BUILD A RADIO TREASURE-HUNTER

RADIO NEWS

SEPTEMBER
25c

COMBINED WITH

All-Wave Radio

ARINE OP'S
XPERIENCES

ADIO NEWS
56MC
RESELECTOR

Beginner's
HORT WAVE
ECEIVER

ONE-TUBE
RANSMITTER

U. S. ARMY
ADIOMAN

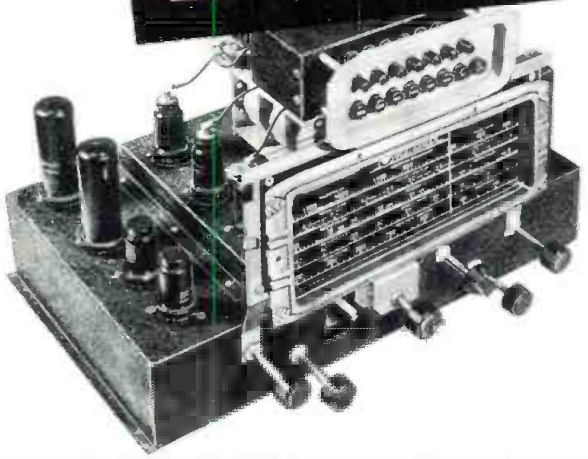
Radio W9HEZ Afloat
SEE PAGE 50

"IT'S FUN TO BUILD!"

Kit Guarantee

When you build a radio receiver from a Meissner Kit of parts exactly in accordance with the Meissner Pictorial Diagram and Instructions, that receiver will either work satisfactorily, or you have the privilege of shipping it (prepaid) to the Meissner plant for inspection and mechanical or electrical adjustment! If the fault is due to a defective part, or to an error in instruction or diagram, no charge whatsoever will be made for putting that receiver in perfect operating condition. Before you ship, just write the Meissner Manufacturing Company, Mt. Carmel, Illinois, for instructions, thoroughly explaining your difficulty. We will even supply a shipping carton so that you will not have the burden of packing.

12-TUBE "CUSTOM" SUPER



COMPLETE KIT CONTAINS THE FOLLOWING: Assembled and prealigned 5-band Tuning Unit, with condenser, dial and escutcheon; punched and drilled chassis base; Ferrocart (iron core) band expanding I. F. transformers; volume, tone, sensitivity controls; switches; sockets; power transformer; electrolytic, paper and mica condensers; knobs; resistors; miscellaneous small parts; tuning eye assembly or push button tuner assembly; screws, nuts, washers, etc.; hookup wire; solder; complete pictorial and schematic diagrams as well as full instructions for assembling, wiring and operating. (Parts Kit does not include Panel or Cabinet.) And this model is only one of 12 Meissner complete kits!

COMPLETE KIT

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1938 CATALOG
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Meissner

"A FAMOUS NAME FOR TWO DECADES"

RADIO NEWS, Number 3. Vol. 20, Sept., 1938, Published monthly by Ziff-Davis Publishing Company, at 608 S. Dearborn St., Chicago, Ill., U.S.A. Subscription $2.50 per year, single copies 25 cents, foreign postage $1.00 per year extra, except Canada. Entered as second class matter, March 9, 1938, at the Post Office, Chicago, Illinois, under the act of March 3, 1879.

FOR many years there has been agitation that the license requirements be so changed that the learning of the code be eliminated. We have felt steadfastly that the code was a necessary adjunct to any license, and recently we had an opportunity to see our views entirely justified.

Our government issues a 3rd Class Telephone license which is given without knowledge of the code being a prerequisite.

A few evenings ago three yachts, each with a third class operator aboard and a ship-to-shore radio equipment, were engaged in trying to find out what had become of a certain ship which had not been reported for several hours. After much rag chewing back and forth over the airwaves, one of them got the idea to use the radio-land telephone lines to get the Coast Guard Commandant out of bed and find out what, if anything, they were doing about searching for that ship.

The commandant was duly reached and he ordered that a certain Coast Guard ship, then searching for the lost boat, report to the ship inquiring, and advise just what progress, if any, had been made in the location of the lost ship.

Then the fun started. The 3rd class operator called the C.G. base on phone, using the regular C.G. frequency. He did not listen, and so he disrupted the CW transmission between the base and the very ship that they were seeking to contact. C.G. base stopped its transmission and told the 3rd class op that they were working the C.G. searching ship and that both it and the searching ship would call the 3rd class op on fone as soon as the "priority" traffic was finished. Within the next half hour the 3rd class op broke in three or four times asking that he be put through to the searching C.G. ship. He broke up the transmissions so badly that the C.G. searching ship was over a half hour in getting the information that it was to contact the 3rd class op. Finally when everything was bugged up good and fine, the C.G. base and also the C.G. searching ship went over to fone to answer the 3rd class op that no word had been received from the lost ship till then and that they would call him when anything was heard.

What we are driving at is that had the 3rd class op known *any* code—even a 10 word a minute speed—all the confusion would have been avoided. As it was, his ignorance caused much confusion, QRM, and the like.

After this we are more than ever definitely in favor of a code test for all operators regardless of whether they intend to operate CW or fone!

* * *

IN the next issue Louis J. Gamache, W9RGL, will describe a VOX system for use with a transmitter. What the VOX system is, the readers will have to wait to see; but we promise that it will be a unit which every ham will want.

* * *

AS our readers know, W9LLX has been on a vacation with a 30 watt 14 mc. and 28 mc. rig installed in his car. His travels took him from Chicago through the west and the southwest. At this writing he is at the old home town of Delcampo, Tex.

We made a schedule with Harry for every day, but nary a peep did we hear from him on either band. Two days out of Chi he reported in via another ham that "all was well," and that he could hear us and had already lost a lung calling. That was the case throughout the whole trip.

Yesterday our phone bell rang, and W9NLP told us to go ahead and talk to W9LLX in Texas. Placing the earphone of the telephone handset to his mike, NLP transmitted our voice over the twenty meter band to Harry. To receive he reversed the process, placing the mouthpiece against the loudspeaker. We had a swell QSO of over an hour with the sigs R9 plus both ways. Harry was using 28 watts tied to the end of a *500* foot sky wire pointed in our direction, while Rowly had 850 watts going into his squirter (making 3200 watts effectual signal).

Two things were apparent: that 28 watts on the end of a long antenna almost equaled 850 watts into a squirter and that the thrill of radio for even the old timer is not yet gone.

Harry said that he had sunburned tonsils from looking at the marvelous antenna arrays that the west coast crowd is using, and that nothing like it has been seen here. He has promised to write it up for us as soon as he returns. It should be a fh article for those who cannot afford a kilowatt and who want to really "get out." Watch for this in a very early issue of RN.

* * *

IT is of interest that the City of New York has just passed an ordinance which prohibits the operating of any device which causes radio interference (broadcasters excepted). This is a step in the right direction, and it is to the credit of that city that they have taken the matter of interference in hand and are trying to eliminate it. It will be interesting to watch how this new ordinance works out, and whether it shall have the desired effect.

* * *

IN an effort to find what the readers want in this magazine, we are asking all those who would like to see the column "QRD" returned to the pages, please write us.

THE F.C.C. is getting active in the suppression of illicit radio transmissions by amateurs. It recently suspended the privileges of one John Evans of Palmyra, N. J., for "operating a licensed station with excess power, on unauthorized frequencies, etc." If the F.C.C. gets any more active we foretell a quick demise of the California Kilowatt Transmitter."

* * *

WHILE we are on it, how many of the readers are working on the receiver contest? Don't let the opportunity slip through your hands. Now is the time that you are not too busy with traffic on account of static, and these evenings can be spent in getting yourself that receiver. See August issue of RADIO NEWS for details. September 8, 1938, is the deadline!

* * *

WE are hot on the trail of a simple "secrecy" device for use for the ham. If we are successful in obtaining the circuit and the instrument we shall be happy to pass it on to the hams for inclusion in their sets. We hope that all those who are accustomed to call CQ until the most hardy of us wilt, will use it so that we can get a rest from hearing those confounded words over and over and over.

* * *

RADIO NEWS has scored an out-standing hit in obtaining the services of Frank C. Jones, Technical Editor of *Radio* as a feature writer. Mr. Jones will continue his connection with his own magazine, and write special material for us as well. Jones has been with W6AJF since 1921, transmission engineer for the Pac. Tel. & Tel. from 1925 to 1928, after graduating from the University of California. He is the well known author of four editions of the *Radio Handbook,* many smaller books on 56mc, antennae, and radiophone subjects. In the past 15 years he has been a prolific writer having had over 200 articles published. Mr. Jones' first article for RADIO NEWS will be on the construction of a 600 watt transmitter involving several new and unique features. We greet W6AJF and hope that this is the "beginning of a beautiful friendship." Watch for the Jones' series of articles.

* * *

WELL, that's that for this month. We are disgusted with conditions on the 20M. band . . . you can't hold a QSO for more than two or three minutes before the skip sets in and you are wiped out. We are so disgusted, that we think that we will get to building that new all-wave band switching transmitter we have promised ourselves since Hector was a pup. BCNU next month es 73. W9QEA.

—30—

RADIO NEWS
INCLUDING All-Wave Radio
The Magazine for the radio amateur, experimenter, serviceman & dealer

SEPTEMBER 1938
VOL. 20 No. 3

The Contents

★

F. C. Jones, W6AJF, author and engineer, whose feature articles will appear in RN.

★

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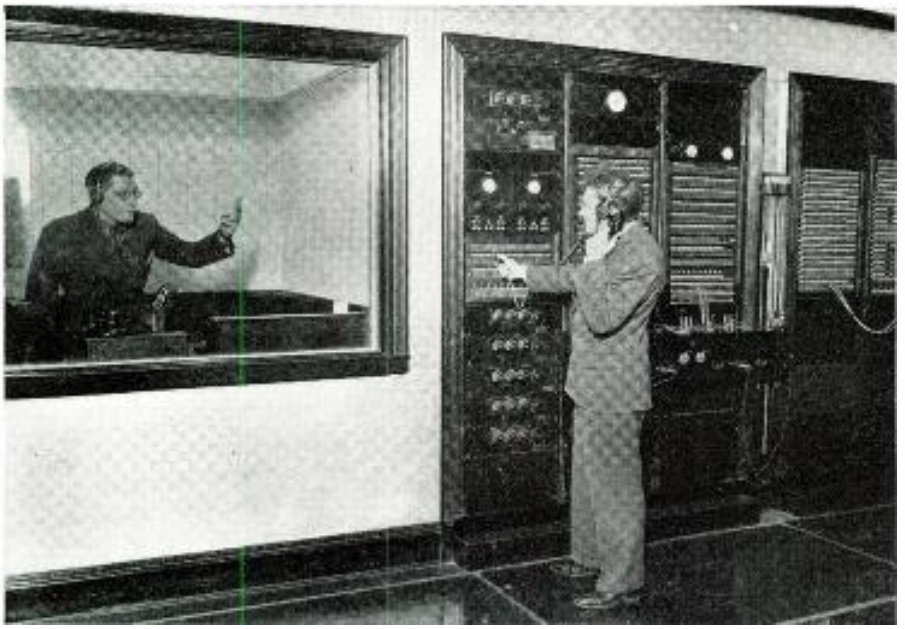
by JACK RYAN
NBC, Press Dept., Chicago, Ill.



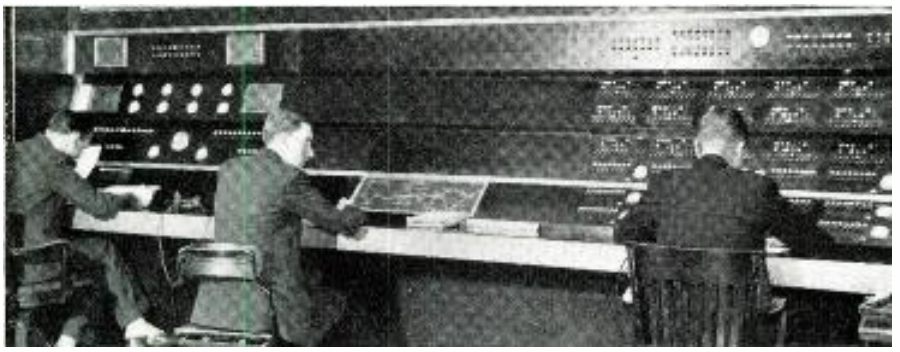
There are more live terminals at the south end of the control room than you can shake two cross patch cords at. Announcer signals, "2 seconds before next switching."

THE *Nerve Center* OF A

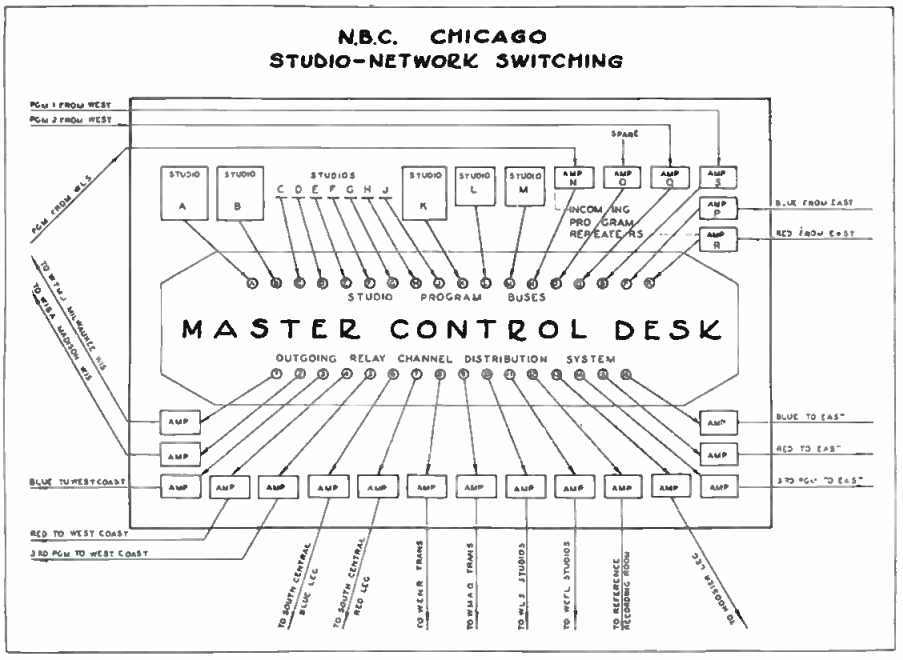
It takes only two men plus over five hundred push-buttons to track one of NBC's programs through Chicago. The author tells how you get your program.

TWO men and 547 push buttons control one of the greatest radio switch-tracks in the nation—the NBC master control desk in Chicago.

Take a look at a railroad map of the U. S. A. The lines run out, east, west, north, and south, a mass of creeping threads that hook the coasts to the borders and that tie the Everglades in with the Dust Bowl. If you wanted to chop that knot of lines at the most vulnerable spot, you would seek out Chicago, because it is at Chicago that the biggest mass of those creeping threads sag or bend around to cross and recross in the same spot. Chicago, from a railroad standpoint, is the great half-way station, the point where you can box the campass with reshipment directions.



The master control board—one of the greatest radio switch tracks in the world.



Block diagram of what takes place inside the control room radio switch track.

As with railroading, so it is with radio, in one sense, for at sometime or other in almost any 24 hour period the program traffic for about 150 stations in the NBC networks will get its switching through Chicago. It doesn't matter where on the NBC map a program originates. If a show has a network it generally slides through the Chicago control desk, to be combed out and headed down the right wires for the ultimate station outlets. But perhaps the most astounding feature of the whole thing is the fact that one single engineer, seated in front of a three-by-five foot section of the main switchboard, can hold the whole of NBC in both hands and use a nearby typewriter to hammer out the operations log at the same time.

The arrangement of that switchboard is a matter of convenience. It looks simple, but it isn't. The very unpretentiousness of the board's operation is a perfect mask for a singularly difficult engineering achievement. Not counting power supply apparatus, meters, and gauges of various sorts, it takes something more than 18,000 individual pieces of equipment to make that board function as it must function—and keeping track of 18,000 pieces of equipment is no simple job in any man's language.

It was some years ago that NBC engineers found that relay switching was the answer to most of their traffic routing problems, and it is on a complicated system of relays that the functioning of the

main control room at Chicago is dependent. It takes just 976 relays and 7,444 relay contacts to complete the switching layout for the main control room and the adjacent studios at Chicago, and there are 864 indicating lamps in the setup to let the engineers and announcers know what switch buttons to push. Not counting the local switching which the announcer handles from the studio, the main board handles around 1,000 channel switches in a normal day's work. Nobody has ever had time to stop and count up the channel switches on a day when the networks are really busy, but the other figure gives a fair idea of what to expect.

But, getting away from the stratosphere statistics for a moment, a clearer idea of the main control rooom function may be obtained by following a program out of the studios, through the board and down the specially engineered telephone lines.

Two days before a program goes on the air, the engineering staff gets its copies of the Advance Program Traffic Schedule, a big pink or blue multigraphed sheet (the

In this large room all the programs that come to Chicago are re-routed on schedule.

BROADCAST NETWORK

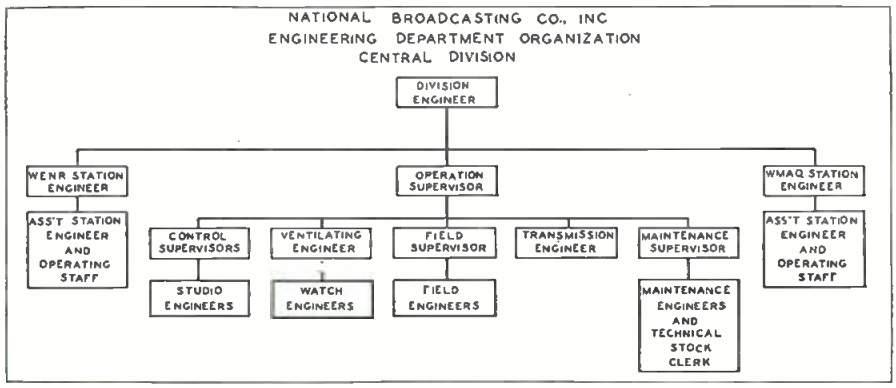
color varies with the network) which serves to give a preliminary listing of what programs are coming up. The day before the program is aired, a mimeographed Local Program Traffic Schedule is handed down. This sheet contains detailed information about studios, production, time, announcers, cues for the NBC chimes, etc. This is the engineer's route sheet, to be checked and rechecked, corrected for last minute changes, and to guide his work at the switchboard. Finally, via teletype from New York headquarters, comes the Operating Order for the broadcast, a brief paragraph noting time, program, outlets and chimes cue. Operating orders may be received anywhere from four hours to 15 minutes before a given show goes on the air.

Taking a typical order out of the day's schedule, the outsider would be presented with the following heiroglyphics:

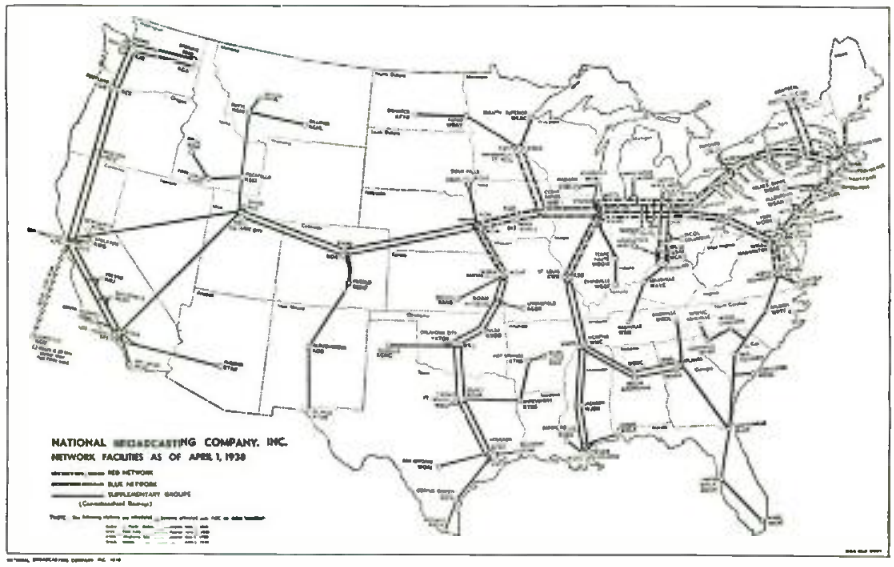
O O
NO 5
TIME 9-915AM CNYT
BLUE BKFST CLUB (SUS CHI) (NON)
ILL MID COUN LOU NTN HOS

Reading like Greek to anyone but an NBC engineer, in translation the "O O" stands simply for Operating Order. A literal reading would make the message state "This is Operating Order No. 5, scheduling a broadcast from 9:00 to 9:15 a. m., New York Time (all programs, however long, are ordered by 15 minute intervals). On the Blue network, the NBC *Breakfast Club* will originate as a sustaining broadcast from Chicago studios. There will be no break (NON) at the end of this 15 minute period, because the program is scheduled to last longer than that. The program will return to Chicago on the Blue leg from the east (ILL), feeding stations enroute. The east will receive

(*Continued on page 72*)



To insure smooth working and letter-perfect results, the engineering staff at NBC, Chicago, is divided up much the same as the Army. Highest coordination is necessary.



A chart of lines fed by NBC in normal conditions. Emergencies create many more lines.

A RADIO BUG

Radio is an important factor in the defense plans of the Panama Canal, the navy's indispensable "life-line."

The Tropics! To the average person this spells romance and señoritas. To the radio-op it means the crashing of static, hard-to-keep schedules, bugs, rain, and excitement.

RADIO was one of my first loves, and the only one that endured. Now as I gazed shoreward from the deck of the army transport *Republic* at the dark, silent, steaming panorama, that is the jungle of Panama, I wondered if it would survive this.

What appeared to be a log suddenly came to life on the canal bank, as one of the huge alligators which infest the lakes and rivers was awakened from his *siesta* by a blast from the ship's whistle. We had left Christobal and the choppy Atlantic behind. Just ahead were the *Pedro Miguel* locks which would lower us to the shores of the Pacific; the hot, humid land that was to be called home for the next two years.

The radio men in Uncle Sam's service outfits, have been called "gold bricks," and everything else but workers, by their lusty service brethren, but from the very first I did not find it so.

First there were the long, hot hours of military drill on the dusty parade ground. Here the future radio operator marched with the future medical interne, the future artillerymen, cooks, and grass cutters.

One — two, one — two: the monotonous chant of distracted recruit sergeants fell on deadened ears and was frequently broken by staccato growls, as some straggling recruit raised a dusty arm to wipe away the sweat that blinded his eyes. For weeks this instruction went on. I often wondered if I'd ever get my hands on a key again.

Then one day came the long awaited order for me to report to the radio school at Fort Amador. What joyous news that was. The stifling heat, along with the almost unbearable humidity, seemed not so noticeable now. I had almost cut my first tooth on spark coils, crystal detectors and oatmeal boxes. Later I had graduated, through the school of hard knocks and shocks, into a fairly decent amateur. I soon learned that you do not "cut up," at least over the air, in Army radio. It is a business.

I will never forget the day when one of the students sent some words (uncomplimentary but in fun) to another operator of a portable station, while practicing out in the field. It happened that the communications' officer was monitoring the portables from the main transmitter, K5AA. The words that were showered upon us by the "noncoms" will not bear reproduction here. In any event there was lots of painting and brass polishing after regular quitting hours.

When the rains arrived (and it really rains for about six months), we studied army procedure. It is quite different from anything the amateur ever attempts. The portable calls consist of two letters and a district number such as HU-5, IU-5, Mu-5. Superfluous signals are kept to an absolute minimum by the use of "Z" signals, which correspond somewhat with the amateur "Q" signs. Many times whole messages are sent exclusively by means of these time-saving abbreviations. A code speed of about twenty words a minute is required for graduation from the school, while regular service messages in the field are sent at about fifteen words per minute. Accuracy is stressed almost to the point of fanaticism, and all letters are printed. The reason is obvious when consideration is taken of the fact that many of the messages are coded and the mistake of a single letter may change the meaning or render the message impossible of decoding. The secret coding of the messages is done by the radio section crew. There are several codes and methods, and their transcription is one of the most interesting branches of Army radio but they are of course, secret.

Just as our six months of rain was beginning to subside, I was turned to duty

Uncle Sam has greatly fortified the Canal Zone area. A rare photograph of one of his armed islands. Each island is interconnected with the other by radio and rails.

in the TROPICS

by KENNETH B. MENEAR
Former Army Radio-op, Grafton, West Va.

Tortola Island (right background) on which the author participated in war games.

as a full-fledged Army operator. But alas! I soon found out that there is more to Army radio operation than just sitting quietly at the key, in the comparative cool of the radio shack.

Fort Amador and K5AA are part of the Coast Artillery Corps, and the main duty of the Coast Artillery is to fire the big guns. Even when they are only practicing, these big guns shoot a long way. This means that range details had to observe azimuth (horizontal) and angular height deviations of the shots when they burst at the target.

I remember when the machine gunners used to shoot. Each of the so called "Gold Bricks" was loaded down with telescopes, telephones, batteries, cameras, wire, transmitters, and sometimes our field packs of canteen, blanket, tent—well anyway we were usually loaded.

Then would come the long hard climb to the top of one of the fortified islands. Several times we started to count the steps to the top but we never finished. Even here where man has worked out marvels of defense, symphonys of steel and concrete, the lush, green tropical jungle seems to be trying to cover the scars. Many times a deer would bound up the long cement stairs ahead and Iguanas would scurry from the path of the common enemy—man. This is the only place in the world where the sun rises in the Pacific and sets in the Atlantic. There was stark, wild beauty here and even familiarity could not breed contempt.

I always considered a machine gun flank detail a vacation in comparison to an anti-aircraft one. We always had to be in such uncivilized places. If it was at Cobey flank, the mud, sand fleas, mosquitoes, and countless other insects, made one curse his luck for not being at the other flank—that is until he did get on the other. The flank at Tortola is the most beautiful, the most exciting, and the nicest after you get there. Note that I said *after*.

A trip to the island of Tortola, meant first—that you had to start several hours before the other groups. After equipment had been checked and rechecked, we loaded aboard a motor launch and put out to sea. If there had been any bad weather we soon knew about it. Sometimes it was hard to keep down hastily eaten breakfasts. Sometimes waves had the annoying habit of breaking over the boat, especially at night when there was no sun to burn you. Cool night ocean breezes and wet clothing are not comfortable in combination, even in the tropics at nine degrees above the equator. When we came up to Tortola the trouble really started. The islands are volcanic and rise almost perpendicularly above the breakers which pound at its bowlder strewn base.

The motor launch could approach to within a hundred yards or so of shore, providing that the tide was not coming in, or the waves too high. In any event we always had to load the heavy but valuable equipment into a small open rowboat, then trust in Providence, good rowing, and a fair sea to get us ashore. We always expected to lose some of the expensive tools of our trade but we never did, though we had several close shaves.

Upon landing we had first to scramble and struggle with the running gear until it was reposing safely on the summit. Sometimes two or three trips were necessary. Worn clothing and shoes many times made the final assembly look more like a hobo camp than an elite collection of exclusive radio men.

The regulations state that the flank details shall get in communication with the base as quickly as possible, so there was no time for rest. Incidentally, about the only cheerful news I ever heard from the regulations concerned an article which states that "In war, radio operators shall be as sheltered from gun and shell fire as much as possible."

The Army transmitter, its generator and accessories are put up into three boxes which are said to be portable on fair ground. The generator, which is turned by hand, and its accompanying gear is the heaviest case. (This is for prospective Army operators.) It is amazing how soon the men learn to avoid this case.

(*Continued on page* 74)

Radio equipment in foreground is used to command coast artillery gun squad. Firing on unseen targets, it receives range corrections by radio from planes.

SHORT WAVE WAR in LATIN AMERICA

by J. S. WILSON
New York City

The author makes a survey of the propaganda activities directed at Latin America and compares those of the U.S.A.

SHORT wave radio has become an active weapon of international politics. At the present time Great Britain and the United States are joined in a war against Germany and Italy . . . via radio.

Except for the U. S. A., it is a battle of propaganda. Since 1930 short wave broadcasts, first from Italy and later from Germany, have blanketed South and Central America more and more thoroughly with each passing year. In Argentina, for example, in 1934 there were 89 programs relayed from Germany; in 1935 there were 145; in 1936, 239; and in the first *nine months* of 1937, there were 235. Radio is just one cog in the huge propaganda machines being unleashed by these two countries, but it is becoming increasingly a more important and more effective one.

The German and Italian programs have had their most apparent effect in Brazil, where President Getulio Vargas set himself up as dictator last November. Portuguese is the predominant language among Brazil's 40,000,000 people, 800,000 of whom are Italians. Before Vargas assumed open dictatorial power, programs from German stations were being printed in Brazil as completely as local stations. Since few people in South America have long distance short wave receiving sets, arrangements have to be made with local stations to intercept and rebroadcast the short wave programs. The fact that the German broadcasts were used widely enough to warrant equal publicity with local programs gives an indication of the influence Germans were able to bring to bear on Brazilian stations.

Furthermore, Brazil has a Federal law requiring every station in the country to broadcast a program prepared by the Department of Propaganda from 6:45 to 7:45 each evening. This program is relayed from Rio de Janeiro by wire to those stations within reach of telephone communication and by short wave to the more distant stations (Brazil is larger than the United States). Thus, for one hour every day, every station in the country is broadcasting the same program, and anyone who turns on a radio then cannot escape it. Italy and Germany have reciprocal agreements with Brazil whereby they supply a certain number of programs for this hour, and, in return, they relay Brazilian programs in their own countries. These Italian-German programs cover "news and information, music and general culture."

Naturally, these programs supply "news and information," etc., with an extremely pro-fascist and anti-democratic slant. Turner Catledge, *New York Times* correspondent, on a recent visit to Brazil, reported that "one cannot walk out on the street without hearing German and Italian music being broadcast in public places. . . . The spoken part of these broadcasts usually is in Portuguese. They originate both in Europe and in stations here (in Brazil), and many of them are climaxed by comments emphasizing the wonderful work of Chancellor Adolph Hitler and Mussolini as contrasted with the slow movement of democracy."

Catledge notes that the Italians take advantage of the known Latin love of good music to make their programs attractive to Latin-Americans, whereas the Germans are less subtle and more purposeful. As an example of the direct anti-American tone of the German programs, the *Times* correspondent cites a broadcast which gave a resume of the reputed successes of Hitler in dealing with social and economic problems as contrasted with the alleged failures of President Roosevelt in such programs as the N.R.A. and A.A.A.

During the month of February, the German national broadcasting station in the Charlottenburg district of Berlin broadcast a daily series of widely disseminated all-Latin-American programs. The daily schedule consisted of two news programs, one economic program, a feature called *Echoes from Germany*, numbers by Latin-American Musicians, and special appeals promoting good-will toward the Nazi regime.

When Great Britain found her influence in Latin-American diminishing as German and Italian prestige grew, the British government began to take cognizance of the forcefulness of this radio propaganda. Undoubtedly British attention has been focussed on this means of influence as a result of her recent radio skirmish with the Italians on Arabian matters.

Felix Greene, New York representative of the British Broadcasting Company, was instructed to make a survey of the South American situation. He reported that Germany and Italy were flooding South America with propaganda by radio, news, and personal contact. He noted the increased power of the stations using this propaganda, and the use of recordings of movie stars to increase the interest of their programs. There were 200 or 300 relays of German programs, he said, to one British, and in Brazil programs were relayed from Germany which had been especially constructed for Brazil with the Brazilian Ambassador at Berlin participating.

As a consequence, on March 15 Britain started a daily half-hour broadcast in an attempt to offset some of the propaganda programs of the fascist countries. Using the call letters GSB on 31.55 meter wave, the programs go on daily at 8:45 p.m., Eastern Standard Time, and consist of news items. The first fifteen minutes is in Spanish, and the program is then repeated in Portuguese. According to British officials, the items are taken directly from the news agencies and are not colored, although they are usually condensed. They are depending on South American people tuning in London for accurate, impartial news in contrast to the biased reports heard on most of the other programs. Believing that the eye is more likely to remember than the ear, the British are also working on television with the aim of adding this to their overseas broadcasts.

The United States is also taking steps to offset the wide-spread Italian and German broadcasts. Heretofore the National Broadcasting Company has been sending programs to South America daily from 5 p.m. to 1 a.m., and the Columbia Broadcasting System has been sending similar daily broadcasts from 6:30 p.m. until midnight. For the most part these are merely the regular American programs, although between 10% and 25% are specially prepared for Pan-America with Spanish and Portuguese announcements.

However, this has afforded only the mildest of competition to the other foreign programs, and some Latin-Americans have felt that the United States had abandoned them to fascist propaganda. Therefore, the Government has been taking steps in an attempt to offset this feeling. American commercial houses doing business in South America have been encouraged to increase their publicity activities there by using radio, printed matter, and other means.

As a further step in this direction, the World Wide Broadcasting Foundation started special Pan-American broadcasts over W1XAL, Boston, in the middle of February, using the temporary channels of 15.13 and 11.73 megacycles. Speaking on the opening broadcast, along with a number of South and Central American officials, Cordell Hull, Secretary of State, said that "radio can be one of the strongest moral and spiritual bonds between people if it is utilized in the spirit of mutual and sympathetic understanding."

That this fine sentiment has not been true recently is seen in the fact that many Americans, especially in Brazil, have accused German stations, and secret stations in the mountains of Peru and Chile, of interfering with news broadcasts from Pittsburgh and Schenectady.

Moreover, despite the official welcome given by Latin-American countries to propaganda broadcasts coming from fascist-directed nations, programs expressing an opposite point of view are frowned on.

With the fascist countries well-entrenched and experienced in the use of radio propaganda, the democratic countries face a long up-hill fight in their attempt to overcome this influence.

The question is, will they?

—30—

MUTUAL Makes NO Money

by HERBERT I. DIAMOND
Brooklyn, N. Y.

How the Mutual Network came into existence is told by the author in describing this most unusual of all radio systems.

Mr. Fred Weber, General Mgr. of the only mutual radio network.

YOU have to start at the beginning to understand this network business. If you want to learn what makes a network tick, you must know how there happened to be a network in the first place. And since radio is almost totally a business of *ideas*, you must begin with the idea in Marconi's mind that started the whole thing.

Then you progress to the following ideas —the thoughts that fired the imagination of the young fellows who fooled around with cat's whiskers and crystals in those early days. They wanted to understand the dots and dashes, to send their own words across space—and so the ham was born, full of ambition and ideas. Came the phone—and another idea: broadcasting to the public. The brain wheels turned again to produce the first sponsor. Then, magnificent idea, came the networks: to put the same program on the air over many stations simultaneously; to sell the combined time as a unit; to finance bigger and better sustaining features. Networks had so much to offer a station that they were progressively able to sign inclusive contracts—with time priority and comparatively low payments for commercial time to each station. Then the networks bought new stations, improved their old ones, until finally the Federal Communications Commission whispered "Monopoly!" and decided, on March 18 of this year, to investigate networks, network contracts, network profits, network competition. And what will come of the investigation, nobody knows.

But that's running ahead, because here is the story of another idea, as revolutionary as any in radio. It started about 1934—by which time the networks had become so well entrenched that unless a sponsor was willing to buy at least 15 stations, he couldn't go national. The NBC red and blue, and the younger Columbia, all worked on the same principle.

A sponsor—whose name has been forgotten—wanted to buy time in New York and Chicago. When the big fellows turned him down, he vowed he'd make his own network. So he bought his half-hour on WOR and he paid for his half-hour on WGN and he leased the necessary landline. Presto! An idea! Nothing impossible or difficult about it, only it hadn't been done before. Pretty nifty, thought a couple of salesmen for these stations—and proceeded to line up two or three other sponsors who wanted to cover these same territories but didn't want the cities between. Then another advertiser ordered powerful WLW in Cincinnati, and finally the Gordon Baking Company added Detroit to these three cities. With this literal "bread-and-butter" account the Mutual Broadcasting System was born—and this sponsor's *Lone Ranger* is still bread-and-butter for Mutual.

The landlines, in the summer of 1934, were up. Station executives got together, agreed to swap a few programs. And on October 2nd Mutual was officially created as America's fourth major network. The name was selected because it set the keynote for network operations. In the words of W. E. Macfarlane, president since organization, "The Mutual Broadcasting System was built for advertising and sales coverage at the lowest coast-to-coast rates and minimum of waste. It has appealed to members and affiliates by giving them the majority of the gross from time sales." Yes, this was going to be a different kind of network. Instead of being run to show a profit for the network and to create the majesty of Mutual, this was to be a purely cooperative venture for the benefit of the stations themselves. Actually, in its original form, it was a joint sales organization supplemented by such network facilities as might be possible.

Mutual started out with its four major markets—New York, Chicago, Detroit, Cincinnati—claiming, as is the way of radio, to blanket the spending power from the Atlantic to the Mississippi at the lowest advertising cost. The claim was true, to the extent that at least one of the stations could be heard easily in any part of this vast area. But the general public prefers locals to DX. Mutual knew it; advertisers knew it, too, and demanded intermediate outlets. Soon Mutual programs were being aired from Baltimore, Pittsburgh, Cleveland and other additional cities, and Detroit power was increased five times by switching over to CKLW. That's how Mutual grew at first, and no one was more pleasantly surprised than the system's own executive council: President Macfarlane, Chairman of the Board Alfred J. McCosker, Vice President Theodore C. Streibert and Secretary-treasurer E. M. Antrim—the "four horsemen."

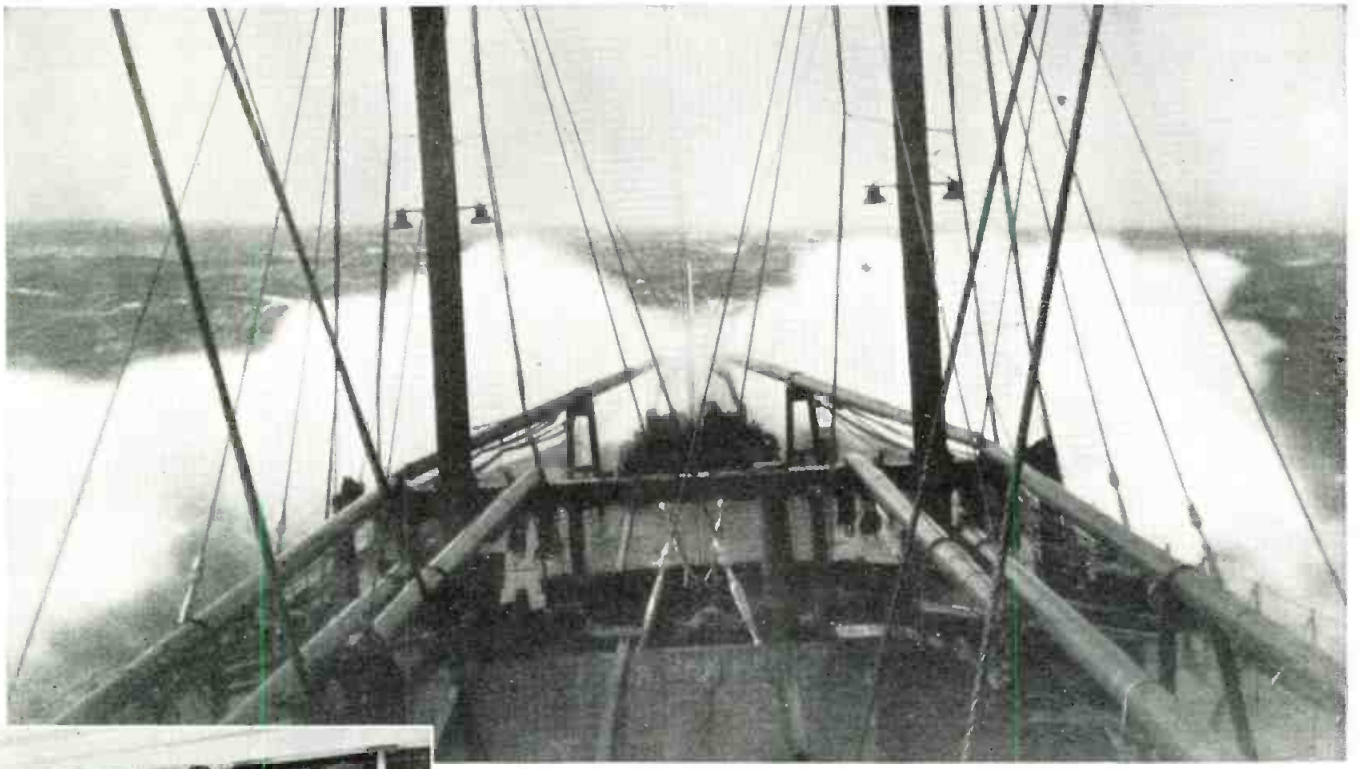
The march to Mutual began: New England's Colonial network, KWK of St. Louis, Nashville's WSM, Kansas City's WHB, the Iowa network, the Central States Broadcasting System of Nebraska, Denver's KFEL—and, crowning triumph, California's Don Lee system, celebrated with a four-and-a-half-hour jubilee program on December 29, 1936. Some of the stations came in because they were originally included in sponsor's plans. Others applied for membership or affiliation. Still others were invited to join, to fill blank spaces in the coverage map. By the end of 1935, Mutual was selling 15 commercial hours weekly. The figure nearly doubled in 1936. Almost two million dollars was billed in 1937. And in the first three months of this year, time sales are up 10 per cent more. But this is just a drop in the bucket, and there's a long way to go before the volume approaches NBC's or Columbia's. But Mutual is on the way up.

Mutual stations operate the network. On other nets, a contract clause provides for the clearance of any time on 28-day notice. But not with Mutual. No local sponsor ever must be shifted because national time has been sold. It is purely within the station's own discretion. Nor is there any agreed or implied compulsion to take any sustaining feature. Instead of getting from 25 to 37 per cent of its card rates for commercial time as is the practice on other nets, Mutual stations earn their full card rates, less only the usual advertising agency commission. Affiliated stations are charged a small sales commission. Mutual's member stations — that includes WOR, WGN, CKLW, WHK-WCLE, Don Lee and Colonial—share the operating expenses of the network. Each station pays its own line charges. That is the completely simple financial structure.

Actual ownership of Mutual is divided between WOR and WGN. Mutual makes no money, doesn't want to make any money, actually isn't in business to make money

(*Continued on page* 65)

MARINE MANNERS



"Taking it green over the bow in a blow." Because not all days at sea are as smooth as a billiard table, the radio-op must be possessed of a fine pair of "sea legs."

The author, in sea togs, talking to the late Amelia Earhart Putnam. To the author's left is the late Wilmer Stultz. Flanking Stultz is Lew Gordon. Picture taken aboard the "S.S. Pres. Roosevelt" in 1928 when the crew of the transatlantic plane "Friendship" returned from Wales.

by LEE SCUPPER
W. Chop, Martha's Vineyard, Mass.

The mere holding of that commercial operator's ticket is not all that makes the marine radioman. He needs to know the "code of the sea." The author, who has "stood" many a watch in a blow, advises you what it is.

I DON'T want to discourage you, young fellow, but that new commercial radio operator's license the Government just issued to you doesn't prove you know any of the important rules of conduct for a life at sea. It's nothing but a ticket which allows access to a ship's radio room.

The school gave you a basic knowledge of electrical theory, training in radio law, instruction as to equipment, and code practice. The FCC exam was your final test; the license, your diploma. The radio education has been excellent, as shown by your high grading; but what do you know of ships, or the men on them?

Nothing. Climb upon my figurative knee, sonny boy. The time has come when you, like most other graduates with a crisp license, should be told the true facts of marine life.

While you are waiting for a ship, use your spare time practicing on a typewriter. You won't do much operating without one, so don't wait until you get past the first lightship to conquer it; at that time, your mind will be occupied by new matters.

Your first assignment probably will be as junior operator on a small passenger ship. The moment the buzzer in the Static Room snaps out your name in code will undoubtedly be one of the happiest in your life. The other operators, waiting with you for jobs, will stop talking while they translate the signals. You will copy your name without realizing it. Someone will nudge you, and say: "Hey—you're not on the beach any more!"

You will leave the building with the assignment slip in your hand, and walk blissfully in the wrong direction. Then, in panic, you will take a cab to the pier. You will, in fumbling excitement, first underpay, then overtip, the driver.

You will never forget the empyreal moment when you turn and see the ship for the first time. The flare of its bow will seem huge; its most commonplace detail will be romantic. The name will thrill you. Stand and enjoy the rare moment; it will never return.

Look up at the mast. See the antenna? Let your jaw sag if it's more comfortable

FOR Seagoing Ops.

that way. Stay there until someone taps you on the arm, and says, gently: "Hold my elbow—I'll walk you across the street, old man."

Your heart will outrun your feet as you walk the pier to the gangway. Odors of old planking, wet rope, and rotten fruit will mix into one delicious stink. In later life, similar odors will bring back vivid pictures.

Pause at the foot of the gangway, for, in crossing it, you will travel further than you have ever traveled before.

On board, you will imagine the ship is moving. It won't be. Take four wrong routes to the radio room. Arrive where you started each time. Ask a man, whose stride has free wheeling, where the radio room is located.

"Second port forward—starb'd side boatdeck," he will answer without shifting gears. When he sees the question mark over your hat, he will stop. "First tripper, eh? Well, Marconi, go through that door, upstairs three flights, and walk right."

