1	R. News, Sahlbach
10	3:40-4:00	1200	WJBC	Ill.	.25	R. News, Sahlbach
10	4:10-4:30	1500	KAWM	N. Mex.	.1	R. News, Sahlbach
10	5:10-5:30	740	KTRB	Calif.	.25	R. News, Sahlbach
11	5-5:20	1420	KIUN	Texas	.1	R. News, Sahlbach
12	4:20-4:40	1310	KTSM	Texas	.25	R. News, Sahlbach
12	4:20-4:40	1390	KRLC	Ida.	.1	R. News, Sahlbach
12	4:40-5:00	1420	KCMC	Texas	.25	R. News, Sahlbach
12	5:00-5:20	1420	KGFF	Okla.	.25	R. News, Sahlbach
12	5:20-5:40	1370	KFRO	Texas	.25	R. News, Sahlbach
14	3:40-4:00	1320	WSMB	La.	1.	R. News, Sahlbach
14	4:00-4:20	1280	WCAP	N. Jersey	.5	R. News, Sahlbach
14	4:00-5:20	1210	WFOY	Florida	.25	R. News, Sahlbach
15	6-6:30	1310	KGFW	Neb.	.1	R. News, Sahlbach
27	2-4	1120	WJBO	La.	.5	R. News, Golson
27	3:30-4	750	KGU	Hawaii	2.5	IDA

Periodic

Mondays—
9:15-9:30 p.m., 690 kc., CJCJ Calgary, Alta., Canada, .1 kw. (tips).

Wednesdays—
12:30 a.m., 1390 kc., KOY, Phoenix, Ariz., 1 kw. (tips).
1:45-2 p.m., 780 kc., WTAR, Norfolk, Va., 1 kw., (URDXC) (tips).

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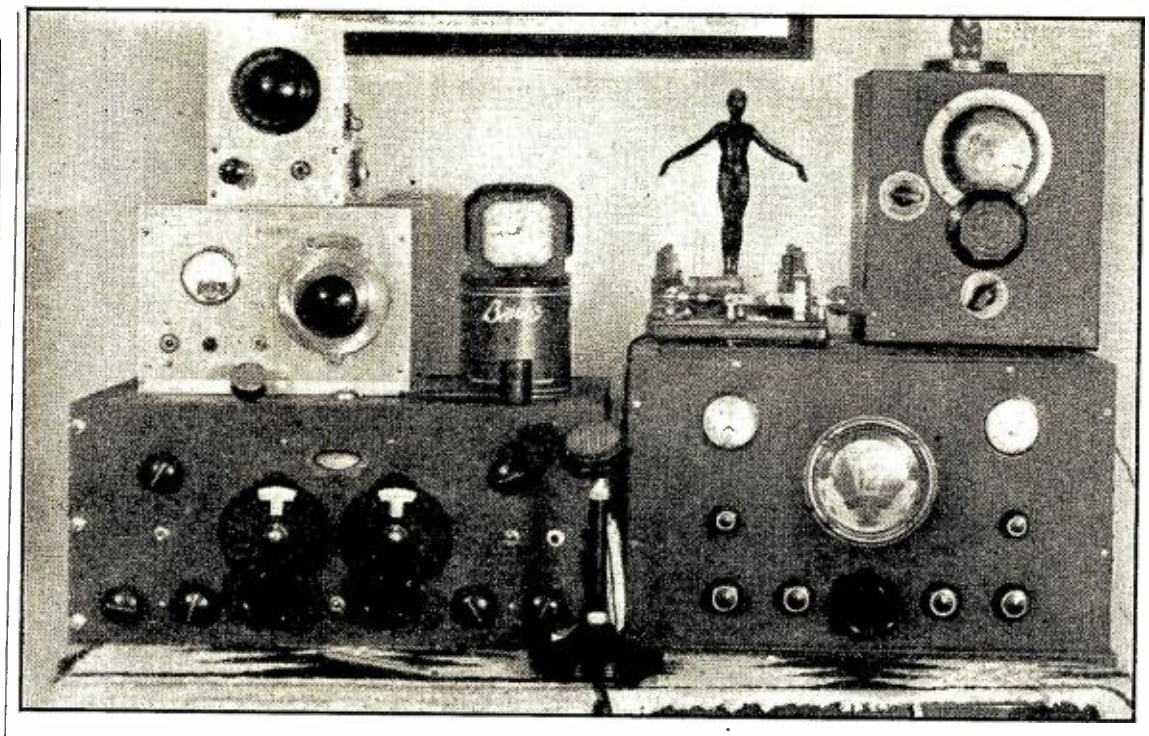


OPERATING TABLE—W1DBM (PORTABLE 2)

Phil Rand now operating portable at his new QRA at West Orange, N. J., is running several hundred watts on 5 and 10 meters. Up in the Orange Hills, with an altitude of 600 feet, he is DX'ing in grand style. We recognize the R. N. "Quartet" and the "Breiting 12" receivers. Our guess is that the other equipment includes a preselector, r.f. oscillator, monitor and the Goddess of DX.

THE AMATEUR OBSERVER

Conducted by W2JCR

WE hear a good many complaints from short-wave listeners to the effect that they send numerous reports to amateur stations without obtaining the coveted QSL cards in return. It is true that many amateurs are lax in the matter of sending out cards but, on the other hand, the short-wave listener must learn that the enclosure of return postage is an important item which he too often overlooks!

Observer Jack Quintrell of Maryland once more brings this point up quite forcibly. He reports that he has never yet failed to get a QSL from a reported station except in the single instance of OQ5AA (and he is still hoping for this one). He believes that this record is the result of always including the necessary return postage and the evidence seems to substantiate this belief. He recently had occasion to go through the hundreds of SWL letters and cards received at amateur station W3FII. From these he found that Australian listeners as a group are the only ones that consistently send return postage. About half of the English listeners enclose postage but among the United States listeners four out of every five expect the amateur station to pay the postage.

Listeners should bear in mind that many of the leading amateur stations receive many hundred reports each year. Sending cards in response to all of these is an arduous task but one which most of these stations' operators willingly undertake. It is entirely too much to expect them to add to this task the job of paying the postage.

It is highly probable that those who take their DX work seriously as do the Radio News Observers do consistently enclose return postage. To others let us repeat, if you want QSL cards, make your reports complete and *don't forget to enclose return postage.*

NEW OBSERVERS

(Appointed during November)

United States

California: W. E. Crane, J. E. Moore, Jr., R. A. Rush
Colorado: J. J. Doyle
Connecticut: Owen Shepherd, Jr.
Georgia: D. J. White
Illinois: Leo Herz, K. M. Miller
Iowa: Clifford D. Kruse, Jack R. Lewis
Maine: Willis E. Blanchard
Massachusetts: John B. McGowan, Sydney G. Millen
Minnesota: Raymond J. Roehl
New York: R. C. Eaton, Howard Mann, Nicholas Woytan
Ohio: Thomas Reep, R. F. Shamleffer
Oregon: Don Smith, Jr.
Pennsylvania: J. Arp, Walter F. Drake, Burnell Unger, Austin Wardman, Samuel D. Wildt
South Dakota: Dwight H. Sholl
Tennessee: David McKinney
Virginia: D. S. Catchim

Foreign

Canada: Eric Adams, Stanley Clarke
England: M. J. Bright, G. A. Clayton, H. F. Hamilton, H. R. Moon, P. L. Stiles, E. H. Walker, Ken Weale
Italy: Renato Brossa
Portuguese East Africa: Denver Edward Whyte
South Africa: Eric Gertenbach, H. Westman, Oscar Westman

Calls Heard

By W. F. Herzog, Box 544
Center Moriches, N. Y.

20 meters: VO6D, 6B, ON4SS, F8PU, 8QD, 8XT, EA9AH, OQ2QY, G2KU, 5PW, YV4AB, 5ABT, 5AM, 5ABQ, VK3KZ, K4DDH, ZU5Z, ZS5M.

By Charles J. Havlena, 41-1424 Chapin Street, N. W., Washington, D. C.

10 meter phone: G5ML, 6WU, GM6RG, VO6JQ, YV4AB.

20 meter phone: EI2L, HH5PA, HK3JA, K6BNR, 6GQF, 6OQE, GM6RG, G2HA, 5TO, 5RV, 6IA, 6LK, 6JF, 6WN, 6VX, TI2AV, VK3XJ, 3AL, 3GQ, 3KR, 4JX, 6LW, VP9G, YV4AX, 5AA, 5AE, 5AF, F8JB, 3NF, HC1JB, 2CG, LA1G, LU1HI, NY2AE, OA4R.

By J. C. Sibbon, 61 Victoria Street, Onehunga, Auckland, New Zealand

20 meter phone: KAX, NOB1, NU8MC, 8JM, K6OQE, 6MVQ, 6MZK, KA1HS, 1BH, G5RV, 6DL, HI4F, 7G, HH5PA, CE3AS, 3CO, SM6AY, 7YA, TI2RC, LU5CH, 7DK, CN8AJ, NY2AE, CA9AX, F8AH, EI2O, F8LX, PK3AA, W2CYX, 4RU, 4EEE, 6MXK, 6FV, 6BKY, 8OW, 9YGC, 9IMG, VS7GJ, HJ1EP, SU1FG, XE1GF, J2KJ, 2MI, VE5EF.

By Stanley Clarke, 468 Bourgeois Street, Montreal, Canada

10 meter phone: EI2L-7, F8LX-5, G6BW-6, 6DH-6, 6LK-6, 6RH-8, 8GX-7, PAOXD-4, ZS2N-6, ZU6P-6.

10 meter c.w.: D3DSR-7, 4KPJ-6, EI6G-9, 7G-7, 9J-7, F8BS-7, SCT-6, 8OB-6, 8QW-7, 8RR-8, 8WK-5, 8XW-7, G2IM-6, 2LA-7, 2PL-5, 2WD-9, 5JU-6, 5PP-6, 5QY-7, 6KD-7, 6MK-6, 6QB-8, 6QZ-6, 6RB-7, 8AZ-6, GM6KH-8, 11IT-5, K5AG-6, 5AN-7, OH2NB-4, 7XC-7, OK1FF-6, 2RM-5, 3VA-8, ON4FT-4, 4XC-6, 4SS-8, 4VU-5, OZ6G-6, PAOAZ-7, OVB-6, OVI-7, OXR-4, PV2CW-4, TF5C-7, TI2RC-7, YM4AA-4, YV5AA-7, ZS1AH-6, ZT6AU-5, LU3DS-6, 5AN-4.

20 meter phone: VO6D-9, VP3THE-9.

20 meter c.w.: F8SJ-8, FM8AD-5, G2WJ-7, 8RG-7, HH3L-8, HK4AG-9, K5AB-6, 6JPD-4, OH3NQ-6, OX2QV-6, 2ZA-7, VK3NG-4, VO6JQ-9, VP2AT-8, 4CF-5, LU8EN-4, ZS1AH-9, 2X-9.

By Burnell Unger, 525 Frederick Street, Hanover, Pa.

20 meter phone: VP3BG-7, 3BH-8, 3TH-3, 6YB-7, K6NZQ-4, LU1EA-4, HH2B-8, G6WP-8, YV5ABY-8.

By Robert H. Hibbs, 503 Main Street, Hayward, Calif.

20 meters: CE1AO, 3AI, 3EO, 3AC, 3CO, HC1JB, HK1JN, HH2B, 5PA, K7FBE, LU1JC, 3BAC, 4BL, 5CO, 5FG, 6KE, 9FB, NY2AE, OA4AL, TI2DC, 2RC, VP3THE, YV4AB, 5AA, 5AD, 5AE, 5AK.

By John B. McGowan, 66, Bedford Road, Woburn, Mass.

CE1AO-7, CN8AJ-6, 8AM-8, 8MB-7, CT1AI-7, 1AG-7, 1AY-8, 1QG-6, FT4AN-5, HC1JB-8, HH2B-8, 2G-7, 2PB-7, 5PA-8, HK1BG-7, 1JN-7, 1LE-6, 4AG-9, 4FM-7, K6NZQ-6, LU4BH-6, 8BR-7, OA4AI-6, 4AL-7, 4AR-7, 4R-8, ON4BG-7, 4PA-7, 4SS-8, OQ5AA-5, SU1KG-7, VK2NO-7, 2UU-6, 2VN-7, 3BZ-7, 3ZL-7, 4JU-6, VP2AT-8, 2CD-7, 2DA-8, 3BG-7, 3THE-9, 3NYZ, 5AF-7, ZS2N-6, 6AI-7, ZT6J-6, ZU6P-7.

By William W. Oglesby, Jr., Harrisburg, N. C.

20 meter phone: F3OO-3, SU1CH-6, J2MF-5, 5NI-7, 6WR-5, 6RA-4, LU4AP-4, OA4R-7, CE1AO-5.

By Milton Hawley, Lake Orion, Mich.

20 meter phone: VP4TH-9, EI2I-8, G2XV-4, 5PP-5, 5WH-7, 6RG-7, 6WD-7, 6GF-6, HK1GK-6, ZU6W, 6P, HR9D-8, ON4GA-8, F3ID-6, LU1EX-5, PK4AU-3, OA4AK-8, CE3DW, PY4AK.

By Samuel D. Wildt, 305 E. Pine Street, Selinsgrove, Pa.

20 meters: VK2TR-8, 3WD-8, 3ZZ-8, 3GQ-8, 3NP-8, 3KX-7, 3LI-8, 3BZ-4, 4JX-8, 4BR-9, VP2AT-7, 3BG-8, 4DA-8, 4TH-7, 5AF-9, OA4R-7, 4AI-8, HK1Z-8, 1LE-7, 1DG-7, 3IA-8, YV4AB-5, 4AO-8, 5AA-7, 5ABO-8, HH2B-8, 2LD-8, SV1KE-5, TI2AV-9, FGXG-6, CE3AA-7, CT1AY-7, D4HNG, EA8AE, LU4KA, PY1FR, SE2AH, KA1ME, G5KH, CN8AM.

By Homer Bohlender, R. R. 2, Brookville, Ohio

10 meter phone: VK2GU-6, K6OQE-8, 6MVV-8, 6KMB-7, LU1EX, 7AG-6, G20A-7, 2KU-7, 2PA-5, 2DH-7, 5VM-8, 5SA-7, 5TH-8, 5JO-7, 5BJ-7, 5BM-6, 5VT-6, 6AG-7, 6RH-7, 6HL-8, 6CW-6, 6IA-6, 6LL-7, 6NK-7, 8SA-8, 8BJ-7, 8FZ-7, 8GX-6, GM6RG-7, ZE1JR-6, EI2L-7, 6G, 8L-7, 9J-8, ZU6P-8, 6E-7, ZT6I-6, 6AK, ZS1C-6, 2N-7, 6T-7, 6P-8, 6AJ-6, F3HM-6 3HL-6, 8KJ-6, 8LX-7, 8JD-7, 8RR-6, SP1HH-6, SM5SV-6, 7YA-6, HK1EP-6, 3IA-7, VP5GM-6, YV5AK-8, 5AA-8, HH5PA-7, PA-UN-7, TI2FG-8, FA3JY-6, VP6YB-8.