The shack will appear complicated, and have the exact aura you hoped it would. The Chief will take his feet from the operating table, and question you with his eyebrows.

"I'm the new junior," you will stammer.

He will put his feet back on the table. "We sail tomorrow. Sign on this afternoon. Upper bunk is yours."

The lack of formality will disappoint you. "Here is my assignment slip," you will say, hopefully. "Do you want my license?"

"I don't even want my own, sometimes," he will say, cynically. Later you learn he didn't mean it. "Get ready to garbage up at two bells."

That will mean you eat at one o'clock, and also that your seagoing life has begun. It will be different than your mental preview; no better, no worse, but different.

The stewards, for example, will have more control over your future life on board than the skipper. They are a clannish group, outnumbering any other department on passenger ships. An important part of their business is to estimate the amount of shirt-stuffing contained by those they serve, and they are more than shrewd in this respect. Give a wide-awake steward 48 hours on a ship with an average passenger, and he could tell the tourist's mother things that would surprise her.

Don't try to hide anything from your room-steward, table-steward, or any other member of the group. If you tip him properly and treat him with casual respect, word will pass among all the other stewards that you are okay. You will notice the difference in the entire department, from night watchman to Chief. As a matter of pure opinion, I believe an American steward has that in his makeup which demands more consideration than those of other nationalities. If this is a disadvantage, the fact he will become more sincere in his efforts, if he is treated properly, more than compensates for this fact.

The Captain came into the shack one morning on the 4-to-8 to read press as I pounded it out on the mill. The steward had not removed my breakfast tray, and, when I saw him looking at the empty dishes, I remarked:

"Steward is a little late this morning—he usually picks up the tray before this, sir."

"I was looking at the side of your glass," he explained, pleasantly. "Buttermilk, wasn't it? Guess I'll order some."

He 'phoned to the pantry. "Captain speaking. Send buttermilk to my cabin." He held his hand over the transmitter, and turned to me. "The pantryman tells me they have none on board. That *was* buttermilk, wasn't it?"

"Yes, sir." The ridges on the side of the glass would have made denial useless, and I make it a point to tell the truth—when I am cornered.

The Captain returned to the 'phone. "Send some buttermilk up whether you have it or not. If it isn't here within fifteen minutes, I'll come down for it!"

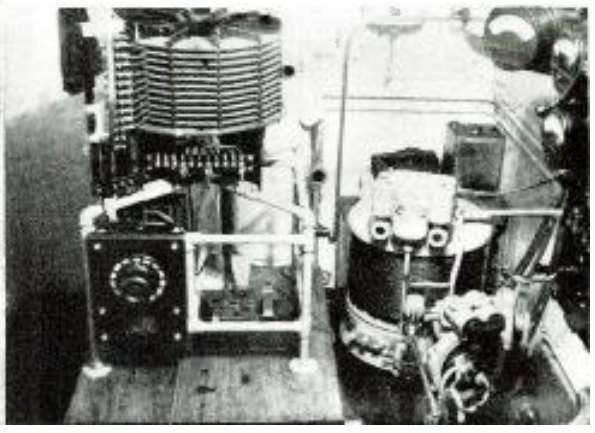
In the home port, the Chief Steward won the argument by proving, from stores records, that no buttermilk had ever been delivered on board. From then on, my morning glass was emptied furtively, behind a switch-panel. I sympathized with the master, for I knew what a buttermilk addict goes through when deprived of it, but I could have done nothing. The bottles were brought aboard for my exclusive use by my room-steward, who knew his business well enough to show his appreciation for proper treatment.

Don't accept tips. Miss Emily Post, in a list of crew members which she recommends tipping after a sea trip, mentions "assistant" radio operators. This classification represents neither a true picture of a junior operator's position, nor of his expectations. If the matter were put to vote, the "nays" from the shack would be vehement.

It is equally proper for a passenger to tip a Captain, Chief Engineer, or First Officer. The radio operator, although he has no executive authority outside his own department, is rated as a ship's officer. He wears gold stripes, as do the deck and engine-room officers. Other than that, his position is largely determined by the respect his conduct induces in his shipmates.

If a passenger wishes to know why you refuse money, explain that you are a navigating officer, and that, having access to all confidential correspondence, are in a posi-

(*Continued on page 70*)



(Left) You will never forget the thrill of seeing your first ship on which you go to sea as radioman. The author's first, the "S.S. Orizaba". (Below) The shack will appear complicated. The 5 KW arc ship's transmitter.

STUDIO BRIEFS

by SAMUEL KAUFMAN

FROM time to time reports reach our desk on the results of radio popularity polls conducted nationally by magazines, newspapers, clubs, schools, committees, and other types of sponsors.

Their intentions are always of the best. We'll grant that much, anyway. But, oddly, the results of the respective polls are different. One might show Jack Benny as the number one funny man while another will report that Fred Allen is the premiere comic. And, in turn, each radio talent classification will have different "bests" in the respective polls.

Here's one reason they lack value: The various programs are broadcast over chains of different size. A toothpaste comedian may be on the air coast-to-coast but a cereal funster may be presented only in three or four states where that product is distributed. Hence, even though the cereal comic may be the funnier and the better of the two, the toothpaste laugh-dispenser walks off with the first honors. It's all very confusing. Why not drop such polls altogether?

Mail and other forms of program comment from listeners carry weight when studied sectionally but public expression on programs loses value when classified nationally. The programs with the most outlets get the bulk of the votes even though other air features may surpass them if the ballots were tallied in ratio to coverage.

* * *

SPEAKING of polls brings to mind a remark I overheard in Radio City while attending an NBC Symphony Orchestra concert.

"Now, that's the kind of song I like," a man behind me remarked when the orchestra presented a spirited march. "If they stuck to stuff like that instead of all the highbrow tripe that people only pretend to like, the public would take to symphonic concerts in a bigger way."

I recalled that in radio's embryo state—a decade ago—a New York station did ask listeners what kind of music they wanted to hear. If the results of the poll were adhered to, broadcasters would continually be repeating "William Tell," "Poet and Peasant," "The Stars and Stripes Forever" and even "When You and I Were Young Maggie."

Broadcasters don't like to reject public expression. But, in the case of symphonic music, why not leave the programming to men who make music their life's work? It is impossible to build a symphonic hour that would contain favorites of everyone, but rather, through a day's schedule, spot the various kinds of music so that all tastes can be catered to.

* * *

WE discussed recently the growing antagonism between radio and newspapers with most of the clash being expressed or demonstrated by the publishers. Radio columns have been eliminated by newspapers in various parts of the country and there have been whispers that even program listings will be dropped, except for inclusion as paid advertisements.

If that happens the stations won't take it lying down. True, they have no right to state their demands for free space but they have come to count on the free listings for so many years that they've taken them for granted. In various cities, stations are weighing the idea of starting program sheets along the lines of the British Broadcasting Corporation's *Radio Times*. Under the plan that's been discussed—but in no way started—the program listings will be copyrighted and newspapers will be *forbidden* to publish them. A long cry, indeed, from the heavy pressure press agentry of the present! Instead, the stations' community paper would have exclusive listings. A radical move. But it may happen!

* * *

THE 1939 New York World's Fair will be the point of origin of a great many nation-wide broadcasts. Even at this early date many important programs have come from the partially completed fair grounds on the Flushing Meadows. John S. Young, former NBC and free lance announcer, is the radio chief of the exposition and, at this writing, is in Europe lining up international radio tie-ups with the big event.

It is too early to list even a few of the commercial features that will reach the networks from the Fair site. But a sample of radio activities is contained in the Standard Brands, Inc., announcement of a building that will contain a huge outdoor theatre

Architect's model of Standard Brands' outdoor radio theater for New York's Fair.

where its hit programs will take to the air. Among these may be *Rudy Vallee's Varietics,* Charlie McCarthy and the all-star *Chase & Sanborn Hour* and *One Man's Family*. Even when the artists themselves are not present, their features will be available in marionette form in cleverly arranged displays.

Besides broadcasting at the fair, there will be radio features in the form of receiver and parts displays and television demonstrations.

* * *

MAJOR EDWARD BOWES, who heads two stellar CBS hours, finds more personal uses for radio than anyone else on the talent side of the business.

As conductor of the nation's best-known amateur program and the *Capitol Family Hour,* the Major has been fascinated by the gadgets that he has observed in the studios and is applying them to other uses.

His home in Rumson, New Jersey, is equipped with a centralized radio system, not unlike those in hotels, giving him a choice of several stations' programs on any part of the estate. The home is also

Major Bowes at the two-way ship-to-shore telephone installed on his yacht "Edmar."

equipped with broadcast pick-up apparatus so that he can preside over his Sunday *Capitol Family* program without leaving the comfort of his gown and slippers. Also, his new 81-foot yacht *Edmar* boasts of a $4,000 two-way, ship-to-shore telephone system permitting calls with any land phone. The ship's call letters are WBOZ.

Henry Grossman, CBS chief division engineer, personally supervises all of the Major's "extra-curricular" radio activities.

* * *

THE Joe Louis-Max Schmeling fight broadcast is a thing of the past. But here's a "behind-the-scenes" story that shows the mental stress a radio executive could be under at such an event.

John Royal, NBC vice-president in charge of programs, was one of the many radio personalities at the ringside. But Royal's interest in the fight was secondary to his anxiety over the time. All through the preliminaries, John's eyes were on the clock. His main concern was that the fight shouldn't start before 10 o'clock New York time. And if the preliminary bouts ended early that's what would have happened and NBC would have faced a claim by Fred Allen's sponsors for a full credit on their interrupted hour—even though Fred may have completed three-quarters of it.

NBC'S billing to Buick was only $12,000 because the fight lasted less than fifteen minutes. And if it started just a few minutes earlier, the chain would have had to face a credit claim for Fred Allen's time which nets about $20,000. On top of that worry, NBC had to credit Lucky Strike for its full hour which didn't take to the air between 10 and 11 as usual, but many observers feel that Lucky lost a good bet by refusing to fill out the hour after Max Schmeling was kayoed in less than three minutes. Undoubtedly, the program could have held a large part of the tremendous fight audience.

-30-

"HAM" RADIO IN MEXICO

Carlos A. Covarrubias, XEIDC, Sec'y, LMRE, and Bus. Mgr. "Onda Corta."

by MILTON LEVENTHAL
Los Angeles, California

Below the Rio Grande are as fine a group of hams as are found anywhere. The author tells something of them and their problems.

ADELANTE colega—cambio, cambio. With this phrase somewhere south of the Rio Grande a Mexican amateur informs his colleague to go ahead as he stands by for the return communication.

XE2BJ in Bacobampo, Sonora calling XE1AM in Queretaro, or XE1AX of Toluca, Mexico calling XE2KH of Torreon, Coahuila, or XE2GO of San Luis Potosi standing by for XE3A of Oaxaca. It could be any of the 400 active amateurs in any part of our neighboring republic to the south, on any of the bands on which your choice might fall.

The "XE" members of the radio family are a most congenial group of fellows, who are always delighted to exchange a pleasant greeting in addition to furnishing the necessary information required for an official QSO. They are modern in every respect, and much of their equipment would be acceptable in many of the shacks of the most exacting amateurs. They read the various radio periodicals eagerly, not only of Mexico and the United States, but also those published in South America and Europe, from which they glean all the information possible for the development of their technical proficiency. The mind of the Mexican experimenter is always open to suggestion, and readily appreciates a constructive suggestion if proffered by a brother amateur.

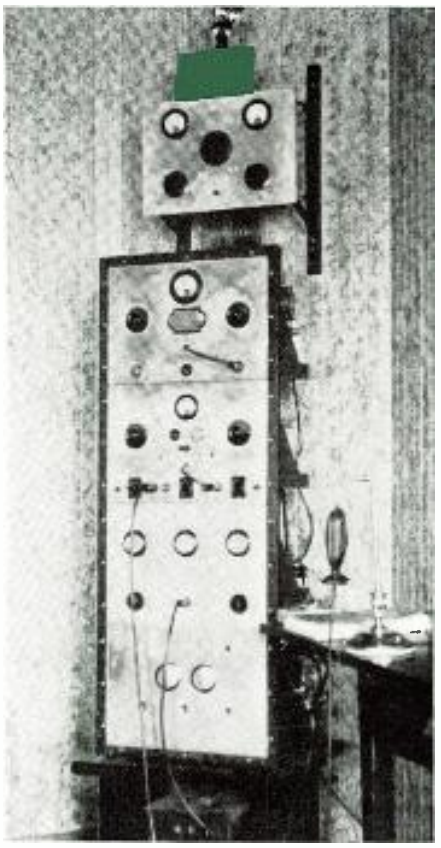
Mexico, as far as amateurs are concerned, is divided into three districts. The first includes all the states in central Mexico from the Atlantic to the Pacific; the second is composed of all the northern states up to the American border; the third includes all the states south of the central district down to the Guatemala frontier. Competition is keen among the amateurs of each district, and many are the hours that have flown by in strenuous effort to surpass the accomplishments of a fellow colleague.

Glancing over the list of amateurs in the various sections of the *Call Book* has become an almost universal indoor sport among the brethren of the radio faithful, and from time to time one pauses to comment on the number of licensees having XE calls. It goes without saying that there is not so great a number of names listed for our southern neighbors as compared with our country or with several others, but what Mexico lacks in numbers she more than makes up in enthusiasm and accomplishment. In international competition she has either taken the lead or has followed very closely on the heels of the winner, but with Mexico in the running the final result is never certain until the last point is counted.

When an American delves into the *Call Book* to find the QRA of a Mexican colleague, quite often he looks up in mild dismay and cannot seem to understand why the majority of amateurs have two surnames appearing opposite their calls. This may appear to be somewhat of an enigma, but is very simply explained. Let us suppose that we find that XE2ABC is Sr. Julio Carranza Corella: "Sr." is equivalent to "Mr." in English, Julio is the Christian or given name, Carranza is the family name of his father, and Corella is the family name of his mother before she became Mrs. Carranza. To the American way of thinking the addition of the mother's surname is quite superfluous, but to the Latin mind this is not only desirable but essential.

For all legal and ordinary purposes the correct surname is that of the father although as a rule both names are used on all occasions. If the American amateur does not know XE2ABC well enough to call him by his first name, the correct way to address him is by the father's surname, or Sr. Carranza, and not Sr. Corella (the mother's maiden name.) Looking at ourselves from their point of view, when a Mexican comes to the United States and sees all the Jones and Smiths listed in the various directories, the first question that is generally asked is how does one tell whether these people are brothers or cousins if they do not use the mother's name for identification.

But to revert to the subject of radio, one of the principal reasons for the universal interest in radio south of the Rio Grande is the constant impetus and encouragement given by the *Liga Mexicana de Radio Experimentadores,* familiarly known throughout the world as the *LMRE.* This progressive organization was formed in 1932 by a group of enthusiastic amateurs who recognized the fact that not only was concerted action necessary for their own personal benefit, but likewise was a patriotic duty to promote the progress of wireless



Father & Son station XE2F-XE2HO, in Cananea, Sonora. Heard throughout the U.S.A.

communication as a whole in their country.

According to the precepts of the LMRE, one of its principal tasks is the dissemination of accurate information. In this undertaking this organization avails itself of the two most effective means at its disposal; namely, by radio transmissions and the power of the pen, the results of which have more than gratified the expense and labor involved. The first of these two methods has been effected by the League's station XE1CB, which has been granted a special license by the government for this purpose. Every evening of the week, except Sunday, this powerful transmitter is on the air ready to be of assistance to any of its members. Different amateurs are given the opportunity to conduct a program over XE1CB, which is of inestimable value to the experimenters located in the more remote regions of Mexico.

The second means by which the LMRE disseminates the information at its disposal is through the publication *Onda Corta* (Spanish for "Short Wave"). *Onda Corta* is the only magazine in Mexico which devotes its pages strictly to the amateur and radio experimenter. This periodical is prepared and edited only by members of the LMRE, the subject matter being limited only to topics pertaining to amateur radio. Original articles are written for each issue by Mexican radio engineers, and are supplemented with columns prepared by individuals well versed in the various topics under discussion. Not content with local information, the staff of *Onda Corta* makes translations of pertinent articles appearing in American, French, English, and German publications, in this way providing its Mex-

(Continued on page 66)

HAVE YOU A TELEVISION FACE?

by HERBERT ROSEN
Paris, France

All types of faces are not adaptable to television transmission. Here are some of the necessary requirements.

AMONG the many new occupations which will make their appearance with the advent of television, that of announcer is creating probably the most interest among the fair sex. The British Broadcasting Company, now transmitting televised programs with a remarkable degree of regularity and marked success, has shown a preference for comely young lady announcers. Other European countries are taking the same attitude.

Consequently European *femmes* are preening their feathers for a try at a vocation which is strikingly akin to that of a movie star. Many, to their consternation, are finding that the requirements for a television "hostess" are even more exacting than those for their sisters of the celluloid.

The emphasis is strongly on the brunette, where television is concerned. The features should be "contrasty," that is, they should be very pronounced and distinct. The scaning lines in a televised picture reproduce contrast much better than elements which flow smoothly one into the other.

To emphasize such contrast even more, special makeup is used, similar to that for black-and-white photography. If you were to meet one of the fair announcers in her makeup, you would think she was suffering from some new and terrible disease.

Her skin would be a yellow ochre and her lips would be painted brown. The inside of the nostrils would flame a vivid red in contrast to a dark yellow nose. Green eyelids framed in coal-black eyebrows and lashes would complete the picture of a television hostess in her working clothes. However, the picture of her as received by your television receiver would be extremely pleasing and probably would show her to better advantage than if you were to meet her in street makeup.

In addition to features which lend themselves to televising, she should have an oval face, since such a face "frames" in the television screen more pleasingly. As well as these physical qualities, she should have good diction and a pleasing voice, rich in overtones.

The BBC also requires that their lady announcers be able to speak French and German and, of all things, they should be *married*. Unmarried lady announcers seemed to take the altar walk in short order and gave up their careers for a life of domestic bliss.

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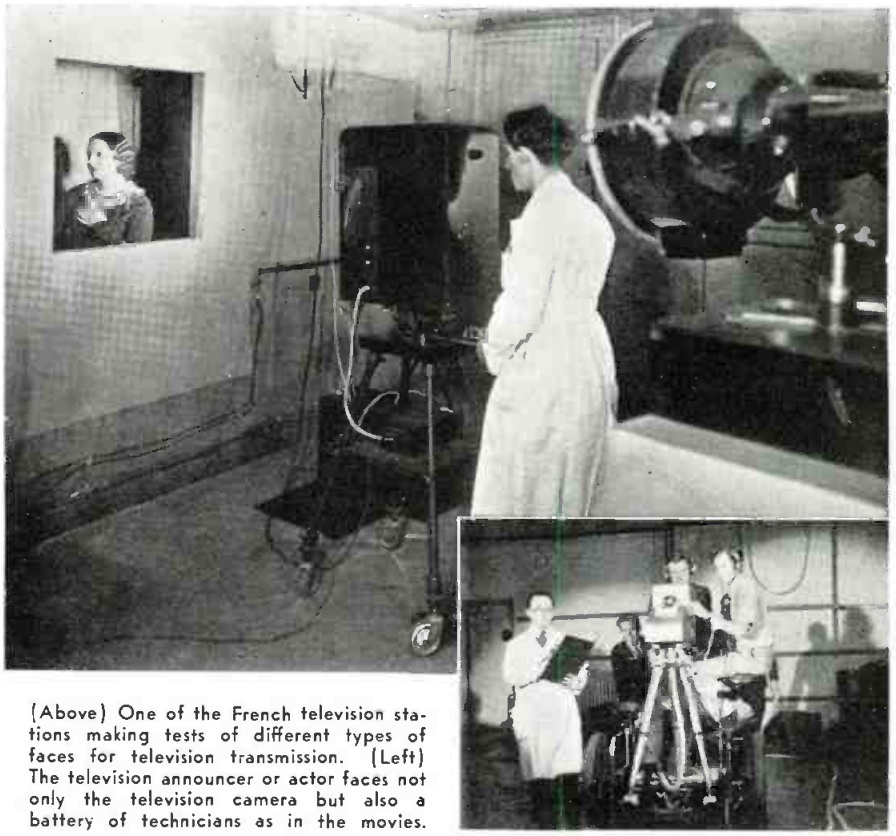
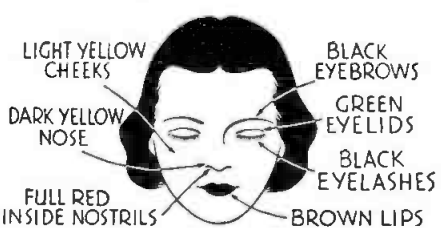


(Above) One of the French television stations making tests of different types of faces for television transmission. (Left) The television announcer or actor faces not only the television camera but also a battery of technicians as in the movies.

Blondes, due to light coloring, tend to washout on the television screen.

Brunettes with strong features and oval faces are favored for television jobs.



Color chart for television makeup.

Elizabeth Cowell, BBC television hostess.

Without a person aboard, the Lightship St. Clair is wholly controlled by radio from a land station which is 8 miles away.

RADIO CONTROLLED LIGHTSHIP

by C. S. VAN DRESSER
Washington, D. C.

From sounding a fog horn at the right time, to turning on, and sending out the proper radio beacon, and lighting the all-important light—all is done by radio signals. The author describes this interesting and unique ship which protects sailors.

This is the remote transmitter which is used to operate the devices aboard the St. Clair. Impulses are sent automatically.

A PASSENGER steamer is chugging its way patiently through Lake St. Clair, which connects Lakes Huron and Erie. For the last two hours she has been receiving the regular intermittent radio-beacon signals from the Federal lightship *St. Clair,* anchored in that treacherous body of water for the protection of navigation. Suddenly a fog develops. Simultaneously the signals from the *St. Clair* change. The radio beacon, warning the vessel of the position of the lightship, increases from intermittent to constant signaling. The moaning wail of a deep fog horn now booms out regularly. As the steamship plows on, night begins to fall and a powerful light springs to life from the masthead of the lightship and glows eerily in the twilight and fog.

These sudden changes of signals on lightship *St. Clair* entail the starting of dynamos, turning on of gasoline motors, tuning of radios, pushing and pulling of switches, and other electrical maneuvers—yet during all this complicated procedure, *there is not a living person aboard the lightship!*

Fog horns wail, brilliant lights flash, fog bells clang, the steady, high-pitched whine of the radio beacon comes over the steamship's radio receiving set from the *St. Clair* while it rides at anchor like a ghost-ship, untenanted, deserted, with not a man, woman or child aboard her.

What is this ghost-ship that signals with no apparent human agency to control its many functions?

It is the latest development in navigational aids, evolved after five years of intensive technical and engineering research by the Federal Bureau of Lighthouses and established in Lake St. Clair.

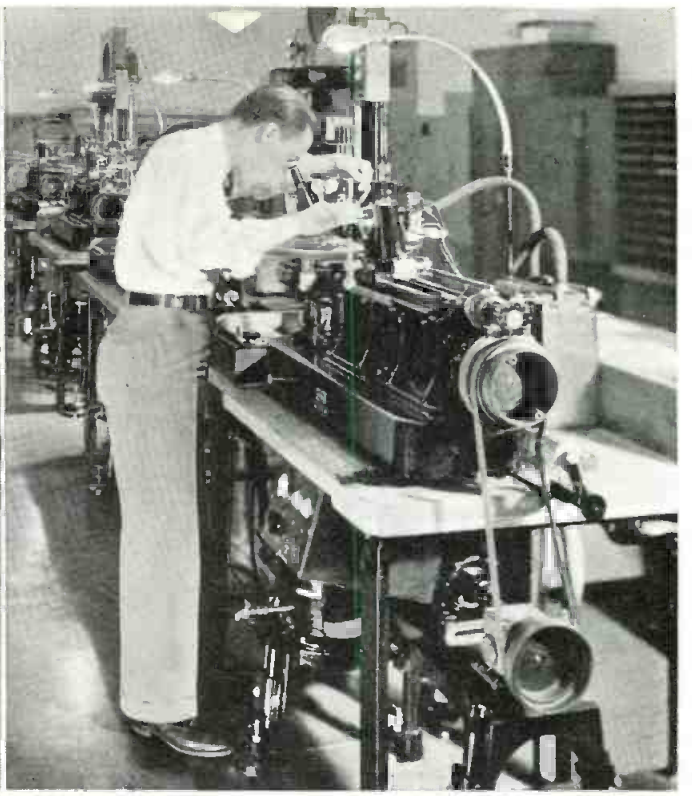
It is like no other ship of its kind in the entire world. For it runs itself! When fog comes up—and it gets mighty foggy in that region—the mechanical brain of the ship turns on the fog signal as well as increases the frequency of operation of its radio beacon. When night approaches, this never-failing brain illuminates a powerful light on the ship's mast. When daylight arrives, it turns off the light, and, similarly, when the fog dissipates, it ceases the blowing of the fog horn!

Furthermore, what is most amazing of all, the lightship *listens to itself* and reports by radio-telephone the progress of its various signals to the keeper on shore, eight miles away. When anything goes wrong, it tells the keeper in no uncertain terms which device has failed, and by the mere touch of a button, the remote and unseen operator throws duplicate mechanism on the ship into action to replace that which has ceased to function.

Somewhat similar and almost equally

(*Continued on page* 68)

Transcriptions have to be enacted first. Sometimes other transcriptions are used as sound effects as in the picture above.



Mounted on concrete, the recording machines cut the "wax" while the engineer watches the "grooves" closely through a microscope.

HOW ELECTRICAL

by EDWARD REYNOLDS
Ferris and Livingstone, Chicago, Illinois

Electrical transcriptions have become a tremendous business requiring specialized equipment and an entirely different type of radio engineer to operate. The author describes the care and difficulties encountered in making the recording on wax.

BEHIND each announcement, "This program comes to you by electrical transcription," lies an interesting story: the story of a thriving industry hidden from the public by a wall of formidable-sounding phrases.

The listener seeking to find out just what goes into the making of an electrical transcription finds himself confronted with a barrier of technical terms, and in most cases decides that maybe he wasn't so very interested in the first place.

Seeking to cut a convenient gate through that wall, we went to the transcription studios of the World Broadcasting System, and followed a program from the microphone to the playback, obtaining a layman's picture of the scientifically controlled processes which go into the production of recorded radio.

Since *Judy and Jane* is pioneering in the exclusive use of the new wide range vertical recording method, we selected that show as our guide. The air's oldest *transcribed* show, *Judy and Jane* has been entertaining audiences since February, 1932.

Several advantages offered by transcriptions were outlined to us by Robert Wamboldt, producer of *Judy and Jane*. In the first place, it guarantees perfect performances. Recording is a series of processes, any of which can be repeated in case of error. The advertiser using a transcribed show not only selects each station in his net work, but can choose the most strategic time placement at each station as well.

Wamboldt took us into the control room, where we learned that the first steps in transcribing are much the same as the corresponding steps in a "live" show. The engineer at the mixing panel controls the volume and balance of dialogue, sound effects, and music, just as in an actual broadcast.

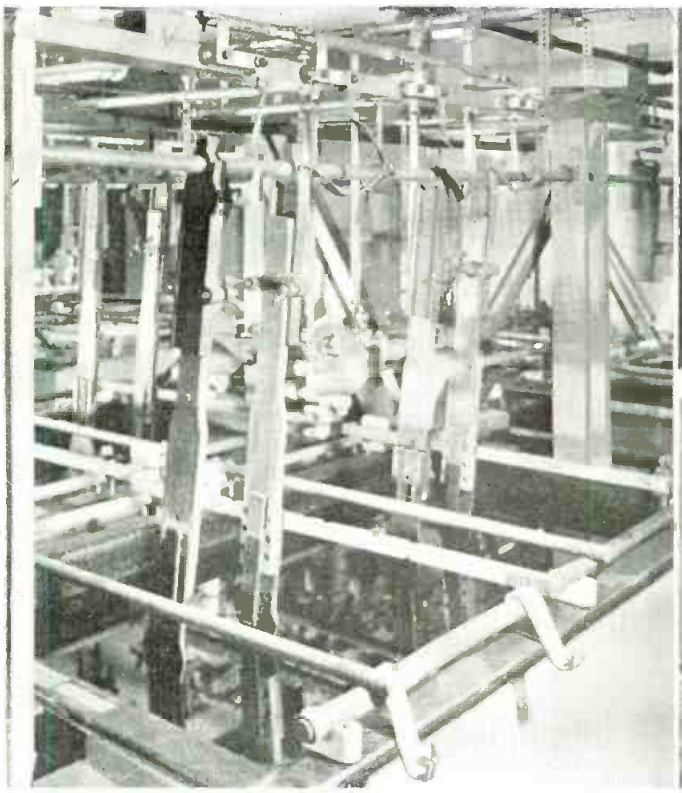
Whereas the control room in a broadcast studio feeds the program out to the listening public through its transmitter, the control room in a transcription plant pipes the program to the recording department, where a sapphire stylus translates sound waves into tiny hills and valleys on a revolving steel-backed wax disk.

If you had planned to play a transcription on your phonograph, the first step is to redesign your machine. Unlike a phonograph record, which starts at the outer edge of the disk and works in toward the center, transcriptions for radio are cut from the inside toward the rim. Too, in order to crowd 15 minutes of entertainment onto one record, World cuts its transcriptions at a speed of 33⅓ revolutions per minute, less than half the speed (78 r.p.m.) at which your phonograph turntable revolves.

As their names suggest, the lateral method records sound in a wave pattern swinging from one side of the groove to the other, while in the vertical method of cutting, the sound wave is cut in an up-and-down, rather than a side-to-side pattern.

Users of the vertical method claim several advantages for it, with greater fidelity a chief one. In long-playing records, adjacent grooves must be extremely close together. The side-to-side wave pattern of the lateral method reduces the thickness of the side walls, and in order to minimize the danger of the reproducing needle cutting through the track, it is necessary to reduce the volume of low frequency tones. And to cut down the surface noises which result when the stylus scrapes against the sides of the groove, the high frequencies must be filtered out, leaving a somewhat restricted range.

The function of the reproducing stylus is simplified by the vertical method, with accompanying improvements in fidelity. Weight must be employed, in the lateral method, to keep the stylus from slipping out of its spiral groove as it swings from side to side in following the modulations of



After being "sputtered" with pure gold, the wax & gold plaque is heavily copper-plated. The long arms keep the disk moving.

Mounted on a solid block of concrete imbedded in bedrock is the play-back machine for checking the final baked recording.

TRANSCRIPTIONS ARE MADE

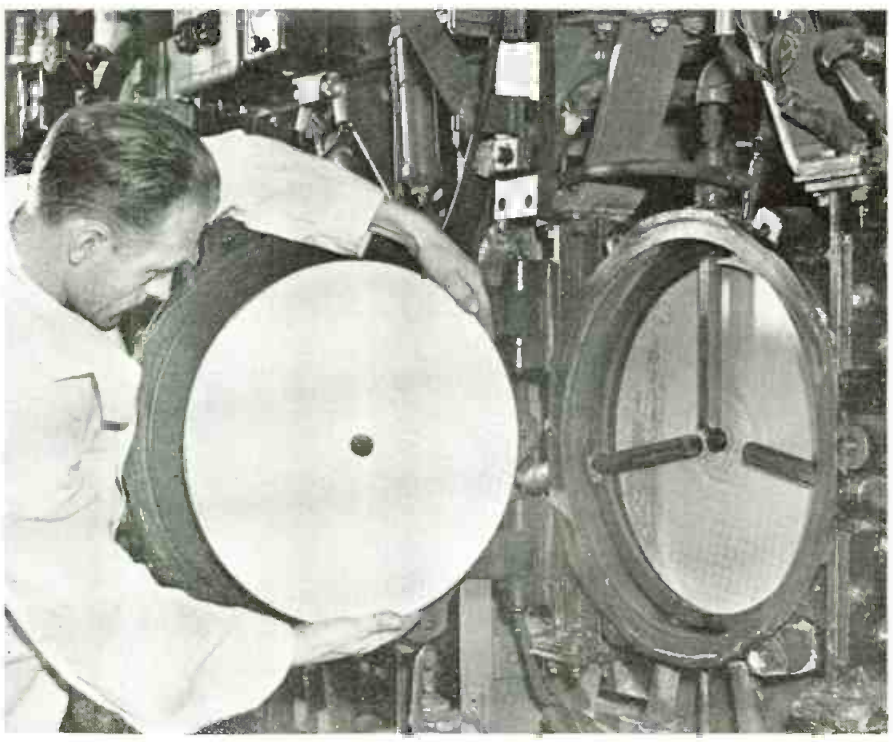
the sound track. There is no lateral movement in a vertical cut record, hence no problem of preventing the stylus from hopping the track. Less pressure is needed, so that record and stylus wear are cut to a minimum. A sharper stylus and a more sensitive assembly can be used, making it possible to follow the most complex wave patterns.

We might tell you of scientific tests which have shown that vertical cut recordings reproduce sound with "live" show fidelity and an audio range of 10 kc. However, the entire situation may be summed up with the simple statement that the capacity of the vertical method for recording sound is far beyond the capacity of the average home radio set to reproduce.

Elaborate precautions are taken throughout the entire process to eliminate the recording of outside sounds. Refinements in studio design, in mechanical equipment and in processing have reduced extraneous noise to a practically irreducible minimum. The amount of unwanted sound which creeps into a vertical-cut transcription is so small as to defy measurement.

Each studio and control room is an independent building, set up with wide air space between its walls and the walls of the building proper. This air space varies in size, with enough free air around some of the larger studios to permit a man to mount a ladder between the inside and out-

(*Continued on page* 58)



After the copper plating has taken place, the disk is heavily copper plated a second time and trimmed. Thereafter it is chromium plated and then it is ready to be used as a "master." Wax disks are so delicate that a person's breath will imprint. The "master" disk is then used to stamp out the final records used by the studios.

Not For REBROADCAST

by "X-73-88"

The author is one of the best informed men on radio in the country, withholding his identity to maintain complete freedom of comment.

FUNNIEST story of the month comes from the engineers of Chicago NBC.

It concerns two bricklayers and goes something like this:

Managers of the Merchandise Mart, in which the net's Midwest studios are headquartered, sent the two mortar and brick magnates up top to construct a one-story shack for new air conditioning equipment.

"Be sure not to disturb any wires the radio engineers have up there," they were told.

The brickmasons did just that. Gradual dropping of volume in the network's monitor receivers caused technicians to check their aerial.

They found the 200-foot skywire running *RIGHT THROUGH* two walls of the shack.

But—the bricklayers proudly pointed out—they hadn't disturbed the wires!

* * *

NETS QUARRELED OVER TRANS-ATLANTIC HOP:

Behind the scenes in broadcasts of Howard Hughes' hop across the Atlantic was an interesting little sequence.

NBC was all set to radiate a relay from the Hughes plane, around 10:30 EST, on its first night out. . . . Net announcers had already given the cue, "This is the National Broadcasting Co." and listeners were awaiting the relay—but it didn't come through.

Investigation showed that CBS had stopped the pickup on grounds that the flight pickups were to be an exclusive NBC feature.

"And," mused one NBC official. "With *OUR* radio engineer abroad!"

Both nets, of course, handled subsequent salutations from the ship as it essayed the first-leg hop of its round-world flight.

* * *

THE Television Group of NBC in New York is completely veiled in secrecy. It has its own engineers, operators, and maintenance men. The other NBC engineers (in other departments) located in the same building, often on the same floor, actually have no knowledge of just what is going on in the Television labs and engineering offices. The transmitter located in the top of the Empire State Building is not open to the public; and it is virtually impossible to get a permit to see any part of the apparatus. This recent policy of complete secrecy may be due to the leakage of technical information which occurred up until 1936, when a new policy was effected. To readers who may wonder about the Progress of Television; Engineers of both NBC and CBS have made greater progress in the last fifteen months than during any other similar period in the history of radio. But cost still prohibits commercially available television for the general populace.

* * *

"PUT ON REAL SHOW!" ENGINEERS ORDERED:

One of the Eastern 50-kilowatt radiators has an unique scheme for impressing visiting notables from other countries.

"The minute we get word a tour party is on the way to our Control Room, we get busier than hell," explans the top op.

"We stop playing checkers, begin plugging in all spare cords, patching and unpatching memo spots, testing with pickup engineers, throwing peaks back and forth—and when we have time we press a button on one phone, which rings another in the same booth. Another engineer answers it. We have a swell time!"

Asked who suggested all this, Sparks said, "Why, the owner of the station, of course. He likes to impress visitors."

* * *

ACTRESS FAINTS DURING AIRCAST:

Actress Ginger Jones fainted away "cold" during a recent "Helen Trent" sketch in which she was programmed. Excess sunburn, does diagnosed.

* * *

DICK RYAN, Joe Penner associate, is running for job of assemblyman from Queens, N. Y. . . . Wonder why radio artists' social clubs never seem to get places? Idea has been tried in Chicago, N. Y. and on W. Coast, with disappointing results. . . . The current installment of the Press vs. Radio war is lulling but the successful re-broadcasts of round-world flight are likely to kindle it anew. The Press hates to be scooped. And, it does take longer to get presses going than it does merely to speak over a mike!

* * *

FEW loudspeaker voices possess the human qualities encompassed in the microphonings of Columbia's Henry M. Neely. A student of music (especially fond of the Gilbert and Sullivan works), H. M. N. can step before a mike and ad lib concert comment that other mikesters stumble over even when reading it from script! . . . Through all of his descriptions of music, special events and regular programs, Neely injects a smile that I cannot see while listening to him.

But I know it is there.

(He works, I believe, out of Mr. Paley's Manhattan headquarters.)

* * *

COAST TO COAST—

HOLLYWOOD: Truman Bradley here for M-G-M try.

OKLAHOMA CITY: Ad Club speakers don't run overtime anymore. Stations installed "Time's Up!" signs that bob up when alarm rings.

CHICAGO: Most-played of the current ditties here: *Music, Maestro, Please!*

LA PORTE, IND.: Mayor Alban Smith hasn't yet answered the challenge in which this column offered $100 cash for public demonstration of the "light that lights from static electricity," which supposedly was invented by ex-Ku Klux Klan Grand Dragon D. C. Stephenson.

(The ex-Klan biggie is a client of the Mayor's. Is now serving life term for brutal gang kidnap-attack-murder of Madge Oberholtzer. Could the lamp story be an idea for interesting the prison board in Stephenson's plea for a pardon? I'm just wondering, that's all.)

ATLANTA: Keeler McCartney is new radio ed of Hearst's Atlanta Georgian, replacing Tom Ham, who joined paper's editorial staff.

LONDON: Car radios are getting more popular, but Police Commissioner Sir Philip Game will not permit them in taxis. Says the noise would become a nuisance.

* * *

"ONE HAMBURGER!" VIA WIRED WIRELESS—

Novel dodge used by a Chicago neighborhood hamburger stand: He is installing three wired wireless sets in neighborhood—one in each of a trio of taverns which send him considerable quick-lunch biz.

Now the stews step up to a regular radio mike in the jolly spots and croon their own orders. System works so well should be copied in other spots.

* * *

THOSE who have asked how ended my offer of $100 for a successful demonstration of the Michigan inventor's "war ray": The offer isn't ended. It still stands—but it appears the National Inventors' Congress' Mr. Taylor, who reported the absurdity, has lost interest.

* * *

CANDID EAR:

Some impressions of a dialer:

Those Latin senoritas heard on the ham bands have the most alluring voices on the air! (Ah, me!) . . . Sugariest of the "W" hamettes is 5DEW, whom this BCL dials occasionally. . . . Most distinctly tarheel: W-4EBM and W-4AHH.

Methinks special events announcer BOB TROUT talks too much during his words-eye-views. Or is it that he repeats himself at boring intervals? . . . Another overrated air celeb is Clem McCarthy. Top radioman at races, he flops miserably, calls many errors, in ringside and other sport events. . . . If you haven't dialed to one of those *The World is Yours* Sunday afternooners, do so this coming Sabbath. On NBC Red Net at 4:30 p.m., it dramatizes in popular fashion each week some historic or scientific milestone of Man. The recent conservation corps' expose of "The Soil Erosion Gang" and its dirty work was an example.

(The series is co-sponsored by Smithsonian Institute and the U. S. Department of Education. Unlike the WPA, it is probably the only federal project that has run the gauntlet of several years unscarred by criticism.)

(*Continued on page* 54)

Henry Behrens, attorney for Cash family, appeals for aid in finding Baby Cash.

Radio REPORTS THE CASH KIDNAP CASE

by TOM THURSDAY
Miami, Florida

A small broadcaster scoops the big stations in reporting the case.

"WHOEVER you are, wherever you may be, I appeal to you in the name of God to return my child. I have kept the faith in paying you the $10,000.00 ransom as you directed —I now beg you, as the father of Skeegie Cash, to fulfill your promise!"

Thus spoke James Bailey Cash, Sr., over the mobile unit of WIOD, on Tuesday night, May 31st at the little town of Princeton, Florida. As the world now knows, the appeal was not heeded; it could not be heeded—Skeegie Cash was then lying face upward, dead, in a thick Palmetto jungle, a short distance from the broadcast appeal.

In the small crowd that stood beside the microphone that historic and heart-breaking evening, calm, cool and quite at ease, was a young man named Franklin Pierce McCall! The twenty-one-year-old moron and degenerate was a member of the huge volunteer throng that was deeply concerned in the search for little Skeegie. McCall was among the most concerned and remarked time and again that the man who could perpetrate such a heinous crime should be lynched. We in this part of Southern Florida agree in full with the young man's statement.

Three local stations had a part in the news broadcasting—WIOD and WQAM of Miami, and WKAT, of Miami Beach. The first had mobile units in the field, while WKAT, the smallest and newest of the sector's stations, had to rely on direct telephone service. However, the Beach station scored a complete-scoop on its bigger brothers on the morning that the body of the Cash boy was found. The older stations had shut down for the night, as usual. The WKAT outfit had inaugurated an *Insomnia Club*, which had the air between midnight and 3:00 a.m. The object is to entertain those who can't sleep.

Shortly after 2:00 a.m., June 9th, the station received a flash that the body of the Cash boy had been found. They broke into the middle of a transcription and gave the news to the air audience. Although this was two hours after the actual finding of the body, it was, nevertheless, the first broadcast of the discovery.

The elapsed time between the actual finding of the dead boy and the broadcasting of the news was not the fault of the WKAT folk. It seems that Mr. J. Edgar Hoover, who was very much on the job, decided to withhold the news. Just why, precisely, the FBI chieftain held up that bit of news, I do not know. The outstanding attribute of the so-called G-Men is that they never have anything to say.

(*Continued on page* 53)

(Left) A pack transmitter is carried into the Everglades to keep the listeners informed of progress in the search for Skeegie Cash. Without radio, communications are almost impossible from these swamps. (Above) An announcer describes the efforts to find child's body by divers.

The Treasure-Hunter, or M-Scope, is light in weight and can be easily carried about.
(The set cannot be used for the benefit of others without violating the Fisher patents.)

BUILD YOUR OWN Treasure

by CHARLES E. CHAPEL
Lt., U. S. M. C., Ret.
San Leandro, California.

RADIO has supplanted the "doodle-bug" in the search for oil, precious ores, and buried treasure. More than 150 large corporations are now using the radio equipment invented by Dr. Gerhard Fisher of Palo Alto, California, in their everyday work of locating oil and metal beneath the surface of the earth. Hundreds of individuals who have tried the Fisher sets in prospecting and treasure-hunting have reported successful finds. Now you can make your own set at home for a small sum, by following the simple and easy directions which RADIO NEWS is authorized by Dr. Fisher to release for amateur use only.

"I'm glad to supply the readers of RADIO NEWS with information about my equipment," said Dr. Fisher. "I was an amateur once myself and I am glad to encourage experimentation. Out of the ranks of the experimenters come the leaders of science."

This is the same Dr. Gerhard Fisher who was headlined in the newspapers as the designer of direction-finders on the ill-fated *Macon*, and the inventor of the homing-devices used by the *Macon's* airplanes in returning to the mother-ship. All of his inventions have been given to the U. S. Government by him for the free use of the Army and Navy. His generosity in releasing facts on making his radio treasure-hunting equipment to experimenters is characteristic of the man. He is a typical scientist rather than a long-haired, crack-pot inventor such as we find so often behind the scenes in stories of "doodlebugs."

Diagrams for making treasure-locating radio equipment are presented here with Dr. Fisher's permission. The first, called the *Metallascope*, or *M-Scope*, was developed in 1929, and is protected by U. S. Patent No. 2066561. A few of the early purchasers of this set apparently loaned it to their friends to copy, but the imitations brought poor results and reflected on the Fisher theories; hence his present policy of revealing everything about his equipment, in the hope that experimenters who copy his circuits will have success which they might not have with poorly designed equipment.

The principle of the *M-Scope* is that of the *Radio Balance*, which requires a radio transmitter tuned to any frequency between 50 and 5,000 kc.; with wavelengths between 5,996 and 59.9 meters; and a modulation of 1,000 cycles. The transmitter output is coupled to a balanced loop antenna.

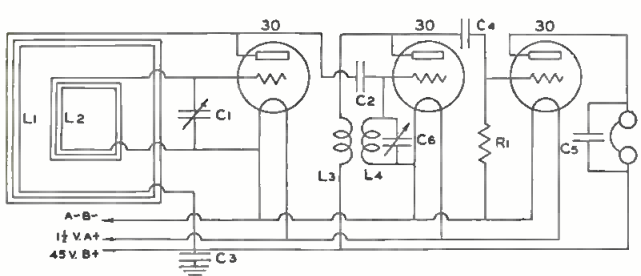
The receiver has an impedance coupled radio amplifier, audio-amplifier, detector, and a sensitive tube volt-meter. Like the transmitter, the receiver is also coupled to a balanced loop antenna.

To avoid the "vertical antenna effects," which would unbalance the set-up, the transmitter and receiver chassis, tubes, batteries, and meters are all placed inside the loops. Likewise, it has been found necessary to use a non-radiating receiver and a modulated transmitter, because an oscillating receiver radiates and creates another field which also unbalances the instrument. As a further precaution, metal is kept to a minimum in constructing the set to avoid distortion of the electrical field from that source.

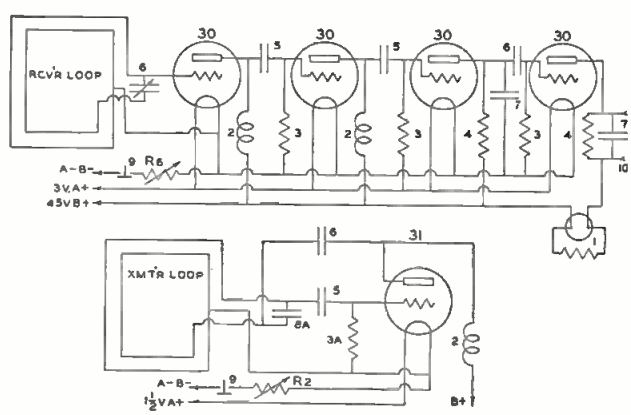
This *M-Scope*, which is the best of the Fisher circuits, has a vertical transmitter and a horizontal receiver, as can be seen in the illustrations. However, it could be built with the transmitter horizontal and the receiver vertical, without changing the essential features of the equipment.

What we mean by "balance" is best shown by a simple explanation of the operation of the set in the field, and this should be understood before we proceed to the actual details of construction. The operator stands between the transmitter and the receiver, which are fastened together by wooden handles. He then turns the transmitter on its axis so that it is at right angles to the receiver. If the set has been properly constructed, the receiver is now at the neutral point of the transmitter field, and no signal will be picked up by the receiver, because the two fields are in balance.

If the set is in balance, and there is no metal present, there will be no sound in the phones, but if there is any metal present it will disturb the balance, there will be a



A small M-Scope with both xmtr. & rcvr. combined.



A more elaborate M-Scope using "in-front-in-back loops."

C_1—.00025 mfd., 1 w.
C_2—.00005 mfd., 1 w.
C_3—.0 mfd., 1 w.
C_4—.001 mfd., 1 w.
C_5—.001 mfd., 1 w.
C_6—.0001 variable, 1 w.
R_1—1 meg.
L_1—9 turns
L_2—7 turns
L_3—15 turns, 1" form
L_4—25 turns, 1" form
R_5—5 ohms, 1 w.
R_6—2 ohms, 1 w.
1—Milliammeter (0-1)
2—R. F. Choke, 1500 turns No. 34ECC
3—1 megohm
3-A—3 megohms
4—.1 megohm
5—.0005 mfd., fixed
6—.006 mfd., fixed
7—.001 mfd., fixed
8—0 to .0005 mfd., trimmer adjuster
8-A—.00025 mfd., fixed
9—Push-pull switches
10—Phone tip jacks

Hunter

Heeding the tremendous call for further information, RADIO NEWS brings the first comprehensive circuits of a treasure-hunter which should afford excitement and a chance for discovery of wealth to the builder.

An assistant of inventor Gerhard Fisher trying out the M-Scope. If he passes any metal, meter needle deflects, and a buzz is heard.

1,000 cycle modulation note heard in the phones, and the tube volt-meter will register the strength of the disturbance caused by the metal.

One of the reasons why experimenters have had trouble with previous treasure-hunting radio sets, is that they thought they could increase the power of the transmitter, and increase the amplifications of the receiver, thus getting a vast increase in the sensitivity of the instrument. In theory, this appears all right but practical considerations limit the results.

If your transmitter and receiver are far apart you can increase the power in the transmitter very greatly, and locate large objects at great depths. On the other hand, if you want to find small objects, you must bring your transmitter and receiver close together, and this requires a reduction in power if you want your set to balance accurately.

The Fisher sets are a compromise between the extremes of theory. The *Metallascope* here described uses a frequency of 175 kc., and is especially adapted to finding small objects relatively close to the surface, but a higher frequency can be used by changing the inductance and capacity values and the impedance of the choke coils, and this will enable the builder to detect large objects, such as gold deposits at great depths, if he is careful to keep down the amount of metal he puts into the equipment.

In looking at the diagram, you will see that we have indicated conventional type-30 tubes for the receiver, and type-31 tubes for the transmitter. These weigh less than shielded-grid or pentode tubes which some experimenters prefer, require less plate voltages, and are less noisy in operation than the heavier tubes.

Construction of Apparatus

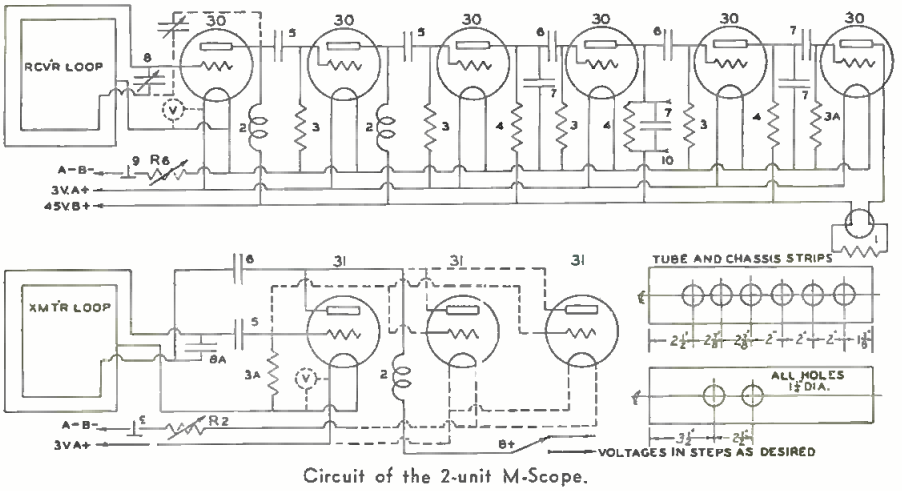
You can duplicate the *M-Scope*, the largest of the Fisher sets, for your own use, but not for sale, or for use by you as an employee of another person, since sale or rental of the device, or using it for hire would subject you to prosecution for violation of the patent.

Perhaps the best things to make first are the handles. These are of oak. There are two, each 34" long, 1½" wide, and ¾" thick. These should be planed and sandpapered and the holes should be drilled in accordance with the drawing. Use no paint on them; a simple stain is sufficient to protect them from the elements.

Next, make your frames. These are of oak, too, but you must not use any nails, bolts, or screws of iron or steel. Use wooden dowels and glue as much as possible, and when you do find it necessary to use metal, select brass bolts and nuts. Where you employ glue and dowels, reinforcing blocks can be placed inside the corners. These are not essential, and they are

(*Continued on page* 56)

An M-Scope with separate transmitter and receiver. One man has the receiver the other holds the transmitter at a distance.



Circuit of the 2-unit M-Scope.

1—Milliammeter
2—R. F. Choke. 1500 turns, No. 34 enamel copper
3—1 meg. resistor
3A—3 meg. resistor
4—.1 meg. resistor
5—.0005 mfd., 1 w., fixed
6—.006 mfd., 1 w., fixed
7—.001 mfd., 1 w. fixed
8—0 to .0005 mfd. trimmer adjuster
8A—.00025 mfd., 1 w., fixed
9—push-pull switches
10—Tip jacks for phones
R_5—5 ohms, 1 w.
R_6—2 ohms, 1 w.

THE NATIONAL QSO PAGE

BELIEVING that the best interests of ham radio would be served if the amateur fraternity were to know a little more about the A.R.R.L. Headquarters crowd, the Editors of RADIO NEWS herewith present a brief summary of the personnel of the Directors, Officers, and Executives of the League-QST. Compiled from sources believed to be reliable, it is presented with the hope that the ham fraternity will study it carefully and then decide if this is what they want not only in the way of representation, but also in the executive and business departments of their League.

The League Officers

President: EUGENE C. WOODRUFF, State College, Pa., is about 55 years old, married, and a resident of State College where he is employed as a professor. Mr. Woodruff is also an inventor and several valuable patents on radio devices which are said to have paid him royalties.

Vice-pres.: GEORGE W. BAILEY. Weston. Mass., is about 52 years old. married, and treasurer of the Erikson Electric Co., mfgrs. of high grade special lighting equipment, at 6 Power House St., Boston. Mass. Bailey is a graduate of Harvard. Class 1907, and was superintendent of a large shoe concern for 12 years after graduation. Is said to be interested in the Bailey Rubber Tile Co., Park St., Boston.

Secretary: KENNETH B. WARNER. 282 Fern St., W. Hartford, Conn., employed by ARRL as Sec'y-Manager for the past 19 years. Is about 43 years old and married. Salary reported to be about $11,000.00 per year. He is credited with owning stock in the ARRL.

Treasurer: ARTHUR A. HEBERT. 87 Ballard Drive, W. Hartford, Conn., is about 46 years old, married, and has been associated with the ARRL for the past 15 years. He is credited with owning stock in the ARRL. His income from the League is about $8,000.00 per year.

Communications Mgr.: F. EDWARD HANDY, 35 Brookline Dr., W. Hartford, Conn., is about 37 years old, married and a graduate of the University of Maine. He has been with the ARRL since graduation. His income from the League is between $5,000 and $6,000 per year.

General Counsel: PAUL M. SEGAL, 733 15th St., N. W.. Washington. D. C.. is about 38 years old, married and hails from Denver where he was admitted to the bar in 1922. He specializes in matters before the FCC and was suspended for a period fixed by the FCC from Dec. 6, 1937 to Feb. 5, 1938 as a result of certain charges brought by the FCC. The suspension pertained to his practice before the FCC only. His retainer from the ARRL is said to be in the neighborhood of $1,000 per year.

The League Directors

EUGENE C. WOODRUFF, GEORGE W. BAILEY, (see above).

ALEX REID, 169 Logan Ave., St. Lambert, Que., Canada. is about 50 years old and the manager of Hartt & Adair Coal Co., of Montreal. Reid is married.

WALTER BRADLEY MARTIN, 25 Arbuta Rd., Roslyn, Pa., is married and about 35 years old. He is the secretary and treasurer of Walter T. Bradley Co.. Inc., of Philadelphia, Pa. Martin owns his own home.

R. H. G. MATHEWS, is married and about 41 years old. and a member of Ford, Browne & Mathews. 100 East Ohio St., Chicago, Ill. The firm was formed in early 1935. Ford, Browne & Mathews are an advertising agency handling many radio accounts.

FRED W. YOUNG, 228½ Willard St., Mankato, Minn., is about 37 years old and a native of Iowa. He is employed as a teacher in the local Normal School since 1927. Young is married.

E. RAY ARLEDGE. 920 W. 28th St., Pine Bluff, Ark., is about 35 years old, married and a native of Star City, Ark. After working for years with a local refrigerator company Arledge prospered and opened his own business during 1930. He now owns his own home. Is in refrigerators business exclusively.

KENNETH T. HILL, 115 Willow St., Douglaston, New York City, is married and about 38 years old. He is employed in the local telephone company in the engineering dept., and has been with them for about 20 years.

FLOYD E. NORWINE, JR., 120 S. 4th St. St. Louis, Mo., is about 36 years old, married and asst. sec'y and treas. of the Norwine Coffee Co.. St. Louis, Mo. Norwine has been active in the management of the affairs of this company since 1927.

PERCY C. NOBLE, 37 Broad St., Hampden, Mass., is 32, single and a native of Westfield. He teaches at the Westfield Trade School, and lives with his mother.

RALPH J. GIBBONS, Umatilla Co., Pendleton, Ore., is a pilot for the United Air Lines, 30 years old and married. He is a native of Walla Walla. and has been graduated from Kelly Field with the rank of Lieutenant, U.S. Army Air Corps Reserve. Gibbons is not a resident of Pendleton at this time.

J. L. MCCARGAR. 66 Hamilton Pl., Oakland, Cal.. is about 41 years old and married. McCargar is employed as a rate clerk in the freight traffic department of the Southern Pacific Company, San Francisco for the last 15 years. He owns his own home.

H. L. CAVENESS, 2607 Vanderbilt Ave., State College, Raleigh, N. C., is about 42 years old, married and formerly of Durham, N. C. For the past 11 years he has been asst. professor of chemistry at State College.

EDWARD C. STOCKMAN. 618 S. William St., Denver, Col., is about 54 years old and married. He is a World War Veteran, owning his own home.

BENNETT R. ADAMS. JR., 1512 Grove Pl.. Homewood, Birmingham, Ala., is about 29 years old, married and a native of Montezuma, Ga. He is employed by the A. T. & T. Co., and owns his own home.

CHARLES E. BLALACK, 443 Main St., El Centro, Cal., is a member of the firm of Blalack & Blalack. He is about 49 years old, and single. Blalack is a native of Mississippi and his firm handles wholesale feed, seed and farm implements.

WAYLAND M. GROVES, Humble Pipe Line. Titus Co., Talco, Tex., is 38 and married. He is employed as a driller by a local oil company and has been there for the past 5 years.

The QST Executives

General Manager: K. B. WARNER. (See above).

Editor: Ross A. HULL, Bolton, Conn., is about 35, single, and a native of Australia. Ross lacks only his last citizens papers towards U.S. Citizenship. Since 1924 he has been employed by the ARRL. and his income therefrom is about $5,000.00 per year.

Technical Editor: JAMES J. LAMB, 93 Meadowbrook Rd., W. Hartford, Conn., is about 36 years old, married and has been employed by the ARRL since 1928. At present he is on temporary leave of absence and confined to a sanitarium for his health. Although on leave of absence he is still receiving his salary, reputed to be in the neighborhood of $5,000.00 annually.

Asst. Technical Editor: GEORGE GRAMMER. 84 So. Quaker Lane, W. Hartford, Conn., is about 33 years old and married. and has been employed by the ARRL since 1929 in his present capacity. His salary is in the neighborhood of $4,000.00 per year.

Managing Editor: CLARK C. RODIMON, 1691 Asylum Ave., W. Hartford, Conn., is about 29 and married. He owns his own home and has been with the ARRL since leaving school in 1924. His income from the ARRL is about $4,000.00 per year.

Circulation Manager: DAVID H. HOUGHTON, is 40, and lives at 98 Ardmore Rd., W. Hartford. Conn., and has been with the ARRL since 1921 although he was first employed by the General Electric Co. in Lynn, Mass. His income is about $4,200.

Asst. Circulation Manager: RALPH T. BEAUDIN, 478 S. Quaker Lane, W. Hartford, Conn., is about 28, married and has been employed by the ARRL since 1926. His income is about $2,400 annually.

Advertising Manager: F. CHENEY BEEKLEY, is 38, married and since 1923 employed by the ARRL. He is also owner of the West Hartford Printing & Lithographing Co., which does general job printing and lithographing for the local manufacturers. It is reputed that about 20% of his own business originates from the ARRL.

Asst. Advertising Manager: CHARLES BRUNELLE, Charter Oak Pl., Hartford, Conn., is about 28 years old and married. On graduating from Cornell University, in 1936 he started to work for the ARRL. He has an income from the ARRL of about $2,000 per year.

Let's break that down and formulate some summaries. The total salaries paid by the ARRL to its officers and executives is over $51,600.00 per year. Quite a tidy sum. We have nothing to say as to whether that is high or low, but we do say that you amateurs should get something for that $51,600.00 in the way of excellent service and representation at Washington. Are you getting it? Look at the cartoon. It's funny. Not "funny—ha, ha!" but "funny—peculiar!" With the League *actively* engaged in *protecting* your rights, you have *lost* at every turn of events. Is that the kind of action you want?

Now they talk of "no more 20-40 meter bands after 1942!" Is that what you want? Are you so willing to let your bands be taken without raising a single voice for their preservation? Why have not many of you talked up the chances of getting *more* bands?

Recently a notice went around for the re-allocation of bands above 30,000 kc. All interested parties were asked by the FCC to file the name of their representative who would argue or sit in at the conference. Representatives of the ARRL were conspicuous by their absence. Even supposing that we could not have received more bands at that conference, certainly there was something to be said in favor of "showing our faces" and thus indicating that we were at least interested. *Where was the League when that meeting was announced?*

Further breaking down the ARRL directorate, four are school teachers in one form or another. Five are actively interested in commercial radio or allied services, and only eight are not financially interested in radio. What sort of work can such a

board accomplish. What can they know about the situation as it confronts the ham? Actually the school teachers and the radio men can outvote those who have not any interest financially in the radio picture. School teachers make admirable leaders for those who are interested in theory and (in some cases) practice, but the very philosophy that turns a man to teaching as a profession is also that which might make him weak on the practical side. (Director Young is an exception.) This has been demonstrated in the workings of our government (remember the Brain Trusters) and also in other countries as well.

What the ham needs, is a red-blooded fighting mad, nevertheless cool and keen directorate. Not that some of those on the Board now do not come under that category. Their work at the meetings will speak for them, but in the whole the Board seem to be a bunch of yes-men who are prone to be led by the HQ gang.

It is understandable that the HQ gang should want to lead the Directorate into their way of thinking. If the directorate wished it, all the executives of the HQ gang could lose their jobs. But would it not be better if the directorate thought of the men who elected them, the "boys back home," and the ham situation which cannot ever be improved as long as the League does not take any action?

How shall the League take that action? By at once registering themselves at Washington, D. C., as a lobbying body. By taking more than a passive interest in and with the FCC in the solution of the ham problems. It is not enough to recommend to the FCC what the hams are seeking in the way of xtal control on 56 mc., or that the code speed should be upped or downed. The ARRL should be in a position to carry the ham's fight to the FCC in every form—new bands, new and greater privileges, and further recognition. It should carry the amateur's fight and story to each and every congressman and senator. This will mean money, time, and effort. Of money there is enough in the ARRL treasury for the purpose (about $109,000 in 1936), and the machinery is there to do the rest. What the HQ gang lack is the unequivocal order to "Get Going!"

It will not get that order until each and every ham writes his director that he, himself, wants that order carried out. More and more hams should join the League and all join in the common fight.

There are those who in a misguided notion think that this is a personal fight between RX and QST. They could not be further from the truth. This is a bitter, bitter fight to keep the ham in existence and not have him "after 1942" have the sign "RIP" placed on his antenna.

If you want your hobby, hams, get going! Write your director, the HQ bunch,—write us . . . *but above all don't quit on the job at this crucial time!*—The Editors.

Correspondence

Dear Sirs:

Keep up the good fight and let's make it a win for the men who have made radio what it is today. After all, we have the finest group in America, the best from all walks of life and there is no reason why we can't keep what we have in the ham bands and get a fair break on what we should have. Radio as a hobby, to me, means real recreation and I know it means the same to the other thousands who are really interested.

I happen to know some good men that will help, and from the standpoint of brains and influence I am sure we can get some place. (By brains I mean good old fashioned common sense.)

(Sgd.) V. J. Peters, W9BHO.

We intend to do just that, W9BHO, and we will welcome any help or suggestions from any ham (whether a member of the ARRL or not) on what should be done to improve the American Amateur's conditions. That the solution lies with the ARRL is a conjecture which will be better answered with the passage of time. But in the meantime let us fight to make the League representative of the ham fraternity. Many of the hams are letting this last opportunity slip through their fists and they are not requiring that their League "go to bat" for them. The ARRL has by itself assumed a responsibility towards the ham and it must not shirk that responsibility. It should ACT! If the League fails to respond, then and only then will it be time to seek other means of accomplishing the universally sought goal of the preservation of the bands we now have and our expansion to more frequencies.—The Editors.

—30—

A 3/4 Meter Transceiver

by BILL BARTLETT
Ava, Illinois

For local one to two mile transmissions this little transceiver is the equivalent of a direct wire. With no static, no interference, the ideal 3/4 meter band has been neglected much too long.

THIS "Necklace" transceiver was designed explicitly for the "hams" who are turning to short wave radio's greener pastures, the ultra-high frequency bands. Every day, more and more serious minded amateurs are looking to the 3/4 meter channel as a realm of unexplored possibilities, and a field in which there is still plenty of latitude for exploration and research.

So, with the needs of this ever-increasing army of radio enthusiasts in mind, the 3/4 meter "Necklace" was conceived. The rig is so small that it can be readily carried about on one's person, suspended from the neck by a leather strap, or from any other convenient part of the body that the experimenter may elect. The "Necklace" falls in the featherweight class, and the transceiver proper, sans battery supply, weighs about one and one-half pounds.

Batteries are of the midget variety, and are economical, due to the low current consumption of the tube complement, a pair of 955 "acorns." Weight of the batteries is of course determined by the number used. Two small 3-volt batteries are imperative, to provide filament and mike current sources. From two to four 45-volt "B" batteries provide the plate potential, of 90 to 180 volts. More output is derived from the higher plate voltage. On an average, the batteries will weigh around seven pounds and are carried in a knapsack or similar container, on the wearer's back.

It will be noticed in the photos that the set leaves both the operator's hands free, which is a very desirable quality in an experimenter's transceiver. It is often necessary to climb towers or buildings to conduct field tests at 400 megacycles, because in the quasi-optical regions, the signals should be generated as high above the ground as possible and allowed to get a good start, unstymied by buildings or other obstructions. The "Necklace" cooperates in this respect by being extremely compact and unobtrusive, and by leaving both the hands free for climbing.

The author demonstrates how the rig looks. To operate, the mike must be held upright.

The set is built into a standard metal shield can, approximately 3" x 3" x 4", which houses all parts of the transceiver excepting mike and mike transformer. If this should be the reader's first attempt at building a set, the dimensions of the container should be enlarged considerably, else he is apt to come to grief attempting the ticklish soldering in cramped quarters.

The single button carbon type mike is mounted on a length of 3/8" copper tubing, so that when the transceiver case is in position on the chest, the mike will be at the level of the operator's mouth, about eight to ten inches distant.

The microphone transformer used in the circuit is not a standard part, but a unit of the type used to connect the output of a pair of 42's to a 200 ohm line.

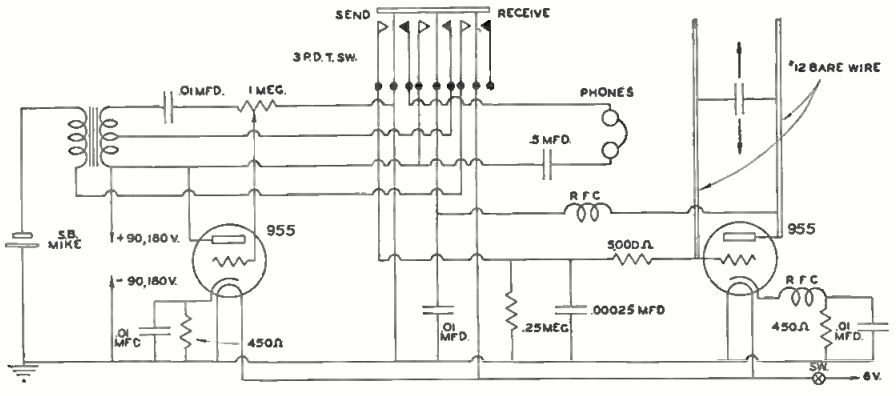
The change from "transmit" circuit to "receive" hook-up is effected through a three-pole-double-throw switch. It should be of the anti-capacity type, since at these high frequencies, capacity must be kept as low as possible in the circuit to insure oscillation in the proper band. The switch is installed at what is ordinarily the top of the shield can.

A one-megohm potentiometer is mounted on the side of the can, as shown in the photo. The potentiometer is used to control the magnitude of the mike's modulation impulses fed into the grid of the modulation tube. It should have a snap-on switch mounted at the rear, so that the control may also be used to break the filament circuit.

On the side of the can opposite the side where the mike transformer is mounted, two 3/8" insulators are mounted exactly 1" apart, to take the two parallel wires that make up the tank circuit of the tiny oscillator.

The type 955 tubes utilized in this circuit are mounted on special bases, each having five clamp contacts to accommodate

(*Continued on page 52*)



(Above) The circuit of the 3/4 meter transceiver. (Below) The complete station from antenna to the needed batteries.

SHIP TO SHORE RADIOPHONE

by GEORGE R. REISS
Youngstown, Ohio

Almost unbelievable is the fact that a ship's phone has a bell that rings the same as ours, and the connection is as easily made from the ship as at home.

Ship radiophone calls are received here and re-routed over land wires.

"THE port captain calling you on the telephone, skipper," lustily bawls the burly mate from the open window of the Great Lakes cargo vessel's pilot house. "Want it in your office?"

And thus the Great Lakes ship commander, be he on his vessel lying at a dock or ploughing a white bow wave through the middle of Lake Superior, has become as much a slave of the telephone as his company's president in an ornate office in a skyscraper office building.

Now, just as easily and simply as does his company's president ashore, he can pick up his telephone receiver in his private office aboard ship and call almost any place by long distance telephone—Cleveland, Chicago, Salt Lake City, San Francisco, or any backwoods community reached by the telephone lines.

By his telephone, he can confer with his port captain on a matter of ship's business; he can talk with his wife in his home about the grocer's bill; or he can swap a bit of weather or navigation information with the skipper of the steamer passing to his starboard. And he needs no more technical knowledge of the system than his line's president must know how to install a telephone switchboard to talk long distance.

That's all the result of the ship-to-shore radio telephone system—probably the simplest one in existence—being operated on the Great Lakes by the Lorain County Radio Corporation, a subsidiary of the Lorain Telephone Company, of Lorain, Ohio.

It's a system that is saving vessel owners and operators thousands of dollars worth of valuable time annually; it has greatly increased safety; and best of all, it's convenient.

A few years back, the Lorain Telephone Company found itself with a supply of idle equipment and a staff of excellent trained men on hand, the result of an ill-fated experiment. The company had experimented with "wired broadcasting service" to Lorain homes. That is, it had installed loud speakers in subscribers' homes, hooked up the speakers by telephone wires, and broadcast over these selected programs.

A fine system and a pleasant way to listen—with certain reservations. No twisting of knobs, no consulting of dials, no "fishing" in the ether. No fading or surging of power or constant interference from static.

But the subscriber had to take the programs dished up to him. Either take it or leave it. Too many decided to leave it, and bought their own radio sets. The result was the service incurred large losses. So the company sought a way out.

"Why not," suggested R. A. Cox (now with Radio Station WHK at Cleveland), "start a ship-to-shore radio 'phone service?"

The idea clicked with H. E. Hageman, secretary-treasurer of the telephone company, who was familiar with the problems of the vessels ploughing up and down the lakes with their varied cargoes. There was the necessity, desperate at times, of keeping up on the latest weather information, of being posted on the conditions at the loading or unloading docks where congestion in one harbor might hold up a vessel for expensive days while other harbors were virtually empty. Less than 100 of the over 400 lakes vessels carried "dot and dash" radio operators.

"But," protested associates in the telephone company, "it won't work. The system is too complicated, and the boat operators won't stand for the expense of hiring operators. It wouldn't . . ."

"We'll make it," overruled Hageman calmly, "so simple it will work, so simple no trained operators will be needed, so efficient there will be no danger of breakdowns and the boats won't be able to afford to get along without it."

So Hageman surrounded himself with a staff of trained engineers under H. P. Boswell, chief engineer, built a station just outside Lorain to enable it to operate with-

(*Continued on page* 57)

The antenna system maintained at Lorain, Ohio, for ship's radiophone. From here emanate the voice controlled transmissions which are used.

The skipper of a Great Lakes ship hears a bell ring, picks up the phone and talks.

The entire receiver set up.

CONSTRUCTING The Marine-Ham

by RAYMOND P. ADAMS
Canoga Park, Calif.

In this sequel to the first part which appeared last month, the author describes the construction of the loop and the use of the entire instrument as a "homing" device or compass.

BEFORE actually discussing the loop circuit, it must be understood just what a loop is supposed to do and how it must be designed if it is to work effectively.

1. First, it must be clear that the loop is not strictly an antenna. At least it doesn't make a very efficient one, particularly if it is built for effective radio-bearing service. Very little current is set up in the assembly even when it is adjusted for maximum pickup.

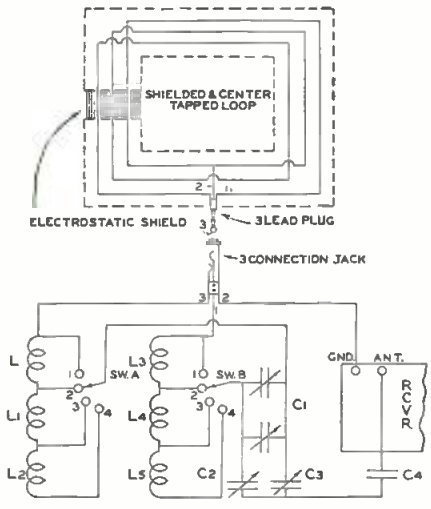
2. Second, the loop is directional. That is, it effectively indicates the line of direction of any transmitting station to whose signal frequency it is tuned. When it points directly at such a station (which is to say when its plane coincides with this line of direction), pick-up and effective signal level are greatest. When it is swung broadside (plane at right angles) to the station direction, pick-up and signal strength are at minimum. If a loop is swung through a full 360 degrees and loop and receiver are tuned to a certain station, two points of maximum and two of minimum signal pick-up—or two points of maximum and two of minimum current flow—will be noted.

3. It follows that if a loop is coupled properly to a well shielded receiver (or wired into the input tuned circuit of that receiver) it would permit establishment of a bearing line between receiving and transmitting points, which is to say a line of direction to the transmitter with respect to the known ship's course, direction being indicated by means of a loop scale and pointer reading for either maximum or minimum signal intensity position.

4. A maxima reading is rather hard to obtain, however, as the zone of greatest signal intensity is always rather broad. Therefore minima or "null point" indication is depended on, the zone of silence being more precisely defined.

5. The more precise the null reading on a station, more accurate the bearing. As there is always some "antenna effect" in the loop, even when adjusted for minimum pickup, and as this effect is largely caused by electrical dissymmetry in the overall loop circuit, some means of bringing about accurate balance and a sharp line of zero current flow is necessary. Generally, center-tapping the loop circuit will do the trick.

6. Interference pick-up may prevent precision null reading. The loop must therefore be electrostatically shielded, but not continuously so; that is, there must not be a closed turn of the shielding in the plane of the assembly.



The loop circuit.

C_1—820 mfd., Meissner type 15116
C_2, C_3—3-30 mfd. trimmer
C_4—.00025 mfd. mica
SW A—SW B—2-gang switch, Meissner, type 19292
L, L_1, L_2, L_3, L_4, L_5—See text

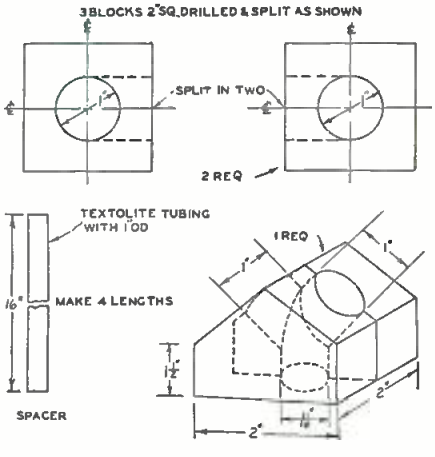
The Loop Circuit

In the loop circuit the use of such a shielded and center-tapped coil is indicated. The loop is mounted on a three circuit plug for connection to the tuning condenser and associated components. The plug is metal-jacketed—or shielded—and the jacket connects to center tap, to one plug terminal, and to the loop shielding. As the jack into which this plug is inserted makes frame (and one terminal) contact with the receiver can on which it is mounted, all the shielding is continuous for the overall assembly, once the loop is plugged in.

Loop coverage over the standard broadcast band will be needed, as the program stations will come in handy when "homing" into port; and a further extension of the tuning range down to about 200 kilocycles is necessary, so that bearings on airport beam and U. S. Lighthouse Service beacon signals may be taken. As one loop, with maximum practical tuning capacity variation, cannot be made to work effectively over the complete spectrum from 1500 to 200 kilocycles unless it is tapped (or its effective circuit is so tapped), and as the average boat-owner will not want to employ more than one plug-in pickup, we have therefore provided a switching arrangement whereby various small coils may be connected in on each side. With the recommended value of maximum loop tuning capacity (C1—820 Mmfd, Meissner type 15116), and with the experimental loop built to our specifications, the highest frequency to which the circuit will tune is approximately 1800 kc. This frequency is obtained with the condenser at minimum mesh and the two section Sw-A and SW-B switch adjusted so that no wavelength-increasing coils are in connection. At full mesh, the tuning strikes about 900 kc, and as coils are switched in, the range extention increases, until, with the selector arms adjusted to make contact at positions 4 and 4A and with C1 at maximum mesh, we reach 200 kilocycles.

The coupling layout comprises the small condensers C2, C3, and C4. C2 and C3 are adjustable trimmers of 3 to 30 mmfd range; properly set to equalize the circuit and to compensate for any electrical dissymmetry in the loop and the switching and tuning set-up, they effect accurate balance. C4 couples loop circuit output to the antenna coil of the receiver proper.

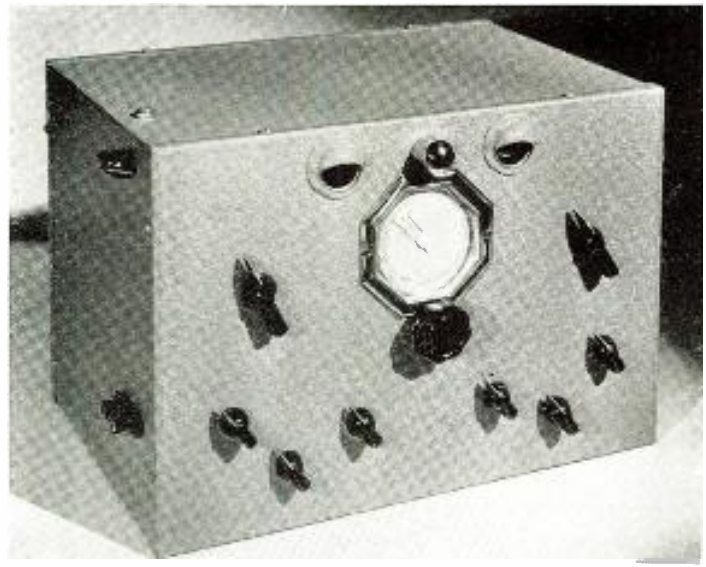
When the loop is brought broadside to



Construction of the loop.

Loop Receiver

PART II



After the summer, the set will make an attractive one for the home.

the line of transmitter direction, zero current is effectively produced in it (granting balance), and zero signal appears at C4. As the loop is swung into endwise position with respect to this line, less and less balance and a stronger and stronger signal result, until, with loop plane and line of transmitter direction parelleled, a point of maximum pickup is reached.

Loop Construction

The particular loop built by the author, is an experimental or laboratory job, provides for extremely accurate null point reading and will be satisfactory in marine navigation work. It may not be exactly the sort of thing which some builders, perhaps a little handier with tools than the author, will want to construct as a finished assembly—nor exactly a suitable item for installation aboard smaller ships, due to its rather ample size. However, it is recommended for careful study and instructive duplication, if only for the reason that it will, in both its construction and application, nicely illustrate design fundamentals.

Required is this material for the loop proper: four sixteen-inch lengths of one inch O. D. General Electric Textolite tubing; hardwood blocks and bearing plates formed and drilled to Fig. 3 specifications; a 360 degree home-made or purchased scale of any convenient diameter; 60 feet of No. 20 or 22 d.s.c. loop wire; a sheet of small mesh copper screening, about 12"x18" in size; and a three-circuit, shield-shell plug.

The mesh screening is first formed into three tubes 18" long and two tubes 8" long of such diameter as to fit into the Textolite lengths snugly. (4 16" lengths of 1" O. D. Textolite manufactured by General Electric are needed.) They should be securely soldered after shaping, and any frayed wire ends should be clipped back.

The three 18" tubes are inserted into three Textolite lengths to extend an inch at each end. The two eight-inch tubes are inserted into the fourth Textolite piece to extend similarly and to form a non-shield window (Fig. 5) within the Textolite (window two inches long).

Lay out the four built-up loop partitions end to end, split the screening extensions and fold them back (so that the partitions will meet), center-tap the 60 feet of loop wire, thread the 30-foot lengths on each side of c.t. through the tubing (one in clockwise and one in counter-clockwise direction), cut away left over wire (by equal amounts for each side) until short connections may be made to the plug. Form the screen-shield extensions around the coil at right, left, and upper tube-end points of loop juncture (soldering the shielding together and cutting away frayed wire ends). Form lower screen extensions around the plug, and assemble the layout together securely by means of the split hardwood blocks. Secure one bearing plate (bearing surface down) to the bottom block so that the plug will extend to ¾ inch shell-jacket length beyond its lower surface. Affix the 360-degree scale to the upper surface of the plate and in such position that zero reading will be at right angles to the plane of the loop.

Mount the jack on the top of the cabinet (¾ inch in from the left hand edge and three inches back from the front, so that it will clear all chassis components), the second bearing plate over this jack, the switch on the side of the cabinet and conveniently near the jack assembly, and the variable condenser in the position indicated in layout drawings. Condenser C1 must be completely insulated from the chassis by means of an elevated bakelite plate; neither its frame nor its shaft should make ground contact. (Grounding will short one-half the loop circuit and prevent both balance and proper tuning.)

Connect the C1 stator lugs together and hang C2 and C3 one from frame connection and one from stator connection at the side of the tuning condenser. Connect their free terminals to C4 and the free end of C4 to the chassis antenna post. The rest of the wiring needs no discussion.

See to it that when the loop is plugged into place a perfectly rigid assembly results. Wobbling will prevent accuracy of reading. (If necessary, use cross-supports for the loop itself, as we have done.) And see to it that the loop rides smoothly on the bearing plates and that plug and jack make proper connection.

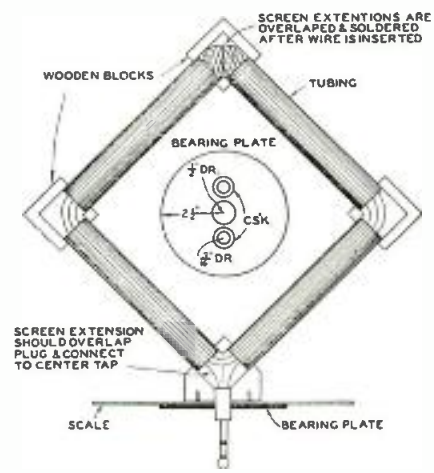
A suitable pointer, placed on the top front edge of the cabinet and in such position and extension as to read properly against the loop scale, will of course be required. This pointer, by the way, might best be set in line with the direction of cabinet depth; it will then be comparatively easy business to locate the apparatus properly when installing it aboard ship, as the cabinet will then be positioned with its panel facing directly forward to bring about a proper alignment between pointer direction and ship's course.

Other required items will be the coils for range extension, which should be built up a pair at a time of No. 24 D.S.C. wire (they may be scramble-wound and should be quite small and reasonably symmetrical) for trial-and-error application until the switching provides for maximum desired loop-tuning coverage. Mount these coils right on the switch, series-connected on each side, and on such switch terminals that the follow-up sections will short them out as the switching backs down toward the No. 1 or no-coil, maximum frequency adjustment position.

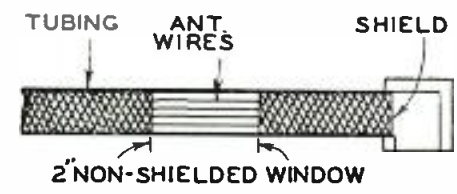
The Application of the Complete Instrument As a Direction Finder

With the assembly completed, made perfectly rigid, adjusted to give an accurate pointer-against-scale reading with loop swing, and installed aboard-ship with its panel at right angles to a fore and aft line of direction, the instrument is ready for

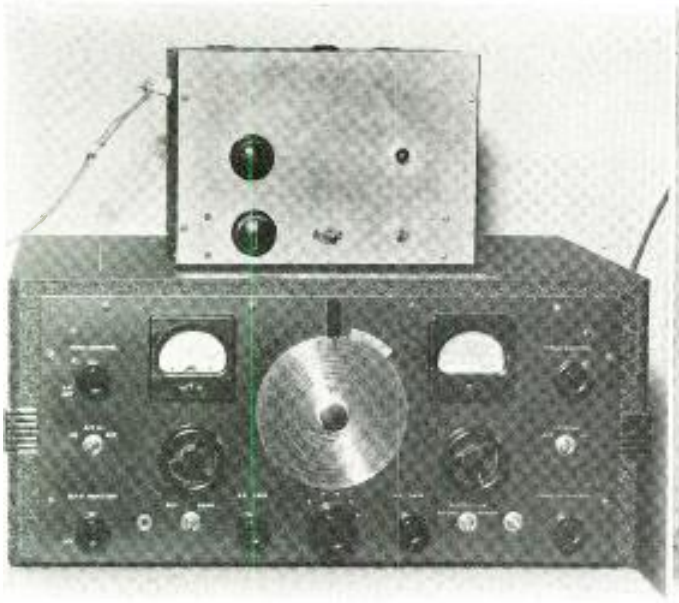
(*Continued on page* 64)



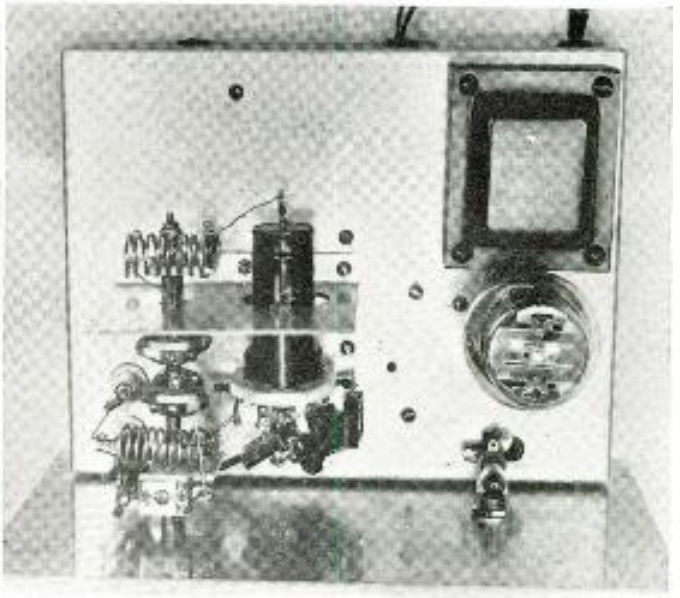
The assembled loop.



The "window" details of the loop.



When used with a standard receiver, the preselector will bring those hard-to-receive five meter signals up to R9 levels.



The heart of the RADIO NEWS 56 MC Preselector is the RCA1851 tube. Side mounting the tube and adequate shielding are needed.

HOW TO BUILD The RADIO

by S. GORDON TAYLOR
New York City, N. Y.

With the 5 meter band opening up again and again, every ham will want to be in on the real DX possible with the use of this rig.

THERE are probably many others who, like the writer, have been disappointed in the ultra-high frequency operation of the newer types of all-wave superheterodynes designed to cover the ranges all the way down to five meters. Such a receiver may be a world-beater on the other ranges but below ten meters is certain to fall far short of this standard.

There are several reasons why this is so, but principal among them is the inefficiency of standard vacuum tubes at these frequencies. As radio-frequency amplifiers, for instance, at 60 megacycles, these tubes are more likely to produce loss than gain. As mixers they are not much better, but at least will do their work if a strong enough signal is put into them, as indicated by the fact that most of these receivers will provide satisfactory results on strong, nearby signals.

Highly selective receivers for "five" are becoming almost a necessity for hams who desire freedom from QRM, and the increasing number of stable transmitters make such receivers entirely practical for the ham who is willing to forego contacts with modulated oscillators, or for those who use one of the older types for working these "wobbulated" oscillators, reserving the selective receiver for use when working stable signals.

As the situation has been, many of the stations working on five meters also work other bands, using a super-regen or other broad-tuning receiver for "five" and a regular communications type receiver for the other bands. This is the case at W2JCR, the Super Skyrider, Model SX17 being the receiver used for 10 meters and all lower-frequency bands. If the receivers used for the other bands also cover the 5-meter band, no matter how insensitive they may be in this latter range, they provide the answer to the 5-meter selectivity problem and provide the foundation for as good operating results on this band as they do on the lower ranges.

If an all-wave receiver is capable of tuning in strong, local, 5-meter signals all it needs is a good preselector to make it "go to town" on this band. This statement is based on actual experience at W2JCR and it is the purpose of this article to present a description of the little preselector we worked out, and of the results obtained with it.

To obtain some quantitative data some measurements were run on the preselector. The method employed may be of interest and will be briefly described.

Not being equipped with a precision signal generator going down to five meters, and wishing to avoid complications leading to possible error, the simple scheme was adopted of calibrating the "Carrier Level" meter of the SX17 in decibels; then by putting a signal into the receiver direct one reading would be obtained and another with the same signal going through the preselector. The difference between the two readings would represent the decibel gain provided by the preselector and from this the voltage gain could be readily computed.