20 meter phone: ZS1J-6, 2N-5, 3F-7, 5M-6 ZU5L-6, 5Z-6, 6P-7, 6E-6, F3VC-5, 3HL-6, 3GR-5, 3OO-6, 8KW-7, LU1PA-7, 1QA-6, 1DJ-6, ZE1JR-6, HA8N-6, HK1JN-7, 1Z, 4AG-7, CX2AK-7, 3BL-6, YV3AA-7, 4AX-6, 5AK-8, 5ABY-7, G2FC-6, 2XV-7, 2AK-6, 5NI-7, 5JO-7, 5WO-5, 5RV-7, 5KH-6, 5JW-7, 5ZJ-7, 5ML-8, 6XR-8, 6IA-6, 6WT-6, 8KW-5, 8MY-6, 8IX-7, EI3J-6 O,N4BG-6, 4DM-5, 4SS-6, VP2DA-7, 2AT-6, HH2B-7, 5PA-8, VK2VA-5, 2NP-6, 20G-6, 2ADE-4, 3ZL-6, 3GQ-7, 3NG-6, 3TW-6, 5DC-6, EA9AH-8, VP6YB-7, 6TR-6, TI2AV-7, 3LR-7, OA4C-6, 4AL-8, 4R, K6GAS-7.

By Gerald Swanberg, 16 Seaver Street, Brockton, Mass.

20 meter phone: EI2L-8, G6BC-6, 6IA-7, K6GQF-5, LU5CZ-5, 8AB-7, ON4VK-8, SU1CH-6, VP3THE-8, ZU6P-4.

75 meter phone: W8GSC7, 9AGX-6, 9CPD-8, 9GFQ-7, 9HYO-8, 9JVM-5, 9KQH (Portable in Chicago)-7, 9MKC-8.

By Sydney G. Millen, 40 Wayland Street, Roxbury, Mass.

10 meters: G2DH-9, 2IL-5, 2KU-6, 5VM-8, 5ML-9, 5KH-8, 5IQ-5, 5IO-5, 5BM-7, 5SA-7, 5AS-7, 5VT-7, 6BW-9, 6RH-6, 6BH-8, 6QB-6 6AG-7, 6HL-8, 6IA-6, 6LK-8, 6PC-9, 6MK-8, 6AR-9, 6LO-7, 6PL-8, 6NF-8, 6LP-8, 6GF-4, 8G-8, GM6RG-8, F3KH-8, 8SA-6, 8IR-7, 8KI-8, 8LZ-7, 8LX-8, PAOBE-3, VU2FV-7, ZH6P-9, YV5AA-9, 5AK-9, EI6J-6, 2L-6, 9J-8, ZL6Q-6, ZS6AJ-8, ZE1JR-6, VK2GU-8, I1TKM-6, O4VRR-8, HK3JA-6, 4EA-9, OK3UA-7, ON4ZK-4, SP1HH, VU2CQ-6, VP6UB-8, K6NEK-9, 6MVV-6, 6KLW-7.

By W2KFB, Julian D. Hirsch, 18 Edgewood Park, New Rochelle, N. Y.

20 meter c.w.: G2MA-6, 2QB-8, 5QA-8, 6WB-6, 6KU-7, 8FZ-7, 8PC-8, F8ET-5, 8SK-5, ON4VW-5, 4AU-6, 4CL-3, PAOZB-5, CX2AJ-4, YV1AK-7.

20 meter phone: F3GR-8, VO6D-9, G2PU-6, 6VX-6, 6XR-7, ON4SS-7, HK3JA-9, TI2AV-8, YV4AA-7, 4AS-8, OX2QY-7, VP3THE-9.

40 meter c.w.: F8PV-5, K6SO-4, ZL2BV-4.

80 meter c.w.: W4DQW-7, 5MK-6, 5FRB-6, 5GFT-5, 7FUI-6.

By Jack Flagg, 2207—13th Avenue, Oakland, Calif.

10 meter phone: K6LCV-9, 6QE-9, 7PQ-9.

20 meter phone: K6BAZ-9, 6BNR-8, 6JLV-8, 6NZQ-8, 6OQE-8, 7FST-8, NY2AE-9, HH5PA-7, LU5CZ-8, TI2KP-7.

75 meter phone: W5DNV-8, 5EBO-8, 9DXD-7, 9GFQ-8, VE4EA-9, 4EC-9, 4EO-8, 4GA-7, 4LA-8.

By Austin B. Wardman, 832 Linden Avenue, East Pittsburgh, Pa.

20 meters: ZU6P, F8PU, HA3L, G5JA, W8OOR, 8EJR, 9GFJ.

By Wilbur Croston, 2737 Mahoning Road, N. E., Canton, Ohio

10 meter phone: LU7AV, K6MVV, PY2AC, ZE1JR, 6P, YR5AA.

20 meter phone: VO6L, 6JQ, OX2QY, CT3AQ, PK6WF, VQ1AB, F8AC, J2MI, NW6A, CE3DW, EA8AH, LU5CZ, 7AC, 9HX, 9KA, OA4A, TI2DC, 2LR, 2RT, VK3LA, 3MR, 3MX, 3VW, VP3BG, 3AL, 4CQ, 6YB, CX1AA, FI4AA, CP1AA, HK4AB, HH2B, K6BAZ, 6CMC, 6NTV, 6QOE, SP1HH, ZB1H, G5BJ, 5ML, 6JF, 6XR, 8LP G,M6RG, F8KW, ON4SS.

By David McKinney, Box 816, Kingsport, Tenn.

HH3AC-2, 5PA-5, HK1JM-5, K6BNR-8, 6KLV-8, NY1AE-3, TI2RC-7, 2PG-6, VP3BD-4, 3BQ-6, 5EZ-8, 5PZ-8, 6PR-7, 6TI-3, YV4AA-7, 4AF-6, ZS1AH-4, 4U, ZT2L, ZU6P.

By Jack R. Lewis, 909 South 6th Street, Burlington, Iowa

20 meters: EA9AH-8, HB9BL-8, HC1EGC-6, HK1EP-8, 4HG-8, K6NZO-8, 6OJI-7, LU4BH-7, NY2AE-8, TI2AV-8, VP3BG-8, YV5AG-8.

75 meters: W2AU-8, 3JC-8, 3FGJ-8, 3CW-8, 3DG-8, 4BZX-8, 4CMF-7, 5BRW-8.

160 meters: W1AA-6, (portable), 4DIV-8, 4ERH-7, 5CYQ-8, 5CRG-7, 5GPR-8, 5FNY-8, 5FLB-7.

By Clifford D. Kruse, 1316 Garfield Avenue, Dubuque, Iowa

20 meter phone: K7EGU, LU1RC, 1MU, 1LU, 4BM, 4BL, 4NA, 5AN, 7AC, 7BX, VK2FU, 2HK, 2HF, 2RX, 2XX, 3AL, 3KI, 3KN, 3LI, 3LA, 3MX, 3RC, 3TE, 4JU, 4JV, 5BO, 5LV, 6YB, ON4BK, VP2DQ, 3BG, CE1AO, 1LK, 3AH, HK1BT, 1RV, 1AE, 1BA, 1JN, 4AG, TI2WW, 2AV, 2FG, 2KP, 2RC, 2FR, 2XE, 3RE, HC1JB, 1JV, 1SK, 1EZ, 1FG, F3JD, 3LN, G2CU, 2GY, 2PU, 5LI, 8BX, HH5PA, K6BNR, 6KMV, 6MAZ, 6MVQ, 6MZQ, EI2L, VP5AU, 5PZ, VO6L, KA1AK, OA4L, 4R, 4N, 4AB, 4AL, 4C, CX1CC, EA9AH, PY9AQ, YV2IRR, 3AB, 5ABT, 5ABC, 5AB, 5AD, 5AE, 5ABE, 5ABH, 5ABS, 5ABP, 5ABF, 5AK, 5AM, ON2QY, VQ1AB.

By D. J. White, Palmetto, Ga.

20 meters: G5KH-4, 5ML-7, 8RO-5, VO6D-8, TI2AV-8, 2AB-9, 5AF-5, HC1JB-9, YV5AFV-8, 5AA-8, 5AV-5, 5AE-9, LU8AB-6 OA4C-7, 4AL-5, HH2B-4, ZU6P-2, ZT5X-4.

By Howard Mann, Box 10, Jordan, N. Y.

10 meter c.w.: F8RR-9, ON4VU-9, PAOXR-7.

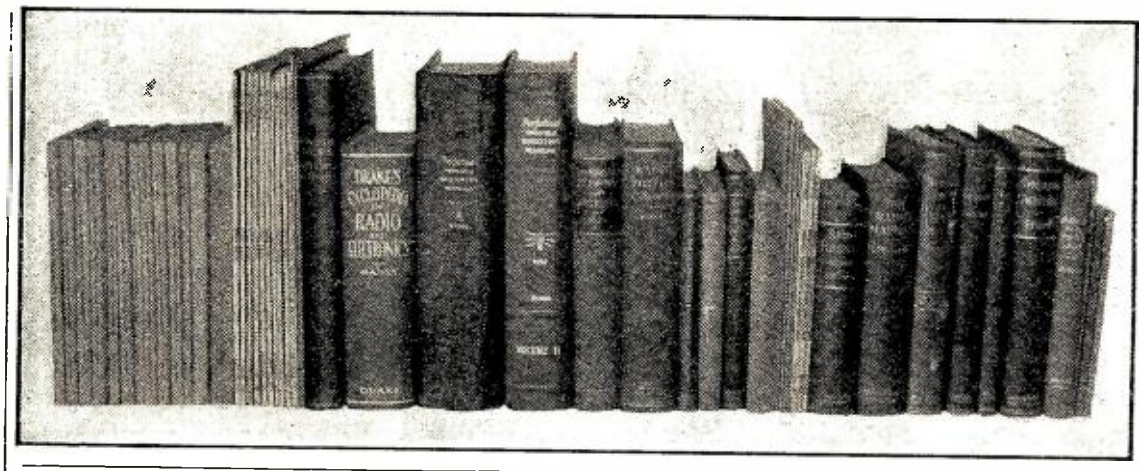
10 meter phone: CN8AV-8, CT1GU-5, EI9J-8, F3HL-8, 3KH-9, G8SA-7, 8SB-7, GM6RG-9, K6MVV-9, PAOFB-7, PAOWN-8, SM5OI-8, ZE1JN-9, 1JR-6, ZT2G-7, 6AM-6, ZU6P-8.

20 meter phone: CE3DW-6, CN8AJ-9, CT1AY-4, EA9AH-8, EI2L-9, F3OO-9, 8AN-7, 8DC-5, 8DL-8, 8KW-8, 8PW-7, GM5NW-9, 5ST-7, K6BNR-8, 6KMB-5, 6NTV-6, 6NZQ-9, LU4BH-7, 7AG-6, OX2QY-9 P,Y2BA-5, SU1KG-6, SU8MA-8, SV1KE-4, 2ADE-7, 2AZ-9, 3KR-6, VQ1AB-8, ZU6P-7.

By W1IJ, Owen Shepherd, Jr., Route 2, White Gate Farm, Madison, Conn.

5 meters: W1KUH-4, 1IKB-7, 1KQR-8,

(*Turn to page* 512)



THE TECHNICAL REVIEW

CONDUCTED BY THE TECHNICAL EDITOR

The Radio Amateur's Handbook, Fifteenth Edition, published by the American Radio Relay League Inc., 1938. This enormously popular manual reaches its fifteenth edition improved by the addition of new features and by adopting a new method of presenting fundamental theory. The new volume contains 564 pages, 600 illustrations, 73 charts and tables and 111 practical equations and formulas.

New chapters have been added and others revised. There is a general treatment of workshop practice, dealing with the problems of handling metal and other material, assembling and wiring apparatus and constructional data on work benches, operating tables and transmitter racks. Of special note is the attention given in another chapter to portable and emergency equipment, which is becoming increasingly important. For the raw beginner a new chapter on fundamental principles explains what it's all about in the simplest terms. This Handbook has achieved world-wide acceptance for its authoritative information on all phases of amateur radio. The new edition has been translated into Spanish to increase further its universal usefulness.

Radio Foto Log, by Samuel Kaufman, published by National Union Radio Corp. of New York, 1937. A lively little booklet containing lists of all broadcasting stations in this country, and a world-wide short-wave station list and time table. Photographs of radio celebrities and interesting information regarding them form the introduction. Two world distance charts are included. This booklet is especially valuable to servicemen and DX listeners.

Supplement to Frank C. Jones Radio Handbook, by Frank C. Jones, published by Radio, Limited. 1937. This booklet contains additional information regarding the design and construction of transmitters and receivers for amateur use. Tables of tube characteristics, coil calculations, and capacitive reactance supplement data in the well-known larger Handbook by the same author. An improved v.t. keying circuit and a pre-selector are among the articles included in this booklet.

Sylvania Technical Manual, published by Hygrade Sylvania Corporation, 1937. The new edition of this well-known tube manual lists the characteristics, operating conditions and circuit applications of more than two hundred types of tubes. The appendix contains a number of receiver and amplifier circuits, lists of interchangeable tubes and a bias resistor chart as well as some fundamental laws and formulas. This new edition is made up with a ring binder which allows the booklet to lie flat when opened. This feature adds considerably to its convenience as a reference book.

RCA Review, October, 1937. RCA Institute Press. In this quarterly issue Dale Pollack discusses the factors affecting coil resistance at frequencies ranging from 4 to 25 mc. Some popular misconceptions regarding the effect on coil Q of high-loss coil forms are exploded. Shepard presents, among others, more of his unique circuits for capacity-operated and photo-cell relays. Additional articles cover the design of video amplifiers, a review of microphones and recent developments in other branches of the radio field.

Advanced Disc Recording. Universal Microphone Co. Ltd., 1937. This booklet contains considerable information on lateral recording on aluminum and cellulose nitrate discs. The design of a recording amplifier is discussed and a representative circuit shown. The factors involved in the choice of a cutting tool and head are considered as well as many

other points which are of interest to those engaged in or about to enter this type of work.

Review of the Proceedings of the Institute of Radio Engineers for November, 1937

An Electrodynamic Ammeter for use at Frequencies from 1 to 100 Megacycles, by H. M. Turner and P. C. Michel. A description of the design, construction and theory of operation of an electrodynamic ammeter which provides an absolute means for the measurement of current of the order of 1 to 5 amperes at frequencies from 1 to 100 megacycles.

A Low-Distortion Audio-Frequency Oscillator, by Herbert J. Reich. An adaptation of the Turner "Kallirotron" negative resistance circuit to a variable-frequency oscillator of low harmonic content. A complete circuit and design data are given.

An Analysis of Admittance Neutralization by means of Negative Transconductance Tubes, by E. W. Herold. A theoretical analysis of the method of reducing capacitance by feedback from the anode of a negative transconductance tube in order to compensate for decrease in impedance at high frequencies.

Review of Contemporary Literature

The Necessary Conditions for Instability of Electrical Circuits, by D. G. Reid. Wireless Engineer, November, 1937. A mathematical analysis in which the possibility of self-oscillation of a circuit is shown to depend on the signs of the real parts of the roots of the characteristic differential equation of the circuit.

Radio Amateurs in the Television Picture, by James J. Lamb, QST, December, 1937. Announcing a plan whereby radio amateurs may cooperate in the development of television.

Disc Recording Equipment and Its Quality Requirements, by T. L. Dowey, Communications, October, 1937. A discussion of the factors involved in high-grade recording systems.

Thermal Drift in Superheterodyne Receivers, by John M. Miller, Electronics, November, 1937. Since low-loss dielectrics show a smaller temperature coefficient of effective dielectric constant than higher-loss types, the author finds that by substituting better materials in a given design, thermal drift is greatly reduced.

An Inexpensive Bridge for Capacitance and Conductance Measurements, by L. E. Herborn, Bell Laboratories Record, November, 1937. Describes a modified Schering type of

bridge for use over the voice frequency range. Because it eliminates capacitance standards the bridge is compact and relatively inexpensive.