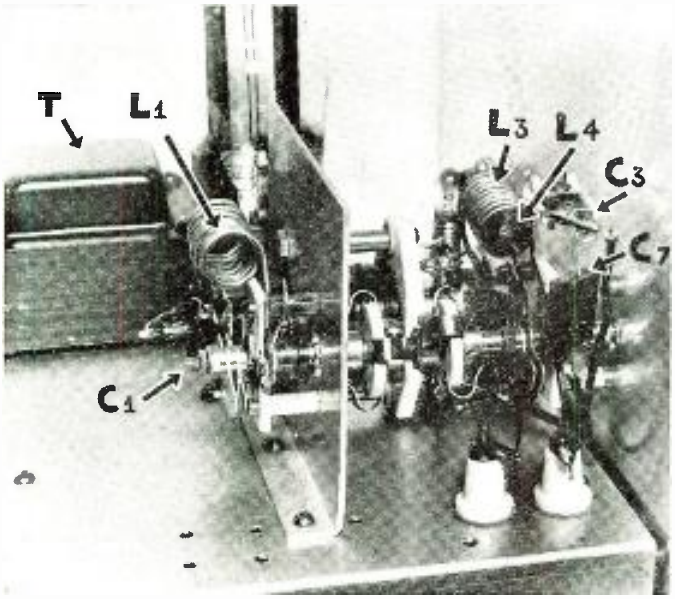
To avoid errors which might result from different input impedances of preselector and receiver, the test signal was fed into an antenna on the roof and from this was picked up by the 5-meter antenna a few feet distant from the first one. Thus the test signal (a crystal controlled oscillator) reached the "shack" exactly like any other signal and the receiver (or preselector) was loaded only by the regular antenna, as in normal operation.

The crystal oscillator employed was one designed to provide strong harmonics from a low-frequency crystal. Several of these harmonics fell in the 56-60 mc. range and therefore permitted a check of the entire band-width.

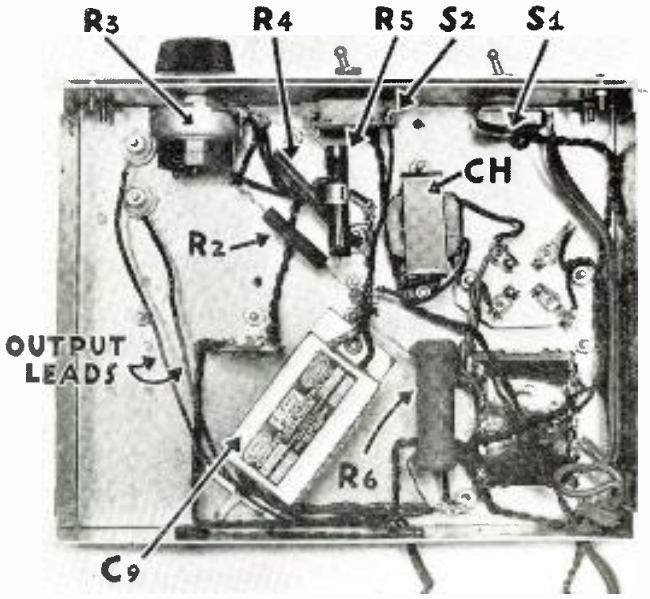
The results of these measurements were little short of startling, inasmuch as they showed *an average voltage gain of 197 for the preselector!* With the oscillator output adjusted so low that it would not register on the "R" meter, the insertion of the preselector brought the meter up to R9!

Double checking, a similar procedure was followed in testing on crystal-controlled ham signals. Any signal which on the receiver alone registered R4 or better pushed the meter off scale when the preselector was connected. On the other hand, signals which shoved the meter up around R9 or somewhat higher with the preselector were uselessly weak when the preselector was cut out.

It is the new 1851 ultra-high frequency pentode that has made these results possible. This is an octal-base metal tube of about the same shape and size as standard metal tubes but having a pin on top for the grid terminal instead of the conventional



A side view of the preselector. Each part has been numbered to correspond to the circuit diagram below. Note insulation.



Underside the chassis shows the careful consideration given to the placement of component parts. It should be followed.

NEWS 56MC Preselector

metal cap. It has the highest amplification factor and mutual conductance of any tube offered to date; the amplification factor-6750 and mutual conductance 9000.

Regeneration contributes a good deal of the gain obtained but no steps have to be taken to introduce this regeneration; instead steps must be taken to hold the tube down and prevent oscillation. This is a simple matter, however, and is accomplished by using a moderate amount of shielding and by close coupling the input and output circuits to load the tube rather heavily. In television receivers where it is desired to completely eliminate regenerative effects, this loading is accomplished by shunting resistors across the tuned circuits but in this preselector it is only necessary to increase the input and output coupling until oscillation does not occur at any part of the tuning range.

Not the least point of interest in this unit is that the total cost for parts, including the cabinet and tubes, is less than fifteen dollars—a lot cheaper than building up a special 5-meter receiver. This cost can be further reduced by omitting the built-in power supply and drawing the necessary filament and plate voltage from the receiver with which the preselector is used, or from a separate power supply. Also, the well known "junk box" will in many cases supply some of the parts, as they are all standard.

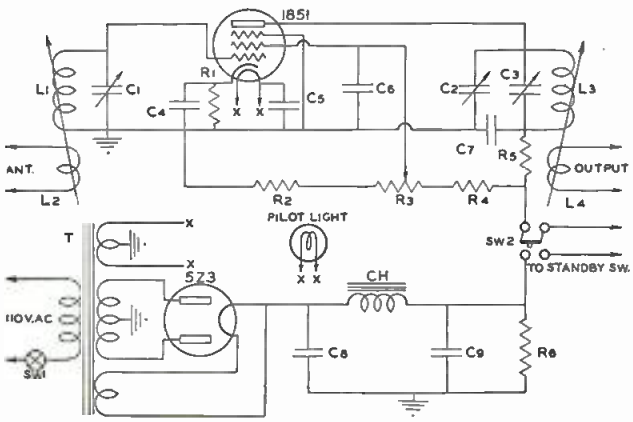
The circuit of the preselector consists of the single 1851 tube and its power supply. Both the grid and the plate of the 1851 are tuned, providing more efficient operating conditions for the tube and also more efficient coupling to the receiver. The input and output coupling is inductive and the coils L2 and L4 are made variable to permit just the right degree of coupling to be obtained to properly load the 1851 circuits. The condensers C1 and C2, Cardwell midgets, are ganged for single dial control. At 56 to 60 megacycles tuned circuits are necessarily very broad and the alignment of these two tuned circuits is therefore simple. It is accomplished by means of the trimmer, C3, and by stretching or squeezing L1.

The by-passing is an important consideration in this, as in all ultra-high frequency circuits. The condensers C4, 5, 6 and 7 are all mica and the first three should be connected right at the tube socket terminals and grounded to a single point on the chassis. The ground return of the tuned plate circuit should be made to this same point but the grid return may be made through the chassis by grounding the condenser C1 to the shield partition on which it is mounted.

The power supply is simple and quite conventional except for the unusually low value of the input filter condenser. *It is used for voltage adjustment* purposes more than for its contribution to the filtering action. The manufacturer (RCA) of the 1851 recommends a supply voltage of 300 at the filter output. Inasmuch as the supply voltage will vary widely, depending on the size of C8 it was more simple and considered better practice to adjust this voltage by selecting the proper value of capacity than to accomplish it by means of additional resistors. The other values in the filter are ample for adequate filtering action.

The construction, as shown in the photographs, is not at all difficult. The 1851 is mounted in a horizontal position to

(*Continued on page 62*)



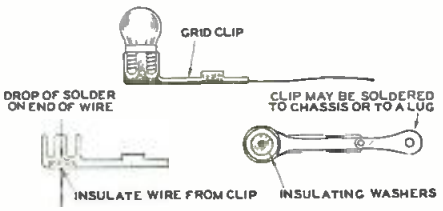
Circuit of the 56MC preselector.

C_1, C_2—10 mfd. Cardwell ZR-10-AS midget var.
C_3—3-30 Isolantite trimmer Hammerlund
C_4, C_5, C_6, C_7—.001 mfd. mica
C_8—.5 mfd. 500 volt paper
C_9—8-8 mfd. Electro
CH—Midget filter choke
R_1—150 ohms, ½ watt
R_2—30,000 ohms, 1 watt
R_3—20,000 ohm potentiometer
R_4—25,000 ohms, 2 watts
R_5—4,000 ohms, 5 watts
R_6—30,000 ohms, 10 watts
S_1—S.P.S.T. toggle switch
S_2—D.P.S.T. toggle switch
T—640 v., c.t., 40 ma., 6.3 v., 5 v., Kenyon Transformer, K40MY

"RADIO Gadgets"

Homemade Pilot Light Socket

The accompanying drawing shows how a socket for the radio pilot light or a flashlight bulb may be made easily from an ordinary screen-grid tube clip, a few pieces of



insulated wire and a couple of insulating washers. A drop of solder on the end of the bottom lead makes a good contact for the positive terminal of the bulb. The socket can be mounted by soldering directly to the chassis or by means of a soldering lug as shown in the drawing.

Antenna Impedance Matching Simplified

The ham is often faced with a difficult problem when it comes to matching the feeders to an antenna. Normally the antenna is operated in an elevated position where it is not accessible, so the matching is done on the ground, with a prayer that when raised to position the match will still be satisfactory. Where the feeders are of the tuned variety this of course does not apply. It is in the case of non-resonant feeders so commonly employed on the five-and-ten-meter bands that it does apply, and is one of the reasons that standing waves are so often present on such systems.

Where the antenna is a type that employs a matching section, such as the "J", the "half-waves-in-phase" and various other arrays this problem can sometimes be overcome by making the matching section more than one half wave or quarter wave long. Under conditions where a half-wave matching section is specified, it can just as well be two or more half waves long and can thus be extended down to a point within reach of a ladder or the roof, and the proper point for attaching the feeders determined with the antenna in its normal elevated position. Or when a quarter-wave matching section is specified, it can be lengthened to any *odd* number of quarter waves.

Suppose the problem involves a 5-meter vertical "J" antenna with spaced feeders, the "J" to be mounted on a mast with its bottom 30 feet above the roof. Normally a quarter-wave matching section would be employed and the point where the feeders connect to it would be about 27 feet above the roof, with the shorting bar a foot or so below that. If the mast is husky enough to support a long ladder, all well and good. It is more simple, however, to make the matching section five quarter waves long, thus bringing its lower end down to about 10 feet off the roof where it can be reached comfortably from an ordinary step ladder. The shorting bar position near the bottom end can then be determined in exactly the same way as with a quarter-wave section, and the correct connection point for the feeders also. The only difference would be that the match would be a permanent one because the antenna would be in its normal position during the adjustment and therefore not subject to changes encountered when an antenna is matched on the ground, only to have its characteristics altered due to surrounding objects when raised into position.

Chart of Tap and Clearance Drills

In radio construction work experimenters are often confronted with the problem of selecting the correct size drill for tapping, or for drilling a clearance hole to take a certain size machine screw. This chart gives the drill sizes required for average use. If the machine screw must pass readily through the hole, then the size drill is selected under the column headed "Clearance."

Screw Number	Threads Per Inch	Drill Per Tap	Number Clearance
2	48	50	44
2	56	50	44
2	64	50	44
3	40	49	39
3	48	45	38
3	56	44	38
4	32	43	31
4	36	42	31
4	40	41	31
5	30, 32	40	29
5	36	38	29
5	40	37	29
6	30, 32	35	26
6	36	33	26
6	40	32	26
7	30	31	21
7	32	30	21
8	24, 30	30	17
8	32	29	17
9	24	29	13
9	28	28	13
9	30	27	13
9	32	25	13
10	24	25	8
10	30	22	8
10	32	21	8
12	20	19	2
12	24	16	2
12	28	14	2
14	20	10	¼
14	24	7	¼

Meter Kinks

Presented herewith are simple methods whereby two separate meters are employed to obtain multiple current, voltage and resistance measurements.

An 0-15 milliammeter of 295 ohms resistance can be purchased for about 60 cents and one with zero adjustment for about $1.00. A meter of this type will take care of all current measuring requirements with sufficient accuracy. A shunt equal to one-ninth of the meter resistance will increase the range ten times, measuring current up to 150 mas. Connected as in Figure 1, the meter is always prepared for the highest reading and is a safeguard against burn-out. To read 0-15 ma. press down the key, this will momentarily disconnect the shunt.

To measure resistance use your more sensitive voltmeter in the substitution method, with a 100,000 ohm calibrated adjustable resistor. The range can be extended by connecting known values in series and adding so much to the reading. This method avoids meter error and voltage drop. Simply adjust to the same voltmeter reading, whatever it may be and the resistance is the same as the unknown resistor which produced that same deflection. No ohms scale is required on the voltmeter.

For the voltmeter, an instrument of 1000 ohms per volt is good, one of 2000 ohms per volt very good and 5000 per volt excellent. Three d.c. voltage ranges of 30, 300, and 600 volts should meet all requirements. Connect as shown in Figure 2. In calculating multiplier resistances, you must know maximum meter current and the meter resistance; then add resistance in series until the sum (multiplier plus meter resistance) equals the desired voltage range divided by decimal fraction of an ampere. As shown in Figure 2 the meter is always set for the highest voltage—protected against mistakes. Lower voltages are read

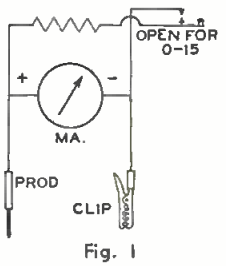


Fig. 1

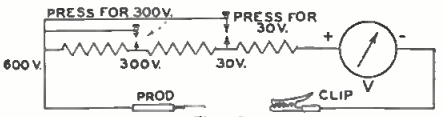


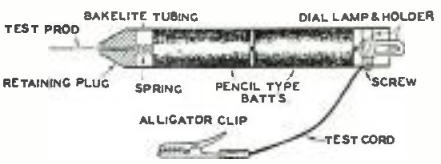
Fig. 2

by holding down the proper key, temporarily shunting out part of the multiplier resistance. A cheap a.c. voltmeter can be extended in the same manner with a top range of 700 or 800 volts.

Handy Continuity Tester

This pencil-tester should find a wide variety of applications in every experimenters and serviceman's workshop in tracing continuity and shorts. It is especially useful in checking from point to point, testing coils, switch contacts, and other applications where very low resistance is found.

The sensitivity of the indicator can be



controlled by substituting lamps of different current drain. A dial lamp of high current consumption is useful where it is desired to limit the resistance indication to a few ohms such as in coils and switches, while the special low current dial-lamps used in battery operated receivers can be used to indicate continuity in circuits up to approximately 50 ohms. Another useful application of this unit, is its employment as a small torch for working in dark corners of receivers, etc. For use in this capacity it is only necessary to fasten the alligator clip to the test prod.

—30—

THIS MONTH

Mastery of the International Morse has been the one stumbling block to many seeking a ham license. The author tells how to overcome this obstacle.

by F. A. PETRAGLIA
New York City, N. Y.

LEARNING the code can be quite a tantilizing experience. In fact, it generally is so for those who must depend upon self-instruction. However, most licensed operators, both amateur and commercial, have prepared themselves in this way and it is safe to say that the vast majority of beginners today are pursuing the lonely road to licensehood.

Code-learning becomes tantalizing when one becomes ensnared in inevitable difficulties which result through inadequate guidance. Most articles on the subject of "getting started" advise the beginner on just this alone. Trouble, in the form of receiving and sending "dead spots" begin to appear—after one has started!

This article proposes to take up from that point, that is, the point at which your receiving speed reaches three, four and five words per minute and on to the amateur license requirement of thirteen.

Constant practice is the sum and substance of code mastery. However, mere unthinking practice is not enough if one is to secure a license within a reasonable limit of time. A systematized approach will help you to cover far more ground than just a series of guerilla attacks on the subject.

With this attitude, let us consider a common source of difficulty,—the tendency to confuse similar letters, which are legion. For example, S will often appear in your copy in place of H—F in place of L—Q in place of Y. One such combination will offend conspicuously for a time, and as the difficulty disappears, another appears! The despairing beginner just keeps on copying until the situation clears of itself.

A more effective solution attacks the problem directly. First, it is necessary to "check" and then to practice those letters during keying periods until they have become correctly and indelibly impressed upon the mind.

Checking "Weak" Letters

You are bothered, let us say, with the letters S and H. Now, then, how to proceed with the cure? In copying, when you hear either of these letters, *pause and check* by first asking yourself: "Was that *dit-ditdit* or *ditditditdit?*" Nine times out of ten you will be rewarded with the correct letter.

These letters which you have been confusing are your "weak" ones. The next step is to strengthen them, of course. Do this during your keying practice. Make up five or six letter groups composed principally of the offending characters and send them a half dozen times at each sitting. Taking two pairs, S and H, F and L, compose ten such groups as the following: SHIISH HISHS SIHSH FLLFL SFHLF. It is this kind of practice which consists in strengthening the weak links in the chain which will hasten your eventual mastery of the code.

"Seeing" and "Hearing"

Code is *sound* and because of this it is imperative to get oneself into the habit of thinking of it as such. Hence, one must overcome the tendency to visualize letters as so many dot-and-dash combinations. Rather, drop these words—dot and dash—from your radio vocabulary, and substitute the sound equivalents *dit* and *dah*. Further, think of letters only as single *units of sound*. The letters A,B,C, are respectively *ditdah, dahditditdit, dahditdohdit,* and so on through the alphabet.

"Stopping" for Letters

Many a beginner moans: "I stop to catch a letter and lose three or four others that follow." Every student has had this experience. One should acquire early the licensed operator's habit which is to let that missed letter go by. In practical operating one can always ask the transmitting operator for a "repeat." Then, again, the fact that the stopping habit is bad business is evidenced by the poor bargain of exchanging one letter which you might get for three which you will probably lose! Copying solid comes later with mastery, but at the outset the beginner is best advised to keep on going and disregard lost letters. These lost letters are usually the "weak" ones and the corrective was suggested above.

Is Your Copy Legible?

Let us look at your copy. . . .

Isn't it often just an unintelligible mass of *disconnected* letters with no whole words showing through? Of course, you miss many in the transmission, but the total effect is aggravated by the white space showing between letters, separately written . . . Sometimes you feel, too, that *you have copied solid* but the meaning is all broken up because no whole words are apparent.

This tendency originates in early practice when the beginner is concerned with individual letters of the alphabet. Later, however, this tendency becomes a habit and a hindrance which must be overcome. Some beginners realize that they could just as easily run their letters together as they copy them down, but the old custom of separating them persists. Hence, the difficulty sometimes attains what seems to be mountainous proportions. In classroom experiments which I have conducted with adolescent boys, it was conclusively proved that after some forty hours of separate-letter writing, this habit was broken in only 15 minutes of concentration on writing letters the natural way, that is, together in words. Try it.

Next, *do not print.* Another odd development in beginners is the tendency to print. As your speed increases, printing will slow you down considerably. It is again surprising how little effort is required to switch to the more natural method, and the faster one,—writing in longhand.

Trivial as the following suggestion may seem, it is worth including in one's mental notes. When copying, use a fair-sized, sharp-pointed pencil, not a blunt-edged stub. Stubs cramp the fingers, cause mental strain, and result in scrawling characacters. Clean copy with letters together and adequate spacing between words is legible at a glance—an important factor in your later speed work and traffic-handling as an operator.

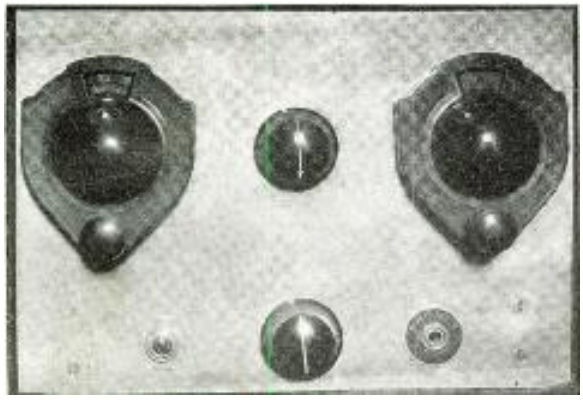
What Is the Best Practice?

Copying not more than two or three words beyond your average speed is the best stride to strike. Occasionally, for sheer fun, one may indulge in the pleasant excitement of copying speed away over his head. The danger, however, is that some beginners succumb to the illusion that they thereby are learning faster. Actually, one becomes unnaturally geared-up, strained, and accuracy is sacrificed. Such an exchange is likewise a poor bargain.

Also, copying all methods and manners of "fists" and speeds is all right when one has passed thirteen, but it is an unavailing method of learning. One hour spent copying code transmitted at an even speed within one's range is ten times more fruitful of results than so many scatter-shots.

There is no better practice, therefore, than that which is obtainable by working

(*Continued on page 67*)



Front view of the receiver.

A Beginner's

by FREDERICK DILLION
Hollywood, California

A two tube battery operated receiver using the latest tubes makes an ideal set for the DX fans and amateurs.

IN submitting a receiver for the beginner there are a few things to be considered. These are simplicity in circuit design and the cost of the outfit. With these features in mind this two tube battery operated set was designed, making use of the latest development in tubes. A band spreading system which will increase the range of the set is also included.

This article is a request from beginners of my acquaintance, for a working explanation and a step by step construction plan for building a simple yet efficient radio set.

First obtain all the parts listed at the end of this article. Then take the front panel and lay out the holes as follows:

The two main tuning condensers (C2, 3), 1¾" from the end, 2¾" from the top. Antenna condenser (C-1) is placed half way between C2 and C3 the same distance from the top.

The battery switch (SW-1) and the phone jack (J-1) belong 2½" from the ends and 1" from the bottom. The regeneration control (R2) is in line with the antenna condenser above; see the photograph. This gives an even symetrical appearance to the set.

The screws that hold the panel and chassis together are, 1" in from the ends, 1" apart on each side.

The twist drills used for drilling the panel are, ⅜" for the condensers, regeneration control and the phone jack. Use ⅛" for dial holes and panel-chassis mounting screws. Use ½" drill for the switch. Counter sink the panel-chassis holes with a ½" counter sink.

After the above holes have been layed out on the panel. Place the panel in the vise with two small blocks of wood on either side of it, between the jaws of the vise, then tighten. This is done to protect the panel from any unnecessary scratches.

When you have finished drilling the panel, take it out of the vise and hold the chassis against it, so that a ½" margin is left on either side of the panel and is flush with the bottom. Hold the two together and mark the place for the screw holes to be drilled on the chassis. Drill these, then fasten the chassis and panel, check ridgeness of the set up. Straighten if crooked.

Now mark the lower control holes that go thru the chassis, drill and mount all the parts on the panel. The antenna condenser and phone jack are insulated from the panel by fiber washers. These control holes are then enlarged to about ½".

Place a washer on each side of the panel holding the antenna condenser in the center of the hole, so that the shaft does not touch the panel. Then tighten the mounting nut. Do the same with the phone jack. To check these two parts for complete insulation. Take one of the 4½ volt batteries and connect one phone tip to one side of the battery and from the other side of the battery run a convent length of wire to the panel. The other phone tip goes to the mounting nut on the parts to be tested. Put the headphones on, place the wire against the panel and the tip of the phones to the part. If a click is heard then it means that the part is not properly insulated. Fasten the wire by placing it under the chassis and the phone tip to one side of the part. Take one at a time and loosen the mounting nut and move it around until the click is gone, then tighten up and everything will be O. K.

It is best to leave the dials off until you are ready to operate the set, as they will be scratched in moving the set around.

The chassis is 7x9x2 inches, layout as follows: The five prong socket for the battery cable to plug into, is set 4½" from the ends, 1" from the top and bottom of the chassis.

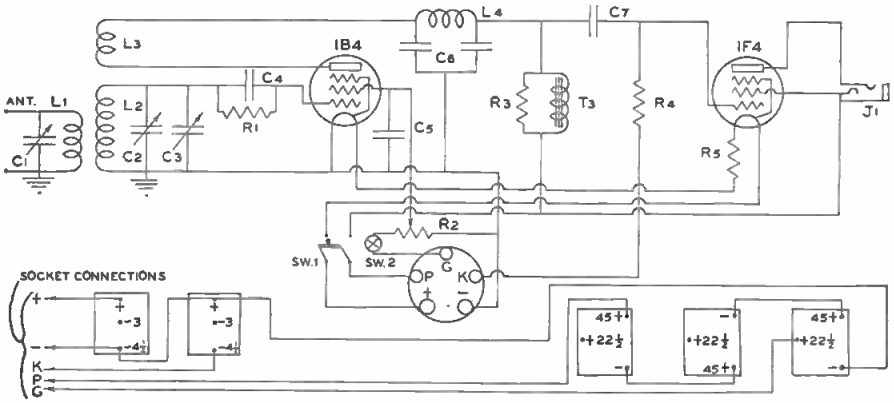
The binding post strip that the aerial and ground connect to, is placed at the right of the socket and ⅜" from the end of the chassis, the same distance from the top and bottom. Holding it in place mark the two holes that hold it.

The socket mounts in 1⅜" diameter hole drilled with a 1½" diameter tappered metal reamer. The mounting holes for the binding post strip are drilled with ⅛" drill and the holes for the antenna lugs to go thru are ¼" diameter. Be sure they clear the sides and do not touch the chassis, as this will ground the aerial and hinder reception.

The audio choke (T3) is centered at 4½" from the sides and 1½" from the back of the chassis. Mounting holes are drilled with ⅛" drill. The tube sockets are same diameter as the battery socket and layout 1½" from the ends and 3" from the back of the chassis. The coil socket is the same, located 3½" from either of the tubes, and 3" from the front panel.

The rest of the parts are supported by their own leads, known as "big-tails." This view shows the under chassis layout of the rest of the parts. This condenser is placed right close to the potentiometer (R2) as one side goes to ground and the other to the arm of the regeneration control (R2).

In the various views of the finished set a type *230* & *232* tube is shown, but the tubes



The circuit diagram of the two tube receiver and battery connections.

C_1—20 mmfd. var.
C_2—35 mmfd. var.
C_3—140 mmfd. var.
C_4, C_6—100 mmfd.
C_5—.5 mfd. 200 W. V. Tubular
C_7—.02 mfd. 400 W. V. Tubular Coupling
R_2—50,000 ohm pot. and dial
SW_2—S.P.D.T. Tog. Sw.
R_1—2 meg. carbon ¼ w.
R_7—1 meg. carbon ½ w.
R_5—8 ohms wire wound
L_1—2.5 Mh. R. E. choke
T_3—A.F. choke Thordarson T-2927

3 6-prong coil forms Bud Jr. and ⅛th lb. nos. 24 & 30 D.C.C. wire
J_1—phone jack
R_3—.25 meg. carbon ½ w.
SW_1—1 D.P.S.T. Switch

Short Wave Receiver

designated—1B4 & 1F4 are far superior.

The plug for the battery cable can be bought or made by the reader as he desires. It is made from an old burned out five prong tube, which will be given you, by the dealer from whom you buy your parts. The glass portion is broken off and the base cleaned out, by scraping with a knife. The five wires from the cable are soldered into the prongs according to the diagram figure 1. The base should be filled with parafine to keep the wires in place.

If the reader wishes, he may make his own coils, altho these too can be bought ready made. The following material will be necessary: 5- *Bud Jr. Low Loss* Coil forms having six prongs each. ⅛th of lb. of Nos. 24 & 30 D.C.C. wire.

Scrape the wire clean and put it thru the first hole and down into the prong and solder. A bit of soldering paste pushed in the prong first, will insure a well soldered joint.

Now wind 3 turns from left to right. Holding the wire along side of the second hole measure the length to go down to the second prong and cut it off. Clean the wire a little over the length of the prong. Put it thru the hole and down into the prong.

The two largest coils start ¼" from the top of the form. The largest coil is wound in two layers of 50 turns each. Wind 50 turns then start right at the top again and wind 50 more.

Wind the required number of turns on the form and measure the space they cover. Drill the two holes at the beginning and end of the coil. Be sure the windings are tight. Leave enough wire at the ends to make the connections to the prongs.

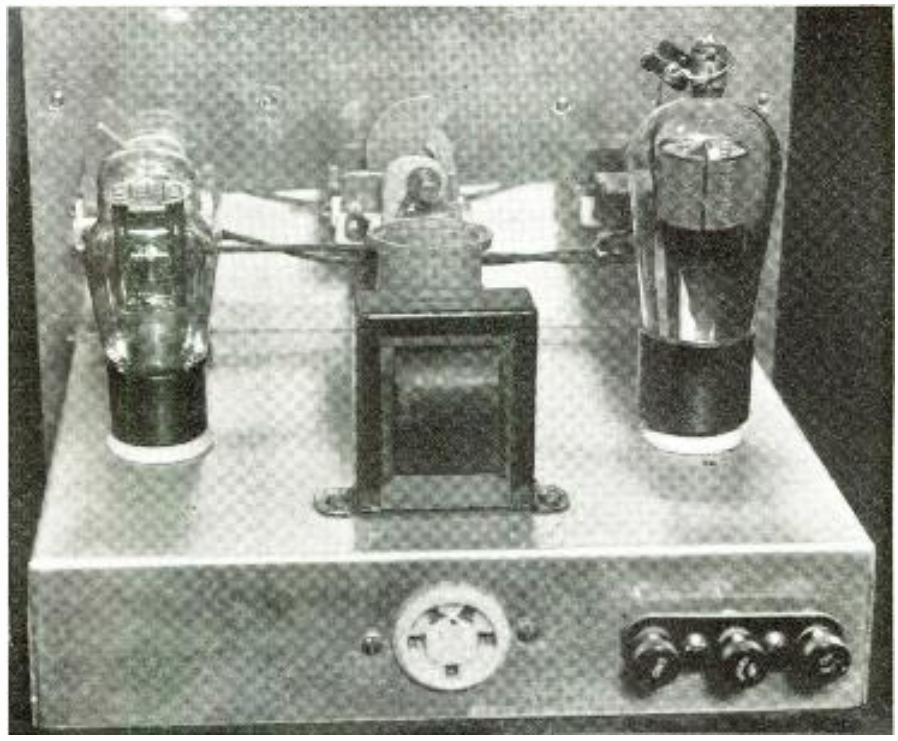
After all the parts are mounted, you may start to wire the set.

The batteries are connected to the set by means of a five prong socket located at the rear of the chassis. Into this, a five wire cable is plugged.

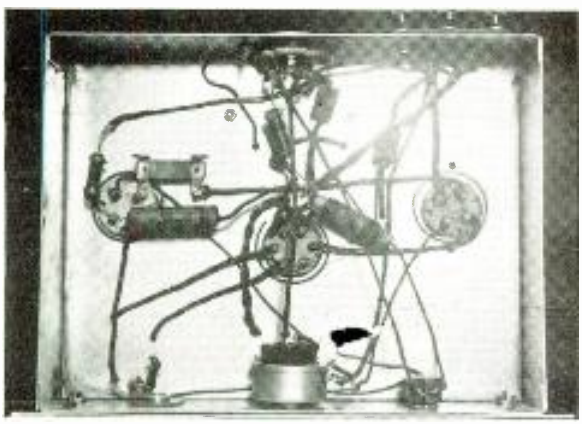
In wiring up the batteries care should be taken to get the same wire connected to the battery and the corresponding prong on the power socket.

In order to make the "A" batteries economical in cost and compact a small eight ohm wire wound resistor (R5) is employed in the filament circuit in series with the two tubes. A small 4½ volt battery can be applied giving the required two volts to operate the tubes. This does away with the cumbersome rheostat. A double pole single throw toggle switch (SW-1) turns the set "ON and OFF" opening the filament and "B" battery circuits. Switch (SW-2) is wired in series with the high voltage end of the potentiometer (R2).

This switch is mounted on the back of (R2). It automatically turn "ON," when it is first advanced to the right. When the set is to be turned "OFF" this control must be fully retarted to open the circuit of (R2), see figure 1. This helps to extend the life of the batteries.



Rear view of the receiver showing the audio transformer in center; coil is behind it. A 30 tube is shown which should be replaced with a 1B4. Condensers are on a line.



Underside chassis shows simple wiring.

The art of operating a short wave receiver successfully is only learned after many hours of patient trying. The reason most short wave sets give poor results is because they are tuned too fast. Even with the new type airplane dials a set must be tuned very slowly in order to catch every possible signal.

The best way to tune a regenerative set is to start at the end of the dial, or when the condenser is fully meshed.

Set the regeneration control so that the set is just oscillating. Then as you tune the set very slowly, signals won't be missed for lack of regeneration.

When this procedure is followed, the wavelength of the receiver is decreasing. It is a known fact in engineering practice, that the shorter the wavelength the less regeneration is needed. Therefore the set will be in constant oscillation. It should be reduced a little for too much is as harmful as too little. The most sensitive point is just before it breaks into oscillation (just before the click is heard in the headphones).

To tell whether the set is oscillating touch the grid cap on top of the 1B4, if a loud noise or squeal is heard, then the set is oscillating.

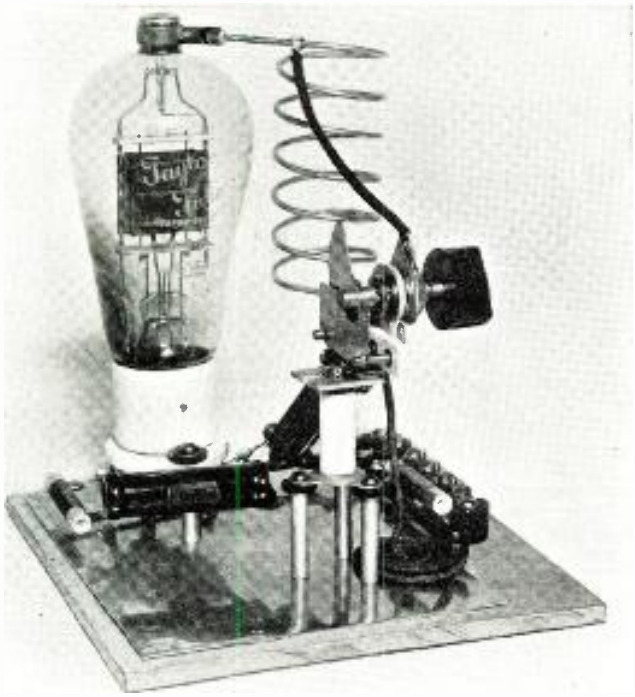
When you have a station, a high pitched whistle will be heard. It will rise and fall and rise again; before you have passed a division or two on the dial. In order to hear this station clearly you must go back to the point where it was first heard. Tune very slowly until the first rise and fall, then stop. There is the station. It can not be heard because the set is still in oscillation. To take it out of oscillation the regeneration control (R2) is retarded (turned to the left), until the familiar click is heard. Advance it slowly until the station is heard clearly. This form of tuning is known as "zero beat" tuning. If it should whistle again, repeat the above operation even more slowly.

It would be well to practice tuning in on the 160 meter amateur band as these stations are mostly local and are easy to receive. The knack will come with practice and more enjoyment will be had from your short wave set.

A few hints on the best time to listen in on the various short wave broadcast bands.

(*Continued on page* 54)

Beam Pole Oscilla or



The oscillator itself is so constructed as to give short leads.

Sufficiently stable to be received on a superhet, this beam pole 56MC transmitter should be just the thing to work real DX whenever the band opens up. It also makes an ideal rig for the newcomer to start in on.

FROM the time amateur radio left "200 meters" and started its dramatic march into the higher frequencies, the pioneer work has been done on *low power*. Band after band was opened up with receiving tube transmitters and these so called "peanut whistles" always went through to real DX until the "Rock Crushers" and "California kilowatts" began to pile up on them, when they were forced either to move on to new fields or enter the race for more power, if location and pocket book permitted.

The old cycle is already well under way on the 5 and 10 meter bands, and will doubtlessly soon be felt even on 2½ meters. There are, however, literally thousands of amateurs who cannot afford this power competition and many who are unable to participate due to local interference with their neighbors, lack of room in their homes, etc.

Fortunately, in the ultra-high frequency bands, there is an "out." Location and efficiency are even more important than power input and it becomes increasingly difficult to maintain efficiency with increased power. Hence it happens that in the 2½ and 5 meter bands, given the same location (and that of course is a vital point at these frequencies) a medium low power transmitter of from 20 to 50 watts input can be made to compete quite successfully with the average high power installation.

The Beam Pole Oscillator was designed with this purpose in mind. It puts out a very fine carrier in spite of the fact that its cost is low and construction simple. As a matter of fact you will find that it disturbs the ether *more* than some of the 200 to 500 watt outfits, a large part of whose output is often dissipated before reaching the antenna, much to the annoyance of the neighbors.

The frequency stability of this oscillator is surprisingly good and compares very favorably with the average "long lines" outfit. This is due to a combination of factors, one of which is obviously the low over-all resistance of the entire high frequency circuit, and the stabilizing influence of the balanced radiating system which is directly coupled to the tank circuit with no intervening transmission line. Good, clean speech is obtainable from this transmitter on even fairly sharp super-het receivers, such as the well-known "Quartet" for instance.

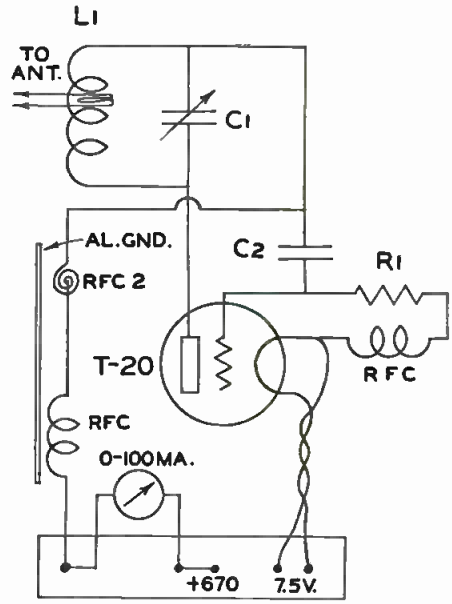
The general layout of the oscillator can be clearly seen in the photograph. It is built entirely on the base board of the weather-proof containing cabinet, which is afterward assembled around it.

The establishment of a local "ground," always advisable in ultra-high frequency construction, is obtained by fastening a sheet of aluminum over at least part of the base board.

The double spaced 6 mmf. tank condenser is mounted on small stand-off insulators so that it is approximately half way between the grid and plate connections of the tube. A little more height might be advantageous as the plate lead to the top of the tube should be as short as possible—every half inch helps.

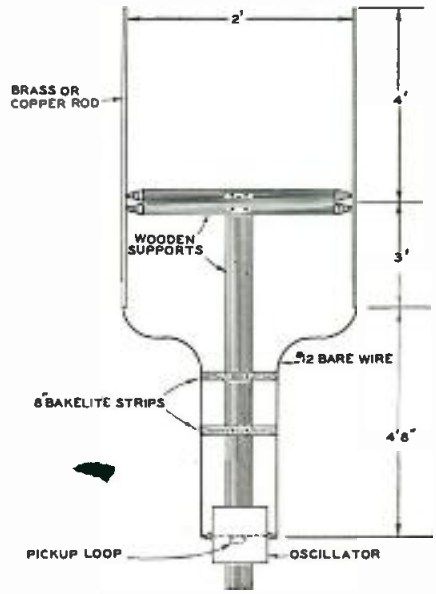
The oscillator circuit is the well known ultra-audion or capacity coupled Hartley. Grid excitation in this circuit is primarily a function of the inter-electrode capacity ratios and the amplification factor of the tube used. Excitation may be controlled to some extent by the grid leak and capacity of the grid condenser, although this method is rather awkward and has its limitations when stability plus efficiency is to be considered. The best way to control excitation is through a combination of antenna coupling and actually varying the effective inter-electrode coupling capacity by introducing a small capacity between the grid or plate end of the tank coil and the "ground."

The tube suggested for this oscillator is the Taylor T-20 which has a "mu" or amplification factor of 20 and fairly low inter-electrode capacities. With this tube the tendency will be toward over excitation which may be counteracted by coupling the antenna near the grid end of the tank coil and by connecting the high voltage supply



Circuit of the oscillator.

Oscillator
C_1—6 mmf. double spaced variable (Bud)
C_2—35 mmf. fixed
R_1—8000 ohms, 5 w.
L_1—See Text
RFC—5 M RF Choke, Ohmite
RFC_2—See text



Beam construction details.

For 2½ to 5 Me ers

by A. J. HAYNES
New York City, N. Y.

also at this end of the tank circuit. Still further adjustment can be obtained by including a small spiral pancake winding of 4 or 5 turns in the high voltage lead between the tank circuit and the r.f. choke. This small pancake is formed in the wire lead so that it is parallel to the aluminum "ground" plate and may be adjusted by bending so as to have more or less capacity to "ground." Proper adjustment of this capacity, which is very small, will improve both the stability and efficiency of the oscillator.

The optimum value of the grid condenser is about 35 mmf. Unless a very good, small high voltage condenser of this value is available it would be well to use two of the small mica receiving types in series; a 100 mmf. and a 50 mmf. will do the trick.

A five point connection block is used to provide terminals for the two filament and plus high voltage leads. The other two posts are merely in series with the high voltage connection and provide for the temporary connection of a milliammeter when tuning up. When the milliammeter is removed a wire jumper is placed across these two binding posts.

Before inclosing the oscillator in its box it should be tested and adjusted in the operating room with a dummy antenna consisting of a 15 or 25 watt lamp with a two turn loop of push-back wire soldered to its terminals. This will enable the best adjustment for efficiency and stability to be determined.

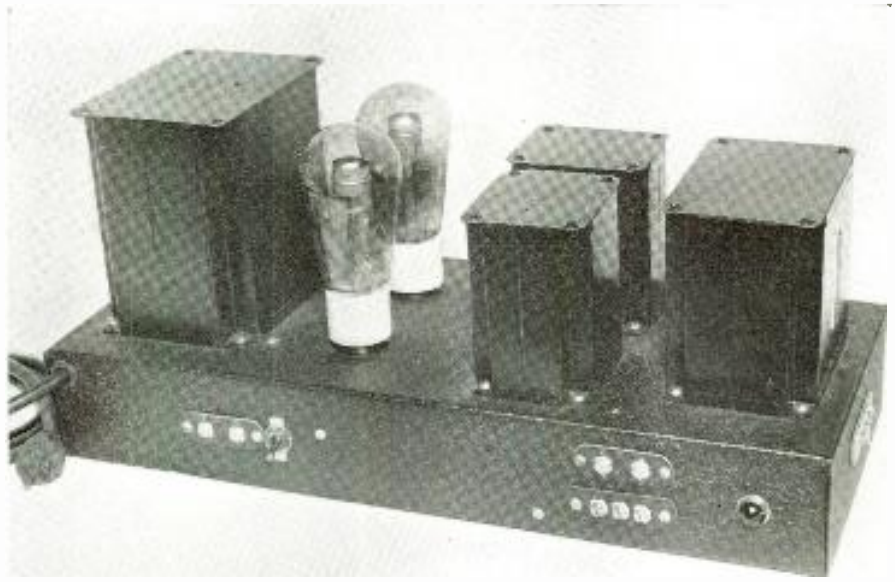
Under load the plate current should read about 75 milliamps and the grid current between 10 and 15 mils. When the load is removed the plate current will drop to about 40 mils. The plate voltage measures 670 volts.

Under these conditions a good fat 15 watts of output can be obtained and this output, mind you, is practically all *antenna output.*

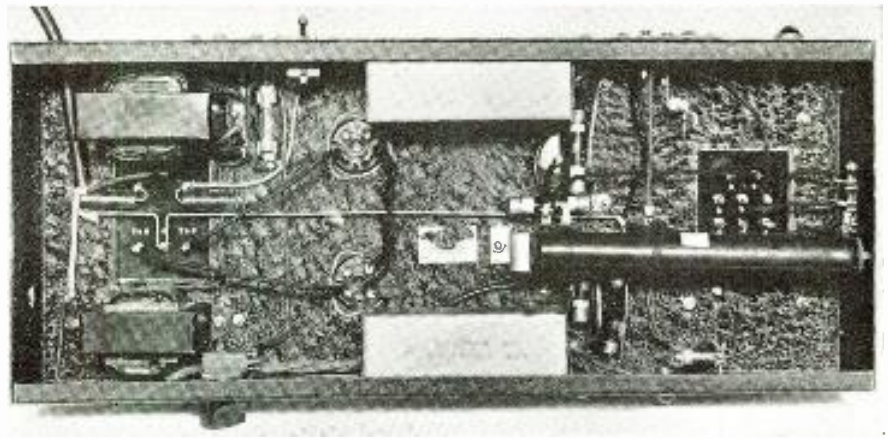
The very simple but effective Double "J," out-of-phase beam used with this pole oscillator was described by the writer in the December, 1937, issue of Radio News. This form of radiator not only gives the effective output power another big boost, but being so closely coupled to the tank circuit it has a very stabilizing effect on the signal frequency.

Two 7 foot copper tube rods serve as the antenna proper while No. 12 bare copper wire is used for the quarter wave matching section. The beauty of this antenna is that we don't care *where* the antenna ends and the matching section begins. The overall length of the antenna system from the tip of one rod down through its side of the matching section, across through the tank circuit coupling coil and up to the tip of the other rod will always be approximately one

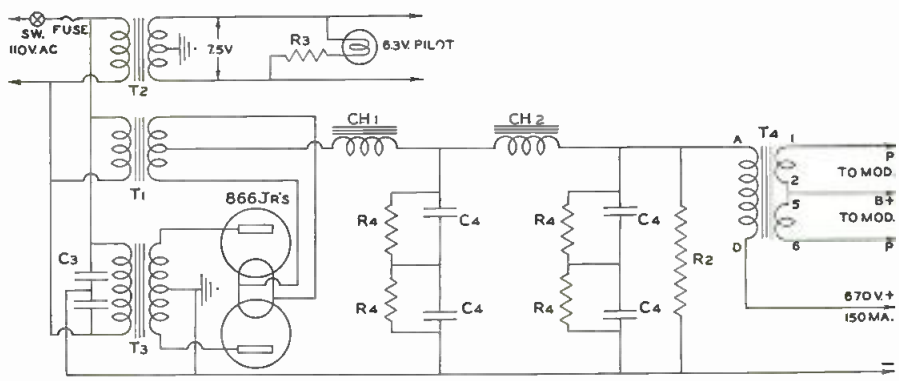
(*Continued on page* 58)



The modulator transformer and power supply are mounted on one chassis.



Underside the modulator transformer-power supply chassis.



Circuit diagram of the power supply and modulator xfmr connection.

T_1—2.5 volt fil. trans.
T_2—7.5 volt fil. trans.
T_3—Power trans.
CH_1—Swinging choke
CH_2—Filter choke.
T_4—Variable impedance Modulation trans., Kenyon T-493
R_2—30,000 ohms, 20 w.
R_3—6 ohms
C_3—.01 mfd., 600 volt paper
C_4—8-8 mfd. electro.
R_4—2 meg., 1 w. resistors
SW—S.P.S.T.

Serviceman's Experiences

by LEE SHELDON
Chicago, Illinois

Shall a small service charge be made on all calls or shall the serviceman advertise that they are free? The author arrives at a conclusion in a startling manner.

I PARKED the delivery truck, and entered our shop with the firm stride of a man who has made an important decision. Al was working at the service bench; I stopped before him and drew a preparatory breath. He beat me to the draw.

"With business dropping off like a waterfall, and with times so tough actors are losing their conceit, you stop work in the middle of the day to come in and breathe down my neck. Make it snappy, and get out on the job!"

Aside from being my partner, Al is the desert air upon which I waste the fragrance of my talent. I drew another, a more determined, breath.

"Salutary Sales & Service," I began calling our store by its formal name, "must face a problem. We—"

"There is nothing the matter with our business that regular repair jobs won't correct," Al interrupted, "and I strongly advise you to make efforts toward getting them. Go forth. Hit the weather. Come back with some red in your cheeks, and some green in your pockets!"

"The subject," I insisted, "is vital to our success, and I must speak."

"Ten words" said Al pulling out the soldering iron plug.

"Perhaps you don't know it, but our competitors down the street are dropping their dollar service charge. Look." I handed a card to him.

REDOUBTABLE RADIO REPAIRS, INC.
No charge for inspection
The Best Things In Life Are Free

"I already know it," Al declared. "Their sound truck passed here yesterday carrying sandwich signs while the phonograph played *Give a Man a Horse He Can Ride.* The amplifier was so overloaded the grids drew current on notes lower than middle C, and the drop across the power supply made the turntable slow down. The effect was even weirder than their advertising. They got a ticket this morning for playing *Rocked In The Cradle of the Deep.*"

"On account of the noise?" I asked.

"No—the bass notes stalled the car. What's free service got to do with us?"

"Well, you're always telling me if the importance of getting into the customer's home—don't you realize what it would mean to us if we made free calls? All the folks who didn't want to spend a dollar would send for us."

"Who wants them to call if they won't spend a dollar?"

The lifeline rang. Al answered it, and said to me: "Randle, 4345 King Street. Majestic 92. Hop to it, Mercury, my boy, and don't get any ideas about dropping the service charge."

Mr. Randle listened to my diagnosis tolerantly, my remedy approvingly, and my promises happily. Then, when I thought I had him ripe, I disclosed the cost of a condenser block.

Yeah! I know its silly, but each likes his own program, and all are on the air at the same time!

"Sorry," he said, "but eight-fifty is more than I had planned to spend. I'll have to wait and think it over."

"You're thinking doesn't change what's wrong with the set," I replied, piqued after losing the work. "It will cost just as much to repair the set a week from now as it does today."

He said nothing as I packed up my tools.

"The service charge," I reminded him, "is one dollar."

The money came from his pocketbook with all the speed of a turtle in second. I noticed his expression: it was that of a dissatisfied customer. He saw me to the door, but did not bid me good-bye.

I had a feeling of satisfaction as I drove back to the shop. The call had put Al right where I wanted him.

I threw the dollar on the desk before him, and said, with all the indignation I could muster: "Here's the answer to that service charge problem. Instead of the repair job, we get fifty dollars in ill-will and one dollar in cash. Now, who is running the business to pot?"

"That is within your premise, as collector of external revenue," Al replied. "I don't know why you lost the job, but if you lost the customer, it wasn't because you charged him for the call. You must have done something else wrong. Perhaps he didn't have the money just at this time."

"He had a dollar, didn't he? What was I supposed to do, lend him the dough?"

"Hasn't there ever been a time in your life when you didn't have $8.50? You might have told him the dollar would be deducted from the repair bill later after he decided he wanted the work done. You could have had him sign a ticket acknowledging the charge for the call making a later appointment for his answer. Either way would have given us another crack at the set. Perhaps we could have picked up the job after his next payday. He had no reason to tell you if he was broke."

We lit cigarettes and sat down our preliminary to a long discussion. As though signals were connected to the chairs Brown, the financial father of Salutary Sales & Service walked in.

"How," he said with as much airy mockery as could be expected of a 200-pound boss with a cigar in his mouth, "may I determine the difference between a busy day and a strike when I come into this place? Or do I commit a fox pass when I disturb you during siesta?"

I leaped into the breach. "Mr. Brown, we need your advice in a disagreement concerning our business policy. Do you think we should stop charging a dollar per call, whether or not we repair the set?"

"How the hell do I know?" Brown snorted, dropping his whimsical tone for one more honest. "When I put you two commercial invalids on the rest cure, I thought you could decide things like that for yourselves."

A silence fell. He puffed on his cigar so rapidly the "No Smoking" sign cringed. Another silence fell after he slammed the door behind him.

Al looked at me accusingly, as if I owed him money. I did not slam the door when I left.

Something, I decided, as I drove the truck slowly in no particular direction, had to be done. I tried to think of some way to get more business to keep Brown quiet, and some way to prove to Al we should drop the service charge. Preoccupied, I let the truck drift along with a slack rein in the slow traffic.

Suddenly, with the flashing genius for which I try to be noted, *I had it!* I paid the fellow whose fender I mashed when the idea burst, and drove quickly to our printer.

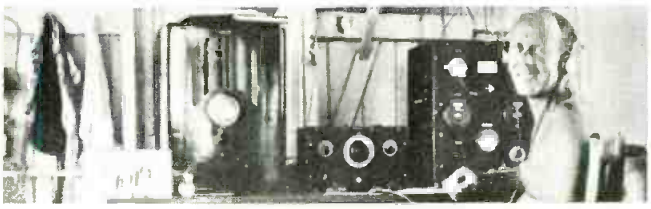
(Continued on page 63)

RADIOPIX

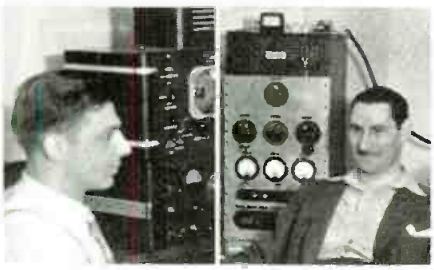
A page devoted entirely to timely pictures of radio in all its phases.

These are not pictures of Hoover, Hitler, Roosevelt, Smith & Mussolini! It is only Doane Powell demonstrating the use of his masks for television.

Compare this radio shack and antenna system which is 2,000 mi. south of Hawaii on Canton I. with the ham shack in next column.



A rotary beam antenna, the latest in receivers, five transmitters and the comforts of home are to be found at radio W9NLP.

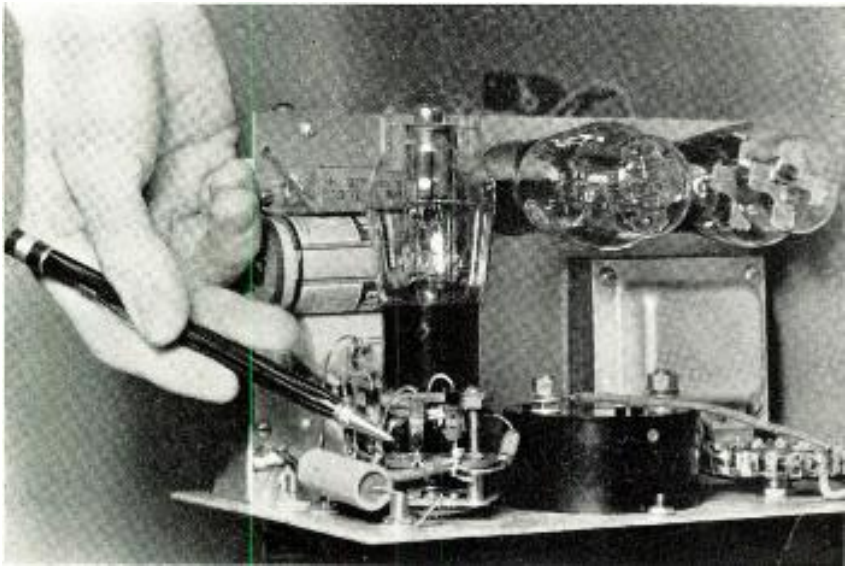


Tom Stoddard, W9OTY, & Bert (Rubber Xtal) Nastor, W9IPS, visitors to W9QEA.

Trying hard to raise a station thru QRM.

Bill Bartlett and his mighty midget. He holds a complete radiophone transmitter.

The receiving position of M. J. Lonis of Hannibal, N.Y. Note cw oscillator on table.



Back view of the 2-5 showing the cam switch. Note clean wiring.

The 2-5

by C. G. GROVER, W6OTW
Salt Lake City, Utah

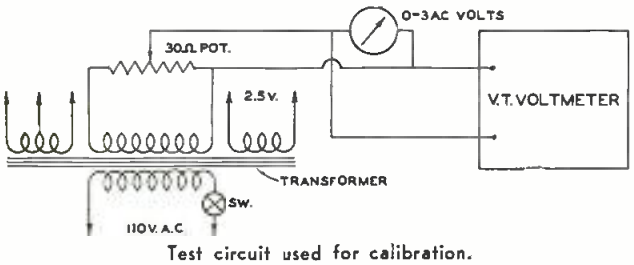
Probably the most useful instrument around a ham shack, or in the serviceman's kit is a vacuum tube voltmeter. Its uses vary from measuring modulation percentage, to computing gain and hum level of amplifiers.

ALTHOUGH cathode ray oscillographs, signal generators, b.f. oscillators, and a.c. and d.c. meters of every description, make, range, and style abound in the modern experimenter's shack and the up-and-coming service shop, one instrument which is not found in many labs as often as its usefulness warrants is the vacuum tube voltmeter. High cost, low sensitivity and complicated, battery operated designs have been some of the reasons. Eliminating many former defects this v.t. voltmeter is completely a.c. operated, of reasonable high sensitivity and accuracy, and at the same time stable and rugged in operation. The 2-5 so called because of its two stage circuit and five self contained ranges in either circuit employs two type 53 tubes in bridge circuits, one as the voltmeter, the other as a direct coupled d.c. amplifier. By this means, the sensitivity has been boosted to less than ½ volt. Throwing a single switch and re-adjusting the milliammeter to zero, takes the amplifier out of the circuit and connects one section of the 53 as a conventional plate circuit v.t. voltmeter, giving less sensitivity and higher accuracy on high frequency measurements.

Construction of the 2-5 is quite simple. A few points concerning the input circuit will be explained. The parts specified are not critical and good components of the same values can be substituted. Wire wound resistors and paper condensers must be used where specified. The sub-panel brackets were revamped from one standard 2½" by 6" aluminum bracket by cutting it in two lengthwise and filing the two halves where required. The angle bracket for the four plate resistors and the bias resistor was bent up from a piece of scrap metal.

The socket for the voltmeter tube is mounted directly on the range switch in order to obtain the shortest possible leads. This keeps down stray input capacities. The wafer socket is easily mounted by removing the two screws which hold the switch contact plate to the indexing plate. Two 1" bolts, of the same size, with two nuts on each will mount the socket and also hold the switch plate solidly in place. Mount the socket as close to the switch plate as possible without shorting the contacts. It may be necessary to file the holes in the socket ears slightly oblong, as their center distance is slightly different from that of the switch plate.

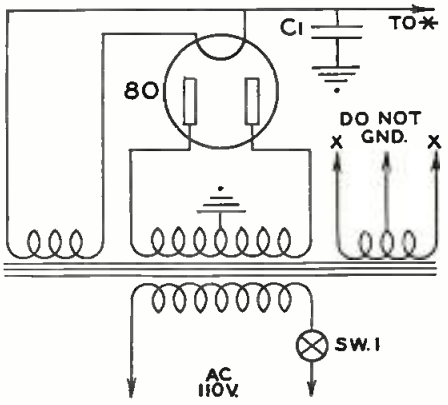
Mount the range resistors around the switch contacts, parallel to the switch shaft, making the leads as short as possible. Note that metallized resistors were used in the original 2-5. Substitution of precision, wire wound resistors is a worth while investment, since the accuracy of the instrument will be much greater. Also, a calibration made on any range will then hold for all the other ranges. However, it is now possible to obtain metallized resistors on special order in high accuracy units, around 2%. If either of the above methods cannot be used, it is possible to use the standard commercial metallized units, and either select them from a large number so that values sufficiently close to the correct ones can be found, or else to make a separate calibration curve for each range. For service work, the commercial units will probably be sufficiently accurate without selection or separate curves.



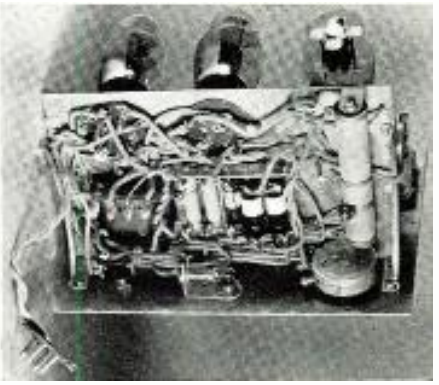
Test circuit used for calibration.

For DC calibration, substitute a 2-6 volt battery for the transformer and use a DC meter.
Connect + side of meter to center terminal of the 2-5, and the — to bottom terminal.
Calibration made as above will be accurate on any frequency, including RF.

After mounting the range resistors, wire the socket to the switch, connecting the switch arm to the grid terminal nearest it. The socket should be mounted so that the filament terminals are at the bottom. Plate cathode and filament leads about 10" long should be soldered to the socket with two shorter leads for connecting the input terminals to the switch unit. Now mount the entire socket unit on the panel and proceed to wire according to the diagram. The filament center tap for the 53's *must not be*

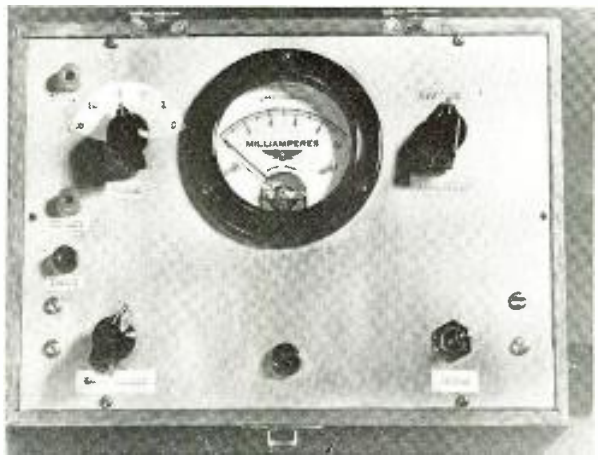


The power supply of the 2-5.



Under chassis view, showing resistor bank.

Vacuum Tube Voltmeter



A 6"x9" hardwood cabinet houses the entire unit.

grounded unless a transformer with separate filament windings for each tube is used. In this case the center taps should be connected to their respective cathodes. Mount the milliammeter last, and leave the leads temporarily disconnected. If a separate 1000 ohm per volt meter is not available for the final adjustment of the v.t. voltmeter, it will be necessary to connect the milliammeter of the 2-5 in series with one watt metallized resistors to make a temporary voltmeter.

The circuit adjustments are made by changing the positions of taps on R1, R2 and R6. These adjustments are important and must be carried out carefully if the meter is to operate at its best and give the sensitivity of which it is capable.

All connections should first be carefully checked with an ohmmeter. Do this with the amplifier switch on both the *off* and *on* positions to make sure that the switch has been properly connected. Tap t4 should be set at about the center of the bleeder, its actual position not being very critical. Place t2 near the high voltage end of the resistor, temporarily. The connection between t2 and the cathode of the voltmeter tube must be broken at some point and the milliammeter connected in series so as to measure the total cathode current of the voltmeter tube. Now, with the amplifier switch on *off* and the amplifier tube out of its socket, short the input circuit (range switch on 0), apply the power and allow ten or fifteen minutes for the voltmeter tube to become thoroughly heated.

Next, carefully adjust the cathode tap, t2, until the milliammeter reads .55 ma. total cathode current. Slightly lower values will give a little better accuracy, but less sensitivity. Higher values only cut down the sensitivity. Replace the milliammeter in its regular position, apply an a.c. input to the meter and check the voltage necessary for full scale. This should be about 4 volts on range 1. The meter is adjusted to zero before applying the input by turning R5. If the zero adjustment of R5 is too critical for easy operation, connect a 1000 ohm, wire wound resistor in series with one of the leads going from the single cell flashlight battery. Attempting to use a tap on the bleeder resistor to supply the bucking-out current for zero adjustment, in place of the battery, will result in greatly decreased accuracy and sensitivity. The life of the battery is practically its shelf life.

Next step is adjustment of the voltmeter with the amplifier in the circuit. Disconnect the milliammeter. Turn the amplifier switch *on*, the range switch on 0, and plug in the amplifier tube. Connect an ammeter with a range of 0-2 ma. or higher in series with the cathode lead of the voltmeter tube (the lead going to t1, with the amplifier *on*). The milliammeter in the 2-5 may be used by connecting a temporary shunt directly across its terminals. Set tap t3 as close to t4 as possible, t1 about in the center of R1. Allow tubes to become thoroughly heated. Now adjust t1 until the cathode meter reads 1.3 ma. total current to the voltmeter tube.

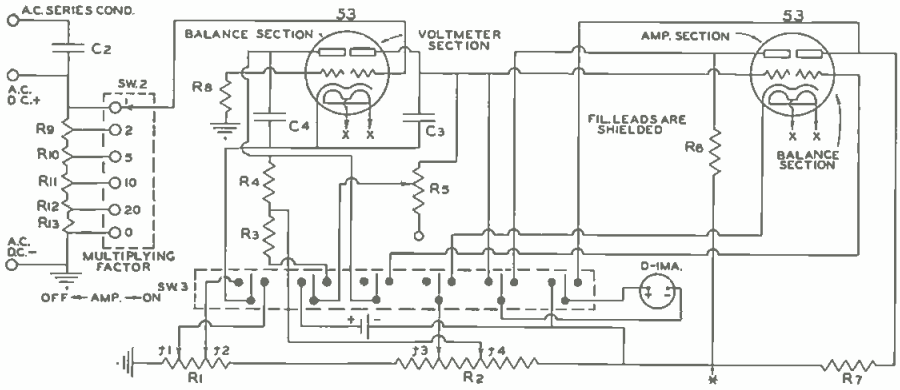
A 1000 ohm per volt meter with a range of 250 volts should then be placed across R4. The reading should be about 45-50 volts. Connect a voltmeter with a range of 100 volts across R7. Then carefully adjust the cathode tap, t3, of the amplifier tube until the meter reads 25 volts. This adjustment is very critical and varies as R5 is turned. Set R5 at about the center of its range whole making the adjustment. Then adjust the end clip on R6 until the milliammeter in its regular position reads zero. This adjustment will also vary with the position of R5, which should again be in about the center of its range.

Tighten all taps thoroughly so that pulling them slightly in any direction will not change the meter reading. This is important, since a loose clip will ruin the calibration curve. The sensitivity with the amplifier *on* may now be checked by applying an a.c. input. Full scale should be reached at ½ volt or less. With the amplifier *off*, if the milliammeter reads backward with a.c. input, reverse the meter connections. Then, if the knob of R5 turns in the opposite direction to the meter needle, change the wire leading to the outside terminal of R5 to the outside lug on the other end of the potentiometer winding. Now, if the meter reads backwards with the amplifier *on*, reverse the leads going to the grids of the amplifier tube. When adjusting R6 for a zero meter reading with the amplifier *on* if sufficient resistance cannot be obtained, reverse the two plate leads from the amplifier tube to the plate resistors.

The meter is calibrated by using an a.c. voltmeter and the filament winding of a power transformer to supply the input voltage, according to the diagram. For service work use, as an output meter, resonance indicator in r.f. circuits, aligning receivers by measuring the a.v.c. voltage, a calibration curve is not essential.

In public address work, the voltmeter is invaluable, since the input to any stage can

(*Continued on page 71*)



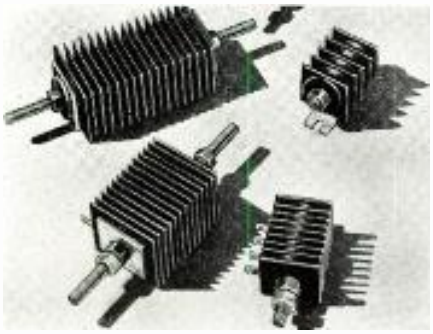
The circuit of the 2-5 Vacuum Tube Voltmeter.

Sw_1—Single gang, shorting type selector switch. Single circuit, six pole. Yaxley 1216L.
Sw_2—SPST toggle switch.
Sw_3—Six pole, double throw switch Yaxley No. 3263J, non shorting type. Set adjustable stop for two position operation.
R_1—1,000 ohm, 10 w. adjustable wire wound
R_2—15,000 ohms, 50 w. adjustable wire wound, Electrad Truvolt.
R_3—90,000 ohm wire wound, 20 w.
R_4—100,000 ohm wire wound, 20 w.
R_5—10,000 ohms, Yaxley universal wire wound volume control, Linear taper.
R_6—10,000 ohms, 10 w. wire wound
R_7—10,000 ohms, 10 w. wire wound
R_8—2 megohms, ½ w. metallized
R_9—1 megohm, ½ w. metallized
R_{10}—600,000 ohms, ½ w. metallized
R_{11}—200,000 ohms, ½ w. metallized
R_{12}—100,000 ohms, ½ w. metallized
R_{13}—100,000 ohms, ½ w. metallized
C_1—8 mfd. 500v. electro (see page 40)
C_2—¼ mfd. 200v. paper
C_3 and C_4—½ or 1 mfd. 400v. paper
0-1 MA milliammeter
Power transformer, 2.5v. @ 4A; 5v. @ 2A; 300-0-300
Aluminum or electraloy panel, size 1-16 by 6½ by 9 inches
Aluminum or electraloy sub-panel, size 1-16 by 5¼ by 8½ inches
Cabinet, ¼ inch hardwood, with a slip hinged cover. Size, inside measurements, 6 by 9 inches by 5¼ inches, in depth. The lid was 6 by 9 by 1½ inches deep.

What's NEW in Radio

Several pickup units for transmitting sound, vibration, impact, heartbeat, and other phenomena into suitable electrical terms that can be observed as pattern on the cathode-ray oscillograph screen, are now available through Allen B. Dumont Labs., Passaic, N. J.

A complete line of dry disc rectifiers for servicemen, amateurs, and experimenters, has been introduced by P. R. Mallory and Co., Indianapolis.



Types are available for outputs from 1 to 20 volts and ½ to 20 amps. A new catalog, R-610, is available on request.

A new heater-cathode type of transmitting tube, RCA-832, containing in one envelope two beam power units, has been announced by the RCA Manufacturing Co. The tube is designed primarily for use as a push-pull r-f power amplifier with maximum ratings at wavelengths as short as 2 meters, and with reduced ratings as wavelengths as short as 1 meter.

Designed for low temperature, the IRC type PR-25 all metal 25-watt rheostat has been placed on the market by the International Resistance Co., Philadelphia. Safe operation at full 25 watts, down to ¼ rotation with a temperature rise of about 160 degrees is due to the heat-dissipating, asbestos insulated, aluminum core. Bulletin sent upon request.

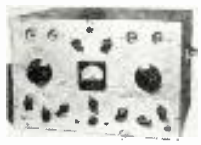
The Bliley Electric Co., Erie, Pa., is now producing a new standard frequency crystal unit (Type SMC100). It is a dual-frequency mounted crystal for use in secondary stages of frequency. It provides a simple means of checking the calibration of receivers, test oscillators, signal generators, amateur frequency monitors and similar devices.

A new high power Genemotor of unusually small size has been developed by the Carter Motor Co., Chicago, Ill. It will deliver up to 500 volts at 200 mils and weighs less than ten pounds.

The Hickok Electrical Instrument Co., Cleveland, announces two new signal generators, models 17 and 18. Both of the models have five output selections—frequency modulated R.F. output, amplitude modulated output, 100-10,000 cycle continuously variable audio frequency output, and 400 cycle fixed audio output. All ranges are controlled by output attenuator. Synchronized horizontal sweep voltage is provided for oscillograph.

A new list of more than fifty dealer and service helps of the finest, most practical kinds, many available without cost and others at extremely low cost, has been announced by the Arcturus Radio Tube Co., Newark, N. J. An attractive four page catalog, listing and describing these helps in detail, is just off the press and will be sent to any dealer or serviceman upon request.

The Rider Chanalyst, a unique new test instrument, designed to minimize the time in locating receiver troubles and to enable the serviceman to conduct tests quickly that heretofore have been impossible with any single test instrument, has been announced by Service Instruments, New York City.



The signal fed into the receiver through the antenna post, can be traced through the r-f, i-f, and a-f channels, thereby making it possible to establish the points where the signal exists—how far it travels through the set, where it becomes weaker, where it becomes distorted or where it takes on hum. The Chanalyst will trace the passage of a signal and detect its presence, without interfering with the receiver's operation.

The Harry Davies Moulding Co., Chicago, Ill., has developed a complete line of stock tuning knobs for both mechanical and electrical tuners. These knobs have patented friction mounting and may be had with recess tops for inserting call letter discs,

or plain tops to be used with escutchion plates. Knobs for mechanical tuners have knurled edges. The company also has a complete line of stock knobs for instruments, meters, rheostats and other equipment.

Anderson Radio Products, Anderson, Ind., are now producing a new line of low loss, low minimum capacity transmitting condensers. Standard sizes are in stock. The condensers incorporate phosphor bronze dust proof contacts, Alsimag 196 insulation, high voltage dual and single.

New additions to their Vitreous Enameled Resistor line have been announced by Utah Radio Products Co., Chicago. These new additions include adjustable types in sizes from 10 to 200 watts dissipation. The standard resistance tolerance on the new resistors is plus or minus five percent.

A revolutionary public address development is offered by Lafayette in its new "Binaural" Third Dimensional Sound Systems. These systems have been designed to emulate the direction-finding, three dimensional effect of the human ear. Complete information is available through Wholesale Radio Service Co., New York City.

The Radio Division of the General Cement Co., Rockford, Ill., announces a line of Radio Chassis Guards, chassis jacks, and radio bench lamps for the serviceman and experimenter.

Radio Engineering Laboratories, Long Island City, N. Y., is now re-entering the field of manufacturing two way radio equipment for police and fire departments and also for aircraft and boats.

Compliments on your splendid new magazine. Hope that your work will make the old ARRL come to life. Think your editorial policy quite fair. Keep it up.

—Howard A. Fast, W6BUZ,
San Francisco, Cal.

(Thank you for your kind letter, W6BUZ. What we need more than anything is cooperation from the ham fraternity. With that the old ARRL will be brought to life by the hams themselves. Ed.)

In your (recent) issue under the title "Pounding Brass on a Pig Boat" you have a very fine story, but unfortunately the picture of the *Bonita* does not have the proper underwriting as the *Bonita* is no longer in active service. She has been placed out of commission about 2 years ago, and now lies at the Navy Yard, Phila. I speak with authority for I am a submarine sailor and helped decommission her.

—Adam E. Gorecki, Ship's Cook 2/c,
U.S.S. *Pompano*, Mare Island, Calif.

(Thank you for the information. We received that picture from the U. S. Navy Dept. in answer to our request for submarine pictures. The navy did not tell us that the BONITA was out of commission, but we suppose that this was in keeping with our government's new policy of not giving out the pictures of the latest ships. Ed.)

Congratulations on your including a section for western short wave listeners in your last issue. It's about time some magazine got around to something like this.

—A. B. Nelson.

(RADIO NEWS will always aim to give its readers the very latest in everything. Ed.)

Keep up the good work on the ARRL. It is very apparent that they need to be brought to their senses. It is only too true that the amateurs will lose their best bands unless they wake up to the fact and start some immediate action. The ARRL could be a powerful organization if it were managed in the right way.

—Edward R. Sherman, Jr.,
North Attleboro, Mass.

(You will find the fight continued on our National QSO page. We sincerely hope that the amateurs will take up the fight and make the ARRL what it ought to be . . . for the ham! Ed.)

I take six radio mags (five now). Here's my reaction to combined July issue. Four Stars—your color cover; Radiopix; Not For Rebroadcast: Letters to the Editor and at least three articles, Radio Lands the Plane, Radio Weatherman, and Chatham Radio Guards the Sea. Three Stars—Within Earshot, Shortwave Time Table, National QSO Page. One Star—Short Wave Flashes.

J. F. Satterthwaite,
Toledo, Ohio.

(Thanks a lot. But we feel badly that we didn't rate 4 stars with our own column. Hi! Ed.)

I am writing to congratulate you on the value of RADIO NEWS. Your magazines are entertaining, being both human and educational and in every way matching up to the standard which the world expects from American publications.

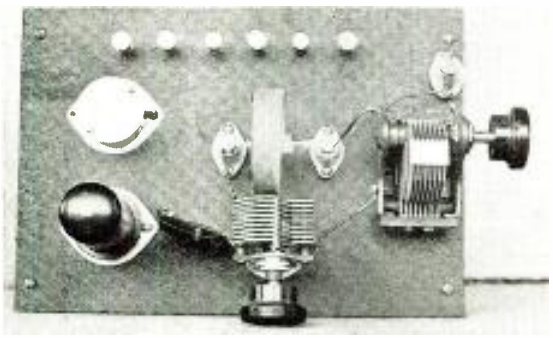
—E. L. M. Brown,
Tunbridge Wells, Kent, England.

(Thank you, Mr. Brown. But you have given us a rather large order to fill. Ed.)

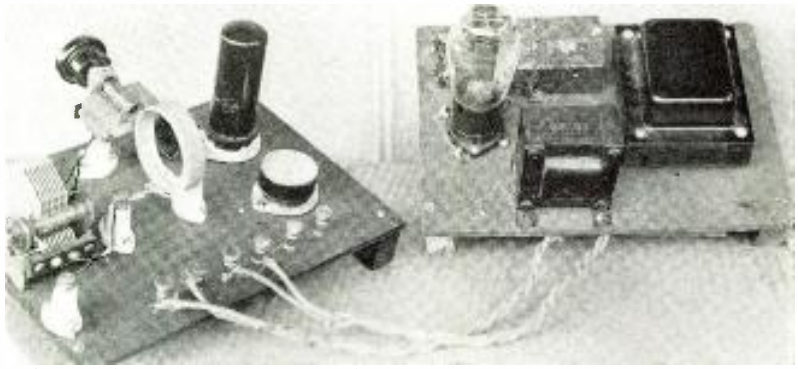
Too often when we are at our keys and mikes do we lose sight of the fact that Radio is a big thing, that it encompasses the most part of the civilized world. Its uses vary from the direction of ships over reefs to the lighting of glassware on some of our better bars. I, for one, am happy that RADIO NEWS brings all of the phases of radio to my door step every month. I am preparing for a career, and want to get into radio. With your fine book at hand, I can see the entire scope of the field and am therefore better able to judge where I shall eventually fit.

T. V. HOLLEY,
Chicago, Ill.

(Thank you, Mr. Holley, for your letter. Ed.)



This simple one tube rig is capable of fine DX.



The complete transmitter connected to its power supply for desk top mounting.

One Tube Transmitter

by STANLEY JOHNSON, W9LBV
Grand Island, Nebraska

For general QRR or standby use and also for the beginner to start into the ham game with, this transmitter is just right.

MANY so-called "beginners" or "low power" transmitters are too expensive for lean pocketbooks. This one tube C. W. transmitter, however, costs no more than a four tube receiver. It is easy to build and, thanks to the efficiency of the type 6L6 "beam power" tube, has an output of twenty watts. As many amateurs know, twenty watts in a good antenna means a range of a thousand miles, with always the chance of greater DX.

The circuit used in the transmitter is a modification of that of the famous Frank C. Jones regenerative oscillator. In this circuit, a built-in antenna coupler has been added, making it easy to tune the transmitter to an antenna without—the use of pick-up coils or external tuning condensers. The transmitter is powered with a power pack made up from inexpensive parts of the type used for replacement in broadcast sets.

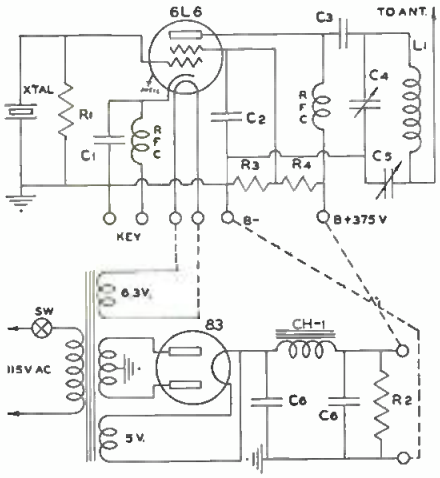
The first step in building the transmitter is to make a "baseboard." This consists of a black crackle finished composition panel (panels of this type are sold under several trade names—they are made of a material similar to "pressed wood" which may be used instead) which is mounted on small wood cleats. Then the two socket holes are cut in the panel with a circle cutter or a coping saw. Drilling the holes for mounting the sockets, insulators, and binding posts completes the work on the panel.

Once the parts are mounted, the next job is wiring. All leads above the panel are made with stiff No. 14 wire. Wiring underneath the panel is done with *solid* hookup wire, preferably of the kind which has "spaghetti" insulation. Arrangement of the parts underneath the panel is not important so long as the various leads are kept short. The parts are small and can be supported by their tinned leads.

The self-supporting coil for the transmitter is homemade. The first step is to wrap a small sheet of celluloid, which may be obtained at a harness or a luggage repair shop, around a cardboard tube so that the ends overlap half an inch or so. Then the coil is wound over the celluloid and "doped" with clear lacquer. When the coil is dry, the cardboard form may be torn out. The ends of the coil are secured with china cement. When this is hard, the coil is trimmed to the proper dimensions with a sharp knife.

The power supply is built up on a pressed wood panel in much the same fashion as is the transmitter. The length of the various leads in the power supply is not important but it is necessary to use good insulation, as there will be considerable "fireworks" if the high voltage leads touch each other.

Check the wiring carefully before connecting the power supply to the transmitter. One wise precaution is to test the filament voltage with a 6.3 volt dial light bulb. The bulb should light brightly when the power supply leads are touched to it. The high voltage leads from the power supply should be "color coded" by twisting a bright colored piece of wire around them so that there will be no danger of connecting the high voltage leads to the "heater" binding posts and burning out the tube by mistake.



The circuit of the one tuber.

R_1—100,000 ohms 1 w.
R_2—20,000 ohms 50 w.
R_3—50,000 ohms 2 w.
R_4—20,000 ohms 10 w.
RFC—2½ mh. RF choke 125 ma.
C_1—.0005 mfd. mica
C_2—.004 mfd. mica
C_3—.002 mfd. mica
C_4—.00014 mfd. variable
C_5—.000365 mfd. variable
L_1—Ten turns of number 16 DCC wire. Inside diameter 2 inches. See text.

Before considering how to tune the transmitter, something should be said about crystals and transmitting antennas. In a transmitter of this type, as much power as possible must be taken from a crystal oscillator, a good crystal is absolutely necessary. The "AT," "low drift," or "LD-2," cuts are recommended. Such a crystal, with holder, may cost almost five dollars—making it the most expensive item in the transmitter. A transmitting crystal which oscillates strongly and will follow keying is an excellent investment, probably seeing years of service in many different transmitters, but a crystal of the "bargain" variety may cause no end of trouble.

The impedance matching system used in the transmitter works best with a single wire antenna. This type of antenna is much easier to erect than the more complicated variety with two wire feeder systems so it has much to recommend it for the beginner. The antenna may be either the "end fed hertz" or the "single wire fed hertz." The first of these is the simplest, consisting of a single wire a half or a full wave length long. For example, an end fed hertz for forty meters consists of a wire 66 feet (one half wave length) or 133 feet (a full wave length) long. The length is measured from the antenna post on the transmitter to the insulator at the far end of the antenna. The antenna may be bent and one end of it brought down for a lead in.

The single wire fed hertz consists of a half wave antenna with a single wire feeder connected a short distance off center. The dimensions for this type of antenna are quite critical and the builder is advised to consult either of the current amateur hand-

(Continued on page 71)

WORLD SHORT WAVE TIME-TABLE

Compiled by the Editors of RADIO NEWS

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

HOURS OF TRANSMISSION

8 9 10 11 M 1 2 3 4 5 6 7

EASTERN STANDARD TIME

Wave-length 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
13.99	DJS	21450	Zeesen, Germany
15.77	HS8PJ	19020	Bangkok, Siam
16.86	GSG	17790	Daventry, England
16.87	W3XAL	17780	Bound Brook, N. J.
16.88	PHI2	17770	Huizen, Holland
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
19.71	PCJ2	15220	Huizen, Holland
19.72	W8XK	15210	Pittsburgh, Pa.
19.74	DJB	15200	Zeesen, Germany
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
20.64	HBJ	14535	Geneva, Switzerland
22.00	SPW	13635	Warsaw, Poland
24.52	TFJ	12235	Reykjavik, Iceland
25.00	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.
25.36	W2XE	11830	New York, N. Y.
25.42	JZJ	11800	Nazaki, Japan
25.42	DJO	11800	Zeesen, Germany
25.45	W1XAL	11790	Boston, Mass.
25.49	DJD	11770	Zeesen, Germany
25.51	OLR4B	11760	Podebrady, Czech.
25.53	GSD	11750	Daventry, England
25.58	CJRX	11720	Winnipeg, Canada
25.60	TPA4	11718	Pontoise, France
25.60	CR7BH	11718	Lourenzo, Marques
25.62	HJ4ABA	11710	Medellin, Colombia
25.63	SBP	11705	Motala, Sweden
25.64	HP5A	11700	Panama, Pana.
26.01	SPD	11535	Warsaw, Poland
26.24	COCX	11435	Havana, Cuba
26.31	HBO	11402	Geneva, Switzerland
26.60	HIN	11280	Trujillo, D. R.
27.17	CSW	11040	Lisbon, Portugal
29.04	ORK	10330	Ruysselede, Belgium
29.35	PSH	10220	Rio de Janeiro, Brazil
30.43	EAQ	9860	Madrid, Spain
30.31	IRF	9830	Rome, Italy
30.81	CSW	9737	Lisbon, Portugal
31.06	LRX	9660	Buenos Aires, Argentina
31.09	YNLF	9650	Managua, Nicaragua
31.09	CS2AA	9650	Lisbon, Portugal
31.10	HH3W	9645	Port-au-Prince, Haiti
31.14	12RO3	9635	Rome, Italy
31.20	HJ1ABP	9616	Cartagena, Colombia
31.25	RAN	9600	Moscow, U.S.S.R.
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.
31.41	W2XAD	9550	Schenectady, N. Y.
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
31.55	GSB	9510	Daventry, England
31.55	HJU	9510	Buenaventura, Colom.
31.55	VK3ME	9510	Melbourne, Australia
31.58	PRF5	9500	Rio de Janeiro, Brazil
31.82	COCH	9428	Havana, Cuba
32.12	OAX4J	9330	Lima, Peru
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.

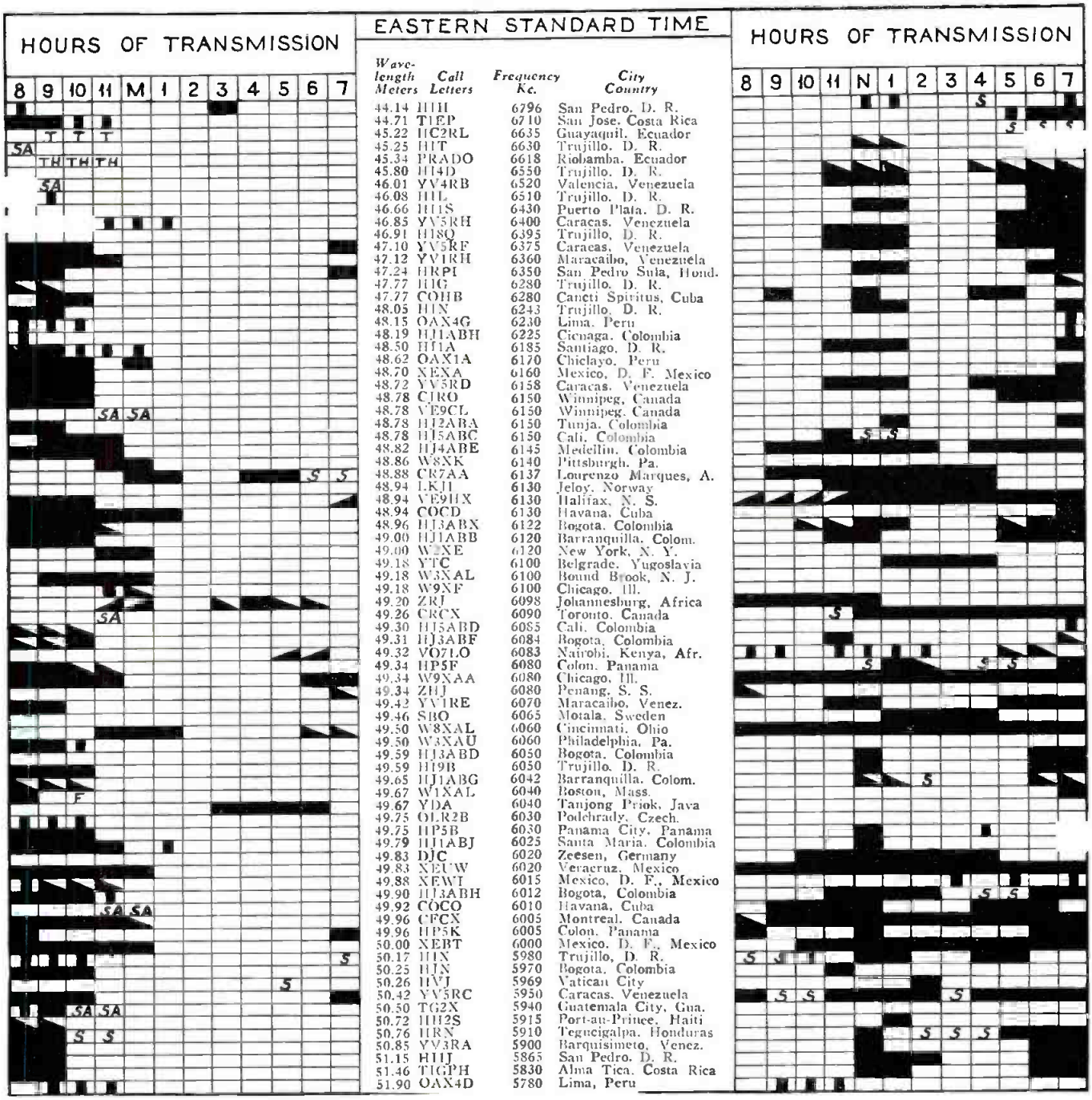
HOURS OF TRANSMISSION

8 9 10 11 N 1 2 3 4 5 6 7

WORLD SHORT WAVE TIME-TABLE

Compiled by the Editors of RADIO NEWS

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



Wave-length Meters	Call Letters	Frequency Kc.	City Country
44.14	HIH	6796	San Pedro, D. R.
44.71	TIEP	6710	San Jose, Costa Rica
45.22	HC2RL	6635	Guayaquil, Ecuador
45.25	HIT	6630	Trujillo, D. R.
45.34	PRADO	6618	Riobamba, Ecuador
45.80	HI4D	6550	Trujillo, D. R.
46.01	YV4RB	6520	Valencia, Venezuela
46.08	HIL	6510	Trujillo, D. R.
46.66	HI1S	6430	Puerto Plata, D. R.
46.85	YV5RH	6400	Caracas, Venezuela
46.91	HI8Q	6395	Trujillo, D. R.
47.10	YV5RF	6375	Caracas, Venezuela
47.12	YV1RH	6360	Maracaibo, Venezuela
47.24	HRPI	6350	San Pedro Sula, Hond.
47.77	HIG	6280	Trujillo, D. R.
47.77	COHB	6280	Canoti Spiritus, Cuba
48.05	HIN	6243	Trujillo, D. R.
48.15	OAX4G	6230	Lima, Peru
48.19	HJ1ABH	6225	Cienaga, Colombia
48.50	HI1A	6185	Santiago, D. R.
48.62	OAX1A	6170	Chiclayo, Peru
48.70	XEXA	6160	Mexico, D. F. Mexico
48.72	YV5RD	6158	Caracas, Venezuela
48.78	CJRO	6150	Winnipeg, Canada
48.78	VE9CL	6150	Winnipeg, Canada
48.78	HJ2ABA	6150	Tunja, Colombia
48.78	HJ5ABC	6150	Cali, Colombia
48.82	HJ4ABE	6145	Medellin, Colombia
48.86	W8XK	6140	Pittsburgh, Pa.
48.88	CR7AA	6137	Lourenzo Marques, A.
48.94	LKJI	6130	Jeloy, Norway
48.94	VE9HX	6130	Halifax, N. S.
48.94	COCD	6130	Havana, Cuba
48.96	HJ3ABX	6122	Bogota, Colombia
49.00	HJ1ABB	6120	Barranquilla, Colom.
49.00	W2XE	6120	New York, N. Y.
49.18	YTC	6100	Belgrade, Yugoslavia
49.18	W3XAL	6100	Bound Brook, N. J.
49.18	W9XF	6100	Chicago, Ill.
49.20	ZRJ	6098	Johannesburg, Africa
49.26	CRCX	6090	Toronto, Canada
49.30	HJ5ABD	6085	Cali, Colombia
49.31	HJ3ABF	6084	Bogota, Colombia
49.32	VQ7LO	6083	Nairobi, Kenya, Afr.
49.34	HP5F	6080	Colon, Panama
49.34	W9XAA	6080	Chicago, Ill.
49.34	ZHJ	6080	Penang, S. S.
49.42	YV1RE	6070	Maracaibo, Venez.
49.46	SBO	6065	Motala, Sweden
49.50	W8XAL	6060	Cincinnati, Ohio
49.50	W3XAU	6060	Philadelphia, Pa.
49.59	HJ3ABD	6050	Bogota, Colombia
49.59	HI9B	6050	Trujillo, D. R.
49.65	HJ1ABG	6042	Barranquilla, Colom.
49.67	W1XAL	6040	Boston, Mass.
49.67	YDA	6040	Tanjong Priok, Java
49.75	OLR2B	6030	Podebrady, Czech.
49.75	HP5B	6030	Panama City, Panama
49.79	HJ1ABJ	6025	Santa Maria, Colombia
49.83	DJC	6020	Zeesen, Germany
49.83	XEUW	6020	Veracruz, Mexico
49.88	XEWI	6015	Mexico, D. F., Mexico
49.90	HJ3ABH	6012	Bogota, Colombia
49.92	COCO	6010	Havana, Cuba
49.96	CFCX	6005	Montreal, Canada
49.96	HP5K	6005	Colon, Panama
50.00	XEBT	6000	Mexico, D. F., Mexico
50.17	HIX	5980	Trujillo, D. R.
50.25	HJN	5970	Bogota, Colombia
50.26	HVJ	5969	Vatican City
50.42	YV5RC	5950	Caracas, Venezuela
50.50	TG2X	5940	Guatemala City, Gua.
50.72	HH2S	5915	Port-au-Prince, Haiti
50.76	HRN	5910	Tegucigalpa, Honduras
50.85	YV3RA	5900	Barquisimeto, Venez.
51.15	HIIJ	5865	San Pedro, D. R.
51.46	TIGPH	5830	Alma Tica, Costa Rica
51.90	OAX4D	5780	Lima, Peru

LIST OF SYMBOLS

S—Sunday

M—Monday

T—Tuesday

W—Wednesday

Th—Thursday

F—Friday

SA—Saturday

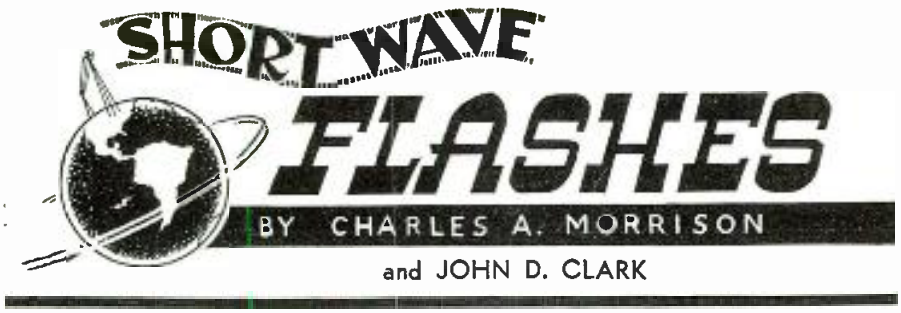
SS—Saturday, Sunday

—Daily

—Irregular

—Daily Except Sunday

—Daily Except Saturday, Sunday



EACH month this department features flashes from the world of short wave, setting forth the very latest news concerning new stations, changes in frequency, schedule, and outstanding DX broadcasts. This is information that has been received after the issue has gone to press.