An Ultra-High Frequency Oscillator, by Arnold Peterson, The General Radio Experimenter, October, 1937. A laboratory oscillator of high frequency stability is described. It is designed to operate at 100 mc. In this issue, a compact dummy antenna for receiver testing is also shown. The new I.R.E. specifications, in case you didn't know, call for a unit composed of a series capacitance of 200 mmfd. followed by a 20 microhenry inductance. This coil is shunted by 400 mmfd. in series with 400 ohms. This single unit takes the place of the two dummy antennas formerly employed respectively for broadcast and short-wave band receiver testing.

FREE BULLETINS

Free Microphone Folder

Radio News offers, through the courtesy of the Stromberg-Carlson Telephone Mfg. Co., a free folder listing the Stromberg-Carlson model Nos. 5 and 6 microphones, and new line of paging systems. Write in for your free copy to Radio News, 461 Eighth Avenue, New York City.

1938 Parts Catalog

Our readers will be pleased to know that the latest Hammarlund parts catalog is now ready for distribution and free copies have been set aside for them. It has been compiled for easy reading and quick reference. A number of brand new items are listed, including new neutralizing condensers, double spaced single and dual micro condensers, and the latest "Super-Pro" console models. Send request to Radio News, 461 Eighth Avenue, New York City.

Latest Parts Catalog

The Try-Mo Radio Company recently announced their 1938 catalog comprising 50 pages and listing test equipment, radio sets, tubes, P. A. systems, etc. A free copy of this catalog is available to Radio News readers for the asking. Send request to Radio News, 461 Eighth Avenue, New York City.

Condenser and Tube Folder

The National Union Radio Corp. just brought out a new folder listing their new line of paper and electrolytic condensers. It also lists their complete line of radio tubes, panel lamps, cathode-ray tubes, P. E. cells, and exciter lamps. Address request to Radio News, 461 Eighth Avenue, New York City.

Special Catalog

Solar's latest catalog No. 2X on their complete line of transmitting capacitors is very descriptive. It is extremely helpful to amateurs, station engineers, and dealers; and they can obtain a free copy simply by writing to Radio News, 461 Eighth Avenue, New York City.

Free Folder

The Drake Mfg. Co. has very kindly offered to supply all Radio News readers with a copy of their new "Dial and Jewel Light Assemblies" booklet. Contained in this folder is their complete line of panel light mountings of the clip-bracket types, bayonet types, etc. Send requests to Radio News, 461 Eighth Avenue, New York City.

To Eliminate Interference

The Aerovox folder entitled "Clear Reception" is an interesting little booklet on the subject of background noise suppression. Also featured are several types of noise eliminators or filters made available by this company. Copies can be ordered free of charge from Radio News, 461 Eighth Avenue, New York City.

RADIO NEWS Booklet Offers Repeated

FOR the benefit of our readers, we are repeating a list of valuable, FREE technical booklets and manufacturers' catalog offers, which were described in detail in the September, October, November, December 1937 and January, 1938, issues. The majority of these booklets are still available to all readers. Simply ask for them by their code designations and send your request to RADIO NEWS, 461 Eighth Avenue, New York, N. Y. The literature marked with an asterisk is available only to bona fide servicemen, dealers and engineers. In applying for these folders it is necessary to send in your request on your card or letterhead. If you are an amateur give call letters. The list follows:

S2—Transformer Catalog. Kenyon Transformer Co.

O2—Sound Equipment Catalog. The Radolek Co.

O3—Instructive data for eliminating interference. The Sprague Products Co.*

O4—Catalog on "Nokoil" Speakers. Wright-DeCoster, Inc.

O5—Circular describing gas-engine a.c. electric plants. Kato Engineering Co.

O7—Guide Book on Peri-Dynamic Speakers. Jensen Radio Mfg. Co.

N1—Parts Catalog. Wholesale Radio Service Co.

N3—Catalog on Radio Accessories, Cabinets, etc. Bud Radio, Inc.*

N4—Allied Radio Corp. Parts Catalog.

D1—R.M.A. Color Code Chart. Free Cornell-Dubilier Corp.

D2—Condenser and Resistor Catalog. Aerovox Corp.

D3—Technical Pamphlets on Intercommunication Systems. Wright-DeCoster, Inc.
D4—Transmitter Manual. Standard Transformer Corp.*
D5—"Skyrider" Receiver Booklet. Hallicrafters, Inc.
D6—The Muter Ballast Tube Catalog.*
D7—Centralab's Volume Control and Accessory Catalog.
Ja1—Modell's Radio Receiver Catalog.*
Ja2—Tube Chart. Raytheon Production Corp.
Ja3—1938 Receiver Line. Freed Mfg. Co.
Ja4—Catalog on I.F. Transformers. Aladdin Radio Industries, Inc.

Television Course

(*Continued from page* 476)

The picture picked up is thus a mosaic make up of 3600 elementary areas being uniform within themselves but from one to the other varying in shades of gray between and including black and white.

The variations of light at the rate of a possible 54,000 per second are translated into equivalent variations of anode current in the photo-cell—that is, the percentage of light striking the cathode of the photo-cell at any instant will cause a corresponding percentage of current to flow. And in one second these 54,000 impulses will be the dissected electrical equivalent of 15 slightly differing pictures in perfect sequence, a line at a time, one following the other. Just as soon as the last or innermost aperture of the disc leaves the picture area the top aperture outermost starts again to scan the area. Any change taking place in the projected picture in 1/15th of a second will be identified in scanning and the illusion of motion may be obtained by 15 slightly differing pictures per second.

With a conventional capacity coupled audio amplifier, these photo-cell current impulses are amplified so that they may be effectively transmitted. When a current is made equivalent to a voice or a sound wave it is called an audio frequency as it effects the auditory nerves on reception. A picture equivalent such as the 54,000 cycle impulse signal is called a "video" frequency as it effects the visual nerves on reception and reproduction.

What Is A Radio Tube?

Washington, D. C.—To prevent public deception in purchase of radio sets and tubes, the RMA is considering promulgation of an industry definition of what actually constitutes a radio "tube." An exact definition is being considered by the Association's engineering organization and Tube Division, for final consideration by the RMA Board of Directors.

Characterization of ballast resistors as "tubes" is a merchandising practice of which the RMA has taken cognizance and also the Federal Trade Commission in its proposed rules for the set industry which would prohibit advertising of so-called "ballast tubes" or dummy or fake tubes.

Serviceman's Diary

(*Continued from page* 452)

Jumped into the truck again—and found it started without a helping push from Cleopatra, standing by and ready to aid.

Next—an old house near the business section. A friend of the boss lives there and had brought in his Emerson midget with the complaint that it made a bad, buzzing sound when turned on during the day but was usually okay at night. We tried the set at the shop, telling him the trouble was probably at his location and not in the set and of course it played all right. While they are not close enough to car lines to pick much noise, there is a saw-mill nearby which might be guilty.

Went inside and switched the set on. As soon as the tubes heated, there was a buzz (and a mean one)! Too loud to be caused by trouble outside the house. I turned the set off and thought a moment. He claimed no trouble at night. As far as the house was concerned, the only difference between day and night operation was that at night lights were on. So I tried it with every light in the room switched on. No trouble. I called in the madam and located the switchboard with her help. One of the old-time cartridge-fused affairs which apparently hadn't been looked over for a long time. Located the proper circuit and had her try the set alone again. Sure enough, as soon as the set was switched on, an arc developed at one of the fuse block contacts. It lasted only a short period and occurred only from a no-load to load condition and not when the set was merely an added load on the circuit. I went over the entire board, tightening and cleaning all the fuse blocks and contacts. I don't think they'll have any more trouble.

U. S. Station List

(*Continued from page* 479)

WOR	Newark, N. J.	710	50.0
WORC	Worcester, Mass.	1280	0.5

(*Continued on next page*)

WORK	York, Pa.	1320	1.0
WORL	Boston, Mass.	920	0.5
WOSU	Columbus, Ohio	570	0.75-1.0
WOV	New York, N. Y.	1130	1.0
WOW	Omaha, Nebr.	590	1.0-5.0
WOWO	Ft. Wayne, Ind.	1160	10.0
WPAD	Paducah, Ky.	1420	0.1-0.25
WPAR	Parkersburg, W. Va.	1420	0.1
WPAX	Thomasville, Ga.	1210	0.1
WPAY	Portsmouth, Ohio	1370	0.1
WPEN	**Philadelphia, Pa. (1.0 kw. night)	920	0.25-0.5
WPG	Atlantic City, N. J.	1100	5.0
WPHR	Petersburg, Va.	880	0.5
WPRA	Mayaguez, Puerto Rico	1370	0.1-0.25
WPRO	Providence, R. I.	630	0.5-1.0
WPRP	Ponce, Puerto Rico	1420	0.1-0.25
WPTF	Raleigh, N. C.	680	5.0
WQAM	Miami, Fla	560	1.0
WQAN	Scranton, Pa.	880	0.5-1.0
WQBC	Vicksburg, Miss.	1360	1.0
WQDM	St. Albans, Vt.	1390	1.0
WQXR	New York, N. Y.	1550	1.0
WRAK	Williamsport, Pa.	1370	0.1-0.25
WRAW	Reading, Pa.	1310	0.1
WRAX	Philadelphia, Pa.	920	1.0
WRBL	Columbus, Ga.	1200	0.1-0.25
WRC	*Washington, D. C. (1.0-5.0 kw.)	950	0.5-1.0
WRDO	Augusta, Me.	1370	0.1
WRDW	Augusta, Ga.	1500	0.1-0.25
WREC	Memphis, Tenn.	600	1.0-5.0
WREN	Lawrence, Kansas	1220	1.0-5.0
WRGA	Rome, Ga.	1500	0.1-0.25
WRJN	Racine, Wisc.	1370	0.1-0.25
WROK	Rockford, Ill.	1410	0.5-1.0
WROL	Knoxville, Tenn.	1310	0.1-0.25
WRR	Dallas, Texas	1280	0.5
WRTD	Richmond, Va.	1500	0.1
WRUF	Gainesville, Fla.	830	5.0
WRVA	Richmond, Va.	1110	5.0
WSAI	Cincinnati, Ohio	1330	1.0-2.5
WSAJ	Grove City, Pa.	1310	0.1
WSAL	Salisbury, Md. (C.P.)	1200	0.25
WSAN	Allentown, Pa.	1440	0.5
WSAR	Fall River, Mass.	1450	1.0
WSAU	Wausau, Wisc.	1370	0.1
WSAY	Rochester, N. Y.	1210	0.1
WSAZ	Huntington, W. Va.	1190	1.0
WSB	Atlanta, Ga.	740	50.0
WSBC	Chicago, Ill.	1210	0.1-0.25
WSBT	South Bend, Ind.	1360	0.5
WSFA	Montgomery, Ala.	1410	0.5-1.0
WSGN	Birmingham, Ala.	1310	0.1-0.25
WSIX	*Nashville, Tenn (0.25 kw. day)	1210	0.1
WSJS	Winston-Salem, N. C.	1310	0.1
WSM	Nashville, Tenn.	650	50.0
WSMB	*New Orleans, La. (5.0 kw. day)	1320	1.0
WSMK	Dayton, Ohio	1380	0.2
WSNJ	Bridgeton, N. J.	1210	0.1
WSOC	Charlotte, N. C.	1210	0.1-0.25
WSPA	Spartanburg, S. C.	920	1.0
WSPD	Toledo, Ohio	1340	1.0-5.0
WSPR	Springfield, Mass.	1140	0.5
WSUI	Iowa City, Iowa	880	0.5-1.0
WSUN	St. Petersburg, Fla.	620	1.0-5.0
WSVA	Harrisonburg, Va.	550	0.5
WSVS	Buffalo, N. Y.	1370	0.05
WSYB	Rutland, Vt.	1500	0.1
WSYR-WSYU	Syracuse, N. Y.	570	1.0
WTAD	Quincy, Ill.	900	1.0
WTAG	Worcester, Mass.	580	1.0
WTAL	*Tallahassee, Fla. (0.25 kw. day)	1310	0.1
WTAM	Cleveland, Ohio	1070	50.0
WTAQ	Green Bay, Wisc.	1330	1.0
WTAR	Norfolk, Va.	780	1.0
WTAW	College Station, Texas	1120	0.5
WTAX	Springfield, Ill.	1210	0.1
WTBO	Cumberland, Md.	800	0.25
WTCN	Minneapolis, Minn.	1250	1.0-5.0
WTEL	Philadelphia, Pa.	1310	0.1
WTHT	Hartford, Conn.	1200	0.1
WTIC	**Hartford, Conn. (1040 kc.)	1060	50.0
WTJS	Jackson, Tenn.	1310	0.1-0.25
WTMJ	Milwaukee, Wisc.	620	1.0-5.0
WTMV	E. St. Louis, Ill.	1500	0.1-0.25
WTNJ	Trenton, N. J.	1280	0.5
WTOC	*Savannah, Ga. (5.0 kw. day)	1260	1.0
WTOL	Toledo, Ohio (C.P.)	1200	0.1
WTRC	Elkhart, Ind.	1310	0.1-0.25
WVFW	Brooklyn, N. Y.	1400	0.5
WWAE	Hammond, Ind.	1200	0.1
WWJ	**Detroit, Mich. (5.0 kw.)	920	1.0-5.0
WWL	New Orleans, La.	850	10.0
WWNC	Asheville, N. C.	570	1.0
WWRL	Woodside, N. Y.	1500	0.1-0.25
WWSW	Pittsburgh, Pa.	1500	0.1-0.25
WWVA	Wheeling, W. Va.	1160	5.0
WXYZ	Detroit, Mich.	1240	1.0

Where two powers are given, the first is used at night and the second (the larger one) in daylight—until local sunset.

C.P.—Construction permit for new station.

*Construction permit for alternate frequency or higher power or both, shown in parentheses.

**Special authorization to work on alternate frequency or power or both, shown in parentheses.

Service—Sales

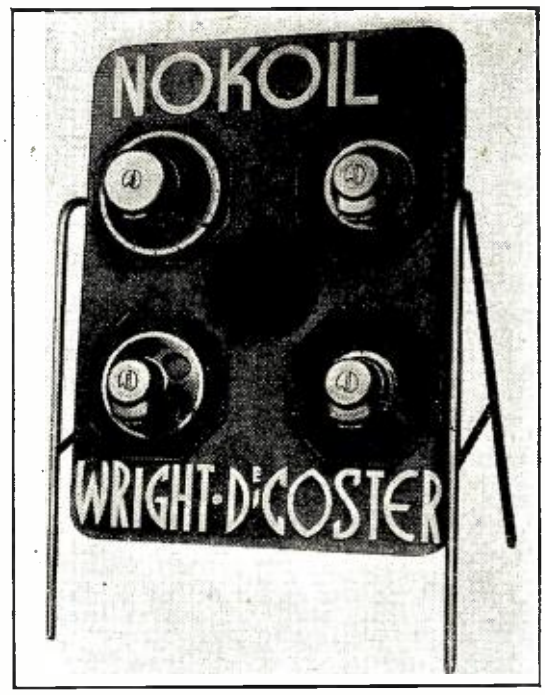
(*Continued from page* 486)

listed a number of useful tools for which servicemen have been searching. A rubber-faced mallet for locating loose connections, dental-type inspection mirror, and a special screwdriver for inserting or removing those new-type, specially-slotted "Phillips head" screws are included as well as a wide variety of line filters.