In order to give complete and useful information, two authorities on short wave conduct this column. Charles A. Morrison supplies information of interest to readers everywhere in his section entitled *Short Wave Flashes — General.* All frequencies in Mr. Morrison's column are in *megacycles* and all time is *Eastern Standard Time.*

John D. Clark conducts his column specifically for short wave listeners residing on the Pacific Coast, where reception differs considerably from the rest of the United States east of the Rockies. Mr. Clark's data is based on reports from listeners in all parts of the Pacific Coast area. In this section of *Short Wave Flashes* entitled *Short Waves for West Coast DX'ers,* all frequencies are also given in *megacycles* but all time is *Pacific Standard Time,* for the West Coast short wave listeners.

SHORT WAVE FLASHES—GENERAL

by CHARLES A. MORRISON

(All Times are EASTERN STANDARD)

Program from Floating Broadcasting Station

DATE: Thursday, September 1, from 2:15 a.m. to 2:45 a.m. EST . . . . STATION: 9MI (6.01) abroad the M/V *Kanimbla,* enroute from Sydney, to Freemantle, Australia.

Norsk Fransk Polar Ekspedisjon, 1938

Roy DeMent, of Plainview, Texas, writes that Jess Tillier, radio operator for the Norsk Fransk Polar Ekspedisjon, which will gather meteorological data in the Far North, left Madison, Wisconsin, early in July for the long boat trip to Danmarkshavn, North East Greenland, from which point the expedition will proceed as far north by boat as the ice permits and eventually establish the main-base camp, and base-camp radio station at Ingolfs-fjord (80° 30' N and 17° W).

An advance camp will be established on the edge of Peary Land at about 82° N and 29° W. These camps will use short-wave radio for intercommunication as well as contact with the outside world. Schedules will be kept at 2:00 a.m. and 8:00 a.m. and 2:00 p.m. and 8 p.m. Reception reports can be sent to Willy Knutsen Og Comte Gaston Micard, Svalbardkontoret, Oslo, Norway.

New Short-Wave Stations
(On the Air)

CHINA—XGJ (11.68), *Hankow,* announcing as the "Official Voice of China," broadcasts war news in German, French and English, daily from 7:00 to 7:30 a.m. Send reports to P. O. Box 90, Hankow . . .

FINLAND—OFE (11.78), *Lahti,* operates daily from 3:05 a.m. to 1:05 p.m. and OFD (9.5), *Lahti,* operates daily from 1:15 to 6:00 p.m. (Another transmitter to operate on 15.19, and 17.8, will be inaugurated in October). Station is announced as "Lahti, Suomi" and also in English every hour. Send all reports to the Finnish Broadcasting Company, Helsinki, Finland.

INDIA—VUE3 (15.16), *Delhi,* comes on air nightly at 8:30 p.m., with chimes, followed by a clock striking seven times (a.m. in Delhi). The opening announcement is "Good morning everybody. This is All-India Radio calling you from Delhi." Hindustani musical selections and songs follow and the news in English is given at 10:15 p.m. The signal is very strong at the start but fades rapidly after 9:30 p.m.

SWITZERLAND—Eugene Reinhard of Locust, New Jersey, writes that the new Swiss Government Station is radiating test programs nightly, for South America, from 6:45 to 7:45 p.m. on 15.36, and for North America, from 8:00 to 9:00 p.m. on 11.865. Reports should be sent to Schweizerische Telegraph Verwaltung, Berne.

VENEZUELA — YV4RA (5.81), first heard testing on June 22nd, announced as "Radio Valencia" in Spanish, French and English, and requested reports.

(Under Construction)

ALASKA — Catholic Society of Alaska, Holy Cross, has been granted a construction permit for a transmitter to operate on a frequency of 5.137 megs, between 9:00 a.m. and 9:00 p.m. with a power of 20 watts, and on a frequency of 3.092, with a power of 16 watts.

FRANCE—Near the end of the year, the first broadcasts will be made from the new 100 to 200 kw government short-wave transmitter now under construction at *Essarts-le-Roi,* near Paris.

GREECE—A 10 kw short-wave transmitter is being constructed near *Athens.*

INDIA—New short-wave transmitters now under construction at *Calcutta, Madras,* and an additional one at *Delhi,* will soon be in operation.

ITALY—By the end of the year, the new short-wave center, which will include two new 100 kw transmitters, a new 50 kw transmitter, and increase in power from 25 to 40 kw for the present two transmitters, will be completed. In the meantime, two 2 kw experimental transmitters, which operate irregularly, as 2R06 on 17.82, and 2R05 on 15.3, are being used for test purposes.

TRIPOLITANIA—A new transmitter now being constructed in the *Zanzur* oasis, will be completed soon, and is to be officially inaugurated on October 28, 1938.

Notes of Interest

BRITISH GUIANA — The British Guiana United Broadcasting Company, Ltd., has acquired control of short-wave stations VP3BG and VP3MR. Charles E. Kellman, former manager of VP3BG, has been appointed director of the new company.

CHILE—The unidentified *Santiago* station, which August Balbi of Los Angeles, Calif., is hearing on 11.85, daily from 7:00 to 10:30 p.m. may be CB1185, the new station which was reported in this column as under construction, some time ago.

COLOMBIA—HJU (9.51) *Buenaventura,* has either gone off the air or is broadcasting very irregularly.

COSTA RICA—Neither TIEP, nor TIRCC, of *San Jose,* verify direct reception reports anymore.

CUBA — Simultaneously with the increase in power of broadcast station CMQ of *Havana* to 50 kw, short-wave station COCQ (9.725), will go to 5 kw power.

DENMARK—OZF (9.52), *Skamlebak,* has been heard testing and signing-off near 7:20 a.m. several times of late. OZH (15.165), was heard on Sunday, June 19th, from 12:20 to 1:30 p.m. at which time the station left the air.

DOMINICAN REPUBLIC—H14D and HI8Q of *Trujillo City,* and HI8J of *Las Vegas,* are all believed to be off the air.

ENGLAND—GSE (11.86), is being used for experimental tests to Australia in the early mornings. If these prove satisfactory the station will be placed on a regular schedule basis.

FRANCE—TPB12 (9.55) of *Paris,* is now radiating the 1:00 to 4:00 a.m. broadcast formerly radiated by TPB11 (9.57).

GUATEMALA—TG25 (5.713), is the portable call for TGS of *Guatemala City.*

HAWAII—KHE (17.95) of *Kahuku,* may often be heard in the afternoons and evenings making modulation tests with native Hawaiian recordings.

JAPAN—Japanese baseball games may be heard over JVH (14.6) of *Nazaki,* almost every Sunday morning to 1:00 a.m. or later.

JAVA — YDB (15.3) of *Socrabaia,* is being heard nightly from 12:30 to 2:00 a.m. on the Pacific coast. The "Hier is de NIROM of Batavia" serves as a positive identification.

KENYA COLONY—VQ7LO of *Nairobi,* was heard by Roger Legge of Philadelphia, Penna., at 9:00 p.m., on an announced frequency of 10.73, while broadcasting a program of native music for the NBC. The operator gave the call as "VQ7LO—telephone call VQG" . . .

MANCHOUKUO — John DeMyer of Lansing, Michigan, one of the first North American dx'ers to receive a verification of TDE (10.065), direct from *Hsinking,* reports that he also received eight very modernistic and highly colored scenic postal cards, picturing the radio stations in Hsinking, Mukden, Harbin and Dairen—each decorated with red and green ribbons.

NORWAY—The Jeloy short-wave station, operating daily on 9.526, is now using the call LKC.

PERU—"Radio Rancho Grande" (12), *Trujillo,* seems to have gone off the air.

PORTUGAL—CSW (9.74), *Lisbon,* heard until 10:00 p.m. some days, is operating irregularly at present.

SOUTH AFRICA — ZRH (6.007), is coming through quite well these days on the daily 11:45 p.m. to 12:45 a.m. schedule.

STRAITS SETTLEMENT—ZHJ, *Penang,* operating on 6.057, is being heard remarkably well in California, daily except Sundays from 6:40 to 8:40 a.m. Ashley Walcott of San Francisco, states that *Singapore* stations ZHO and ZHP are apparently not operating regularly. ZHP (9.53), was heard testing once or twice near 9:30 a.m. but ZHO (6.012) has not been heard at all.

SWITZERLAND — HBO (11.402), and HBL (9.345), have been conducting tests with Mexico, frequently near 11:30 p.m.

U. S. A.—The following stations of Aeronautical Radio, Inc., have been granted permission to operate provisionally on 12.165: KEU, *Burbank, Calif.;* WUCG, *Chicago:* WNAO, *Newark, N. J.;* KFO, *Oakland, Calif.;* KVO, *Portland, Ore.,* and KQD, *Salt Lake City.*

Transmissions of Interest

Daily—12:45 to 1:45 p.m., program by the Palma de Oro Marimba Band, over TGWA (15.17), *GUATEMALA CITY, GUATEMALA;* 8:30 to 9:00 p.m., latest musical hits and jokes in English, conducted by George Williams, over HP5J (9.604), *PANAMA CITY, PANAMA;* 10:00 to 11:00 p.m., *National Hour of Guatemala,* over TGWA (9.685), TG2 (6.21), TG2X (5.94) and TGQA (6.4)

Sundays—12 midnight to 12:30 a.m., "Hawaii Calls," over KQH (14.92) or KHE (17.95) of *KAHUKU, HAWAII;* 7:30 to 9:00 p.m., Lewisohn Stadium Concerts, over W2XE (11.83) of *NEW YORK CITY.*

Tuesdays—6:30 to 7:00 p.m., variety programs in Spanish and Portuguese for Latin listeners, conducted by Laura Suarez, over W3XAL (17.78) of *BOUNDBROOK, NEW JERSEY.*

Revised Schedules

AUSTRALIA—VK2ME (9.59), *Sydney,* Sundays, 12 midnight to 2:00 a.m., 4:30 to 8:30 a.m., and 10:30 a.m. to 12:30 p.m.

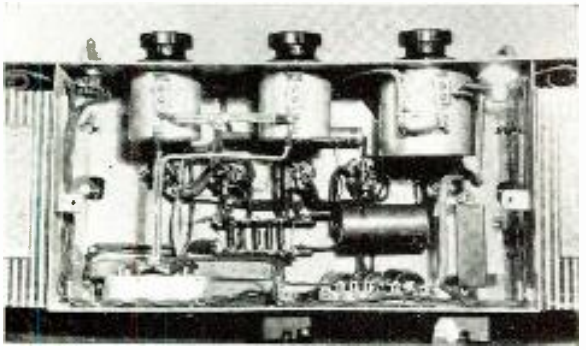
BRITISH HONDURAS—ZIK2 (10.6), *Belize,* Tuesdays, Thursdays and Saturdays 1:30 to 1:45 p.m., and 8:30 to 8:45 p.m.

ENGLAND—GSG (17.79), 12 mid. to 2:15 a.m., 5:45 to 8:50 a.m., 9 a.m. to noon, 12:20 p.m. to 6:00 p.m., 6:20 p.m. to 8:30 p.m.

HOLLAND—PHI2 (17.77), *Huizen,* weekdays 7:25 to 9:30 a.m. and Sundays 6:25 to 9:30 a.m.; PCJ2 (15.22), *Huizen,* Tuesdays 12:30 to 2:00 a.m. and Wednesdays 9:30 to 11:30 a.m.; PCJ (9.59), *Huizen,* Sundays, 2:00 to 3:00 p.m.; (alternate Sundays), 1:25 to 1:40 p.m.; 7:00 to 8:00 p.m. and 8:25 to 9:25 p.m.; Tuesdays 1:45 to 2:00 p.m., 2:10 to 3:40 p.m. and 7:00 to 10:30 p.m.; Wednesdays 7:00 to 9:00 p. m.

U. S. A.—W1XK (9.57), *Boston, Mass.,* daily 5:00 a.m. to midnight; W3XAL, *Boundbrook, New Jersey,* daily, on 17.78, 8:00 a.m. to 4:00 p.m. to Europe, and 4:00 p.m. to 8:00 p.m. to Latin America; on 6.1, 8:00 p.m. to midnight, to Latin

(Continued on page 59)



Under chassis view shows professional wiring job.

A Practical Remote Amplifier

by ROBERT W. CARLSON
Buffalo, N. Y.

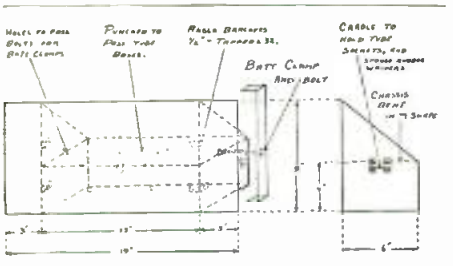
Many a small broadcast station could use a remote amplifier described by the author. Any serviceman or ham can build it.

THE radio station where a great number of outside pick-ups form a large part of the daily operations schedule, must be equipped with not only a sufficient quantity, but also quality type, of amplifiers. Commercial amplifiers meet practically every demand of a broadcaster, however to be equipped with an adequate number is rather costly. The amplifiers illustrated and described here have given faultless service at WBNY for over one year.

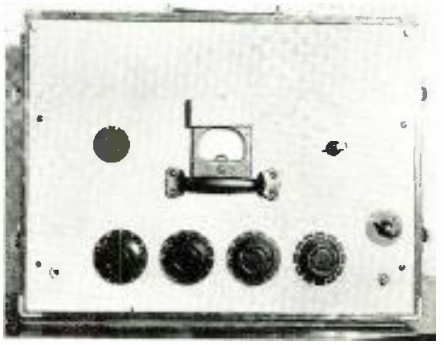
The circuit shown was used in the amplifier illustrated here. The first two stages using 6J7's as pentodes with a 6F6 working as a triode in the output. The input channels are 250 ohms and the output is 500 ohms working into a 5 DB pad to cut down line reflection. The main gain varies in steps of 2 DB from 0 P to 40 DB. The volume indicator can be attenuated from minus 10 DB to plus 6 DB, also in 2 DB steps. The frequency response is plus or minus 1 DB from 40 to 10,000 cycles. The overall gain including mixers and output pad is about 105 DB. The hum level is down 50 DB at zero level, loaded. The filament drain is .9 amps and the B battery drain is 25 mils.

The front panel and chassis is constructed from 14 and 16 gauge aluminum, resp. The front panel is cut 19" long and 9" high. The chassis is bent from one piece as shown in Fig. 4, the top of chassis is 6" and bent down for 4". The sides of chassis are then cut in the shape shown in sketch, being 6" wide with the sides parallel to 4" and tapered to the 9" mark to fit behind the front panel. All these parts are then fastened together with angle brackets. As shown in sketch, 8 such angle brackets will be necessary. Ready made ½" tapped 6-32 brackets will solve this problem perfectly.

Obviously it is much easier to drill all necessary holes in panel and chassis as shown in sketch and then assemble the parts. After chassis has been assembled the tube sockets are mounted in a piece of



Construction details of chassis.



Front panel controls enable easy operation.

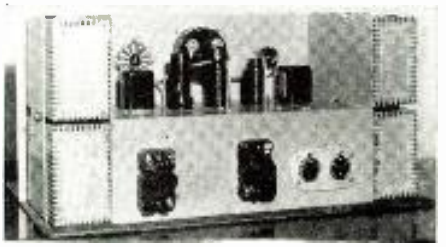
aluminum 2" wide and 6" long, which can be cut from the waste from the chassis. This cradle like element is then fastened to chassis directly below the holes cut in chassis to allow tubes to pass. The cradle is mounted with 1" 6-32 machine screws which are inserted in sponge rubber washers on either side of the cradle and on the top of the chassis.

The tubes will then be free from mechanical jars that may cause undesirable microphonics in the first stages. With the transformers mounted in positions shown in Fig. 3, the microphone receptacle and battery plugs are mounted on the back of chassis as also shown in same picture.

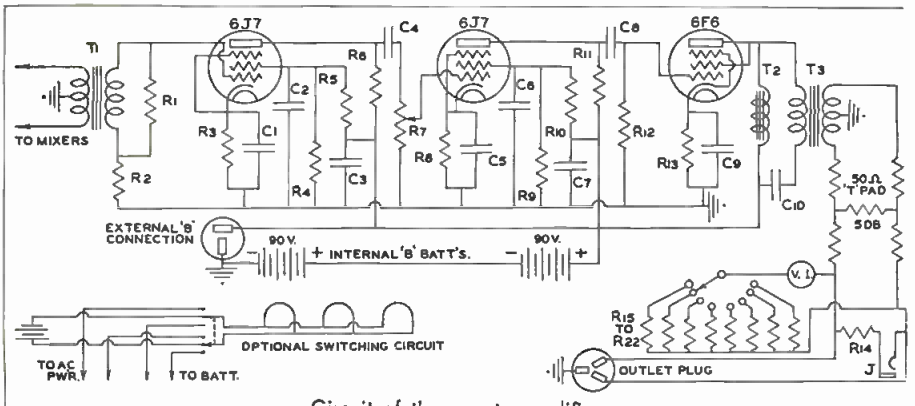
Wiring is conventional, with care taken to shield all the grid leads and the plate leads from the coupling condenser. The placement of the parts in the under chassis is largely a matter of choice, keeping in mind that the shorter the leads the less trouble to be encountered.

After wiring has been completed the gains can be mounted and connected to proper channels, running temporary battery leads the amplifier can be checked for operation with a pair of phones. Now that everything is OK the batteries can be mounted on either side by the use of a large U clamp made from a piece of the 14 gauge aluminum or, if you are more ambitious, a piece of iron. It is drilled to pass a 10-32 machine screw and with batteries in position it can be fastened to side of amplifier. The amplifier can then be checked with an open microphone in the circuit and the output compared to other

(*Continued on page 69*)



Rear view shows ease of servicing the unit.



Circuit of the remote amplifier.

C_1—20 mfd. 25v.
C_2—10 mfd. 50v.
C_3—8 mfd. 200v.
C_4—.1 mfd. 400v.
C_5—20 mfd. 25v.
C_6—10 mfd. 50v.
C_7—8 mfd. 200v.
C_8—.1 mfd. 400v.
C_9—20 mfd. 25v.
C_{10}—1 mfd. 400v.

R_1—.5 meg.
R_2—.5 meg.
R_3—1250 ohms
R_4—10,000 ohms
R_5—50,000 ohms
R_6—.25 meg.
R_7—.5 meg. Pot.
R_8—2,000 ohms
R_9—10,000 ohms
R_{10}—50,000 ohms

R_{11}—.25 meg.
R_{12}—.25 meg.
R_{13}—1,000 ohms
R_{14}—2,000 ohms

All Weston Precision wire wound

R_{15}—410 ohms
R_{16}—515 ohms
R_{17}—649 ohms
R_{18}—817 ohms
R_{19}—1,028 ohms
R_{20}—1,249 ohms
R_{21}—1,630 ohms
R_{22}—2,052 ohms
T_1—UTC A-10
T_2—3,000 ohm choke
T_3—UTC A-24

QUESTIONS and ANSWERS

E. E., New York City, N. Y.: Recently I had a peculiar echo effect on a program tuned in from a distant station. Please explain the reason for this condition.

Answer: An echo effect of a DX program is not uncommon and is explained by the fact that the same program or signal arrives at your set by two different routes. The longer route or distance that the signal has to travel is the repeat or echo. The signal would have to come from a far distant station to produce a noticeable echo effect.

J. D., Scarsdale, N. Y.: I am having considerable difficulty with radio interference. I have checked all outlets, lamps, antennas and other possible sources for the trouble but cannot locate it. The trouble seems to be confined to myself and my next door neighbor. What would you advise.

Answer: Consult a radio serviceman, preferably one that specializes on the elimination of radio interference. As there are 1001 different kinds of radio interference it is really a separate service study and you will find by inquiry that some radio repairmen are specially equipped for this type of work. Another suggestion is to write your local power company. They generally have trained men to run down man made static.

P. A. P., Detroit, Mich.: Please outline a quick and easy way to determine if field current is being supplied to the speaker.

Answer: Turn on the set and hold a screwdriver about ¼" from the pole piece of magnet (small disc in center of cone) if current is present the pole piece will have strong attracting force for the screwdriver. If there is no attraction the field coil or leads to it may be open, grounded or short-circuited.

R. D. D., Fort Wayne, Ind.: I have just built a simple power supply with a two sections choke and condenser filter. The plates of the rectifier tube get red hot. What's wrong?

Answer: You letter would indicate that you have localized your trouble to the power unit. Check the filter condensers you will undoubtedly find one of them defective and short-circuited.

R. C. D., Rochester, N. Y.: I recently moved, and in my new location I am having considerable trouble with fading and sudden changes in volume. Switching lights or electrical appliances on-or-off will cause the volume to pop-up with a big increase in volume and at other times fade out so that the program is almost inaudible. For the antenna, I am using a light socket aerial eliminator. Tubes are all O.K.

Answer: There are a number of conditions that could be responsible for your trouble. It would appear, however, from your notes that your type of antenna is at fault. Using the light lines in this way, for an aerial, its effective length can vary and cause erratic reception. Change to a good outdoor aerial.

C. F., Oklahoma City, Okla.: In some sound installations, horns are used in conjunction with the regular dynamic type speaker. What is the purpose of this?

Answer: Outdoor public-address systems usually employ this type of reproducer. It is directional and provides better carrying power.

P. S. C., Bridgeport, Conn.: A friend of mine tells me that anyone can operate a transceiver in the 5-meter amateur band without the necessity of having any kind of a Government license. I understand that a license is required to operate any kind of a transmitter, on any band. Which is correct?

Answer: You are correct and your friend is decidedly wrong. The U. S. Government requires not only that every transmitter be duly licensed but that it can be "on the air" only when operated by, or under the personal supervision of, a holder of an operator's license. Any attempt to operate any kind of a radio transmitter without both a station and operator's licenses makes a person subject to a heavy fine and imprisonment.

C. D., New York City, N. Y.: There are no markings to determine the positive or negative terminals on my storage battery. Can you help?

Answer: Corrosion usually forms to a greater extent on the positive terminal, also, in the majority of cases the larger post is the terminal and of course if you have a d.c. voltmeter at hand measure the voltage and with the plus side of the meter connected correctly to the positive terminal of the battery is the only way to obtain a reading.

M. F., Philadelphia, Pa.: I would appreciate advice on where I can obtain a complete list of the Broadcast stations in the United States listed by both frequency and wavelength.

Answer: The U. S. Broadcast list arranged in the manner you desire is contained on page 542 of the March, 1938, issue of Radio News.

T. A. M., Detroit, Mich.: I am going to Europe this summer and would like to visit the World Radio Convention. In what country is the convention to be held and what month?

Answer: You are too late—the 1938 World Radio Convention was held in Australia during the month of April.

T. R. J., Brownsville, Texas: I have a radio of the small console type, Could I improve the quality of reproduction by taking the loudspeaker out of the console and placing it on a large baffle.

Answer: If it is a modern receiver of standard make you will probably gain nothing by such a move. The reason is that today, manufacturers are matching loudspeakers to the cabinets.

TECHNICAL BOOK & BULLETIN REVIEW

RADIO, A STUDY OF FIRST PRINCIPLES, Third Edition, by E. E. Burns, 293 pages, size 6 x 8. Published by D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York City.

The aim of this new book is to present the fundamentals of radio in the clearest and simplest explanatory manner in order to give the beginner in radio a mental picture of the action that goes on in the various parts of a radio circuit. It is intended for schools, evening classes and home study and there is considerable material for the advanced worker who wishes to review the principles of radio. There are chapters on television including an explanation of the cathode-ray tube, the iconoscope, and the kinescope, covering the latest method of television transmission and reception. There is a suggested course of study with circuits for actual experiment and the book is so arranged that the student can carry forward his construction and experimental work parallel with his study of radio theory.

HANDBOOK OF AMATEUR TUBE USES, by Raytheon Engineering Staff, 72 pages, size 8½ x 11. Price 50 cents. Published by Raytheon Production Corporation, 445 Lake Shore Drive, Chicago, Illinois.

Here is a large size handbook for the amateur with special treatment on the numerous problems associated with the proper design of the modern transmitter. The information in the book permits the "Ham" to select the correct tubes for his requirements and to employ them to the best advantage. The manual lists a complete line of tubes with characteristics for every amateur requirement, also included are curves and graphs, etc. A feature of the book is the temperature color chart or color scale for comparing plate operating temperatures.

RADIO SERVICE GUIDE, 32 pages. Price 15 cents, size 8½ x 11. Published by Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Illinois.

This new manual, especially prepared for the serviceman, includes many helpful constructional articles, charts, and service codes. Details are given for building a low-cost oscilloscope, a 10-watt high-fidelity amplifier, a chapter on profit or loss, how to use meters, inventory hints, and other valuable subjects.

RCA MANUFACTURING CO., INC. Radiotron Division, Harrison, New Jersey.

Two new publications have just been announced, namely, the *RCA Receiving Tube Characteristics Chart No. 1275B* and the *RCA Air-Cooled Transmitting Tubes No. TT-100.* The first one, on receiving tubes, presented in booklet form for convenience, contains operating specifications on all glass, glass-octal and metal type tubes. The booklet on transmitting tubes, classifies types according to triodes, tetrodes, pentodes, rectifiers and miscellaneous

(*Continued on page* 61)

Constructing A Wired Wireless

by GUY FOREST
Bradentown, Florida

A simple call system using signals transmitted over the regular house lighting wires, is a unit which should appeal to every serviceman who has had a call for such an installation.

The unit is compact and efficient.

WIRED wireless is the name given to radio transmission, not as it usually takes place through the air, but over a wire or pair of wires connecting the sending and receiving terminals. The beauty of the system is that existing wires, already erected and in use for other purposes, can be adapted. The expense of constructing and maintaining a separate line is unnecessary. Electric-light wires, telephone or telegraph wires, high-tension lines, and so on, can be utilized to carry the radio waves without in any way interfering with their regular use. Another name often applied to wired wireless is carrier current—the idea being that the communication "hitches a ride" on the wires between transmitter and receiver, using radio as a carrier.

The outfit described here is wired wireless boiled down to its simplest terms in the way of apparatus. All the installation necessary is to plug the sender into the light socket, and the receiver into another socket. The range is several thousand feet separation between sender and receiver. The circuit is laid out for communication by voice, or telephony, and also by key, or telegraphy. Either method may be worked interchangeably with the other, so that the layout is ideal for code practice. No license is required since the transmissions are not put into an antenna and radiated.

The assembly consists of a sending end and a receiving end. The former incorporates a 6D6 oscillator with suppressor modulation directly from a single-button carbon microphone; and an associated power unit with a 1-v. rectifier. A similar power unit is fitted into the receiving end layout, where a 6F7 dual-purpose tube functions as a regenerative detector and one-step audio. As thus described, the assembly gives one-way telephone or telegraph connection between points. To make it two-way, it is necessary only to build the sending unit and the receiving unit in duplicate, and install one each alongside the respective power units. On the power units terminals are already laid for such operation.

Referring to the circuit diagrams, it will be seen that the power unit supplying the receiver has a resistance, R2, in the filter. If the layout is constructed for two-way, so that this power unit drives both a receiver and a transmitter, *R2 must be replaced by a filter choke, L1.*

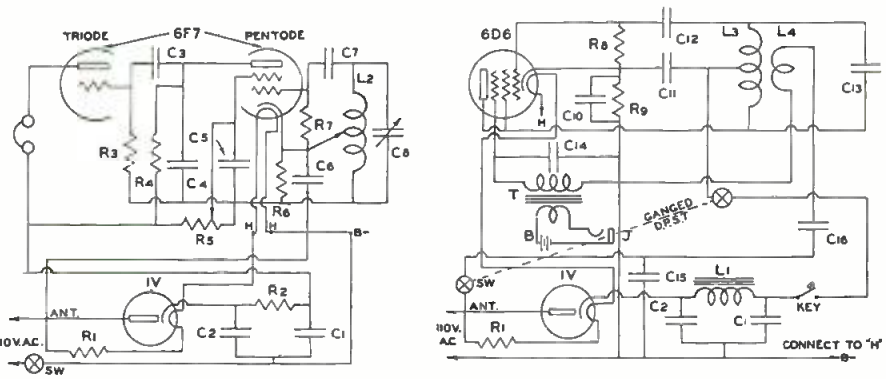
In the sending unit a 6D6 tube is wired into a unique oscillator circuit, which permits the oscillator itself to be deeply modulated with very simple audio equipment. An extra tube for modulator or amplifier is unnecessary. A single-button carbon microphone plugs into the jack, J, in series with the flashlight-cell microphone battery and the primary of the microphone transformer, T. The secondary of T connects to the suppressor of the 6D6.

The oscillator works on about 390 kilocycles, determined by the inductance coil, L3, and the fixed mica condenser, C13. The output of the oscillator is coupled to the line by means of the coil L4 and the condensers C15 and C16. As much of the oscillating circuit as possible is mounted within the coil shield, as shown by the dotted lines on the diagram. The toggle switch, Sw, and the jack J for the microphone mount in holes through a small ¼-in. thick wood panel on the sending unit. When transmitting the DPST toggle switch is snapped ON; and when listening, with it OFF, the B+ voltage and the power-line coupling are cut from the sending unit.

Details for all of the coils are given in the table.

On the receiver the coupling from the line comes from the fixed condenser C9. It, with the portion of the coil included, peaks the pickup approximately to the working frequency. The .00035-mfd. variable condenser, C8, is the tuning control and the potentiometer, R5, is the regeneration control. These two items mount on a 3¼ by 6-in. wooden panel fastened to the front of the unit. The tuning coil L2, the bypass condenser C5, and the grid leak and condenser mount above the baseboard. The other parts are below. The pentode section of the 6F7 operates as the regenerative detector, with screen-voltage control. The output of the pentode is resistance-coupled to the grid of the triode section. It should be noted that the grid leak for the detector goes directly to the cathode, while the grid return for the triode amplifier arrives at the cathode through the bias resistor, R6.

The photographs give an idea as to the placement of the parts, and of details not



The circuit of the transmitter and receiver units.

R_1—330 ohm, .3 amp. line cord
R_2—30,000 ohm 1 w
R_3—1 megohm ½ w
R_4—250,000 ohm ½ w
R_5—250,000 ohm potentiometer
R_6—2,000 ohm 1 w
R_7—1 megohm ½ w
C_1, C_2—8-8 mfd. 200 v. electro.
C_3—.01 mfd. 400 v. paper
C_4—.00025 mfd. mica
C_5—.25 mfd. 400 v. paper
C_6—10 mfd. 25 v. electro.
C_7—.00025 mfd. mica
C_8—.00035 mfd. vari.
C_9—.01 mfd. 400 v. paper
L_2—Receiver tuning coil, 500 T, No. 32 E.W., tapped 20 turns from bottom, on 2-in. diameter by 5-in. long insulating tubing.
L_3—Transmitter tuning coil, 250 turns No. 32 enamel wire, tapped at center, on 1¼-in. diameter by 3¼-in long insulating tubing. Mounted inside shield can.
L_4—Transmitter coupling coil, 13 turns No. 32 enamel wire, wound on 2 layers of paper at center of L3
R_1—330 ohm .3 amp.
R_8—10,000 ohm 1 w
R_9—1,000 ohm 1 w
C_{10}—10 mfd. 25 v. electro.
C_{11}—.05 mfd. 400 v. paper
C_{12}—.00025 mfd. mica
C_{13}—.0005 mfd. mica
C_{14}—.00025 mfd. mica
C_{15}—.25 mfd. 400 v. paper
C_{16}—.03 mfd. 400 v. paper
Sw—DPST toggle switch
J—Jack
B—Three flashlight cells in series
T—Audio transformer, single-button microphone to grid
Shield can—National 3-in. diameter by 3¾ in. high
L_1—30 henry 50 mil. ch.
C_1C_2—8-8 mfd. 200 v. electro.

covered in the drawings. In the one-way layout the H-H terminals on the unoccupied side of the power pack are shorted with a jumper. This jumper is removed if and when the companion unit is placed alongside.

For telegraphy the key is inserted in series with the B+ lead to the sending unit, as noted on the circuit diagram. Reception is accomplished by the autodyne method, i.e., the receiving detector is made to oscillate so as to give an audible beat note on the incoming signals.

Better results usually will be had when the grounded wire in the power pack goes to the grounded wire of the 115-v. AC supply line. Try reversing the plugs of the power supplies, one at a time, and use them in the positions which give loudest signals. If desired, the plugs may be marked.

There is not any difference fundamentally between the "wired wireless" and the commercial call systems except that a greater amount of amplification is used to increase the audio response. If the constructor wishes to, he may add one or at most two stages of straight resistance or transformer coupled amplification. The switch should be so arranged that when using to talk, the stages are cut out and the set is worked straight as shown in the diagram. By cutting in fixed condensers more than one station may be used.

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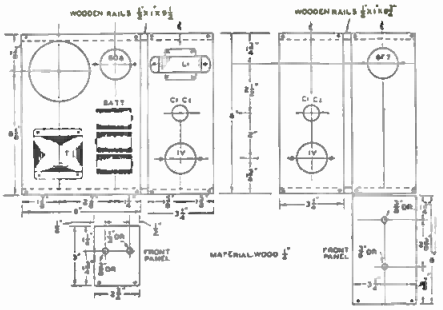
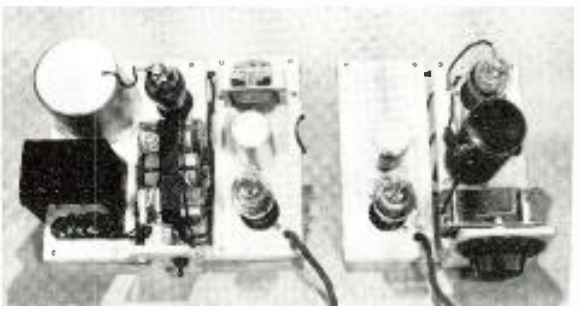
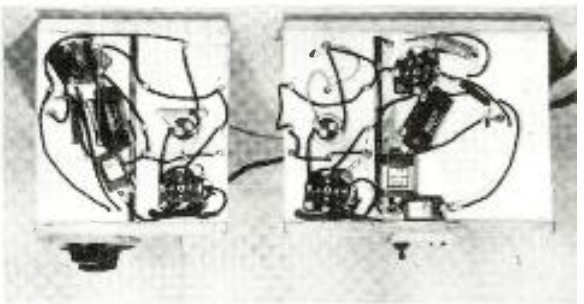


Chassis layout.



Topside of the Wired Wireless.



Underside view of the chassis.

Radio Code Words Report Plane Positions

"SAMPSON—Ebony—Nebo—Nomad—Silver"

If you are a short wave radio fan these words, and others that will sound just as strange, perhaps, will come wafting over the air waves to you. But do not be alarmed. An escaped lunatic from some asylum has not jumped his bearings and commandeered a radio station to haunt the airwaves. It will just be the pilots of American Airlines, Inc. reporting their position under a new code recently devised for the reporting of position by radio-telephone.

Instead of going into a long discourse over the air to the operator on the ground as to where he is flying, the pilot merely says the code word "Ebony" and the ground operator knows he is eastbound between Chicago and Detroit. If the pilot says "White" it means he is westbound between Detroit and Chicago. "Eagle" means he is eastbound between Cincinnati and Washington while "Shadow" informs the ground crew he is southbound between Boston and Newark.

Listed below is the section and the new code names so if you short wave fans hear these words on the air in the future you will know what they mean:

SECTION	COURSE—CODE NAMES	
Newark-Montreal	Northbound:	"Norway"
	Southbound:	"Sampson"
Dallas-Glendale	Eastbound:	"Eno"
	Westbound:	"Waco"
Chicago-Detroit	Eastbound:	"Ebony"
	Westbound:	"White"
Detroit-Buffalo	Eastbound:	"Endicott"
	Westbound:	"Wilson"
Buffalo-Newark	Eastbound:	"Easton"
	Westbound:	"Westlake"
Newark-Boston	Northbound:	"Novel"
	Southbound:	"Shadow"
Cleveland-Boston	Eastbound:	"Elmore"
	Westbound:	"Webster"
Cleveland-Nashville	Northbound:	"Neutral"
	Southbound:	"Simplex"
Ft. Worth-Washington	Eastbound	"Edward"
	Westbound:	"Willow"
Washington-Newark	Northbound:	"Nelson"
	Southbound	"Senior"
Chicago-Cincinnati	Northbound:	"Nebo"
	Southbound:	"Slogan"
Cincinnati-Washington	Eastbound:	"Eagle"
	Westbound:	"Washington"
Chicago-Ft. Worth	Northbound:	"Nomad"
	Southbound:	"Silver"

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ON THE COVER WE HAVE . . .

LARRY LAZAR of 5490 So. Shore Drive, Chicago, whose portable address is aboard the *Nancy Ann III*, Belmont Harbor, in the same city.

Larry's call letters are W9HEZ and the normal band in which he operates is the 20 meter one. However, when on board the only ham frequency used is 1946 KC.

The transmitter is also used under its ship's call letters of WNJL and operates on the usual Great Lakes frequencies of 2118 KC and 2738 KC. Lazar is Chief Radioman, U. S. N. R.

The lineup of this most interesting transmitter is an 807 crystal stage feeding an RCA 814 output tube which is run at 50 watts. The modulators are a pair of 809's in Class B, while the speech equipment consists of a crystal mike, 6J7 input, 6F5 speech, two 6F6's in push-pull drivers. These in turn drive the modulators.

The ship's antenna is a single wire about 65' long, stretching from the stern to the bow. Power is furnished by a single gasoline driven generator of 500 watts capacity.

The *Nancy Ann III* is a twin diesel engine, 62' yacht owned by Mr. Al Stein of Chicago, a radio enthusiast.

One of the unusual features of the rig, when used on the ship's frequencies, is that it connects through the radio WAY, Lake Bluff, Illinois, into the ship-to-shore radio system. Push-to-talk is required so that a "telephone" conversation can be carried on over the connected land wires.

To receive a special RME 69 with special bands is used. Also the transmitter is of the completely band switching type, and no tuning adjustments are necessary to change from one band to another.

Actually the range of the rig is from 1700 kc to 30,000 kc without retuning anywhere. This is accomplished by the turret coil and switching system.

During tests conducted on the lakes, WNJL was in contact with Detroit from her dock position with less than 50 watts input to the final. Of course this was possible due to the lack of QRM so prevalent on the ham bands.

The cover is from a black and white photograph specially posed by Larry who simulated transmitting conditions, and was made by Henry F. Kroeger, Jr., of Chicago, with an 8 x 10 camera and one 850 watt photo-flood lamp.

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TWO NEW SUPREME *Speed* INSTRUMENTS MOUNTED IN ONE COMPACT UNIT!

FEATURES OF MODEL 592 PUSH-BUTTON SET TESTER

1 47 Ranges and Functions
2 Complete self-contained—No A. C. supply needed!
3 Panel area only slightly more than 1/3 square foot.
4 Sensitive 40 microampere meter (25,000 ohms per volt)
5 **Both** 1000 ohms **and** 25,000 ohms per volt in SAME UNIT!
6 Resistance ranges to 50 megs. ALL with internal batteries!
7 Only TWO PIN JACKS used for ALL functions!
8 All ranges and functions controlled from only TWO rows of push buttons. 14 buttons control 47 variations.

MODEL 592 is an exclusive, new push-button switching circuit giving direct current range from 1 microampere to 14 amperes; 0/70 microamperes/0.7 mil./7.0 mils./35 mils./140 mils./350 mils./1.4 ampere/14 amperes.

Two D. C. voltage functions from 0.1 volt to 1400 volts in 7 ranges each! 0/3.5/7/35/140/350/700/1400 D. C. volts at 1000 ohms per volt; 0/3.5/7/35/140/350/700/1400 D. C. volts at 25,000 ohms per volt.

The Model 592 gives you from **one-quarter ohm** to **50 megohms**—in **6** ranges. 0/500/5M/50M/500M/5 meg./50 meg. using completely internal batteries—no A. C. supply required! "Ohms short" push-button on panel allows "Zero Adjust" procedure without shorting leads together.

The 592 offers 7 A. C. voltage ranges in all—0/3.5/7/35/140/350/700/1400. Push a button and a condenser is internally connected in series with all seven A. C. voltage ranges for use as an output meter.

Finally, 5 decibel ranges—10/+6, 0/+16, +10/+26, +20/+36, +30/+46 to check the power output of any P. A. amplifier.

1000 OHMS AND 25,000 OHMS per VOLT!

Supreme's new instruments are **really** speed instruments. They allow you to service **more** sets in **less** time because of their easy-to-operate push-button controls. They make the servicing of sets easier, more accurate—and more profitable than ever before!

And as there are good arguments pro and con for both 1000 ohms **and** 25,000 ohms per volt—Supreme offers both sensitivities in one instrument . . . the 592! See the 592 and 593 combination at your parts jobber. You'll see why Supreme gives you more for your money than any other instruments! Mail coupon below for free literature.

Combination Price — Model 592 and 593 with case as illustrated, $5.09 Down and $5.09 for 11 months. **Cash Price $55.50**

FEATURES OF MODEL 593 PUSH-BUTTON ANALYZER

Due to a tremendous demand for a separate analyzer unit which can be used with any multimeter or set-tester, as well as an additional necessary unit for the SPEED-SERVICE LAB Rack and Panel, we offer the first all-push button analyzer. No more connectors and twin-jacks. Just connect your multimeter to the 593's two pin jacks, put the analyzer plug in the set's socket, the set's tube in the 593 and you can make voltage or resistance measurements between any two tube elements or current measurements in any tube elements circuit. All you do is press two push-buttons for any reading. No fuss or bother. No special instructions! It's as easy as ringing a door bell.

Two rows of special push-buttons are provided, one button in each row for each tube element. For direct current (plate, screen grid, etc.) measurements, just press both the upper and lower buttons numbered corresponding to the element. For D. C. or A. C. voltage measurements, push the upper button corresponding to the one tube element and the lower button corresponding to the other tube element between which voltage or resistance is to be measured. If meter needle backs off scale due to polarity, you merely reverse buttons. Simple, quick, practical to operate. Full instructions. Available with or without wooden tray or combination case, or as standard equipment on the complete SPEED-SERVICE LAB RACK and Panel. An ideal unit in combination case with Model 592 Push-Button Set Tester.

SUPREME SERVICE LAB RACK CONTAINING 4 SUPREME PUSH-BUTTON SPEED INSTRUMENTS!

MODEL 596 SUBSTITUTION BOX by means of nine push-buttons allows rapid, accurate, temporary replacement from 1 ohm to 50M, 100M, 250M, 500M, 1 meg.; also capacitors 0.1, 0.5, and 8 mfd. Speeds up your replacement work 100%.

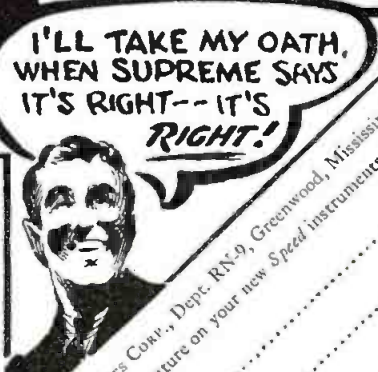
MODEL 592 SET TESTER with forty-seven ranges and functions—resistance ranges to 50 megs.—completely self-contained.

MODEL 594 TUBE TESTER with a new, modern tube testing circuit which utilizes the Model 592 **set-tester's** meter, and its GOOD—?—BAD scale. TOMORROW'S TUBE TESTER!

MODEL 593 ANALYZER unit described above.

ALL in a SPEED-SERVICE LAB RACK especially designed for these four instruments which takes up **less than one square foot** of bench space, and is only two feet high, yet houses a complete testing laboratory. Available separately, with or without portable cases.

$8.36 Down and $8.36 for 11 months. Cash Price **$91.25.**



Supreme Instruments Corp., Dept. RN-9, Greenwood, Mississippi
Please send me literature on your new *Speed* instruments.
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Address.....
City..... State.....

SUPREME INSTRUMENTS CORP., Greenwood, Miss., U. S. A.
Export Dept., Associated Exporters Co., 145 W. 45th St., New York City
Cable Address: LOPREH, New York

SPECIAL BROADCAST PROGRAMS FOR THE DX FAN

HERE are the latest special DX broadcast programs dedicated to RADIO NEWS. Tune in on these broadcasts and send in your reports direct to the station. Give them complete information, reporting the station's signal strength, quality, fading, etc. State in your report if verification is desired, practically all of the stations listed will be pleased to verify reports. The schedule is shown in *Eastern Standard Time* and all hours are *A.M.* unless otherwise indicated.

RADIO NEWS invites all DX clubs and all those having to do with special programs, DX tips and frequency checks to send in the information and help make these schedules as complete as possible. Anyone submitting such data, please bear in mind that RADIO NEWS goes to press thirty days before it makes its appearance on the newsstands, which means that notice of programs for a given month should be in our hands by the first of the preceding month.

Day	Hour	Call	State	Kc.	Kw.
		AUGUST			
9	5:35-5:50	KGMB	T. H.	1320	1.
11	4:30-4:45	WFOR	Miss.	1370	.1
12	4:20-4:35	WRAK	Pa.	1370	.1
12	5:30-5:45	KWYO	Wyo.	1370	.1
13	4:05-4:20	WJBO	La.	1120	.5
13	3:50-4:05	WGAR	Ohio	1450	.5
		SEPTEMBER			
8	4:30-4:45	WFOR	Miss.	1370	.1
9	4:20-4:35	WRAK	Pa.	1370	.1
9	5:30-5:45	KWYO	Wyo.	1370	.1
10	4:05-4:20	WJBO	La.	1120	.5
10	3:50-4:05	WGAR	Ohio	1450	.5
13	5:35-5:50	KGMB	T. H.	1320	1.

PERIODIC PROGRAMS
Frequency Checks and Dedications to DX Clubs and RADIO NEWS

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).

1:45-2:00 p.m., 780 kc., WTAR, Norfolk, Va., 1 kw. (URDXC) (tips).

4:35-4:50 a.m., 1500 kc., KDAL, Duluth Minn., 1 kw. (IDA).

Saturdays—

10:30 a.m., 830 kc., WEEU, Reading, Pa., 1 kw. (tips).

2:45-4:00 a.m., 780 kc., CHWK, Chilliwack, B. C., 1 kw. (URDXC).

Sundays—

12:45-1:00 a.m., 1280 kc., KLS, Oakland, Calif., .25 kw. (URDXC) (tips).

2:45-3:00 a.m., 1010 kc., CKWX, Vancouver, B. C., Canada, .1 kw.

3:00-3:30 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, 3:00-4:00 a.m., 1260 kc., WTOC, Savannah, Ga., 1 kw.

1st Sunday of each month, 4:00-4:30 a.m., 1340 kc., KGDY, Huron, S. Dak., 25 kw.

2nd Monday of each month, 5:20-5:40 a.m., 1250 kc., WAIR, Winston-Salem, N. C., .1 kw.

2nd Tuesday of each month, 5:00-5:30 a.m., 1370 kc., KRMC, Jamestown, N. Dak., 1 kw. 5:00-5:20 a.m., 1210 kc., WSAY, Rochester, N. Y., .1 kw. (NNRC).

2nd Wednesday of each month, 3:40-4:00 a.m., 1310 kc. KAND, Corsicana, Texas, .1 kw. (NNRC).

2nd Thursday of each month, 4:00-4:20 a.m., 1330 kc., KRIS, Corpus Christi, Texas, .5 kw. (NNRC).

2nd Friday of each month, 4:00-4:20 a.m., 1370 kc., WBTM, Danville, Va., .1 kw.

2nd Saturday of each month, 4:35-4:50 a.m., 1310 kc., KTSM, El Paso, Texas, .1 kw. (FC).

5th day of each month, 3:00-3:30 a.m., 1370 kc., KTEM, Temple, Texas. (FC).

Notes from Readers and DX Clubs

Henry Miller director of DX programs for station WBAA, 890 kc., Lafayette, Indiana, would appreciate receiving reports from the DX observers who tuned in WBAA special DX programs on June 21st and July 19th at 2 to 3 a.m. E.S.T.

DX listener Purakanuj of Dunedin reports in the NZDXR bulletin that the evening Americans are coming back again and that the Australians are tuned in with good results. Some of his new loggings include the following: CKMO, KFNF, WBOW, WOW, KOAM, WIRE, KXRO, KTSM, KOVC, WNOX, WOPI, KBIX, KRLC, JOAK-2, WKBW, KRNT, KOIL, KFSD, KARM, and WCKY.

Station Changes for New Zealand

4YZ	Invercargill	680 kc.	100 w.
2YB	Newellmouth	760 kc.	1000 w.
2ZH	Napier	820 kc.	65 w.
2ZP	Wairoa	900 kc.	100 w.
3ZR	Greymouth	940 kc.	175 w.
2YN	Nelson	940 kc.	175 w.
3ZB	Christchurch	1430 kc.	1000 w.
4ZB	Dunedin	1220 kc.	1000 w.

-30-

A ¾ Meter Transceiver

(*Continued from page 26*)

the leads from the tube. Wire leads are used instead of prongs, so that capacity may be kept at absolute minimum. *In no case should the builder attempt to solder the leads from the tube to the circuit.* The tubes are extremely delicate, due to their size, and the heat of a soldering iron is likely to injure them. The leads should be clamped to the tube base, as provided. The contacts of the tube base may be soldered into the circuit, but it should be done with the tube removed.

The 955 that acts the dual role of oscillator-detector in the set should be mounted directly above the two insulators at the bottom of the can, so that the grid and plate contacts on the socket are as near the insulators as is practical. The socket should be mounted on two ⅜" stand-off insulators.

The 955 that takes the job of modulator-audio amplifier is mounted with the base in a vertical position, and is not installed until all other connections have been soldered.

Since the 955 has a tendency to run amuck in regard to plate consumption, self-bias is used to correct this fault and to prevent the tube from damage from overheating.

Phones used in conjunction with the "Necklace" should be of the featherweight type, unless the amateur prefers and can afford a crystal headset, which would be well worth the added expense in this rig, due to their high sensitivity. Notice that a .5 mfd. fixed condenser of paper type is placed in series with the plate lead to the headset, to keep direct current off the phones, thus prolonging their life. This condenser is an absolutely imperative safeguard when using crystal phones.

The inductances for plate and grid consist of two pieces of bare copper wire, 12 gauge, about 1¼" long. These are mounted on the stand-off insulators at the bottom of the case. The wires are bridged by a .0001 mfd. fixed condenser, of the mica, postage-stamp variety. The condenser is arranged to slide along the wires to the point where resonance is achieved as desired.

The antenna for the transceiver is a piece of ¼" copper tubing, 13⅞" long.

Several radio frequency chokes are used. They should be wound on a ¼" dowel, and consist of about 23 turns of number 22 wire, dcc. These turns should be spaced as much as possible, to minimize capacity.

The oscillating 955 functions as a super-regenerative detector in receive position. The change is effected through the switch which, in "receive" position, introduces an additional ¼ megohm of resistance into the grid circuit of the tube, bringing about super-regeneration. In the "transmit" position, the ¼ megohm resistor is grounded out.

All circuit components of the "Necklace" should be as tiny as possible, with "pigtail" condensers and resistors being chosen in preference to the mounting types.

Due to the extreme broadness of the ⅜ meter band, quite a little difficulty may be experienced in getting two ¾ meter rigs to "jibe" unless they are built and calibrated together. Seemingly insignificant discrepancies between two ⅜ meter sets may throw them out of each other's range.

If, however, you build a set and have no partner with whom to check transmission, the modulation of your signal may be monitored with a pair of headphones, shunted by a .0001 mfd. fixed condenser, connected to a loop of copper strip or tubing one wavelength long, with a crystal detector in series between one end of the loop and the headphones. This arrangement will pick up signals several feet away from the rig. *Be sure that the mike is in a vertical position!* If the microphone is used horizontally, it will not modulate.

The fact that the "Necklace" fails to bring in ¾ meter signals at "receive" position may be due to a number of things besides a faulty hook-up, so don't jump at conclusions and start tearing down if the set fails to bring in ¾ meter stations. There may be no stations within the re-

ceptive radius of your rig. Again, there may be stations within range, but due to pranks of the quasi-optical band, you may not be in the exact spot to snare them. Due to its convenient portability, the experimenter may move readily when he finds himself in an unpropitious spot. Sometimes, moving just a few feet will facilitate the reception of signals totally inaudible in the original location.

Since the earth's contour tends to deflect quasi-optical signals upward, the set should be operated from a point as high as possible. A city water tower is an ideal station point for ¾ meters.

Under conducive conditions, the "Necklace" will operate consistently for a distance of 1½ to 2 miles, if the sets are located in sufficiently high positions.

Constant check should be kept on the plate current consumption of the tubes, with a 0-20 plate milliammeter. In no case should the total exceed 14 milliamperes, if long tube life is to be expected.

The range of the transceiver may be greatly increased by the use of a reflector-director antenna system.

-30-

Radio Reports Cash Case

(*Continued from page* 21)

The very first broadcast made was that of WIOD, described in the beginning of this article. The man at the mike was the the veteran newsman and radioncer, Frank Malone, formerly city editor of the *Miami Daily News*. For ten full days Malone, and associates, chased real and imaginary clues up and down the highways and even cowpaths in the vicinity of Princeton.

In the first place, you must understand that the FBI requested absolute silence on the case for thirty-six hours after the snatch. This was FBI strategy—the idea being to give the kidnaper or kidnappers time to return the child. During this period only those on the very inside knew of the crime—the public at large knew nothing. However, while the newspapers and radio stations marked time, as requested, they were in readiness to boom the news as soon as the ban was lifted.

Hoover gave the word at 2:00 a.m., May 31st. Soon the roar of the WIOD mobile unit was heard tearing down the highway toward Princeton. But when the case finally "broke" for public consumption, it was the *Miami Herald* that had the first news. This was quite natural—the *Herald* had had the news for almost two days, likewise the radio stations, but the mobile units were not permitted to broadcast nor were they allowed in the kidnap territory. Once established on the ground at Princeton, WIOD soon established remote equipment and news broadcasts were sent out over telephone circuit to the main studio in Miami. When no telephone circuit could be established, the mobile unit was used and it kept in close touch with the searching parties at all times, relaying the latest news to the field studio at Princeton.

When the search for the child's body was centered at Card Sound, WIOD set

up a short wave station at that point, and was in constant contact with the searchers until the efforts were abandoned. Shortly after, the mobile unit went down the Keys to the town of Tavernier. From there they set up a two-way communication, and during this period a high-frequency, two-watt pack transmitter was in service. This pack transmitter, although designed for only eight miles, worked with perfect clarity for a distance of twenty-five miles. I am also informed that, on some occasions, it has worked effectively for as much as eighty miles.

The WIOD staff, with Milton Scott and Fred Clark as engineers, and Frank Malone, as chief newscaster, was on the kidnap grounds for ten full days.

As to the other station with a mobile unit in the field—WQAM—they had a bit of bad luck in getting their outfit to percolate. This accomplished, however, they made approximately thirty-one broadcasts from the scene. They began with a straight telephone hookup between a *Miami Herald* reporter, Steve Trumbull, and Norman MacKay, in the Miami studio. MacKay pumped and Trumbull sprayed the story. In their nearly seven hours of broadcasting, WQAM used two short wave outfits, toll phones, and Fairchild recorder. This station also supplied a loud speaker service for the men searching in the fields.

Among one of the outstanding high lights of the case was when WIOD was tipped that the father of the child, James Bailey Cash, Sr., had left his filling station in his car, for the first time since the crime, and was off to some mysterious point. Not unlike the newspaper world, the radio lads were not averse to scooping each other. However, WQAM, although giving a splendid job of newscasting, failed to get on the scene of action, as did WIOD with Frank Malone.

The WQAM boys, hearing that the father had left his house on a mysterious mission, missed his car by an eyelash, as it were, but by racing up and down the highways—and even lanes—they succeeded in interviewing several folk who had seen the Cash car go this way, that way, and even the other way. Finally, the WQAM unit returned to the Cash residence and found the car, engine still hot, in front of the door. The WQAM newscaster leaped into the front seat of the Cash auto and gave a very brilliant, albeit insufficient, newscast of the car's trip. He failed, however, in telling what the trip was all about and why.

Meanwhile, WIOD—with better tip connections in this case—had trailed on the car from the time it left the house until it arrived at a rock pit a few miles away. From the edge of this rock pit they broadcast the fact that the father had run into another false-alarm. He had been told that a body had been found in the water at the bottom of this pit, but the body was that of a dog.

Most important and heart-rending of the final broadcasts came via the pack-transmitter from the spot where the decomposed body of James Bailey Cash, Jr., was found. This took place the following morning, or seven hours after Kidnaper McCall had led J. Edgar Hoover to the lonely palmetto thicket and pointed to the dead child.

Standing beside the solitary pine tree that seemed to be on guard over the lad's remains, Frank Malone said:

"Ladies and gentlemen, one foot from where I stand is sacred ground. It is here that James Bailey Cash, Jr., with the whole world still before him, was found. Found with his eyes toward the sun, a quizzical child-smile upon his face, as if wondering why he was not still home in his little cot, where his mother had placed him. This, ladies and gentlemen, is the end of the trail —a sad end, a tragic end—and none can doubt that his little soul will rest in peace."

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Short Wave Receiver

(*Continued from page 35*)

Signals on the 49 meter band require a pathway of darkness between the station and the listener. The 31 meter band is best in the early evening. The 25 meter band is at its best around sunset. The 19, 16, 13 and 10 meter bands are best after midnight and in the early morning hours. Time mentioned here is at the listeners end. Time changes are often the reason for not receiving a particular station.

Don't expect to tune in the world in one night. It takes time for the layman to acquire the knack of tuning a short wave receiver.

To tune the set use the left hand vernier dial, which varies (C2). The other vernier dial is the bandspread condenser (C3), which is left at zero, or when the plates are fully apart, unmeshed.

If a large section of the dial is covered without hearing any stations, code or broadcast (providing the set is oscillating), this is known as a dead spot. To avoid this condition readjust the antenna condenser for loudest back-ground noise level.

The detector tube is a 1B4 pentode of the two volt variety. The regeneration control is in the screen grid of the detector tube and is controlled by a variable potentiometer (R2). Impedance coupling is used between the detector and the amplifier, instead of the usual resistance; it affords more amplification and helps improve the smoothness of the regeneration control. Resistor (R3), is used to subdue any audio oscillation, that may be present.

As this set was primarily designed for headphones. A 230 was considered at first but later changed to a 1F4 power output pentode. The 1F4 is an improvement over the old style 233. It has lower filament and plate current drain also less grid bias or "C" battery voltage is required. The 1F4 has a high power sensitivity and will deliver a considerable amount of audio output with low distortion also by using this tube a magnetic or the new permanent magnetic speaker may be employed on all signals. The headphones or speaker, which ever is used is pluged into the midget jack (J-1).

After the reader has become acquainted with the operation of this set, he will find it reliable and consistent in bringing to his headphones most of the dx. signals the world over.

-30-

Not for Rebroadcast

(*Continued from page 20*)

THE Howard Hughes 'Round-the-World Flight was easily the most outstanding Special-Event contribution to radio in 1938; but it had a number of technical "headaches" for both networks sponsoring special broadcasts in connection with the flight. The NBC and Mutual Network chains were linked for many of the re-broadcasts from Europe, most of which were admirably handled by R. C. A. Communications. But most of the difficulties were encountered when the plane was actually in the United States — almost at the end of the flight.

Even before the Hughes plane had left Fairbanks, Alaska, the N.B.C. was planning to meet the Hughes plane somewhere in Canada and then fly alongside all the way in to New York. The only plane available for such an undertaking—one that could fly as fast and as far as the Hughes plane—was another Lockheed, of *exactly* the same type. This plane was secured from Northwest Airlines, equipment installed, and a crew of two engineers (one had been flown from San Francisco, with a special aircraft transmitter), two announcers, the pilots and assistants, assembled at the Chicago Airport ready to take off when the Hughes plane neared Winnipeg.

But the 'Round-the-World plane landed at Minneapolis—instead of Winnipeg—without advising over their own radio transmitter of their whereabouts or intended plans. As soon as the Hughes plane left Minneapolis the N.B.C. plane left Chicago, and headed northward intending to meet the Hughes plane en route to New York. By plotting the courses of both ships the navigators on the N.B.C-Chicago plane located the Hughes plane, and began to gain on it. But as the N.B.C. plane neared the Hughes plane, people on the ground confused the two, since both were identical on the outside. This resulted in a general mixup between all parties concerned.

Finally, when the N.B.C. plane was over Detroit—just thirty or forty miles behind the Hughes plane (and gaining very fast) —the New York N.B.C. office "gave up the ghost" and sent the Chicago plane back.

In the meantime N.B.C. had chartered another plane in New York. But the transmitter on that plane refused to function properly, and the description of the Hughes landing in New York was sadly muddled, as far as the reporting by air was concerned.

On the ground at New York, the Columbia announcers and engineers could not reach the plane (when it landed) in order to give their network a description. and Columbia was content with a sideline description, while N.B.C. and Mutual clambered around the plane quite freely.

Obviously the cost of broadcasting such Special Events is enormous. Particularly so when complications, such as mentioned with the N.B.C Chicago plane, present themselves. To add a final touch of irony to the Hughes tale of adventure in radio: The Minneapolis local radio stations did not know of Hughes landing in their city, until just a few minutes before the take-off.

-30-

My Greatest Radio Thrill

To W8PGL goes the $5.00 award for the most interesting letter on the subject his greatest thrill in radio.

"I'VE got lots of kick out of ham radio working DX from all corners of the earth, and it was quite a kick working my first ham station. But it was not until the Ohio River was demonstrating its mighty destructive power during the great flood that I got my first real thrill.

"Here's how it happened: W8PGL at that time was located ten miles east of Portsmouth, Ohio, in the river valley. It was after three days and nights of continuous operation handling only emergency messages for food, clothing, and necessities, since this station was the only outlet for communication to the outside world for three small towns. All telephone and telegraph service was wiped out during the first day of destruction, in fact, it was possible to get out of these towns only by boats and one or two small hill-side roads that were made.

"On the fourth day of operation, about 8 a.m., our a.c. power failed. Messages began to pile up; food was getting low. The local doctors were there with messages for medicine and were also in need of a surgical nurse.

"All of my equipment operated on a.c. power. I had no time to lose. I made up my mind to be back on the air so I could get rid of my traffic. I got in touch with the local rural postman and asked him if he could help us locate a power supply somewhere in the district. He was more than glad to help so we started looking and we were pretty much disgusted for awhile.

"We then were told by a farmer that his neighbor had a plant that he thought was an a.c. plant. To our disgust it turned out to be a d.c. 32 volt plant. We were about to leave when the farmer told us he had a small converter if it would do any good. To my surprise it was a small Essco converter 32-100 a.c. We lost no time in getting back to our shack with it. The men who helped out around the shack secured six car batteries from different automobiles and by 2:00 p.m. I was turning on my receiver to see if it would operate it. It worked perfectly. I heard stations calling me and they were wondering what had happened.

"The next thing was to get the transmitter to operate. I switched the power over to the transmitter and turned it on. But nothing doing. It would just barely light up. There were only a couple things left to do. Build another small transmitter or overload the converter by putting more storage batteries on the input and try it that way.

"We all got in a huddle in the shack and decided to try overloading the converter. We put cracked ice on the bearings and turned her on. Everybody was excited. We were taking a big risk on losing our power supply. The little converter hummed quite a bit. The transmitter was given a little time to warm up because it didn't light to near full brilliancy. The send switch was turned on. The antenna meter just moved up slightly. I knew it was working, but could I raise anyone?

"I called an emergency call to any station that could hear me, at the same time explaining that I was operating on auxiliary power and that they would have to call me for about 5 minutes in order for me to change the power supply from the transmitter to the receiver and that the receiver would have to warm up.

"It seemed as though the receiver would never warm up. The room was packed with people, but one could have heard a pin drop they were so eager to listen. I tuned the band and heard no one calling. I tuned over again and close to my own frequency was W3FJU at Allentown, Pa., calling me and calling all stations near my frequency to stand by because I was operating on auxiliary power and it was hard to understand my voice and that I was in trouble. They stood by and then W3FJU stood by for me. I gave all my messages to them and they informed me that they would send me another power supply as soon as they possibly could. However, the little converter did the trick. Food and supplies that were ordered were soon arriving.

"I saw the farmer a couple of months ago and he said the little converter was working as well as ever.

"If I ever get a bigger thrill out of radio, bigger than this one, I am afraid I would never survive to tell about it."

RUSSELL W. BANKS, W8PGL

Build Your Own Treasure Hunter

(*Continued from page 23*)

not shown in the drawing, but they do add strength to your frames. Plywood is used for the side panels.

Having made the handles and frames, we are ready for the actual radio equipment. If you do not have one already, buy a milliammeter (d.c.) with enough shunt resistance to permit about ¾ full scales deflection with the receiver switch ON, and the transmitter switch OFF. The case of the meter should be of bakelite.

In selecting the meter, the experimenter is warned not to pay any attention to the claims of racketeers in the equipment business. Thus, Dr. Fisher has found that unscrupulous manufacturers (of which there are fortunately few), tell amateurs that they have a milliammeter built to secret specifications, so sensitive that it will enable the set-builder to locate even one ounce of metal buried many feet underground. This is merely sales talk. All that you need is a common milliammeter with the standard zero to one (0 to 1), reading, which is quite inexpensive.

Next, you will want the r.f. Chokes, each with 1500 turns, of No. 34 copper wire, enamel covered. Be sure to get No. 34, enamel covered, for another gauge or different covering may throw out the balance of this design. The winding can be either "Random" or "Duo-lateral"; this makes no difference in the result. The Chokes are labelled "2" in the drawings.

Now we jump down to the loop frames which are wound with 80 turns of No. 33 D.C.C. copper wire, center-tapped, and here again we must caution against using anything outside of the specifications if you want to have a perfect balance on the completion of your set.

In the diagram, R-1 is a 10 ohm filament resistor; R-2 is a 5 ohm for 1 tube, and 2.5 ohms for 4 tubes, and R-6 is 2 ohms. You can make up these resistors yourself with 30 Nichrome wire, which you wind on a fibre strip. In figuring resistance, allow 1 ohm resistance for each 1.6 inches of length of wire. At this rate, R-1 will have 16 inches; R-2 will have 8 inches for the one type-31 tube; 4 inches for four type-30 tube, and 3½ inches of wire for five type-30 tube.

If you have assembled your equipment correctly, you now stand between the handles, with the receiver in front of you in a horizontal position, and the transmitter in a vertical plane, behind you, and the phones on your head. Turn on the power. If the apparatus is in balance there should be no sound in the phones, and no dial indication unless you are standing over buried metal. However, failure to follow the specifications we have given you may mean that your set is in balance when the transmitter is inclined at a slight angle from the vertical. Try it in different localities free from electrical disturbances and buried metal until you have located your neutral position of the transmitter, and then mark this with a line scratched on the box for future use.

With your equipment assembled and adjusted, you are now ready to prepare for field work. The simplest way to gain experience in operating the set is to follow a buried pipe line. Strangely enough, a pipe line lying on the surface of the ground, or one that has been laid very recently will not suit your purpose. The reason is that the ground itself is a conductor. A pipeline which has been buried for some time will enable the transmitter to set up eddy currents which re-radiate and create disturbance in the matrix around the pipe. A newly laid surrounded by loosely packed earth, or a pipe lying on the ground gives little disturbance and you will have trouble following it with your set.

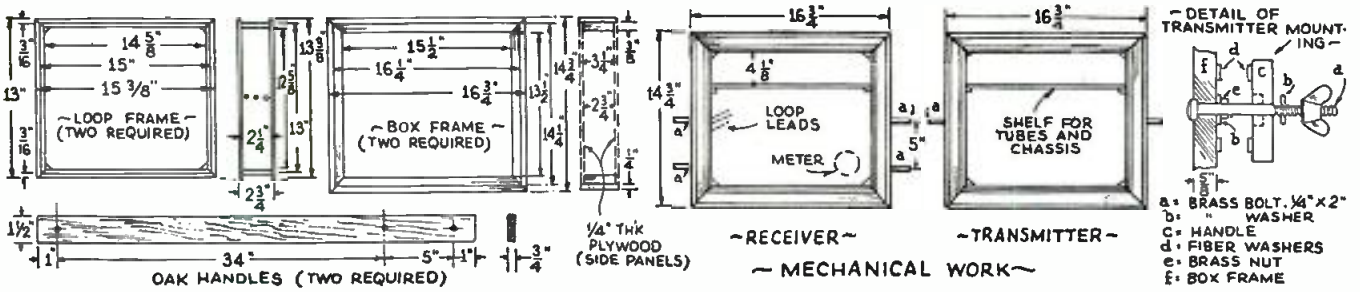
To test yourself, follow the estimated course of the pipe line you have chosen, such as a city water line, and plot it on a rough map. When you have followed this for several hundred feet, take your map to the office of the water company and compare it with their actual surveys of their pipe system for that neighborhood. This will serve as a check on your readings for direction.

To search for buried treasure, oil, or minerals, first go over the suspected ground, plotting accurately on a map of the area the points where you get maximum meter readings, as well as the spots where you get low readings, recording in each case the exact reading of your meter. When you have a large number of readings, connect those of the same degree and you will have located the outlines and center of your metallic substance.

Depth of the object can not be accurately estimated, but you can obtain good approximate estimates by noting the angle of the transmitter at which you get maximum readings on your meter. By taking several readings for these angles, at different points, and plotting them on paper you can then figure the depth by either simple proportion or trigonometry.

The equipment which we have described is the M-Scope, which sells for about two hundred dollars. The simpler set, which is sold for ninety-five dollars, is the MT-Scope, which is also covered by a patent, but can be copied by readers of this magazine by permission of the patent-owner.

The construction of this MT-Scope follows the same mechanical principles we have shown for the M-Scope, but the parts are fewer in number, and better adapted to the beginner who is content with a set of medium sensitivity. This has six type-30 tubes in the Receiver, and one type-31 tube in the transmitter. It has a filament volt meter; filament rheostat; a balanced loop antenna which eliminates body and ground capacity; a portable type 45-volt B battery, and two type "Little Six" filament batteries.



Constructional details for the loop frames, transmitter and receiver boxes, and the handles for the Fisher treasure hunter.

In the transmitter, the MT-Scope, has, in addition to the transmitter tube, a filament volt meter to adjust the depth range of the transmitter; this gives a depth range of over 20 feet which is sufficient for locating most buried treasure. Operating the batteries four hours a day, they should last three to four months, which shows that this set is designed for economy in use.

For the experimenter who wants to try something extremely simple to build, there is a third Fisher circuit, which has never been placed on the market commercially. This uses only three tubes, and employs only the one double-loop, instead of separate loops for the transmitter and receiver.

Whichever set you build, you can be confident that efficient operation will locate any buried metal, whether you are looking for a lost pipe-line or Captain Kidd's buried treasure.

In closing, let me caution you that the circuits and all details of the M-Scope, or other circuits for the treasure hunters invented by Dr. Gerhard R. Fisher, are fully protected by patents.

Dr. Fisher offers the circuits to you freely *for your own use only*. This means that you cannot rent or sell your equipment or offer your services for hire, where the treasure hunter is concerned. *The set cannot be used for the benefit of others without violating the Fisher patents.*

Here's hoping that you go out on your own initiative, find what you are looking for, and have a lot of fun.

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Ship to Shore Radiophone

(*Continued from page 27*)

out the city radio interferences, and was ready to start in business. That was in 1935.

But the operators, parsimonious fellows who were out to wring a profit out of their vessels, didn't share Hageman's enthusiasm. No, sir! There was expense involved, and they couldn't see it—not until they were shown.

The company shopped discouragedly around until it found a single vessel willing to try the service, the *William C. Atwater* (now the *E. J. Kulas*), a long, lean, ore and coal carrier beating a routine path between Lake Superior ore ports and Lake Erie harbors. With much shaking of heads, the equipment was installed.

Then on one of the first trips with the 'phone equipment aboard, an unfortunate accident—a very fortunate one for the radio corporation—occurred. Capt. E. R. Morton, of Cleveland, the 70-year-old commander, stumbled and fell down a steel stairway while the vessel was steaming through the middle of Lake Superior, miles from the nearest doctor. One arm was broken and Captain Morton sustained serious internal injuries.

The captain was made as comfortable as possible while his daughter, aboard for the trip, pluckily called a Lorain doctor on the telephone, asked his advice.

"Just follow my instructions," advised the doctor. Then as various symptoms were described to him on the radio telephone, he advised the captain's daughter what to do. That feat was credited with saving the aged captain's life.

And that feat broke the back of the opposition. When navigation opened in 1936, four vessels were equipped with the radio telephones; when the season opened in 1937, 38 were equipped, and the 1938 navigation season opens with 62 vessels equipped and a lot of other boat owners holding back merely to await business developments.

The radio corporation has greatly enlarged its station, located out in an open field west of Lorain, so that three messages may be handled simultaneously during the rush periods when all these facilities are needed.

During the 1937 navigation season 19,849 radio telephone calls were handled, with 16,633 originating on the ships. Most of these were calls of ship masters reporting their positions and asking instructions of dispatchers on where to dock. Others were calls for weather information or for medical aid.

But some of the calls were far off the beaten path. Many of the lake vessels often carry as guests of the line important personages who like to keep in touch with their businesses. Last year, a famous Cleveland specialist was aboard one vessel equipped with radio telephone. He received a call from a medical associate who quickly explained that a patient of the specialist was near death in a hospital, in Cleveland.

No other physician knew how to treat this patient. The vessel was in the middle of Lake Superior, and the patient probably would die before the ship docked at a Lake Erie harbor.

"What shall I do?" franctically implored the young doctor.

"Keep your shirt on," advised the specialist, calmly. "First, move this call to a telephone in your operating room; and then we'll go on."

The call was transferred to the telephone, then while the specialist advised each move by telephone, the young doctor operated and saved the patient's life.

The whole system, from the vessel captain's viewpoint, is simple enough. The equipment consists of an ordinary cradle-type dial telephone for the captain's desk, a telephone that could be found in any business office; a neat wooden cabinet with a locked door; a loud speaker in the pilot house where the wheelsman may hear any calls for the boat.

And the cost? Low enough—$2,500 for the installation of equipment and 75 cents for each call of three minutes or less, plus long distance tolls for the land wires between Lorain and other points.

And dependability? There's no danger of cutting off communication when it is needed most by reason of a "dot and dash" radio operator being disabled. For no "dot and dash" operator is needed. Anyone who can dial a number on a telephone can operate the radio telephone.

Federal laws, however, require each vessel equipped with the 'phones to carry at least one man with a third-class radio license. He may be the captain, a mate, a wheelsman, or any member of the crew. And failure of equipment? Unheard of. There are four different channels of communication, so if one fails, there still are three left.

These channels are known as No. 10 channel, with the ship's transmitter on 13245 kilocycles and the receiver on 11370; No. 20, with the transmitter on 6660 and the receiver on 6470; No. 30, with the transmitter on 2158 and the receiver on 2550; and No. 40 with the transmitter on 2738 and the receiver on 2738. The 40 channel is reserved for ship-to-ship calls.

How to use it? Pick up the receiver, dial the channel number desired and say: "This is steamer ——— calling on channel 10."

The Lorain operator does the rest.

When the Lorain station calls, those in the pilot house hear the vessel's whistle signal in the loud speaker, followed by one, two or three short dots which indicate the channel number. One dot is No. 10 channel, two dots, No. 20, etc. For instance, The Reiss Steamship Company's signal is 82888 and the *Steamer William A. Reiss* signal is 222. Those in the pilot house would hear the call 82888-222, followed by one, two or three short dots.

And what's the future? Hageman sees a very bright future for it.

"The day will come—and soon—when no vessel will venture out without radio telephone," he said, "for it pays."

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Transcriptions

(*Continued from page 19*)

side walls. This separation of studio and building prevents the transmission of outside vibrations into the studio, confining the acoustical engineer's problem to the interior of the studio.

To break up "standing waves," sound waves which rise vertically along a wall and cause distressing resonances on certain tones, transcription studios are built with walls slanting inward, so that the area of the studio ceiling is appreciably smaller than that of the floor. Further soundproofing is attained by making the studio floor "floating," or independent of the side walls.

A nine-ton block of concrete, free of the floor and extending down to bedrock, assures a vibration-free base for the "dubbing table," the turntable used to dub in recorded theme and transition music and other recorded effects in a dramatic program.

Solid concrete flooring supports the recording machines, which are vibrationless. Wax cut from the disks during the transcribing process is drawn away by suction, to eliminate any possibility of surface noises caused by wax threads which might otherwise fall from the stylus and cling to the master. Sputtering with gold and slow pre-plating before the final copper plating are just two more precautions to guarantee purity of tone.

Though to the layman who has just finished hearing about the high fidelity standards of vertical-cut transcriptions the next process "sputtering," seems literally to be gilding the lily. The disk is placed in a vacuum-sealed chamber, where for 20 minutes it is bombarded electrically with tiny gold particles. This gold film, a few millionths of an inch thick, insures conduction for the electrolytic copper plating which follows.

Until the gold "sputtering" method was introduced, the wax master was dusted with graphite, which serves the same purpose. However, the graphite, being granular, caused surface noises which are eliminated entirely when the disk is plated with gold.

Next, the gold-plated master is suspended in a dilute electrolytic solution, where it slowly acquires a fine-textured copper coating. Then it receives a second plating, and comes out with a thick layer of copper built up on its surface.

Now we have a copper and gold negative impression built up on the wax master. The wax is no longer needed, so it is stripped off gently with wooden tools. Wood is used to avoid marring the surface of the negative. Trimming is the next step in the process. Excess metal is pared off, before the disk is chromium plated in preparation for the final smoothing and aligning process.

At last, we're ready to start making records. The copper master goes into a hydraulic press, along wits a square "biscuit" of plastic material. Controlled heat and a ton of pressure are applied, and, waffle fashion, the transcription is pressed.

Judy and Jane records are made of

The "master" disk is placed into a press with a "biscuit" and a finished recording is made. A pressure of a ton is used.

"vinylite," a plastic of many uses. Dental plates, automobile steering wheels, radio panels are just some of the other products.

World Broadcasting also uses cellulose acetate, another plastic having practically all the advantages offered by vinylite.

Out of the press, our recording is given a final polishing, tested, packed and shipped off to its destination—15 minutes of entertainment packed into a pound of plastic.

—30—

Beam Pole Oscillator

(*Continued from page 37*)

and one-half wavelengths.

All that it is necessary to do to shift the resonant frequency of the antenna is to move the oscillator stand-off insulator connections up or down on the matching section by fastening the oscillator box higher or lower on the pole.

The oscillator is tuned to resonance when the plate milliammeter is at its highest reading. If this adjustment is not sharply defined or if the milliammeter reading is too high at resonance the coupling between the pickup coil and tank circuit should be loosened.

The coupling coil should be made of a piece of No. 12 solid, bare wire extending between the two stand-off insulators across the inside of the box with a single turn loop so placed in it that it may be bent in or out between the turns at the grid end of the tank coil.

No. 12 wire is also used in the tank coil with ½ inch spacing between turns (for 5 meters) so that the coil and antenna pickup loop are sufficiently stiff to hold their position and eliminate the necessity of insulating the latter with spaghetti tubing.

The tank coil for both 5 and 2½ meters is 1½ inches in diameter with 5 turns spaced ½ inch for the 5 meter band and two

turns spaced approximately 1 inch apart for the 2½ meter band.

The oscillator should be assembled and tested on its base, as shown in the photograph. The rest of its weather-proof housing is then assembled around it.

A half-inch hole is drilled at the top of the three fixed side panels. The projecting top with its overhanging skirt is for the purpose of protecting these holes from snow and rain and still allow good ventilation.

The three base holes, through which the filament and high voltage leads pass, should be made a bit over-size to allow air to rise through them.

Use ¾" brass brads in fastening the box together and brass hinges for the door. The material used for the box is ¼" 3-plywood.

Materials for Weather-proof Box
Made from ¼" plywood, three laminations, 9 pieces as follows:
1 pc.—6"x6" (Bottom)
1 pc.—7"x7" (Top)
2 pcs.—6"x12" (Sides)
2 pcs.—6½"x12" (Front and back)
2 pcs.—7¼"x2" (Skirt for top)
1 pc.—7"x2" (Skirt for top)

Buy a small thirty-cent can of asphaltum and paint the wooden sections before they are assembled and again after assembly, particularly where the edges join.

If these simple instructions are followed you will have a rugged oscillator and antenna system which will "stay put" regardless of wind and weather.

The double "J" beam gives a broad figure eight pattern and in most locations can be set permanently in some direction which will allow satisfactory operation. If not, it is so light and compact that it can be made to rotate through 180 degrees with very little trouble, particularly as no awkward transmission line problem is involved.

The power supply was designed specifically for this rig and is ideally suited to it. It is absolutely humless and has very fine regulation giving a clean, silent carrier under all conditions. In spite of its excellent characteristics it is inexpensive and easy to construct. It includes a Varimatch modulation transformer so that any amplifier of adequate power may be used with it. Incidentally, you do *not* need much audio power to fully modulate a self-excited oscillator. Fifteen watts of audio is plenty for a fifty watt input and you won't use it all. An amplifier unit with push pull 61.6 output in Class A is more than enough to do the job.

A word of warning in regard to the filament supply is necessary. The filament should not be operated below normal rated voltage (7.5 volts). Use No. 14 twin conductor if obtainable. If smaller wire is used or the run is long from the power supply up to the oscillator it would be better to use a 10 volt filament transformer with a rheostat in one leg by which the voltage *at the filament terminals* can be adjusted to 7.5 volts *under load*.

The third wire to the oscillator is the plus plate supply and good insulation is more important than wire size. The filament line provides the —B return circuit.

Don't worry about the lack of filament by-pass condensers on the oscillator. You will find that the efficiency and stability is higher without them.

—30—

Short Wave Flashes

(*Continued from page 46*)

America: W8XK, *Pittsburgh, Penna.*, on 21.54, 5:45 to 8:00 a.m.; on 15.21, 8:00 a.m. to 6:00 p.m.; on 11.87, 6:00 to 10:00 p.m., and on 6.14, 10:00 p.m. to 12 midnight.

Frequency Changes

CUBA—COBC, *Havana*, highly variable between 9.98 and 10.02; COCQ, *Havana*, to 9.705.

DOMINICAN REPUBLIC—HIG, *Trujillo*, variable, between 6.28 and 6.285; HIZ, *Trujillo*, to 6.315; HI4V, *San Francisco de Macoris*, to 6.455.

ECUADOR—HCJB, *Quito*, heard on new announced frequency of 12.45, in **parallel with** HCJB (14.43).

FED. MALAY STATES—ZGE, *Kuala Lumpur*, to 6.24.

GUATEMALA—TG2, *Guatemala City*, variable near 6.19; TGQA, *Quezaltenango*, to near 6.44.

NICARAGUA—YN1GG, *Managua*, to 6.507.

PERU—OAX4G, *Lima*, to 6.298.

VENEZUELA—YV3RA, *San Cristobal*, to 5.87, where it is badly QRMed by HRN; YV5RC, Caracas, to 5.95.

Data

AUSTRALIA—New address for VLR is: Australian Broadcasting Commission, T and G Building, Russell St., Melbourne C-1 G. P. O. Box 1685. . . . Experimental Broadcasting Station 5DI (14.085), is being heard Sundays to 1:40 a.m. Reports are requested. Station signs-off with kookaburra bird call, followed by a few bars of *God Save the King*.

BRAZIL—According to the Chicago Short Wave Radio Club, short-wave stations owned by Cia. Radio Internacional do Brasil, Caixa Postal 709, *Rio de Janeiro*, operate as follows: PSH (10.22), Mondays, Wednesdays, Thursdays and Saturdays 6:00 to 7:00 p.m., Tuesdays 6:00 to 7:00 p.m., and 8:00 to 8:30 p.m., and Fridays 6:00 to 7:30 p.m.; PSA (21.08), Fridays 12:50 to 1:00 p.m. and on the first Thursday of each month, from 11:20 a.m. to noon, with programs directed to Italy; PSE (14.935), Saturdays 3:00 to 3:30 p.m. with programs in French, and on Wednesdays 4:00 to 4:10 p.m. and on the 23rd of each month from 4:00 to 4:30 p.m., with programs in German.

CHINA—A. Walcott of San Francisco, Calif., reports the following Chinese commercial stations are again working: *Hankow* uses XTJ (11.7), or sometimes XTK (9.08), to phone Canton, and Swatow, from 4:30 to 8:00 a.m. *Canton* is on 9.485, with XTV-XRB (Hankow calls it XTV. Canton says merely "CAnton" when making Chinese contacts but uses XRB when phoning San Francisco at 9:15 a.m. almost daily). Swatow uses either XTS on 11.44 or XTR on 9.4.

COLOMBIA—HJ7ABB (4.82), "Radio Santander," P. O. Box 37, relays HJ7ABA (1280 kc.) of *Bucaramanga*; verifies with card having small blue call letters.

COSTA RICA—TIEMT (10.06), "Radio El Mundo," P. O. Box 1049, relays TIEM of *San Jose*, daily from approximately 6:00 to 11:00 p.m.

ECUADOR—HC2CW (8.41), "Ondas del Pacifico," Casilla Postal 1166, *Guayaquil*, operates weekdays from 7:00 to 11:30 p.m. and on Sundays from 3:30 to 6:00 p.m. Woman announcer gives station identification. Programs open and close with national anthem; HCODA (9.445), "La Voz del Alma," Calle Noguchi 719 (Apartado 704), *Guayaquil*, verifies with a card having small black call letters.