These items may be obtained from any Philco distributor.

A Novel Speaker Baffle

This demonstrating board (See Figure 5) is arranged to accommodate five Nokoil speakers, any one of which may be quickly attached behind the large grille hole in the center. This enables the distributor to demonstrate to customers the performance of any of the five different speaker models under proper operating conditions.



SHOWS THEM WORKING

Figure 5. This special easel baffle not only displays the speakers, but enables a quick and effective demonstration of how well they work.

The board measures 3 by 4 feet and is mounted on strong bronze finished metal standards in such a way that it cannot accidentally be tipped over.

Dealers and distributors receive this demonstration board free with an order for 10 speakers, five of which are placed on the board while the duplicates are used as fresh stock to fill orders.

Chassis on Stilts!

Many otherwise well-equipped shops overlook the need for some substantial and safe means of supporting the chassis under repair. Often we see tube cartons, old condensers and transformers propped under the chassis, forming a rickety and precarious support which too often caves in and damages the dial, tuning meter

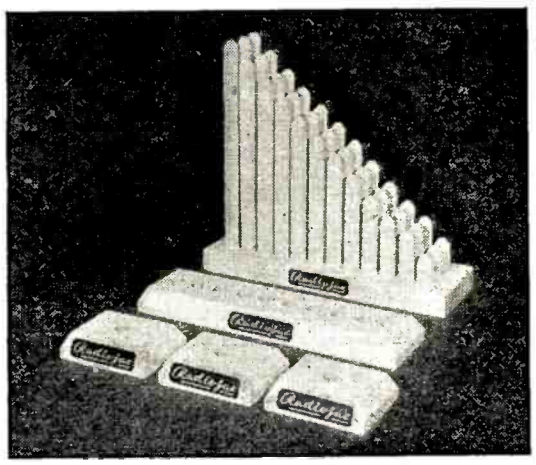


Figure 6. Wooden pins of varying height adapt the Radiojac to any type of chassis.

or some other component of the customer's radio.

The Radiojac illustrated in Figures 6 and 7 does the job in a simple, efficient manner. It is constructed entirely of wood, so there is no chance

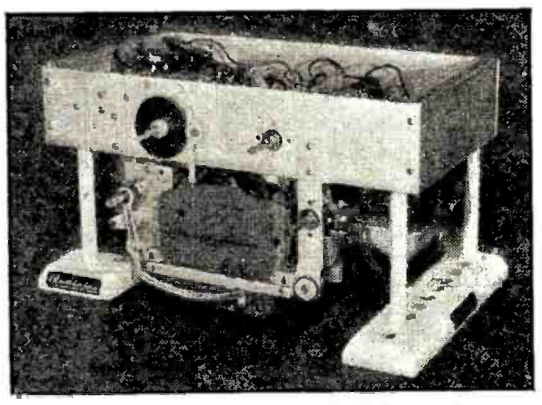


Figure 7. The Radiojac in action.

of shorts occurring such as metal cradles may cause. It is put out at a low price by Cooks Manufacturing Company.

U. L. to Label Cord Sets

On and after April 1, 1938, all cord sets approved by Underwriters Laboratories, Inc., will be identified by a label. Labels will be available January 1, 1938, and may be applied from that date on, to cord sets which have passed the tests and specifications. The Reexamination Service heretofore in force on cord sets, which made no provision for the use of labels on these devices, will be discontinued April 1, and all approved cord sets must thereafter bear a label.

The Standard for Cord Sets, dated October, 1937, does not contain the requirements for attachment plug caps or for appliance or flatiron plugs. Requirements for these devices will be included in the Standard for Attachment Plugs and Receptacles which will soon be released in revised form.

The identification of approved cord sets by means of this label, which states specifically that the cord set is listed by Underwriters' Laboratories, Inc., is expected to be of advantage to both manufacturers of listed products and to purchasers of these products. (From Nema News).

The "Ham" Shack

(*Continued from page* 469)

thode-bias arrangement, it is not necessary to provide for an external C battery. However, in some instances it may be found that a hum will be heard in the receiver when the filaments are lighted. This usually may be eliminated by connecting a small battery in the grid circuit; 4½ volts will be sufficient.

This amplifier was designed specifically for 10- and 20-meter operation, although it may be used on lower frequency bands, if desired, with appropriate coils. The grid coils are wound on standard 1½-inch forms. Connections are made to the filament tips. The coil for 20 meters has 12 turns of No. 16 double-cotton-covered wire with spacing between turns equal to the diameter of the wire. The 10-meter coil has 5 turns of the same size wire wound in the same manner. These coils tune to resonance easily with the 50 mmfd. grid condenser.

The plate coils are standard Coto units, equipped with banana plugs. The 10-meter coil has 6 turns wound on a three-inch diameter with 1 inch between turns. The 20-meter coil has 10 turns wound 3¾ inches in diameter with ½-inch spacing between turns. Both coils tune their respective bands very nicely with the 50-mmfd condenser specified.

The amplifier is link-coupled to the 807 transmitter described in the September and October issues. A single-turn link mounted on porcelain stand-off insulators about ¼ inch larger in diameter than the coil forms (i.e., 807 plate coil and T-55 grid coil) provides ample coupling between the two units to drive the grid of the T-55 at its normal rating. The link coil is mounted around the center of the 807 plate coil and at the filament end of the grid input coil of the T-55.

An external filament transformer that delivers 7½ volts is used for heating the filament. A power supply, capable of delivering between 1000 and 1500 volts, should be used for the plate voltage. The T-55 is rated to operate at a maximum of 1500 volts at 150 milliamperes. This will provide an input of 225 watts and with normal efficiency an output of about 160 watts. However, if the amplifier is to be plate modulated, it is recommended that the input be reduced to about 150 watts for most efficient operation. Operating the tube at this conservative input will extend its life considerably.

Little difficulty should be experienced in putting the amplifier unit in operation. First connect the link to

the exciter stage. If the 6C5, 802 and 807's already have been tuned, no further adjustment is necessary. The filament of the T-55 then is lighted. The amplifier plate voltage is left "turned off" on the T-55. With a 0-to-50 milliampere range ammeter in the grid circuit, the grid-tuning condenser should be adjusted to resonance. This, of course, is determined by "maximum" grid current. The grid current should be slightly more than 30 milliamperes, without plate current applied.

Next the amplifier stage should be neutralized. This is done by attaching a neon lamp to the plate end of the tank coil and tuning the amplifier plate condenser. Unless the amplifier is accidentally neutralized, the neon bulb will glow at resonance. Still leaving the plate voltage off, adjust the neutralizing condenser until there is no indication of radio frequency in the neon bulb. This should indicate that the stage is neutralized. As a further check, disconnect the neon bulb and rotate the plate condenser, observing the grid-current meter at the same time. This should remain absolutely stable. If the amplifier is still not neutralized, the grid current will jump when the plate condenser passes the resonant point. It is important to remember when operating such an amplifier on 10 and 20 meters, tuning in both the grid and the plate circuits is quite critical, so it is necessary to rotate the tuning units very slowly while making adjustments. Otherwise, the resonant points might be missed.

Next apply the plate voltage, and again tune the amplifier for resonance. Now it will be indicated by a sharp dip in the plate current. At both 10 and 20 meters the plate current, without coupling to an antenna, should be between 10 and 15 milliamperes.

The amplifier is now ready to be coupled to an antenna. The method of coupling is determined by the type of antenna feeders used. At 10 and 20 meters the most popular type of antenna is the "Q," fed by a 400- or 600-ohm line. Satisfactory coupling to such an antenna may be obtained by winding a 2- or 3-turn link around the center of the tank coil. Spreading a 3-turn link so it parallels two turns at the center of the tank coil will provide a good match for a 600-ohm line. The pick-up coil should be adjusted by moving it "in and out" of the tank coil for the proper degree of coupling. Proper adjustment will load up the amplifier so it will draw rated plate current of about 150 milliamperes. If a low-impedance line, such as a twisted pair or concentric feeder is employed, one turn about the center of the tank coil should provide adequate coupling.

With normal efficiency at 150 watts input, the amplifier will give an output of better than 100 watts, which has proved quite adequate for operation on the 10- and 20 meter bands. The T-55 will take a higher input, but from the standpoint of economy at high frequencies, it is extremely wise to conservatively operate transmitting tubes.

The 807 exciter unit provides more than sufficient driving power to operate such an amplifier at good efficiency at both 10 and 20 meters. This seems to be one of the problems of 10-meter operation. However, it was found that sufficient driving power could be obtained with a single 807 in the exciter, instead of the two in parallel, and when two were operated in parallel, it was necessary to reduce the plate voltage to 350 volts to keep the driving power within specified limits.

If more power is desired, the amplifier unit just described may be adapted to larger tubes, such as the 100-TH, RK-38, 808 or the HF-100. Any one of these tubes may be employed merely by providing the proper filament voltage. Considerably higher inputs may be applied to the 100-TH, RK-38 and the HF-100 if desired.

List of Parts

1 Chassis 10 by 7 by 3¾ inches, Terminal
1 50-mmfd. per section, 6,000 volt split stator condenser, Cardwell
1 50-mmfd. midget receiving type condenser, Cardwell
1 neutralizing condenser, Cardwell
2 .002-mfd. mica receiving type condensers (500-volt) Aerovox
1 .002-mfd. mica transmitting condenser (6,000-volt) Aerovox
1 2-mfd. 1000-volt filter condenser, Aerovox
1 5,000 ohm, 100-watt tapped resistor, Ohmite
1 200 ohm, 50-watt resistor, Ohmite
2 isolantite four-prong sockets, National
2 closed circuit jacks, Bud
2 coil forms, Hammarlund
10 and 20-meter transmitting inductances, Coto
3 porcelain lead through insulators with banana jacks
4 porcelain lead through insulators for terminals
1 radio-frequency choke coil, 500 milliampere rating, Hammarlund

Education by Radio, In Schools

Columbus, Ohio—A five-year study of radio broadcasts planned for school use has been launched under the direction of I. Keith Tyler, Radio Division, Bureau of Educational Research, Ohio State University. The investigation, Mr. Tyler says, will be concerned not so much with what is now being done in the way of school broadcasts, but rather with what can be done. Broadcasters, including both individual stations and the networks, are cooperating in the various studies.

VENEZUELAN BROADCASTER

The owner of YV5RD sends in a of his QSL card, with 73's to Radio News short-wave listeners.

The DX Corner (Short Waves)

(*Continued from page* 484)

Jensen, Ashton); 15,210 kc., (Diez, Self, Honda, Fleming, Herzog); 15,140 kc., (Wittig, Beard).

JDY, Dairen, Manchukuo, 9920 kc., 7:45 a.m. (Eder); daily 5:30-8 a.m. (Alfred, Moore, Hartzell).

JVN, Nazaki, Japan, 10,660 kc., daily 5-7:45 a.m. (Alfred, Myers, Welper, Pierce); daily 1:40-2 a.m. (Honda); daily 5-10 a.m. (Fleming, Hendry, Dressler, Adkins, Pierce).

YDB, Soerabaja, Java, 9550 kc., (9610 kc. from veri); (Eder); Thursday 7:15-7:33 a.m. (Myers); weekdays: 10:30 p.m.-2 a.m., 5:30-10 a.m., (Saturday until 11:30); and 6-7:30 p.m., Sunday 7:30-2 a.m. and 5:30-10 a.m. (from veri); (Kure, Pierce, Fleming).

PLP, Bandoeng, Java, 11000 kc., daily 5:30-7:30 a.m., (Alfred); daily 4:30-5:30 a.m. (from veri); (Kure, Moore, Pierce); daily 5:30-11 a.m. (Fleming, Pierce).

PMN, Bandoeng, Java, 10,260 kc., daily 5:30-7:30 a.m. (Alfred); daily except Sunday, 10-11 a.m. (Kure, Pierce, Self); signs 10:30 a.m.) (Honda); daily 5:30-11 a.m. (Fleming).

PLV, Bandoeng, Java, 9415 kc., daily 5:30-7:30 a.m. (Alfred, Moore).

YDA, Batavia, Java, 6040 kc., daily 7:30-2 a.m. (from veri); (Kure).

YDC, Soerabaja, Java, 15,150 kc., daily 10:30 p.m.-2 a.m., 5:30-10 a.m. (Saturday until 11:30); and 6-7 p.m. (from veri); (Kure, Self).

PMH, Bandoeng, Java, 6720 kc., daily 5:30-11:30 a.m. and Sunday 9:30 p.m.-1:30 a.m. and 5:30-11 a.m. (from veri); (Kure).

ZBW3, Hong Kong, China, 9530 kc., no longer verify (Eder); irregularly 6-7 a.m. (Alfred, Welper); 9525 kc. (Diez); daily 3-10 a.m. (Pierce).

XGOX, Nanking, China, 9800 kc. heard until 11 a.m. (Honda); 6820 kc. (Diez) 6:50 and 7:32 a.m. (Eder).

XTY, Canton, China, 9490 kc., 7:20-9:20 a.m. (Sporn).

CQN, Macao, Portuguese, China, 10,135 kc., 7-8:30 a.m. (Sporn); 9677 kc. (Diez).

HS8PJ, Bangkok, Siam, 19,020 kc., Monday 9:30-10 a.m. (Pierce); Monday 8-10 a.m. (Self).

YAK, Afghanistan, 18,640 kc., 6-6:45 a.m. (Sporn).

VPB, Colombo, Ceylon, India, 6160 kc., 8:30-10:30 a.m. (Sporn).

VSZOR, Laula Paula, Malay States, 23,800 kc., daily 5:25-5:55 a.m. (Sporn).

CENTRAL AMERICA

YNOP, Managua, Nicaragua, 5758 kc., 8-10 p.m. (Alfred). Slogan: "Radio difusora Boyer."

YNGL, Managua, Nicaragua, 8610 kc., Wednesday 9:15-10 p.m. (Shamleffer).

TILS, San Jose, Costa Rica, 5800 kc., daily 7-11:30 p.m. (Fleming); 5900 kc. (Eder).

HRN, Tegucigalpa, Honduras, 5910 kc., (Diez); daily 7-10 p.m. (Fleming).

TIRCC, San Jose, Costa Rica, 6550 kc., Tuesday, Thursday and Saturday, 6-7 p.m., Sunday 10 a.m.-7 p.m., Sunday and Thursday

8 p.m. relays TIRCC (long wave) (Alfred). Slogan: "Radioemisoca Catolica Castaniceuse." Address: P. O. Box No. 1064.

TIGPH, Alma Tico, Costa Rica, 5820 kc., irregularly 8-10 p.m. (Alfred, Eder). Slogan: "Alma Lica." Address: P. O. Box No. 800.

TGWA, Guatemala City, Guatemala, 11,760 kc. and 9689 kc., relays TGW. 11,760 kc. Tuesday 9-10:30 p.m., 9680 kc., Saturday 11:25 p.m. (Shamleffer), requests reports. (Lindner, Unger); 9680 kc. daily 8-12 p.m. (Welper); 11,745 kc. (Hartzell, Alfred, Magnuson, Moore, Umstead, Scala, Poll, Dressler, Hock, Ashton, Jensen, Wollenschlager); 15,228 kc. (Diez, Honda); 15,180 kc., daily 8 a.m.-1:30 p.m. 11,790 kc., Wednesday 10 p.m.-1 a.m., 9695 kc., daily 1:30-10 p.m. (Fleming, Betances, Harris, Hendry, Adkins, Wittig, Eder, McDermott, Meyers, Sargent).

TIPG, San Jose, Costa Rica, 6410 kc. Signed 11:37 p.m. (Welper); daily 7-9 a.m. and 12-2 p.m. (Alfred, Diez, Fleming, Betances). Slogan: "La Voz de la Victor." Address: P. O. Box No. 225.

TG2X, Guatemala City, Guatemala, 5940 kc. (Eder). Signed to midnight (Welper); 9-12 p.m. on Saturday and Wednesday (Alfred); daily 8-11:30 p.m. (Fleming).

ZIK2, Belize, British Honduras, 11,550 kc., irregularly (from veri); (Fleming).

YSD, San Salvador, El Salvador, 7890 kc., 9:30 p.m. (Eder); daily 9-10 p.m. (Moore, Bauer, Herzog). Slogan: "Radio Nacionales." Relays YSS.

HP5A, Panama City, Panama, 11,700 kc. (Eder); 11,750 kc. 8:45 p.m. (L. F. Gallagher), daily 7-10 p.m. (Unger, Myers); signs with "Anvil Chorus." (Moore, Ashton); daily 9:45 a.m.-1 p.m. and 6-10 p.m. (from veri) (Canal Zone Listener, Shamleffer, Harris, Coover, Self, Fleming, Herzog, Harzog, Harris). Slogan: "Radio Teatro." Address: P. O. Box No. 954.

HP5K, Colon, Panama, 6005 kc. Signed 8 p.m. (Relays HP5) (Honda), Monday, Thursday, Saturday, 7-9 a.m., 12-1 p.m. and 6-11 p.m., Sunday 10-12 a.m. and 6-11 p.m. (from veri.) (Canal Zone Listener, Hartzell, Diez). Slogan: "La Voz de la Victor." Address: P. O. Box No. 33.

HP5B, Panama City, Panama, 6030 kc., daily 10:30 a.m.-2 p.m. and 5-10 p.m. (from veri); (Canal Zone Listener).

HP5J, Panama City, Panama, 9595 kc. (Wollenschlager); Wednesday 9:30 p.m. and Thursday 8:30 p.m. (Shamleffer, Diez); daily 6-10 p.m. and 7-9 a.m. (Fleming, Eder).

HP5H, Panama City, Panama, 6125 kc., daily 7-10 p.m. (Canal Zone Listener, Hartzell). Slogan: "La Voz del Pueblo."

HP5J, Aquadulce, Panama, 11,895 kc., daily 7:30-9:30 p.m. (from veri.); (Canal Zone Listener). Slogan: "La Vov del Interior."

WEST INDIES

HH3W, Port-au-Prince, Haiti, 9640 kc. Monday 7:30 p.m. (Shamleffer). Curacao, Dutch Indies, 5947 kc., 6:36-8:36 p.m. (Hartzell).

FZF6, Fort-de-France, Martinique, 9440 kc. Signed Saturday, 8:25 p.m. (Myers, Harris).

H1IX, Trujillo City, Dominican Republic, 6340 kc. Tuesday and Friday, 8:10-9:50 p.m. (Magnuson, Ashton, Herzog). Sunday 7:40-10:40 a.m. (from veri).

HI8U, La Vega, 6385 kc. 11 a.m.-1 p.m. and 6:10-8:10 p.m. (Betances).

HIN, Trujillo City, Dominican Republic, 12,486 kc. (D'Orsay); 12,500 kc. heard until 6:45 p.m. (Honda); 6243 kc., 7-10 p.m. 9520 kc. 7 a.m. (Alfred, Ashton, Coover, Herzog, Eder, Cindel). Address: P. O. Box No. 604.

HIT, Trujillo City, Dominican Republic, 9510 kc. 7 a.m., (Eder) 6630 kc. daily 7-10 p.m. (Blanchard). Slogan: "The Voice of R. C. A. Victor."

HI4V, San Francisco de Macoris, Dominican Republic, 6477 kc. 8-9 p.m., (Alfred). Slogan: "La Voz de la Marina."

COGF, Matanzas, Cuba, 11,805 kc. (D'Orsay): 11,790 kc. (Eder); requests reports (L. F. Gallagher, Unger); daily 8 a.m.-10:30 p.m. Relays CMGF. (Alfred, Myers, Shamleffer, Ashton, Patrick, Viganello, Wollenschlager, Diez, Self, Fleming, Coover). Slogan: "Radio Philco." Address: P. O. Box No. 51.

COCX, Havana, Cuba, 11,490 kc. (D'Orsay, Eder); no longer "Radio Philco" (L. F. Gallagher, Shamleffer); 11,435 kc. heard 8 a.m.-1 a.m. (next day); (Alfred, Redmond); 9180 kc. (Omstead, Pierce, Ashton); relays CMX. Daily 6:55 a.m.-1 a.m. (Viganello, Wacker, Wollenschlager, Diez, Fleming, Coover, Dressler).

COCM, Havana, Cuba, 9830 kc. (D'Orsay, Eder); 9810 kc. 3 p.m. (Blanchard); daily 8 a.m.-12 midnight (Shamleffer, Lindner, Unger); relays CMCM. (Alfred); 9840 kc. (Moore, Ashton, Viga-

nello, Wacker, Wollenschlager, Diez, Fleming, Coover, Dressler, Betances, Lindner, Hartman, Wittig).

COBC, Havana, Cuba, 9350 kc. (Eder, Staley, Atherton); 9310 kc. Relays CMBC (Alfred, Schrock); 9300 kc. Friday 12 midnight. (Shamleffer, Ashton); daily 6:55 a.m.-12:30 a.m. (Viganello, Diez, Bauer, Herzog, Betances, Honda, Sibbin). Slogan: "El Progreso Cubano." Address: P. O. Box No. 132.

COCH, Havana, Cuba, 11,420 kc. (Eder); 9425 kc. 10 p.m. (L. F. Gallagher, Staley); 9428 kc., daily 8 a.m.-12 midnight. (Alfred, Wardman, Shamleffer, Ashton). Relays CMK. (Viganello, Ruiz Wacker, Wollenschlager, Diez); daily 7:30-12 p.m. (from veri); (Patrick). Slogan: "General Electric." Address: No. 2 B St.

COHB, Sancti Spiritus, Cuba, 6280 kc. daily 9-12 a.m., 4-6 p.m. and 9-11 p.m. (Viganello). Relays CMHB. Address: P. O. Box No. 85.

COJK, Camaguey, Cuba, 8660 kc. (Eder). Relays CMJK. (L. F. Gallagher); daily 6:30-10:30 p.m. (Alfred, Schrock); uses four chimes (Mott); daily 7 a.m.-11 p.m. (Viganello, Wollenschlager, Lindner, Birnie). Slogan: "Radio Zenith." Address: Finlay No. 3.

COKG, Santiago, Cuba, 8940 kc. (Eder); 8 p.m. (Shamleffer); 8850 kc., 6-10:30 p.m. (Magnuson); (Atherton, Sahlback) Relays CMKG, 6200 kc., daily 5-6 p.m., and 9:30-10:30 p.m. (Viganello, Alfred, Betances, Lindner). Address: P. O. Box No. 137.

COCQ, Havana, Cuba, 11,435 kc. 9 p.m. (L. F. Gallagher); 9800 kc. (Shamleffer); 9775 kc. (Dressler), daily 4-12 p.m. (Lindner); daily 7 a.m.-1 a.m. (next day). Relays CMQ. (Alfred, Redmond, Myers, Pierce, Ashton, Viganello, Wacker, Wollenschlager, Diez, Fleming, Coover, Lindner); 9150 kc. (Honda, Sibbin, Eder, Adkins). Slogan: "De La RCA Victor." Address: Calle 25 No. 445.

COBX, Havana, Cuba, 9200 kc. (from veri); (Shamleffer) 9450 kc. Four chimes used (Mott); relays CMBX, daily 7-10:30 p.m. (from veri) (Alfred, Schrock, Diez, Betances, Eder, Pierce). Address: San Miguel 194.

CODX, Havana, Cuba, 9150 kc., daily 10-11 p.m. (Sahlbach); 9190 kc. (Moore); daily 6-11 p.m. (Fleming); 9200 kc. Slogan: "Radio Alvarez."

COCW, Havana, Cuba, 6330 kc. Relays CMW, daily 7-10:30 p.m. (Alfred); daily 6:55 a.m.-1 a.m.

"WAY DOWN UNDER"

Bill Lander, Official Observer for New Zealand, is proud enough of his short-wave results to let other observers see what he accomplishes them with. We wish more readers would send in photographs of their DX Listening Posts. And try to get in the pictures yourselves, fellows!

Sunday 9:55 a.m.-10 p.m. (Viganello); 6300 kc. (Diez, Eder). Slogan: "The Voice of the Antillas." Address: P. O. Box No. 130.

COCD, Havana, Cuba, 6130 kc., 1:30 a.m. (Alfred). Relays CMCD, daily 10 a.m.-11 p.m. and Sunda y10 a.m.-10 p.m. (Viganello, Diez). Slogan: "La Voz del Aire." Address: P. O. Box No. 2294.

SOUTH AMERICA

HJ1ABP, Cartagena, Colombia, 9600 kc. (Eder), 9610 kc. (Shamleffer), daily 7-11 p.m., (Unger, Wardman), daily except Sundays 5-11 p.m., (Myers, Wollenschlager), 9617 kc., (Ashton, Vassallo, Coover, Fleming, Hendry, Lindner). Address P. O. Box 47.

HJ1ABE, Cartagena, Colombia, 9500 kc., daily 11:30 a.m.-1 p.m., 6-10:30 p.m., and Sunday 9 a.m.-3 p.m. (from veri.) (Adkins).

HJ3ABD, Bogota, Colombia, heard Tuesday 8:30-10:30 p.m., (Shamleffer), 4860 kc., (Moore), daily 7:30-12 p.m., (Welper), 4810 kc., (Wittig).

HJ4ABH, Armenia, Colombia, 9540 kc., (Eder), 9520 kc., signed 10:17 p.m. with six chimes, (Mott, Wollenschlager), 9520 kc., heard 7:15-7:45 p.m., (Ashton), daily 6-11 p.m., (Fleming).

HJ7ABD, Bucaramanga, Colombia, 9630 kc., desires reports, (Eder, Shamleffer), heard 6:45 and 9 p.m., (Welper), daily 6-11 p.m., (Alfred, Moore, Ashton, Hartzell, Coover), heard 11 a.m.-1 p.m., 9520 kc., (Wittig). Slogan: "Radio Bucaramanga."

OAX4J, Lima, Peru, 9340 kc., (Eder), 9330 kc., daily 8-9 p.m., and Sunday at 10 p.m., (Vassallo, Diez).

OAX1A, Chiclayo, Peru, 6335 kc., heard 8-11 p.m., (Hartzell).

LRX, Buenos Aires, Argentina, 9660 kc., (D'Orsay, Eder, Shamleffer, Welper), daily 5-11 p.m.,

(Sahlback, Lindner, Alfred, Myers, Umstead, Diez, Fleming, Hendry). Slogan: "Radio El Mundo." Address: Calle Maiper 555.

YV1RL, Maracaibo, Venezuela, 5930 kc., heard 9-9:45 p.m., (Alfred), signed 10:45 p.m. (Eder). Slogan: "Radio Populair." Address: P. O. Box 247.

YV5RC, Caracas, Venezuela, 5800 kc., (Eder), heard 7:45 p.m., (Mott), 5250 kc., 11,560 kc., 7-11 p.m., (Alfred, Moore), heard 5:30-6:30 p.m., (Ashton, Coover). 5780 kc., (Diez, Fleming). Slogan: "Radio Caracas."

YV5RP, Caracas, Venezuela, 6250 kc., signed 10:30 p.m., (Atherton), 6290 kc., (Lindner), 6270 kc., daily 6:30-9:30 p.m., (Schrock); relays YV5RQ, (from veri) (Magnuson). Slogan: "La Voz de Philco." Address: P. O. Box 508.

YV1RI, Coro, Venezuela, 6210 kc., signed 9:30 p.m., (Atherton).

YV5RD, Caracas, Venezuela, 6128 kc., (Diez), daily 5-10:40 p.m., (Cindel).

CB1109, Valdivia, Chile, 12,010 kc., heard 7:30-10 p.m., (Margrie, Moore), 11,950 kc., (Ruiz). Slogan: "Voz de Valdivia."

CB1170, Santiago, Chile, 11,700 kc., heard 5:30 and 6 p.m., (Kruger), signed 10 p.m., (Moore, Ruiz), daily 5-10 p.m., (Self); relays CB89, (Honda). Slogan: "Emisora Otto Becker." Address: P. O. Box 706.

CB615, Santiago, Chile, 12,300 kc., daily 4-8 p.m., (Welper).

PRADO, Riobamba, Ecuador. 6618, kc., Thursday, 9:30-11:30 p.m., (Fleming, Alfred), heard 9 p.m., (Coover, Diez, Fleming).

HCJB, HCJB1, Quito, Ecuador, 8849 kc., daily except Monday at 10 p.m., (Sahlback), daily 7-10 p.m., (Schrock), 8831 kc., daily 8-10:30 p.m., 4107 kc., (Alfred), 14,320 kc., (Mott, Patrick, Shamleffer); call changed to HCJB1, (Birnie). Slogan: "La Voz de Los Andes."

CXA8, Montevideo, Uruguay, 9505 kc., (Bird), relays LR3, daily 6-10 p.m., 9640 kc., (Alfred) signs at midnight, (Moore, Betances, Eder). Slogan: "Radio Belgrano." Address: Belgrano 1841, Buenos Aires.

PPQ, Sepetiba, Brazil, 11,670 kc., relays PRA2, heard 6:30-10 p.m., (Alfred). Slogan: "Radio Brazil." Address: Cia Radiotelegraphica Brasileira, Caixa Postal 500.

NORTH AMERICA

W2XE, New York, N. Y., 15,270 kc., (Honda), 21,520 kc., 8 a.m.-1 p.m.; 15,270 kc., 2:30-6 p.m.; 17,760 kc., 6:30-8 p.m.; 15,270 kc., 8:30-12 p.m., (Shamleffer, Fleming, Redmond, Ashton, Jensen), 17,900 kc., (Diez, Self).

W8XK, Pittsburgh, Pa., 6140 kc., (L. F. Gallagher), 17,780 kc., (Redmond, Wardman), 15,210 kc., heard 10:30 a.m., (Ashton), 11,995 kc., (Diez, Self), 21,540 kc., (Honda, Harley).

WWY, Washington, D. C., 10,100 kc., Bureau of Standards, heard Friday 1:27 p.m., (Myers).

W1XAL, Boston, Mass., 6040 kc., Monday and Friday 7-9 p.m., Sunday 5-7 p.m., 11,790 kc., Saturday 4-7 p.m. and daily 6 p.m., 15,250 kc., Sunday only 10-12 a.m. (Shamleffer, Unger, Redmond, Myers, Ashton, Unger, Fleming).

W3XAL, Bound Brook, N. J., 17,780 kc., (D'Orsay), signs Sundays at 9 p.m., (Unger, Redmond), 6100 kc., (Wacker, Ashton, Jensen), 17,900 kc., and 6072 kc., (Diez, Wittig, Beard), 6060 kc., (Pierce, Harley).

W1XK, Boston, Mass., 9570 kc., (D'Orsay), heard 9 a.m.-midnight, (Unger, Wardman, Wacker), daily 8-12 p.m., (Ashton, Pierce, Harley).

W2XAD, Schenectady, N. Y., 15,830 kc., daily 11 a.m.-9 p.m., (Ashton), 15,330 kc., (Jensen, Dressler, Self).

W8XAL, Cincinnati, Ohio, 6060 kc., signed Saturday 2 a.m., (Unger, Wardman, N. C. Smith), 12:15 a.m., (Wacker), heard 7-7:30 p.m., (Ashton, Honda).

W2XGB, Hicksville, N. Y., 17,310 kc., heard 2:30 p.m. and 11:30 a.m., (Shamleffer, Eder).

W2XAF, Schenectady, N. Y., 9530 kc., daily 11 a.m.-12 midnight, (Unger, Wardman, Wacker, Ashton, Diez, Honda).

W9XJL, Superior, Wis., 26,100 kc., (Honda), heard Sunday 1-1:45 p.m., (from ann.), (Mott), relays WEBC, (Adkins). Address: Telegram Building, Superior.

W9XAA, Chicago, Ill., 11,830 kc., 17,780 kc., daily 2-6 p.m., (Fleming), relays WCFL, (Welper, Redmond, Ashton, Jensen, Diez, Herzog, Shamleffer), signed 1 a.m., (Pierce, Sargent).

W6XKG, Los Angeles, Calif., 25,950 kc., 24 hours a day, (Bridges, Honda).

"Radio Emisora El Pueblo," Jalisco, Guadalajara, Mexico, 7100 kc., daily 8-10 p.m., reports requested, (Honda), heard 10-11 p.m., (Alfred Moore). Address: Madero 204, Jalisco.

XEBR, Hermosillo, Sonora,

Mexico, 11,820 kc., daily 11 a.m.-midnight, (Jensen, Redmond), heard 10 p.m., (Coover), 11,800 kc., (Diez).

XEUZ, Mexico, D. F., Mexico, 6188 kc., desires reports, heard 6-12 p.m., (Margrie), 6120 kc., relays XEFO, daily 2 a.m., (Alfred, Magnuson), 6100 kc., (Diez, Bauer), daily 9 a.m.-1 p.m., and 7 p.m.-3 a.m., (from veri), (Magnuson; Pierce). Slogan: "Radio Nacional."

XEWW, Mexico, D. F., Mexico, 9500 kc., desires reports, (Staley, L. F. Gallagher, Shamleffer), 8580 kc., (Eder), daily 9-12 p.m., (Alfred), 15,160 kc., daily 6-12 p.m., (Moore, Wollenschlager, Diez, Hendry, Sibbin). Slogan: "The Voice of Latin America." Address: P. O. Box 2516.

CJRX, Winnipeg, Canada, 11,730 kc., (Unger, Wollenschlager, Jensen), heard Friday 12 midnight, (Shamleffer), heard 8-9 p.m., (Ashton), heard 6 p.m., (Coover), daily 6-12 p.m., (Fleming).

CFRX, Toronto, Ontario, Canada, 6070 kc., relays CFRB—"Roger's Short Wave Station," heard 8:30-10 p.m., (Mott), heard 12:30 p.m., (Ashton).

Readers Who Are Awarded "Honorable Mention" for Their Work in Connection with This Month's Short-Wave Report

JOHN B. McGOWAN, Austin Wardman, A. E. Redmond, F. Lalljee, E. J. Wacker, Harold J. Leif, Clarence M. Meyers, William Beard, John Palmer, Rudolph Kure, Enrique Aguiar, P. L. Stiles, Gustave A. Magnuson, Arthur B. Coover, N. C. Smith, James E. Moore, Jr., Harold E. Schrock, Fred W. Alfred, Charles Pierce, Trop Welper, Vincent M. Poll, Nicholas J. Hock, Carl and Anne Eder, R. F. Shamleffer, E. Scala, Jr., W. G. Umstead, M. J. Markuson, Kenneth Dressler, Leslie Mott, Edgar J. Vassallo, Burnell Unger, G. L. Harris, Irving Sporn, Clarence Hartzell, W. J. Staniek, Wendell Ashton, Dan T. Wollenschlager, L. M. Jensen, J. M. Ruiz, Max Hausdorff, L. F. Gallagher, P. L. Patrick, Fred Atherton, Harold E. Lindner, Raymond W. Sahlback, George M. Fleming, Harfy Honda, Paul C. Bird, Mike Kruger, Warren D'Orsay, William Dean Noyes, Leo Etzkorn, Edward Wm. De Laet, Edward J. Margrie, Kenneth Vaughn, Robert McCue, Robert L. Blanchard, Jr., Ray Knight, Jack Staley, Sherwood Espenschild, Alfred A. Gilman, Luis Diez A., H. J. Self, Harry E. Kentzel, William L. Bauer, W. F. Herzog, J. Carroll Balloch, Herman E. Wittig, E. H. Davenport, D. A. Harley, Jr., Anton J. Cindel, W. D. Adkins, Hugh B. Sargent, George A. McDermott, Manuel Betances, Fletcher W. Hartman, Andrew J. Maroney, Erroll Birnie, Norman Hendry.

Trade Treaty With Great Britain

Washington, D. C.—The RMA will represent industry interests in State Department negotiation of the proposed reciprocal trade treaty with the United Kingdom and also in revision of the Canadian trade pact. Anticipating the trade treaty negotiations with Great Britain, the RMA Board of Directors already has considered some of the major problems involved and has made informal recommendations regarding radio policies to government officials.

Set Alignment

(*Continued from page* 464)

may then be omitted.

Using a simple change-over switch from the multivibrator to the signal generator so that the same dummy antenna is employed with each instrument, the alignment obtained with the multivibrator will be the exact one and no improvement is possible by switching back and realigning with the signal generator.

Tests in the RADIO NEWS laboratories indicated immediately the value of this new instrument. It was connected to a "communication" type receiver which had not been in use for over a year and the dial was twirled over each band. Insensitive areas showed up immediately on three short-wave bands, being evident in the weakness of the 400-cycle note reproduced by the loudspeaker.

Servicemen should find this multivibrator very useful in demonstrating to customers the need for aligning a receiver since it takes but a moment to hook up the device and make the test. In shooting trouble, the signal may be injected in any grid circuit, either r.f., i.f. or audio and an audible signal will result. No adjustments, except of the attenuator, are required so a quick check of all circuits is possible. For stage-by-stage isolation of intermittent conditions this feature should be of considerable value. In addition, it permits a less experienced serviceman to do a job of aligning that not even an expert can surpass.

Antenna Design

(*Continued from page* 467)

the lower half-wave is being fed and the upper half-wave is simply the radiator. If the folded-over part is spaced the same distance as the feeders, it can be seen that these feeders can easily be tapped off and let down and no radiation can take place because the spacing of the feeders is close throughout. There is also the advantage that radiation patterns are not changed by close proximity of feeders to the radiator.

Another method of using untuned feeders is the quarter-wave imped-

ance-matching system. This is illustrated in Figure 13B. It can be shown mathematically that no standing waves or reflections are present when the input impedance is equal to the output impedance (as we have seen above). It is also possible to use a quarter-wave section of line to couple two different impedances if certain precautions are observed. If the line used is exactly a quarter-wave length for the frequency considered and if the characteristic impedance of this length of line is equal to the geometric mean of the input and output impedances the above conditions are met. The power delivered to the quarter-wave section will be passed on to the output and no reflections will take place. If therefore, we wish to couple a 600-ohm feeder to a 75-ohm half-wave radiator we can simply place a line one-quarter wave-length between the radiator and the feeders and make it equal to 210 ohms. In this way no "fanning" of the feeders is needed. At the ultra-short waves it is not difficult to erect such a quarter-wave section of 210 ohms surge impedance. The section acts as an impedance-changing transformer.

Similar to the above, we may have a single wire feed (Figure 14). Since the radiator and transmitting tank coil are balanced to ground, we may consider the dotted lines to be the second wire of a transmission line. As before, we must vary the contact on the tank coil until the impedance into the line is equal to the impedance at the radiator and the surge impedance of the line. It is very necessary in both these untuned systems, however, to keep the lines in as straight a direction as possible and they should be brought away from the radiator perpendicularly for at least one-sixth wavelength to avoid reaction between feeder and radiator.

The principles discussed above have been explained from the standpoint of radio transmission. However, they also apply to radio reception. In other words, these antenna systems may be applied to a receiver if the same theory of standing waves, impedance matching and harmonic operation is observed. Also, if feeders are installed so that they do not radiate in transmission, they will not pick up when used as a receiving lead-in if connected in the same way, etc.

Of course there are slight differences in practical design. The lead-in for a receiver may take the form of that in Figure 15. In order to pick up a minimum of noise from various electrical machines and wires the antenna itself is placed as high and far away from the source of interference as possible. The electrical waves from the source of interference will induce a similar current flow in both lead-in wires with cancellation in the terminating coil, leaving only currents which were induced in the antenna itself. To minimize the noise pick-up still further, the lead-in wires are either transposed every two or three feet or they may take the form of a twisted lamp cord. In this way, no matter how close the lead-in is to the noise generator, both sides of the line will be balanced to it. Since no high voltages are present in a receiving system comparable to those of a transmitter, the rigid precautions in the case of the latter are not required.

Another interesting possibility in the reception of distant signals is the so-called diversity system. Different receiving antennas (directional or non-directional) are erected. The distance between them should be great compared with a wave-length. The energy gathered by each is amplified and detected and then combined to form a single audio signal. Although one antenna may be receiving energy out of phase with another (due to Heaviside Layer reflection or antenna position) the a.f. resultants will be in phase. In other words, the r.f. energy may be a millionth of a second out of phase with the r.f. of a second antenna, but after detection such a small difference will be negligible. In combination with a good non-directional array the above system would greatly eliminate fading and would strengthen distant signals.

Television in N. Y.

(*Continued from page* 456)

presentation of programs and 5: A nationally agreed standard formula for transmission characteristics.

At present there are no commercial television receivers available to the public. Those who use them will have to build them or have them constructed for them. Manufacturers, at present, cannot build any television receivers until problem 5 has been settled—that is, the number of scanning lines to be used; the number of frames per second, which will decide the band-width coverage for vision. Also a standard frequency separation of the sound and the sight channels will have to be agreed upon. In England, a standard has already been arrived at in the B. B. C., London program transmissions. This is now 405 interlaced lines-per-picture, 55 frames per second, and a 30:70 rate of synchronizing impulse to each picture. This is the Marconi-Emi System. Seventeen British companies are now manufacturing television receivers using these standards. The first sets sold for an average of about $600.00 or more. When factory production

increased the prices were brought down to around $350.00. One British company, The General Electric Company Limited, is now producing a small television receiver for around $175.00. The size of screen of most of the British receivers is 8 by 12 inches; although the lower-priced one, mentioned, is 5 by 6 inches. And while we are talking about the British situation we might mention that there are three one-hour transmissions daily now being made from the Alexandria Palace in London; one during the noon hour, one at 3 P.M., and one at 9 o'clock in the evening.

And now a few thoughts about national distribution of programs in problem No. 2. To have successful programs in a commercial service, they will have to be transmitted individually for each of our larger cities. Television signals, to be successful, with neither fading nor distortion, will be a "local" feature, covering a radius of not more than 40 to 60 miles. For covering the whole country, therefore, programs will have to be sent out by wire or on ultra short-wave relays from a central point. The ordinary telephone wires cannot be used and special coaxial cables seem to be a necessity. This would be a tremendous initial expense and the economic situation, therefore, is closely tied up with the problem of distribution. Again, the present frequencies, slightly lower and adjacent to the 56 megacycle amateur band have definite deficiencies for television transmissions, as I have already pointed out in a number of articles. This is because this band of frequencies do, at times, have long distance capabilities, through reflection from the upper atmosphere layers. We have received many hundreds of letters and reports from our thousands of short-wave observers who have both the present N.B.C. and the London television far away from the home cities. These reports include South Africa, South America, and Australia. I, myself, have made tests with a portable receiver in a car, 100 miles up in New England, and 175 miles westward of New York City as well as south as far as Atlantic City, and have (during the summer) received very strong signals from the Empire State transmitter over distances up to about 150 miles. This is direct proof of more than a visual range to these frequencies. But in spite of that, the actual range, where pictures remain clear and undistorted, is as stated before, from 40 to 60 miles; and although signals can be picked up very strongly at much greater distances *they have no value* (except a negative one). This outside "nuisance range", as it might be termed, would seriously interfere with other television stations in cities a distance of 100 to possibly 1000 miles away. It has been my recommendation, based on experience with ultra short-waves, that television will have to go down to a range between 1 to 3 meters for a non-interfering, "sure-service" commercial projection. And if this is so, manufacturers of receivers will certainly hesitate to produce television receivers for the lower frequencies as they easily might be rendered obsolete in a few years' time.

Not being an expert in economics, I can make no suggestions regarding this, but I suppose it will work itself out eventually as was the case with ordinary broadcasting in its early days.

Our problem No. 4, that relating to special problems of programming for sight and sound, is one which N.B.C. is approaching, struggling with, and making good progress on, along what I consider the proper procedure. That is; to test out, with a competent staff, the making of specialized programs by actually putting them on the air. Also, I suspect that the moving picture interests may start serious researches along these lines. It is rumored that prominent Hollywood motion-picture interests are preparing a special test laboratory to enable experimental work to be done along the line of program making for television. At any rate, it will be almost a necessity to have some part of all television programs transmitted by moving-picture film.

It can be seen from the foregoing, that although there still remain important problems which will have to be worked out before commercial service can blanket the country, a real start has at last been made by putting programs on the air and inviting individual experimentation by those who are interested, who understand, and can afford the construction of the proper receiving equipment. Once and for all, the companies who can and will produce commercial television services now do see the light and have given the word "go ahead with television" so that the problems can be worked out. This is far better than waiting with the naïve but unrealizable hope that a "mature service" may be developed secretly and launched with a fanfare of trumpets to dumfound the public.

"10-80" X'mitter

(*Continued from page* 471)

antenna unit. This unit will be on the same level as the T20 unit in the a.f. rack, i.e., on the top level. A short twisted-pair between the two units will couple them effectively.

The maximum plate current for the two T20's is 150 ma. The stage should, therefore, be loaded so that the T20 plate current is no higher than this value when in resonance. The specified grid current (for two tubes) is 24 ma. for c.w. operation and 34 ma. for phone. The latter figure may be used for both types of operation, since the 807 provides far more excitation than is necessary, even on 10 meters. The excitation to the T20's, as shown by the grid current reading, should never be varied by detuning the grid circuit. This circuit should always be tuned "on the nose" and the excitation varied by changing the distance between the 807 plate coil and its link. It will be found that it will not be necessary to load the 807 beyond about 60 ma. (plate current) in order to provide sufficient excitation to the T20's. Small changes in excitation may be made by detuning the oscillator tank condenser. All other circuits, however, should be tuned to exact resonance at all times.

4 Standoff insulators, type CI-31 (to mount C3)
1 base for plate coils, type CI-6BTLM
1 plate coil (10 meters), type 10BTVL
1 plate coil (20 meters), type 20BTVL
1 plate coil (40 meters), type 40BTVL
1 plate coil (80 meters, see text), type 160BTVL
1 Control wheel complete with No. 13 indicator plate, type CI-45
1 Indicator with No. 12 scale, type CI-47
1 Indicator with No. 13 scale, type CI-47

Hammarlund

2 Coil forms (see text), type TCF
C—Grid tuning condenser, type MCD-50-S
C3—Plate tuning condenser, type MTCD-50-B
2 Isolantite sockets, type S-4

Ohmite

R—2000 ohms, 10 watt
R1—100 ohms, center tapped
R2—200 ohms, 25 watt

Par-Metal Mfg. Co.

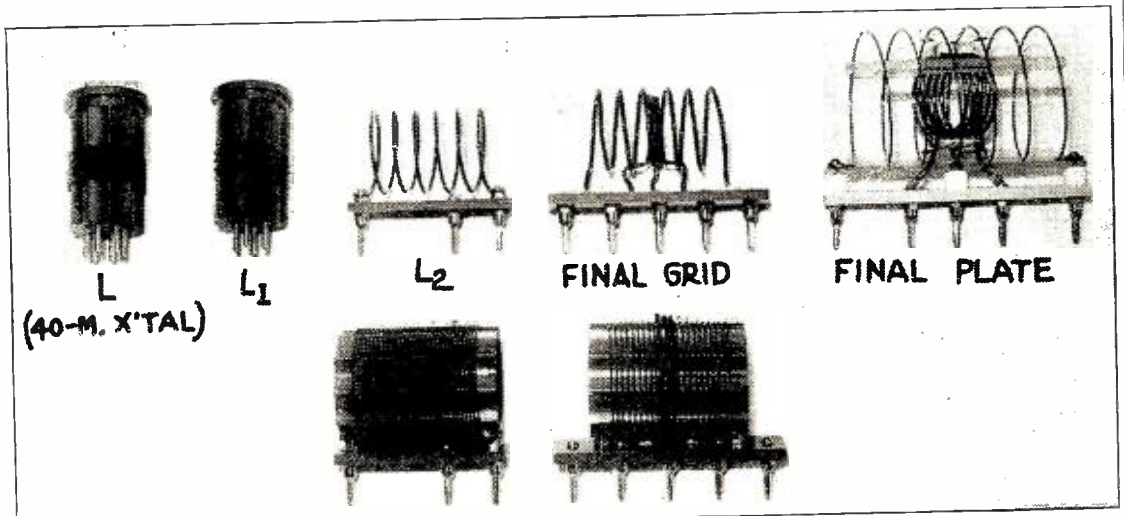
1 Chassis, type C-4526
1 pair of brackets, type SB-78
1 panel, type 3679

Taylor Tube Co.

2 tubes, type T20

Weston Instrument Corp.

M—Rectangular bakelite case meter, 50 ma. d.c., Model 301
M1—rectangular bakelite case meter, 300 ma. d.c., Model 301



COIL CHART

BAND	TURNS	LINK TURNS	WIRE SIZE	COIL DIAMETER (ON FORM)	TAP
		807 PLATE COIL (REVISED)			
80 METERS	38		#20 D S C	T C F	4 TURNS FROM GRID END
		T-20 GRID COILS			
10 METERS	6	3 (INSIDE COIL)	#10 ENAMEL	1 3/4"	CENTER
20 METERS	16	3 (INSIDE COIL)	#10 ENAMEL	1 3/4"	CENTER
40 METERS	22	3 (OUTSIDE COIL)	#20 D S C.	T C F	CENTER
80 METERS	40	3 (OUTSIDE COIL)	#20 D S C	T C F	CENTER

Note: Space-wind 10 and 20 meter coils to length of 3¾"; 40 and 80 meter coils is full length of forms

Note: Links are made of push-back wire.

COILS FOR THE R. N. "10-80"

The top row shows the complete set of coils for 10-meter operation. L2 for 80 meters is wound on a form as shown at lower left and the final grid coils for both 40 and 80 are on similar forms, as shown at lower right. All coils are home-made except the final plate coils, which are Coto and provide variable coupling for the 10, 20 and 40-M. bands.

Next month the fourth step will be covered. This will include the construction of a 400-volt supply for the modulator and the slight alterations in the modulator to step up its output adequately to modulate the T20's.

Parts List
T-20 Amplifier

American Radio Hardware Co.
Birnbach

C1, C2—Neutralizing condensers, type 1303
5 Feedthrough insulators, type 478
5 Jack-type feedthrough insulators, type 478J
2 Cone-type standoff insulators, type 432
20 Banana plugs, type 401
1 spool Magnet wire, No. 20 d.s.c.
1 roll solid enameled wire, No. 10

Coto-Coil Co.

RFC—R.f. choke, 250 ma., type CI-12

Yaxley

J—Closed circuit jack, type A-2
2 Extension shafts, type RS244
2 Panel bushings, type UB241

Miscellaneous

1 4-prong wafer socket
SW—Toggle switch, s.p.s.t.

Additional Parts to Convert Unit B to Unit BD

Aerovox

C3, C4—Filter condensers, 2 mfd. 1000 volt working

Kenyon

T3—Power transformer, type T-656, tapped primary (see text) to provide high and low secondary voltages of approximately 1000 v. and 740 v. respectively, each side of center tap
T4—Swinging choke, type T-509, 6-19 H., 200-30 ma.
T5—Smoothing choke, type T-175, 10 H., 200 ma.

(*Turn to next page*)

T6—Filament transformer, type T-352, 2.5 v., 10 a., c.t.
T7—Filament transformer, type T-353, 7.5 v., 4 a., c.t.

Ohmite
R1—Bleeder resistor, 25,00-ohm, 100 watt

Taylor Tube Co.
2 Rectifier tubes, type 866 (or 866 Junior's)

Miscellaneous
3 4-prong wafer sockets
SW2. SW3—Toggle switch, d.p.d.t.

All-Wave "15-17"

(*Continued from page* 460)

quality musical reproduction. Selectivity is therefore made variable through permanently fixed i.f. couplings. By this means, a simple turn of the "selectivity" knob gives instantaneous choice of 3 kc., 8 kc., or 16 kc. selectivity, besides shifting the audio amplifier input to terminals for pick-up connection for phonograph reproduction. Here is every selectivity choice needed for all modern reception conditions instantaneously available at the turn of the knob. I.F. circuit alignment is effected through inductance variation, the tuning capacities being fixed. Micrometric movement of the powdered iron cores of the i.f. coils does the trick *permanently*, in spite of heat, cold, damp, dry and vibration.

The 6J5 infinite-impedance, linear second detector not only eliminates the harmonic distortion introduced on high-percentage modulation by diode detectors, but it places a high-resistance load across the last i.f. transformer and so makes an important selectivity contribution. Coupled to it

INDEX TO ADVERTISERS

for optimum weak-signal strength is the 6J5 audio-beat oscillator the beat-note pitch is adjustable from the chassis rear. So selective is the entire receiver that by tuning the beat oscillator to produce a 1500 to 2,000 cycle audio-beat note good "single-signal" c.w. code reception is obtained.

The amplified a.v.c. system is operated from the first i.f. tube in order that the a.v.c. amplifier itself may be made sufficiently broad in tuning to follow approximate r.f. selectivity curve shape. This results in a system which holds received signals, varying through the range of 20 to over 1,000,000 microvolts input, at volume constant to 3 db.

The audio amplifier uses a 6J5 triode driver tube in conjunction with a Clough system tuned push-pull audio transformer which is tuned by the "bass tone" knob to give anything from bass "boost" of 16 db., to a 30 db. bass "droop." This plus treble tone control provides the complete control of tone so necessary to compensate for different programs, individual taste in tone, and variations in individual home acoustics.

Two 6L6 beam power tubes, operated Class AB1 in a 10-percent feedback circuit develop 16 watts power output strictly Class A, and a maximum of 20 watts at less than 3% total harmonic distortion for the entire audio amplifier. The new 15-inch loudspeaker will actually reproduce down to 30 cycles, up to 8,000 cycles, and is about 2½ times more efficient than ordinary 10-inch and 12-inch speakers. But even this speaker cannot reproduce actual sound much below 130 cycles in an ordinary console cabinet. So consoles are provided which incorporate the new Jensen-invented "peri-dynamic" and "base-reflex" principles, allowing the speaker to preproduce tones down to 30 cycles. What more can be asked than 3, 8 and 16 kc. selectivity, sensitivity of ½ to 1 microvolt on all bands, complete coverage of 530 to 32,000 kc., signal-to-noise-ratio of better than 3:1 at ½ microvolt sensitivity, a.v.c. action holding practically all stations at constant volume, not over 3 percent total harmonic distortion, up to 20 watts power output, tone so variable as to be "all things to all men," provision for phonograph and headphone operation, 60 to over 200 degrees of bandspread (2½ to 9 inches of band spread dial length on the principal short-wave bands) and automatic 16:1 and 80:1 tuning knob ratios?

(A report on the "air test" of this receiver in the RADIO NEWS' *Listening Posts will appear next month—* THE EDITORS.)

"Speed Key"

(Continued from page 477)

photo. If desired a rubber insert can serve this purpose. All angles and the terminal post are fastened by means of 6/32 machine screws.

Before mounting all the hardware it is advisable to make up the key bar; as stated before this unit consists of a piece of brass rod, a hacksaw blade and a nail. The first section of the key bar which is made from a piece of brass ½ inch wide by 2½ inches long. This section actually consists of two pieces of brass rod soldered together and forming a joint for the suspension pin, as shown in the photograph. The vertical suspension pin is a 1-inch brad nail pivoting in the suspension screws. Soldered to the end of this brass rod is a small piece of hacksaw blade measuring ¼ inch wide by 1¾ inches long. This piece of hacksaw blade acts as a flexible and necessary spring for the key bar, and is a very important unit in the construction of the instrument. The end of the blade is soldered to a No. 10 penny nail which is 2½ inches long. The head of the nail is removed and a ¼ inch slit is made into the nail which enables the blade to be inserted into this cut and then securely soldered. The speed weight and U band slips over the nail.

The special dot and dash contact screws have a special point, they are also obtainable from a telegraphers' accessory store. A reference to the illustration shows that a 6/32 machine screw is employed to fasten the fibre handle to the brass key bar and this screw also acts as the other contactor for the dashes. Directly after the handle there is an adjustment screw in the key bar which is an additional dash control.

Following the suspension assembly is a spring which fastens to the key bar and to a screw mounted on the right side of the instrument. A little diligent search in the junk box will no doubt uncover a spring that can be used for this purpose.

The two parallel angles for the adjusting stops are mounted approximately in the center of the block. The adjusting screws are two standard machine screws 1 inch long mounted ¾ inch from the base. The dot and dash contact points, as well as the suspension pin, are all aligned to a ¾ inch height.

In wiring the instrument there are only two connections to be made. A lead connects the dash and dot terminals together and a connection is brought over from the suspension post to the terminal marked No. 2. Two slight depressions are cut into the

block so as to clear these two leads from the bottom of the base. The heads of all the machine screws are countersunk.

Just a word for the correct operation of this type of key. Dashes are made by holding the key to the left by pressing the key handle with the forefinger; dots by pressing the lever with the thumb to the right. Moving the speed weight along the end of the key bar is the governor for regulating the speed of dots.

Even as You and I

(*Continued from page* 451)

1170 KC: Another lousy heterodyne.

1180 KC: Sounds like next door neighbor's vibrator type battery charger.

1190 KC: A jazz band orchestra leader trying to boost the sale of cigarettes.

1200 KC: Racket. Racket. Racket.

1210 KC: We don't understand French.

1220 KC: Just noise.

1230 KC: A Spanish band.

1240 KC: A brass band playing a military march accompanied by an orchestra from another station on the same wave length in the background.

1250 KC: A fine assortment of jazz.

1260 KC: More jazz.

1270 KC: Can't make out what this is.

1280 KC: Stung again.

1290 KC: A certain Major trying out a sacred soprano.

1300 KC: About 13 stations here.

1310 KC: More than 13 stations here.

1320 KC: The Major again. This time the soprano is making love to the Major by means of her song.

1330 KC: Male blues singer accompanied by an assortment of howls and squeals.

1340 KC: She still loves the Major.

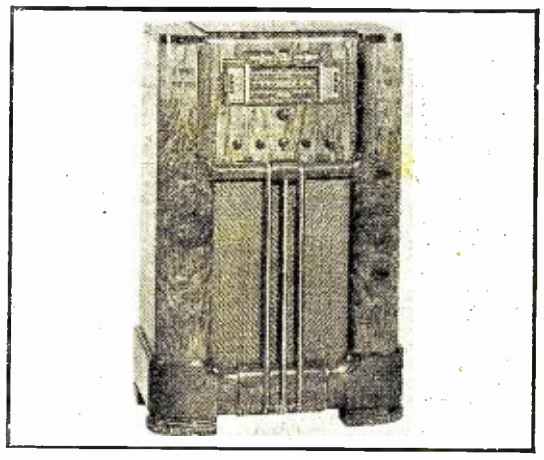
At Your Dealer's

(*Continued from page* 465)

000, 200,000 ohms, 2 and 20 megohms; capacity tester from .001 to 30 mfds.; leakage test, decibel meter and free point tester are among the other outstanding provisions. Of special note are the front illuminated meter and shadowgraph indicator for line voltage control.

11-Tube Push-Button Console

This RCA Victor electric-tuning model 811K has an exceptionally



smart appearance. It has push-button tuning arrangements for 8 preselected broadcast stations which are changeable at will. It employs 11 tubes and covers all the short-wave ranges as low as 13 meters.

Radio Workshop

(*Continued from page* 473)

shield between this hole and the end, scrape the end clean and solder it directly to chassis or solder it to a lug and fasten the lug to the chassis. If the shielding is telescoped slightly (which it should be on r.f. leads), the wire can be removed at any time and the insulation will not be damaged.

F. J. FALKNER,
Ogden, Utah.

DX Corner—BB

(*Continued from page* 491)

Saturdays—
1-1:10 a.m., 1390 kc., KLRA, Little Rock, Ark., 1 kw.
10:30 a.m., 830 kc., WEEU, Reading, Pa., 1 kw. (tips).
Sundays
12:45-1 a.m., 1280 kc., KLS, Oakland, Calif., 25 kw. (UDRXC) (tips).
2:45-3 a.m., 1010 kc., CKWX, Vancouver, B. C., Canada, .1 kw.
3-3:30 a.m., 1410 kc., CKMO, Vancouver, B. C., Canada, .1 kw.
3:30-3:45 a.m., 570 kc., KMTR, Los Angeles, Calif., 1 kw. (tips).
Monthly—
1st day of each month, 3-4 a.m., 1260 kc., WTOC, Savannah, Ga., 1 kw.
1st Sunday of each month, 4-4:30 a.m., 1340 kc., KGDY, Huron, S. Dak., .25.
2nd Tuesday of each month, 5-5:30 a.m., 1370 kc., KRMC, Jamestown, N. Dak., .1 kw.

The Amateur Observer

(*Continued from page* 493)

1CDR-5, 1EER-8, 1DBM-8, 1BRL-5, 1FHN-9, 1ZE-8, 1BWH-5, 1BBM-5, 1JVQ-8, 1KQK-8, 1JLQ, 1JAZ-3, 1BAO-3, 1GDJ-5, 1AVV-6, 1JLK-7, 1KNM-8, 1FLQ-7, 1EYM-5, 1KPF-3, 1JMI-6, 1FUB-5, 1KOK, 1KGR-6, 6ODU-6 (portable 1), 8BGP-7 (portable 1), 2IPH-7, 2KBS-8, 2KUY-4, 2JGB-4, 2IAG-6, 2IYX-7, 2KJS-5, 2IRY-3, 2GHV-5, 2KKT-6, 2HWX-7, 2AFO-5, 2CVF-8, 2KMR-4, 2EJP-6, 2HHN-5 (portable 1), 2JR-5, 2CUZ-5, 2BCC-4, 3KPH-6, 2PCR-5, 2IYU-4, 2JVQ-4, 2JSR-5, 2FGB-7, 2EKI-5, 2DKJ-7, 2JCY-7, 2EXI-3.

By H. R. Moon, 48 Radnor Avenue, Bexley Heath, Kent, England

20 meters: W1ADM, 1DHC, 1AJZ, 1ZD, 1OM, 1BLO, 1CND, 1BCP, 1APA, 1JFG, 1CRW, 1JUG, 1AXA, 1JZA, 1GR, 1FH, 1LAI, 2DH, 2AWL, 2AM, 2JT, 2ZC, 2IUQ, 2IXY, 2DUX, 2CFU, 2AZ, 2GSC, 2RTT, 3FAM, 3BZ, 3PC, 3ANH, 3EOZ, 3CJ, 3BSY, 3FSD, 3MD, 3AFG, 4DSY, 4CYU, 4EEE, 4BYY, 4DLH, 5ZS, 6AN, 8KQ, 8CN, 8JK, 8NFS, 8MDU, 8QQD, 9RS, 9PTY, 9DSL, 9FDL, VK2XU, 5AW, VE1KK, 1FQ, 1BK, 2HG, 2HE, 2NP, 2MA, VO1I, 6L, HC1FV, CO2KL, 2G, 2EG, 2RA, SU1KG, 1SG, PK1ZZ, F8KI, K4DDH, LU7AP, CE3DW, CN8AN, PY5AQ, SU1X, KA1YL, VS6AB, K4EMY, CO6OM, LU4BL.

By Hugh Robinson, 231 A Street, N. W., Miami, Okla.

10 meters: VP6YB-6, K6MVV-6, ZE1JR-7, ZU6P-9, 6E-4, ZS6T-4, 6AA-5, F3KH-5, 8KI-8, G5ML-5, 5SA-6, 5JO-8, 5ZN-5, 5BW-7, 6BW-5, 6AG-6, 6BHS, 6LK-5, GM6RG-8, 6RV-5.

20 meters: LU1CA-8, OA4AL-5, 4AI-3, HC1JB-8, YV5AB-7, 5ABA-8, 5AX-4, CE1AO-5, 3CO-5, HH2B-3, 5PA-6, K6KLV-6, OX2QY-7, YV5AD-6, VP3BG-5, VK2ABE-4, 3GQ-4, ZU6P-4, F3OO-6, 3HL-4, 8KW-4, G2AK-5, 5ML-6, 5NI-4, 5KL-6, 5KH-7, 6AG-5, 6DT-6, 6PU-3.

By Walter F. Drake, 2143 E. Monmouth Street, Philadelphia, Pa.

20 meters: VO6D-7, 6P-6, YV4AB-7, 5ABF-6, HH2B6-, F3KH-7, 3OO-7, PAOMQ-5, ON4VK-6, CT1CV-6, G2PU-7, 2VG-8, 5ML-9, 6WT-5, 6DL-7, 6AG-5, 8OG-7.

By Leo Herz, 730 Roscoe Street, Chicago, Ill.

20 meters: HK3JA, YV5AG, 5AK, 5ABE, 5ABF, 5AD, 5AE, PY1FR, 2AB, 2ET, 2FF, EA9AH, TI2DC, 2PG, 2RC, HK4AG, LU1CA, 4KA, 8AB, CE1AO, SM5SV, OA4R, 4AL, G5ML, GM6RG, HH5PA, OX2QY, K6MTE.

By Nicholas Woytan, 309 S. Wilbur Avenue, Syracuse, N. Y.

20 meter phone: ZS5M, CN8AM, 8MB, EA9AH, EI2L, F8BU, G5BJ, 5ML, 5NI, 6XR, HC1ET, HH2B, 2X, 5PA, OX2QY, VO6D, VP2AT, 2DA, 3BG, 6YB, YV4AB, 4ABA, 5ABF, 5ABQ.

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The GROUND FLOOR of TELEVISION

Every student receives this giant television cathode ray tube as part of his equipment.

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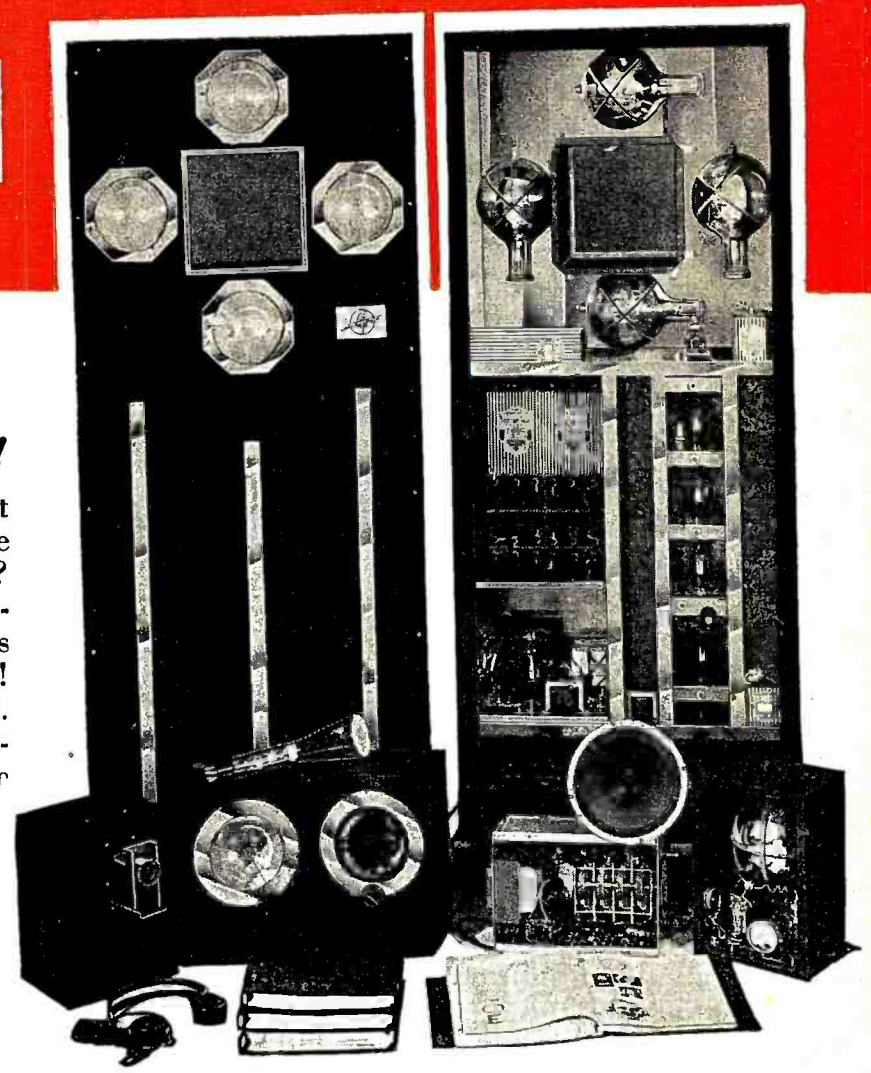
Already Commercial in England!

Television engineering will be the next high salaried profession. Will you be ready to cash in with this new industry? Leaders of radio recognized their opportunity some fifteen years ago, and they as engineers have since earned millions! Now the future of television is assured. Are you going to make it *your* opportunity for success? Trained men will make from $2,500 to $20,000 per year.



THE AMERICAN TELEVISION INSTITUTE

was established in 1935, to provide skilled men for television development in the United States. A. T. I. was founded by U. A. Sanabria, internationally famous inventor of the interlaced scanning system, now universally used. The Institute possesses one of the best equipped television experimental laboratories in the world, and it is here that students complete their courses under the personal supervision of Mr. Sanabria.

A. T. I. TELEVISION TRAINING

qualifies you during the first few months to take your RADIO TELEPHONE FIRST CLASS GOVERNMENT LICENSE EXAMINATION and get into a good paying job in the radio field while completing your television instruction. Many of our graduates are successful in radio and sound motion pictures.

M. B. Foster of Prairie Du Chien, Wis., writes: "As a graduate of the class of 1936, I can highly recommend A. T. I. training with practical equipment. Since graduating, I am a technician with the Ampro Motion Picture Corp., making a good salary. I feel secure in knowing that I am able to do nearly anything in sound motion pictures or radio now, and that I am ready for television."

E. D. Carter of Bethany, Ohio, writes: "I spent two years in college and have investigated other training in radio and the allied arts, and I have yet to find anything nearly so comprehensive as the A. T. I. training in television, which includes all any practical man needs to know about radio. I have earned an average of $2,500 per year since studying with Mr. Sanabria doing television and telephone work."

★ Bulletin! ★

7/17/37. The National Resources Committee reported to President Roosevelt that the most important development work in television was completed, and that only the commercial arrangements remain to be made to provide national television service.

This means trained men must be ready.

AN UNPARALLELED VALUE AMAZING OFFER

Equipment You Receive From American Television Institute

Is not small, ordinary instruction equipment, but a full sized professional television laboratory used for public exhibitions with a steel rack and panels nearly six feet high, two feet wide and eight inches deep mounted on rubber tired casters; R.C.A. amplifier and modulator tubes throughout with A.T.I.'s giant photo-electric cells and 7" x 21" cathode ray receiving tube, together with all other parts to make a complete television transmitter and receiver worth a thousand dollars to one taking this training. All of this is included with the A.T.I. course and is yours to keep. It is all amazingly low in price and on terms arranged to suit you. It costs you nothing to thoroughly investigate this opportunity. You cannot afford to pass it up if you want to get in to television. *Send Coupon Now.*

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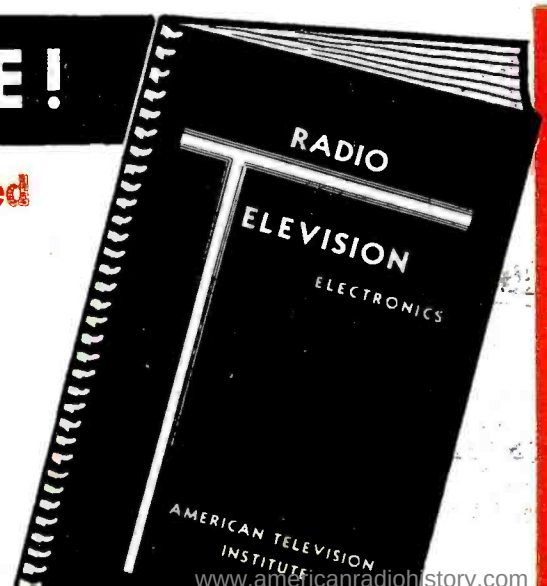
We accept only applicants who can pass the examinations on the first four lessons. We will actually send up to four lessons without cost or obligation, so you may determine how A. T. I. training will benefit *you*, and equip you for a future in radio and television. Clip coupon at right, *now*,



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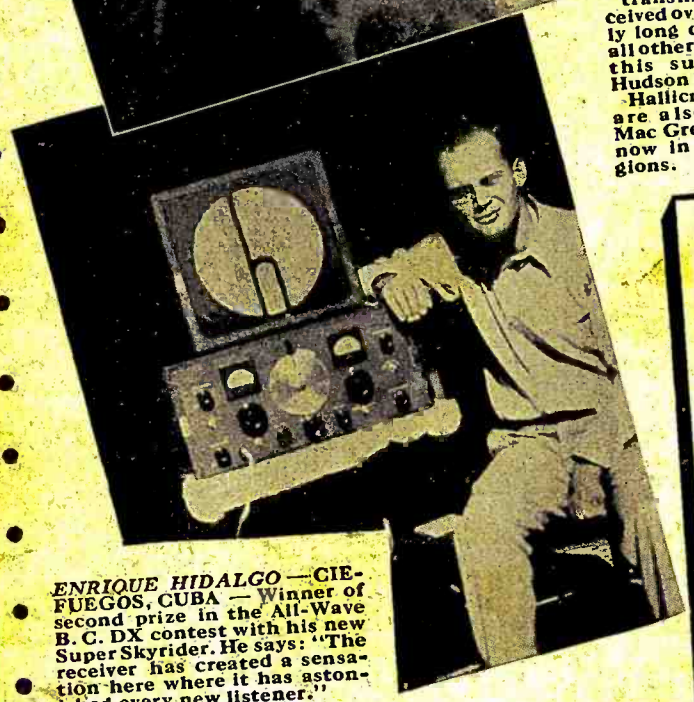
Name .....Age .....

Street .....

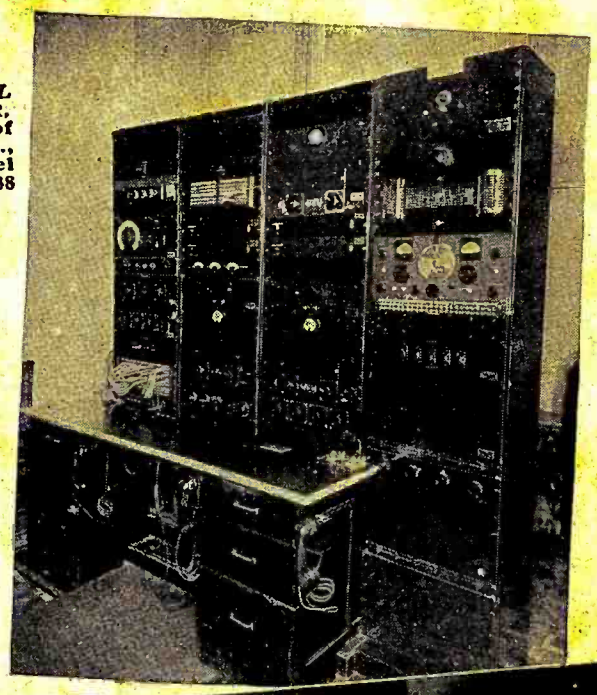
City ..... State .....

A page from the hallicrafters Scrapbook

ENRIQUE HIDALGO —CIEFUEGOS, CUBA — Winner of second prize in the All-Wave B. C. DX contest with his new Super Skyrider. He says: "The receiver has created a sensation here where it has astonished every new listener."



THE CONTROL BOARD OF WFBR, NBC station, of Baltimore, Md., showing panel installation of 1938 Super Skyrider.



HENRY HOFFMAN, operator for Rev. Father Paul Schulte, "Flying Priest of the Arctic," writes from his post in the Arctic waste—"With the Sky Challenger, low-power transmitters were received over a surprisingly long distance, where all other receivers I used this summer in the Hudson Bay failed." Hallicrafters receivers are also used in the Mac Gregor Expedition now in the Arctic regions.

THUMBING through the Hallicrafters' Scrap Book, one cannot help being impressed by the widespread acceptance of Hallicrafters Communications Receivers. We are proud to show on this page a very few of the outstanding personalities who operate Hallicrafters receivers and their rigs . . . The very fact that Hallicrafters receivers figure so prominently in leading amateur, commercial and scientific stations is in itself a testimonial to the merits of these outstanding receivers.

W1KTG — *BEATRICE HOLMAN*, Belmont, Mass.: "The more I operate the Super Skyrider, the better I like it and I am only too glad to add my word of praise. Am on 10 meters at present and have heard plenty of DX this morning that I never copied before."

TED ROGERS—famous short wave radio columnist of the N.Y. World Telegram spins the dial of his Super Skyrider.

W2AMJ— *FRANK LESTER*, Bergenfield, N. J., at the controls of his 1938 Super Skyrider.

W3DTX — *W. W. KELLUM*, Washington, D.C., says: "I selected the Super Skyrider because it is one of the best receivers on the market today including price and performance. In a little over a month, I have worked more DX than ever before and have had good receivers in the shack."

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