FRENCH INDO-CHINA—"Radio Boy-Landry" is operating daily from 7:30 to 9:15 a.m. on 6.2, 9.76, and 11.71 mc's simultaneously. Chinese or Annamite programs are broadcast from 7:30 to 8:15 a.m. and for the last hour French programs of classical and popular music, announced by a woman. News in French is sandwiched in between the classical and the popular. Interval signal is a series of notes on chimes; signs-off with *La Marseillaise*.

JAPAN—According to Ashley Walcott of San Francisco, California, there are two new Japanese ship-to-shore telephone circuits for ships working on 6.65. One is at *Kobe*, on about 8.35, the other at *Moji* on 6.17. These are heard from 5:00 to 8:00 a.m.

JAVA—YDA, *Batavia*, utilizing a new fre-

quency of 7.41, is operating daily except Saturdays from 10:30 p.m. to 2:00 a.m. and on Saturdays from 7:30 p.m. to 2:00 a.m.

MEXICO—XBA (6.977), *Tacubaya*, Central Station of the Government Weather Bureau, gives weather reports daily at 11:00 a.m., 1:00, 2:00, 3:00 and 9:50 p.m.

PANAMA—HP5G (11.78), "Ron Dalley," P. O. Box 1121, *Panama City*, power 750 to 1500 watts, operates daily from 6:00 to 10:00 or 11:00 p.m. Programs are opened and closed with the *Prelude of Traviata;* verifies with a clever blue and white card.

PHILIPPINES—The Philippine Long Distance Telephone Company has a new transmitter and now has two circuits on the air simultaneously. KZGF of *Manila* uses frequencies of 5.465, 6.79 and 7.41, to phone Cebu and Iloilo, while the sister transmitter operates on 6.46 and 7.855, while phoning a new station KZDB at Catsiano. KZGH, *Iloilo* uses either 5.445 or 6.785, to phone Manila. KZDB has only been heard on 6.66. These are all on the air intermittently between 5:00 and 9:00 a.m.

SPAIN—"Radio Malaga," Departamento de Radio, Gobierno Civil de Malaga, operates on either 14.44, or 7.22, with a power of 700 watts.

SPANISH MOROCCO—EA9AI, owned by Dr. Angel Mora, Canalejas. 1, *Melilla*, broadcasts on either 7.151, or 7.185, Fridays and Saturdays 10:00 to 11:00 p.m. Power is 200 watts.

Amateur Notes

The Richard Archbold Expedition of the American Museum of Natural History, landed at Hollandia, New Guinea, on June 10th, after a thrilling flight from the United States, aboard the huge clipper, *Guba*. While enroute short-wave listeners intercepted many messages from the plane's transmitter KHAHX (12.42), and the amateur transmitter PK6XX (14.195), which were used for communication purposes with land stations and the folks back home.

Harold Ramm, W2BVB, is operator of the expedition's station PK6XX, which has a power of 300 watts, and he can often be heard on Sunday mornings between 3:00 and 4:30 a.m. in contact with United States amateurs. A frequency of 14.009 is used for amateur contacts, and one of 11.355 for commercial communication. It is doubtful if reports will be verified but those wishing to take a chance can write direct to the expedition at Hollandia, New Guinea, or to W2BVB, Harold Ramm, 161-07 Station Road, Flushing, Long Island, New York.

The expedition is exploring the jungle regions around Lake Habbema, 12,500 feet above sea level.

BURMA—Max Fisher of San Francisco, writes that XZ2EZ sends an exceptionally fine QSL card, 5"x7" in size, and having call letters 2" high in red, green, and blue. A Hindu Temple is pictured in the upper right hand corner. The station's frequencies are 14.2, and 14.36.

JAMAICA—During a recent labor disturbance, when all ordinary communications had been severed, an emergency amateur network, served as the only means of contact between various points on this island.

PHILIPPINES—Amateur KA7EF (14.122), during a KSO with W5ECL, was heard to state that his station was located at the base camp of the Fabrica Lumber Company, and American Lumber Company, on the Island of Negros.

SUMATRA—Bob Hetzel of Milwaukee, Wisconsin, recently received a QSL card from PK4JD (14.09) of *Billitan, Sumatra*, which stated he was the first to report reception of this station from the W9 district. PK4JD is on the air quite often near 9:00 a.m. and is very anxious to receive reception reports from the United States. The power of his rig is 30 watts.

Last Minute Notes

A short-wave transmitter is now testing in *Wellington, New Zealand*. Programs of broadcast station 2ZB are being relayed on frequencies of 6.975, and 4.53. Reports from the United States are especially solicited.

Short Waves for West Coast DX'ers

by JOHN D. CLARK

(All Times are *PACIFIC STANDARD*)

BECAUSE of the increased interest in trans-Pacific stations, RADIO NEWS presents this month a complete list of the broadcasters which are now being logged regularly on the West Coast. Due to the fact that most Asiatic transmitters are on the air only during their own evening hours, reception of these stations in America is usually possible only between midnight and 7:00 a.m., PST.

4.27 meg. RV15. *Khabarovsk, U.S.S.R.*—An old stand-by and a very reliable station from midnight to 7:00 a.m. daily.

4.85 meg. YDL2, *Solo, Java.*—Extremely weak signal is audible from 2:30 to 5:30 a.m., heard only on the Pacific Coast.

4.99 meg. VUB2, *Bombay, India.*—Comes on the air at 4:30 a.m., and is audible weakly on the West Coast for about one hour.

5.14 meg. PMY, *Bandoeng, Java.*—Weak signals, but audible daily from 2:30 to 5:30 a.m.

6.01 meg. ZHO, *Singapore, Malaya.*—Transmits from 2:40 to 6:40 a.m., but heard in America only under extremely favorable atmospheric conditions.

6.20 meg. *Saigon, Indo-China.*—Station again announcing as "Radio Philco" audible with fair signal until 6:00 a.m. daily, and until 6:30 a.m. on Thursday and Sunday. This transmitter is sometimes confused with ZBE of Kuala Lumpur, Straits Settlements, which works on almost the same frequency from 3:40 to 5:40 a.m. Sunday, Tuesday, and Friday; but ZGE is considerably weaker and on some days entirely inaudible.

6.72 meg. PMH, *Bandoeng, Java.*—Very good station from 1:30 to 6:00 a.m. daily. Doesn't sign off until 8:00 a.m. but fades out after 6:00 a.m.

7.31 meg. 4PM, *Port Moresby, Papua.*—This is a new station. Has no regular schedule as yet, but has been reported irregularly near 1:00 a.m.

8.54 meg. RV15, *Khabarovsk, U.S.S.R.*—A powerful harmonic of 4.27 meg. occupies this frequency, and signals are usually stronger than the original wave from 2:00 to 6:00 a.m.

9.10 meg. XGOX, *Nanking, China.*—A new station, the identity of which is still somewhat questionable. News in English is released at 5:45 a.m. daily, but the complete schedule is not known. No regular schedule seems to be maintained at the present time, the station closing down at almost any time between 6:00 and 7:30 a.m.

9.29 meg.—Another new Chinese station, located in *Hankow* or *Canton*, and usually heard between 5:00 and 6:00 a.m. Despite reports to the contrary, this transmitter has no connection with the 9.10 meg. station, since both have been heard at the same time with *different* programs.

9.42 meg. PLV, *Bandoeng, Java.*—An extremely powerful phone station which contacts California between 5:30 and 7:00 a.m. daily, and occasionally broadcasts programs of native music.

9.50 meg. VK3ME, *Melbourne, Australia.*—An old stand-by which is received with fine volume from 1:00 to 4:00 a.m. daily except Sunday.

9.51 meg. HS8PJ, *Bangkok, Siam.*—Transmits Thursday only from 5:00 to 7:00 a.m. Reception during the first hours is usually excellent, but the station is heterodyned after 6:00 a.m. by XEWW. Announces at regular intervals in English.

9.53 meg. ZBW3, *Hongkong, China.*—A powerful station, broadcasting in both English and Chinese. (See RADIO NEWS, August, page 67 for complete schedule.)

9.54 meg. VPD2. *Suva, Fiji Islands.*—On the air daily except Sunday from 2:30 to 4:00 a.m., and received on America's West Coast with surprisingly strong volume. Programs consist entirely of English recordings.

9.55 meg. YDB, *Sourabaya, Java.*—Another "powerhouse" which may be heard without difficulty from 2:30 to 7:00 a.m. daily, to 8:00 a.m. Friday, and to 8:30 a.m. Saturday. Programs are partially in Dutch and partially in Malay.

9.57 meg. KZRM, *Manila, P. I.*—Reliable station, heard with good volume during early morning hours. Scheduled to operate from 2:00 to 6:00 a.m., but often stays on the air until 7:00 a.m.

9.58 meg. VLR, *Melbourne, Australia.*—Tremendous volume from 12:30 to 5:30 a.m. daily. Relays programs of 310-3AR and Australian National Network. Also on the air from 7:30 to 11:30 p.m., but never audible in this country before 10:00 or 10:30 p.m.

9.59 meg. VK2ME, *Sydney, Australia.*—"The Voice of Australia." Heard weakly Saturday from 9:00 to 11:00 p.m., and fair on Sunday from 1:30 to 5:30 a.m. For listeners on the West Coast, VK2ME is the weakest of all Australian stations.

9.59 meg. VUD2. *Delhi, India.*—Audible with weak to fair volume near 5:00 a.m., but fades out after 6:30 a.m.

9.62 meg. ZRK. *Johannesburg, South Africa.*—Becomes audible about 6:00 a.m., reaching peak volume near 7:00 a.m., and fading out after that time.

9.63 meg. JFO, *Taihoku, Taiwan.*—Usually heard from 2:00 to 7:15 a.m., with news in English at 6:05 a.m. Sometimes signs off at 6:30 a.m. immediately following the news. Volume good, but not as strong as other Japanese stations.

9.76 meg. *Saigon, Indo-China.*—Relays programs from "Radio Philco" on 6.20 meg. Best volume between 5:00 and 6:00 a.m.

9.92 meg. JDY. *Daricu, Manchukuo.*—Broadcasts daily from 4:00 to 5:00 a.m., with news in English at 4:45 a.m. Excellent volume.

10.26 meg. PMN. *Bandoeng, Java.*—Relays programs of YDB and PLP from 2:30 to 7:00 a.m. daily, to 8:00 a.m. Friday, and to 8:30 a.m. Saturday. PMN is now using a new beam-type antenna, and a decided improvement has been noted in signal strength during the past month. The station often returns to the air for additional programs of native music after a few minutes intermission, following completion of simultaneous broadcast with YDB and PLP.

10.53 meg. JIB, *Taihoku, Taiwan.*—Broadcasts English news period simultaneously with JFO at 6:05 a.m. daily, and often releases native recorded music both before and after that time.

10.66 meg. JVN, *Tokyo, Japan.*—Heard with excellent signal strength from 10:50 to 11:20 p.m., and from 1:00 to 4:40 a.m. daily, relaying programs from the Japanese National Network.

11.00 meg. PLP, *Bandoeng, Java.*—Works simultaneously with PMN and YDB from 2:30 to 7:00 a.m. daily, to 8:00 a.m. Friday, and to 8:30 a.m. Saturday.

11.8 meg. JZJ, *Tokyo, Japan.*—"Overseas Program" from 5:00 to 6:30 a.m. is received with tremendous volume, as is also the transmission from 4:00 to 4:30 a.m. This station is also on the air from 11:30 a.m. to 1:00 p.m., and from 1:30 to 2:30 p.m., but reception in this region is extremely weak.

14.6 meg. JVH, *Tokyo, Japan.*—Relays programs of the Japanese National Network, at irregular intervals throughout the afternoon and early evening.

15.15 meg. YDC, *Bandoeng, Java.*—Broadcasts simultaneously with PLP, PMN, and YDB, but reception on America's West Coast is extremely weak and irregular.

15.16 meg. JZK, *Tokyo, Japan.*—"Overseas Program" for Pacific Coast heard with excellent signal strength from 9:30 to 10:30 p.m.

15.30 meg. YDB, *Sourabaya, Java.*—This is a comparatively new frequency, and the first time that a Javanese station has managed to reach the United States during the evening hours. Listen for YDB between 7:30 and 11:00 p.m.

16.87 meg. JZL, *Tokyo, Japan.*—A new Japanese broadcast frequency. This transmitter relayed programs of JZK from 9:30 to 10:30 p.m., and from 3:00 to 3:30 p.m. on several occasions recently.

19.02 meg. HS8PJ, *Bangkok, Siam.*—Programs scheduled for Monday only between 5:00 and 7:00 a.m. Last announcement heard "Our Monday broadcast on 15230 kc. per second" would seem to indicate that a change in frequency is contemplated, and this broadcast may soon be shifted to the 19th meter wave.

Asiatic Amateurs

A large number of Chinese amateur stations have been logged on the popular 20 meter band during the past month, most of them being received near 6:00 or 6:30 a.m. XU8EF, XU8ET, XU8MC, XU8RB, XU8RJ, XU9MK, and XU6TL are a few of the more regular Chinese "hams."

From 11:00 to p.m. to 1:00 a.m., this same 20 meter band is overrun with Australian amateurs, and as many as 43 stations from the land of the kangaroos have been tuned in during this period, many of them with surprisingly strong volume.

From 1:00 to 6:00 a.m. the Pacific Coast listener may, with a little patience, log "ham" stations in almost every Asiatic country. Try the 20 meter band (14.1 to 14.4 meg.) for real DX reception.

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Technical Review

(*Continued from page* 48)

types. The data in both booklets has been prepared in a comprehensive and convenient form. For a free copy write to the above company attention of the Commercial Engineering Section.

MALLORY-YAXLEY RADIO SERVICE ENCYCLOPEDIA, Second Edition, 336 Pages. Price $3.00; Size 8¾x11½ inches. Published by P. R. Mallory & Co., Inc., Indianapolis, Indiana.

The new Encyclopedia surpasses the first edition by a greater number of pages, (over 120 more pages than the first publication) with many new formulas and charts, circuit diagrams, and by the fact that there are something like 17,000 different sets analyzed and conveniently indexed in this new book.

This 1938 edition has been compiled and written from the actual practical field experiences of many radio service engineers. It has been prepared so that the serviceman can find the information that he may seek for the job at hand.

The book is divided into three main sections, controls, condensers and vibrators. These sections are supplemented by helpful articles on transformers, antenna design, rectifiers, automatic tuning, alignment, and other data required for constant reference in everyday service procedure.

RADIO NEWS 56 MC Preselector

(Continued from page 31)

facilitate ganging the tuning condensers. A shield partition of aluminum, 4" wide and 3½" high is bolted to the chassis by means of a ½" flange at its bottom. A large hole is cut in it to accommodate the tube; a smaller one to pass the condenser shaft, and four more for the socket and condenser mounting screws. The placement of the two larger holes is not critical except that the necessity for short leads should be kept in mind. In the model the center of the tube hole is 1¼" above the chassis and 1⅛" in from the edge. The shaft hole is centered 1½" above the chassis and 1⅛" from the other edge. The tube hole is made just large enough to pass the base of the tube: ⅜" diameter is sufficient to provide ample clearance for the condenser shaft. The 1851 socket is mounted on 1⅛" posts with the screen and suppressor terminals uppermost.

This small shield partition provides all the shielding that is needed, and is mounted 3¼" behind the panel, ¾" from the enge of the chassis. In experimenting with the circuit a copper shield was installed to almost completely inclose the plate circuit with its output terminals, tuned circuit, etc., but was not found to offer sufficient advantage to justify the trouble it involved.

The placement of parts not fixed by the dimensions given above can be readily determined from the photographs. The common ground point is on the chassis beneath and in front of the tube socket. The tuning condensers are mounted by means of ½" mounting posts which attach to the isolantite foundations of the condensers so that they are insulated from the panel and shield partition.

The plate and grid coils are mounted directly on the condensers, with leads just long enough to keep the coils approximately ½" from all metal parts. The plate coil has one end directly connected to the stator terminal of condenser C2 but the isolating condenser C7 is connected between its other end and the rotor terminal so that the rotor and shaft are at ground potential. The mica trimmer C3 is connected directly across the coil, however, as a matter of convenience.

The antenna coupling coil L2 is mounted on feed-through insulators in the side wall of the cabinet which constitute the antenna terminals. The resulting leads, about 2¼" long, can be bent as needed to adjust the coupling. The same arrangement is used for the output coupling coil, except that the feed-through insulators in this case are mounted on the chassis at the front right corner. This brings the output terminals under the chassis. To these a pair of slightly spaced wires are connected and extended out through a grommet in the real wall of the chassis and another in the rear of the cabinet, to the doublet antenna terminals of the receiver. The purpose of this arrangement is to isolate the output circuit from the antenna and the grid circuit.

The coils are all "air wound." L1 and L3 are of number 14 wire with ½" inside diameter. L1 has 7½ turns spaced to a length of 1⅛". L3 has 8½ turns and a length of 1 3/16". L2 and L4 are 5/16" inside diameter and wound of number 18 enamelled wire with close spacing. L2 has 8 turns; L4 has 7 turns. The lead from the inner end of each of these coils is brought back through the center of the coil to the outside end.

The condensers are ganged by means of Cardwell extension shaft sections and flexible couplings. In the model preselector two of these couplings were used with a short piece of bakelite shaft between them; the purpose being to provide plenty of isolation between the grid and plate shafts.

In adjusting the preselector it is best temporarily to add an extension shaft and knob on the rear end of the grid tuning condenser so that the condensers may be separately tuned. These circuits cannot be aligned until the coupling adjustments have been made.

When the unit is completed, push the coupling coils inside the larger coils until their outer turns are on the same plane. Tune the two condensers for maximum background noise. The plate condenser will be the sharpest and if the receiver employed has a low intermediate frequency such as 465 kc. there will be two positions on this condenser where noise will be heard, corresponding to the repeat points of the receiver. The point where more capacity is in the circuit is the correct one. The coupling adjustment should be made at the frequency in the range where the background noise is greatest because this is the frequency at which there is the greatest tendency toward instability.

When this frequency has been found, reduce the coupling in the input circuit until the circuit breaks into oscillation. It can be left this way and oscillation controlled by the potentiometer in the screen circuit. This will provide maximum sensitivity. As a final step in the adjustment it is well to try juggling the coupling, increasing the output and decreasing the input coupling correspondingly, and *visa versa*, until the best combination for maximum response is obtained.

Still tuning the two circuits separately, adjust the trimmer condenser and the spacing of the grid coil until the two condensers mesh equally for resonance throughout the range. Then couple the shafts together and the job is done. Be sure, however, that this alignment procedure is followed using the lower of the two resonant frequency settings of the plate condenser. If the wrong point is used the condensers will be aligned at a difference of 930 kc. and the whole circuit will be unstable.

In some installations it may be found desirable to ground one side of the input to the preselector, or one side of the input to the receiver; or possibly to bond the receiver chassis to the preselector cabinet. At W2JCR none of these provided any advantage. The preselector stands on top of the SX17 (insulated from it by rubber cushions) with the point where the output leads leave the preselector directly over

the antenna terminals of the receiver. This keeps the output leads a minimum length and avoids external coupling back to the antenna. Coupling in the model is adjusted so that with the potentiometer turned up full there is no oscillation at any part of the tuning range. This provides enough regeneration for excellent sensitivity but with complete stability. If a little additonal "hop" is required in tuning in an extremely weak signal it is obtained by raising the lid of the preselector cabinet. This provides a little feedback from the plate circuit to the antenna—enough to cause some oscillation and this is controlled by the screen potentiometer, making it possible to obtain maximum regenerative amplification. This feature is seldom employed, however, because during most of the day and night the combination will go down to the noise level. If a signal is below this level the added gain will not bring it out.

The switch S2 is a refinement which will be found convenient by the ham. One side is used to break the plate supply of the preselector, the other side to break the supply in the receiver. Thus both units are thrown into the "stand-by" position by this one switch.

The mention of this preselector has been confined almost entirely to use on the 5-meter amateur band. It is, of course, equally useful on other ultra-high frequency services (except the video transmissions from television stations, for which purpose it would be too selective). The model covers from slightly below 54 megacycles to a little above 60 mc. It would be quite possible, although probably with some sacrifice in efficiency, to make it cover several ranges by using air-wound plug in coils, with small tip jacks into which to plug them. In the 10-meter band it should give an excellent account of itself, as well as in all the ranges above 28 mc.

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"I think you don't," I said, and told him what I'd done. "I don't want to rub it in, but don't you think it's about time for us to advertise free service?"

"No, it isn't. Read one of those cards you passed out so conscientiously, Bright Eyes, and bring yourself up-to-date."

I read the card I had planned to surprise him with:

> ". . . and our experience shows customers do not expect
>
> FREE SERVICE
>
> when work is done properly. It also shows most persons insist upon paying for work they order. For this reason, we are continuing our usual dollar service charge. . . ."

"You switched copy on me!" I said excitedly.

"Why not?" laughed Al. "You switched mine! The printer 'phoned to ask if you were drunk, and I changed the order. You passed out two thousand cards without reading anything but the fold-face 'FREE SERVICE'. When I told Brown, he laughed for the first time in two months."

"I work here, too. Why didn't you tell me?"

"What, and spoil all your fun? You know I try my best to keep the hired help happy."

"That might be funny, but it doesn't explain why we got more calls with the 'free' line," I said, still feeling frustrated. "Maybe you can give a reason for that, my former friend."

"Of course I can. It was because you passed the cards out yourself, instead of hiring some kid to build a bon-fire with them. Now we know how to occupy your spare time!"

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Serviceman's Experiences

(*Continued from page 38*)

"Give me," I ordered him, "two thousand of our regular cards. Change the copy on one line. Instead of the usual 'SERVICE CHARGE, ONE DOLLAR', use 'FREE SERVICE'. Don't bill us before the first." I wanted to show the value of my scheme at the keyboard of the till before Al saw the statement.

When the cards were ready, I hid them in the truck, and used my spare time to drop them into apartment house mailboxes. During the following two weeks, I kept a careful record of the response from that section. Both the number of calls and the average "take" had increased. My cards, with the "free" line had proved themselves by beating any corresponding record for our usual "dollar" cards.

I held my secret as long as I could, and finally told Al.

"Noticed the jobs we've been getting from the Bradley apartments lately?"

"Yes," Al replied.

"Have you any idea why there have been so many, with so few failures?"

"Yes," he said with a smug look.

Constructing the Marine-Ham Loop Receiver

(Continued from page 29)

use as an accurate direction-finding device.

First remove any antenna from connection to the cabinet binding post assembly. Then, with loop not yet plugged-in, tune the receiver over the broadcast band. No signal should be received, as the metal cabinet very effectively shields all chassis components which might pick up electromagnetic energy.

Put the loop in place, tune the receiver until its dial reading is proper for interception of some signal in the broadcast or long wave band, then tune and vary the position of the loop until this signal comes in strongly. With the signal at maximum intensity there should be plenty of both aural and magic-eye indication (minimum shadow) of its presence. Now turn the loop until the signal is no longer heard and the "eye" shows a definite null point (maximum shadow) and observe the position of the coil and the reading on the 360 degree scale. If this reading is, for instance, 45° then the station lies 45° away from the course of the ship, or fore and aft line of direction. Now if the line of ship's direction is known, then the bearing of the station can be accurately determined.

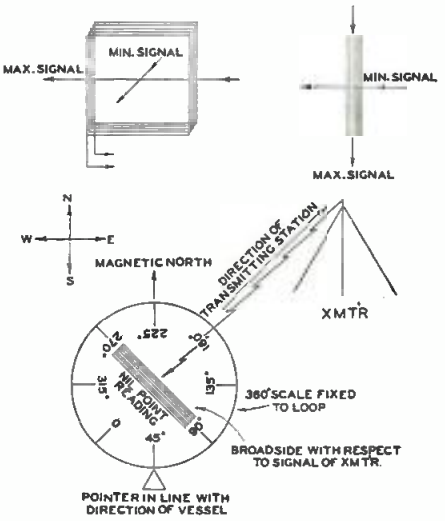
Pick up various other signals and follow this same procedure. Play with the instrument until you know where various stations of known location will come in on the receiver's dial and just what loop switch adjustments will provide for proper tuning to these signals insofar as the input or pickup circuit is concerned. Prepare some sort of chart, listing coastal broadcast and regular beacon stations in terms of their known frequency, call letters, and position, and relating them to loop adjustment and dial reading.

Required for serious bearing work at sea will be, in addition to such a chart: a ship's compass; a shore-line map of the waters in which the vessel is to sail; and a knowledge of the magnetic variation for these particular waters. Compass and map, of course, are standard items in every boat-owner's array of equipment aboard-ship, and his map should indicate the variation.

Hypothetically, should you be lost and want to get into a certain port and there is at or near that port a known broadcast or beacon station. Pick up the signal, tune the loop for precise null point reading, and observe on the loop scale the bearing in degrees. As the pointer and the ship's course are in line, it will be apparent that the station lies off-course by the amount of degree indication, and the course need only be noted by means of the regular magnetic compass, and readjusted until the ship's line of direction coincides with that of the transmitting station. Set the loop for zero reading at the pointer, and "ride the signal" right into port.

Should a bearing be required, proceed as follows:

Knowing the ship's course, as indicated by our compass—the true heading being the sum of this compass reading and the known magnetic variation, tune to a known shore station and adjust the loop for null point reading. This gives what is known as a "line of position" by noting the loop scale reading, and adding to this reading the true heading for the ship (to get a true bearing on this station with respect to our course), and projecting a line seaward (on our map) through this station and at the number of degrees from *true north* totaled for the scale reading and the true heading. To take a specific example, if headed say 10° East from magnetic north and the *magnetic variation* is 10° East to give a true course of 20° East, and if null point reading on a coastal signal is 45° (the bearing from the



Use of the loop antenna for direction finding. Note dial calibrated in degrees.

ship's course), we simply add this 45° to the 20° true course to get a total of 65°, which is the true degree bearing for the station supplying the signal; and a line 65° from north and drawn on our map will be a "line of position." The ship, then, is *somewhere* on that line.

Now if the same procedure is followed on another station up or down the coast and obtain another line of position, it will be found that if extended on our map, the two lines will cross at some point to give a true position.

Advice has been received that the United States Lighthouse Service, in coordination with the U. S. Coast Guard, is now broadcasting (by radiophone) marine information and advisory storm warnings furnished by the U. S. Weather Bureau, the U. S. Lighthouse Service, and the U. S. Navy Hydrographic Office. The frequency of the transmissions is 2662 kc. for Atlantic, Gulf, and Pacific Coast stations and 2572 kc. for the Great Lakes stations.

Fortunately, the all-wave marine receiver will permit the reception of these broadcasts.

For a list of the Coast Guard and Lighthouse Service stations providing the broadcasts and for schedule information effective for April 1, 1938, the reader should write either Commissioner of Lighthouses, Washington, D. C.; or Commandant, U. S. Coast Guard, Washington, D. C.

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Mutual Makes No Money

(*Continued from page* 11)

for itself! Mutual's function is to sell time for member and affiliated stations and to arrange such sustaining features as will be most interesting to the audience. Should there be any year-end surplus, it is turned back to the member stations.

When a Mutual salesman calls on his prospect, he has no "must" list, no "basic network" to sell. He offers, today, 77 stations throughout the United States—from Bangor, Me., to Richmond, Va.; from San Diego, Calif., to Aberdeen, Wash.; from Dallas to Honolulu. The sponsor writes his own ticket. He can buy two stations, three, four—*exactly* the ones he wants, *only* in the towns and cities he wishes. He doesn't have to buy Hartford if he wants only Bridgeport; he can choose between Baltimore and Washington and take either, adding the other at his own convenience.

The result is healthy indeed. New sponsors are attracted. They get first class stations with proved audiences. They can start in as small a way as they wish—testing a program in selected markets before expanding—following distribution of a new product. And always, the whole network is there, ready to serve with coast-to-coast coverage.

Mutual operates on a limited income. It has no unnecessary overhead. The total payroll includes only 30 people—and nearly half of these are concerned with selling and its related detail and secretarial work. Where other networks have scores of top executives, Mutual's "four horsemen"—Maclarlane, McCosker, Streibert and Antrim—are most concerned with their own WGN and WOR, and Mutual's effect on their stations. While others diversify responsibility, at Mutual everything is piled on human dynamo Fred Weber—officially general manager, actually concerned with keeping the salesmen pepped up, maintaining station relations, constantly watching the entire broadcast picture with an eye on Mutual's position and growth. Vast, too, is the responsibility of Lester Gottlieb, publicity coordinator, who with one assistant handles the job of public relations and publicity for which other nets need dozens of people. Program coordinator Adolf Opfinger has a comparatively big staff—three assistants to help in the daily charting and interlocking of landline facilities, arranging the flow of commercials and sustaining programs for all the 77 stations. Robert A. Schmid, sales promotion manager, does a big job alone; and John Steele in London handles by himself the duties of an extensive foreign staff. Everybody in Mutual does at least the work of two ordinary people—because they have an idea, an ideal. Like the ham who goes for days without sleep or food in time of flood or other emergency, these Mutual folks find their greatest reward in the satisfaction of being part of a great constructive movement.

In less than four years, Mutual has grown to be a stalwart youngster. It enjoys equal recognition and program exchange privileges with the Canadian network and the British Broadcasting Corporation. When the President speaks, when important news happens, there's a Mutual mike on the spot. Over Mutual stations come what is probably the greatest array of important dance bands—in four-and-a-half hours last New Year's Eve, 18 of the world's most famous orchestras played for Mutual listeners: Dorsey, Fields, Goodman, Heidt, Kyser, Lombardo, Lopez, Martin, to mention just a few. In sports coverage, Mutual goes to all the games, meets, fights, races—captures its share of exclusives as well as many "stunt" broadcasts. Nor does this network forget cultural and educational features. Talks, classes, operas, symphonies occupy over 22 per cent of its 18-hour-daily service to members.

How can all this be done, without terrific expense? The answer again is in the name—Mutual. While other nets need to send special crews, Mutual's local station picks up the feature or event, puts it on the wires for all the other members. KHJ feeds Santa Anita races to the net, WOL covers Congress, KGMB brings native Hawaiian music: every station is urged to contribute something. Not tied down to New York and Chicago studios, more than half of Mutual's programs originate in other cities. And the stations love it! Big networks don't bother to ask locals for sustaining features, but over Mutual every member can have national recognition, national publicity, a national following. Here are a handful, selected at random:

Saturdays, Iowa hillbillies turn loose *Tall Corn Time* from KSO; Fridays, the University of Pennsylvania debates while WFIL feeds the net; Thursdays, Cleveland's young *Harmonaires* come from WHK-WCLE; Wednesdays, WOL brings in the United States Marine Band; Tuesdays, *Black and White*, twin pianos, originate from CKLW; Mondays, *The Sophisticated Ladies* may be heard from WCAE; Sundays, *Thirty Minutes in Hollywood* from KHJ features George Jessel. On such programs new stars are born, finds are made: talent that might never have been heard outside a local area is brought before the entire nation. What spirit and zest the actors acquire when they know they're talking, singing or playing to the whole United States! If the stations are at all bashful about offering features, Mutual headquarters makes it a point to inquire what show might go over the net.

Mutual's major problem is clearing time, but that difficulty will always exist as long as the net is operated for the benefit of its stations; and as long as some of the members are, of necessity, likewise affiliated with other nets.

So, Mutual goes forward: the network that is no bigger than any sponsor wants; the network that doesn't control its stations but is controlled by them: the network that makes no money because its members are the ones who must profit from mutual cooperation.

This is the Mutual Broadcasting System.

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"Ham" Radio in Mexico

(*Continued from page* 15)

ican readers with the opportunity of seeing what other nations are doing to improve their status in the radio world.

Not content with limiting its sphere of influence to its station XE1CB and its house organ *Onda Corta*, the LMRE has created an academy in which university professors and engineers of repute hold classes in higher mathematics, electricity, radio communication, and telegraphy, at no extra expense to its members. The classes are held in the League headquarters in Mexico City, but at every available opportunity they are rebroadcast through XE1CB so that the amateurs in other parts of the country have an opportunity to improve their knowledge.

Mexican amateurs in many ways have distinguished themselves in their favorite indoor sport. In the annual international radio competition last year Mexico was second only to the United States and the year before carried away the coveted trophy by a comfortable margin, the credit for which is due to Juan Lobo y Lobo, XE2N, whose record in his own country will remain for many months to come. When tidal waves struck the Atlantic coast and when other disasters disrupted the trend of human existence, amateurs from all sides lent their help to the people in the region affected, and considered it nothing more than a patriotic duty. At the present time in the states of Tamaulipas, Veracruz, and Yucatan, the amateurs of that eastern seaboard have banded together to retransmit the bulletins emanating from the various government meteorological observatories, in this way keeping the ships at sea advised of weather conditions at all points along the Gulf of Mexico. All the amateurs of these states are cooperating with their accustomed enthusiasm to make the *Ruta del Golfo* (as they call this chain) a permanent service to the Atlantic seaboard, and in this they are receiving the full support of the LMRE. The credit of this undertaking belongs to Ing. Ernesto Dominguez, government meteorologist in Veracruz and member of the LMRE.

Many of the "XE" amateurs speak fluent English, and for this reason are able to log any number of American conversations. One of the more favored stations in this respect belongs to Antonio Cruz Uribe, XE1BT, in Pachuca, Hidalgo, who has had QSO's with amateurs in almost every state in our union, not to mention the 27 states and 2 territories in his own country. Another famous call among the Americans is that of Dr. James Hard, XE1GE (formerly XE1G), in Cuernavaca, Morelos, who affectionately is known as one of the grand old men of radio in Mexico. On the 20 meter airways one frequently hears Jose Remigio Agraz, XE2Q, of Hermosillo, Sonora, whose signals are quite a favorite among the W6's of Southern California, and on 40 meter phone one finds Saturnino Campoy, XE2F, of Cananea, in the mining district of Sonora.

Queretaro, capital of the state of the same name, boasts of as rabid a group of amateurs as exists in any part of the world; and judging from the way that signals are arriving from that point, one might think that there is a life and death contest among the various cities below our border. A few of the signals pounding in from Queretaro can be attributed to Ignacio Urquiza Septien, XE1DA; Fernando Loyola, XE1CM; Ing. Luis Alvarez XE1CC; and Ing. Carlos Gonzalez de Cosio, XE1AM.

The individual amateur, however, who has won the admiration and respect of all his colleagues both north and south of the American border, is Jesus Salido, XE2BJ, of Bacobampo, Sonora, affectionately known as "Chuey" to his many friends. In spite of the terrific handicap of being totally blind, XE2BJ has one of the most modern transmitters in Mexico, and can be heard either on 20 meter or 40 meter phone at any hour when signals are breaking through. XE2BJ speaks English as fluently as Spanish, and his friends north of the Rio Grande are as numerous as those of his own country. In his radio work he is ably assisted by his trusted friend and companion Francisco Von, the two being inseparable at all times.

The group of amateurs in the third district is not so great as in the central and northern sections, nor is it very often that one breaks through to these our United States. Among the operators who come to mind, however, are Ing. Enrique Orihuela, XE3A, of Oaxaca; Austreberto Aragon Maldonado, XE3J, of the same city, Napoleon Correa, XE3AR, of Tapachula, Chiapas, and Juan Leal Zepeda, XE3AV, of Huixtla, Chiapas. Incidentally, Chiapas is the most southerly state of the Mexican republic, and borders on Guatemala, which is the northernmost country of Central America.

The American amateur taking his first trip to Mexico City, would do well to stop for refreshments at the *Tupinamba* if he would wish to meet the crowd of radio amateurs and engineers who thrive in the capital. In Spain, as in many other European countries, it is the custom for groups of men with common interests to go to a rendezvous to spend a few pleasant moments chatting about the topics nearest their hearts. This same custom has been transplanted in Mexico, where continental atmosphere in this respect has been maintained. For instance, in a certain cafe the athletes and bull-fighters will gather to discuss their respective prowess on the field of sport while in another restaurant the theatre and professional groups come together to while away their leisure moments over a cup of black coffee. Thus every group has its particular rendezvous, and in the case of radio the unanimous choice in Mexico City is the cafe known as the *Tupinamba*. There you will find Ing. Juan Cross Buchanan, XE1K (V. P. of the LMRE and chief engineer of XEB-XEBT); Ing. Herran (chief engineer of XEW and XEWW); Lt. Col. Fernando Proal Pardo, XE1F, of the Army Aviation

Corps; Manuel de Velasco, XE1BN (prominent member of the LMRE and affectionately known as "Don Manuelito" by all his comrades); Ing. Antonio Sierra Basurto, XE1AG (chief of traffic communications for the LMRE); Marcos Veramendi, XE1C (prominent contributor to *Onda Corta*), XE1DC, XE1N, and a host of other well-known figures in Mexican radio. So the cry of the American amateur in Mexico City is, therefore, "On to the *Tupinamba!*"

And with this blissful picture of Mexico, it's time to sign off and let you take to the air with your favorite California kilowatt; but should you turn your signals southward, and especially if you speak a few words of Spanish, you will be well rewarded with as many QSO's with our XE colleagues as you can comfortably handle from your easy chair.

Adelante colega—cambio, cambio!

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Ham Shack

(*Continued from page* 33)

with an automatic code machine. Manufacturers have succeeded in reducing their cost appreciably so that now they are available at prices within the range of all. Further, these machines are also available on rental. The value of concentrated practice with such a machine for a month or two cannot be over-estimated. The ingenious constructionist, on the other hand, may even build such a code machine with an old phonograph motor as the driving unit. It is the variable sending speed of the machine which make it so useful.

A great number of amateur stations maintain code practice schedules on various bands. These present another solution still to the question of securing means for obtaining one-half to two hours of daily receiving practice *at your speed*, whether that speed is three or twelve words per minute. The beginner is urged to utilize these transmissions fully.

How Long Will It Take?

Nothing is more conducive to achieving your objective with a minimum of wasted energy than possessing the proper attitude towards the subject of mastering the code. This rests for the most part upon consistent and regular practice and, more important perhaps, reconciling yourself towards acceptance of a certain time limit before you will be prepared to take the license examination.

Nature will not be hurried, and the code is one of those things in which most people's capacities are pretty much alike. Stories circulate freely as to how this or that operator won his spurs in two or three weeks of code study,—with a phone on one ear, pencil in one hand and cocktail in the other . . . An otherwise reliable magazine once carried the story of an amateur who maintained that he had acquired the then-required ten w.p.m. code speed in ten hours! One wonders why that word-an-hour wonder stopped at ten . . . Miracles may happen, but this, after all, is not an age of fable.

Experience demonstrates quite conclusively that at least 120 hours is the average minimum requirement for attaining a mastery of 13 words per minute. Fifteen hours of weekly practice is a good average stride for practice. This is better, if pursued steadily week after week than ten twelve-hour vigils. Two to three hours daily is likewise a reasonably conscientious daily average.

Cultivating a Good "Fist"

Timing, spacing, and rhythm may be regarded as the three cardinal principles of good sending. To make *dits* sharp and easily distinguishable from *dahs;* to make *dahs* of equal length while forming letters as *one continuous sound*, and to leave enough relative space between words; to avoid choppiness and attain a sing-song lilting rhythm—these are the essence of good sending, of a "fist with a personality."

Exercises

Clear sending depends most on timing and spacing, and clearness is the first quality to strive for. The following plan for working up your own exercises will provide a valuable "course of instruction." Until one has attained sufficient mastery, say a sending speed of eight words per minute, these exercises should comprise the greater part of one's keying practice.

Every letter should be thought of as a *unit of sound*. For hardy souls, it is good practice to write the alphabet two or three times, to impress this fact upon the mind, in the following manner: ditdah, dahditditdit, dahditdahdit, etc.

Dits, it should be remembered are of no appreciable length. They are formed by the instantaneous tapping of the key. *Dahs*, vary in length with sending speeds. At four words per minute, for example, the *dah* should be close to three seconds in duration, diminishing approximately one second as speed increases every four or five words. To develop accurate timing, it is advisable to send a long series of *dahs* timed by the second hand of a watch.

Spacing

"No spacing within letters; some spacing between letters, and three times that much spacing between "words," is a handy rule. To remind oneself how far astray one's sending style may go, it is worth the while to make an analysis of the code alphabet. Beginning with the letter A, we see how a slight pause might sound like "ET." Similarly, B might degenerate into "TS" or "NI" or even "DE." Several such combinations are possible in most letters.

Consequently, no better suggestion can be made than that the beginner write out all such combinations, and, further, make exercise groups containing both the letters and their possible components. For example: AETATE, BTSNI, BNITS, and so on through the alphabet. To vary this, you may also send words containing these combinations, such as EAT, ATE, NIBBLE, DEB.

In conclusion, let us recall the one best test of sending is the impression which your sending style make upon another operator. Try to work with a fellow beginner. He may not send perfectly, or well, himself, but he will be able to detect the flaws and errors in yours. When you have begun to satisfy most comers with the readability of your signals, then you will have begun to attain mastery.

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Radio Controlled Lightship

(*Continued from page 17*)

spectacular is the new radio-controlled lighthouse developed and brought into service recently on Peshtigo Reef, Green Bay, Lake Michigan.

The operations of this aid to mariners, such as the blowing of the fog signal and the change-over from the regular, clear-weather method of operating the radio-beacon to the foggy or emergency type of signals, which will be explained later, are all controlled by radio from a land station nine miles away. But the use of radio telephones, installed on both the tenantless lighthouse and the land station, the operator can determine definitely if the orders he is transmitting to his mechanical "crew" are being received and executed properly.

Just what are the various functions of these two mechanical wizards and how do they operate? Let us hear from the engineers of the United States Bureau of Lighthouses, whose brain children they are.

Roughly, the equipment of the lightship *St. Clair* consists of a powerful masthead light, a gas-operated fog bell, a compressed air fog horn and a radio beacon. The ship itself is a small one and has no propelling engines. It was built originally in 1887 and recently, by removing all living quarters, it was converted into the marvel of modern science that it is, and it now has no connection with the shore except by radio.

Virtually every piece of apparatus has been installed in duplicate and provisions made for instant substitution in case of failure. When a fog comes up and emergency signals must be sent from the ship, such as the blowing of the fog signal and the increased operation of the radio beacon, the shore keeper controls them by remote-control radio.

The powerful masthead light is entirely automatic, being turned on at night and off in the morning by an astronomical clock located on the ship, and is supplied with current by storage batteries which in turn are kept charged by automatic-action gasoline-driven generators. Lighthouse engineers have devised an ingenious method of substituting an acetylene auxiliary light in case the masthead light should fail. A small pilot flame burns continuously and the reserve light goes on the instant the electric light goes out.

One "orphan" piece of equipment, the fog bell, operates independently and has no connection whatever with any other machine on the ship or at the shore station. It rings constantly, one stroke every 20 seconds, and uses carbon dioxide gas for its power. A battery of tanks on the ship holds enough gas to keep the bell ringing for several months before being refilled.

When weather is clear and visibility is normal, the ship runs itself. The shore operator has nothing to do but twiddle his thumbs and read a magazine. The radio beacon sends out signals of 15 seconds' duration every minute day and night. Control clocks automatically start and stop the generators, which supply current for the radio beacon, at the proper time.

But when fog comes up, or dirty weather is imminent, the shore operator takes over and things begin to happen. He pushes a button which automatically takes the control away from the clocks on board the lightship and starts the generator going for the radio beacon. Then the motor on an air compressor starts in action to build up pressure for the deep-lunged fog horn. When there is sufficient air pressure, both the fog horn and the radio beacon begin their signaling, their code warning being controlled by motor-driven cams. When the fog lifts and constant signals are no longer necessary, the shore operator shoves another button and radio control ceases, and things return to normal on the ship, with the clocks taking over and sending out intermittent signals as before.

What happens when the keeper pushes the button and assumes radio control of the ship? At the land station, the keeper has under his charge two radio-telephone transmitters, two so-called "tone generators" and one all-wave radio receiver. Each tone generator and radio-telephone has different radio control over the two radio beacons and air fog horns on the ship, which are independent of each other. In reality, it is a duplicate hook-up, each control set on shore directing one of the two signal sets on the boat.

At the press of a button, one of the tone generators emits a musical tone of a definite pitch which the keeper puts on the air via one of the radio transmitters. This in turn starts the operation of one complete signal system on the boat. A second button starts in operation the second generator, which "sings a different tune" or gives forth a musical tone of higher pitch than its companion generator. This tone is broadcast by the second transmitter, which puts into operation the second complete signal system on the ship. When one signal set fails, the other is instantly put into use.

How does the shore operator know that he has started the emergency fog horn and stepped up the radio beacon? It can readily be understood by the layman that the keeper's radio receiving set instantly tells him whether the ship's radio beacon is operating constantly. But how about the fog horn? It cannot always be heard by the unaided ear, so a definite check-up had to be invented.

This means of checking is considered by engineers of the Bureau to be one of the most remarkable devices of the whole ingenious arrangement. A microphone on the *St. Clair* actually "hears" the fog horn sounding and tells the shore operator so in an astonishing way. If all is well, this mechanical ear will permit the radio beacon to sound the full 60 seconds of each minute. But if the fog signal does not sound, the microphone shuts off the radio beacon for five seconds of every minute. Thus the shore operator knows definitely whether the fog horn is sounding. If it is not, he turns on the second one by pushing the second button as was explained before.

Engineers of the Bureau state that the

automatic features on the lightship are almost "thinking" in the way they operate the equipment and the signals. For instance, to guard against interference in the shore control radio receiving set from other signals, static or similar disturbances, a small so-called "reed" in the receiver keeps out all signals except those desired from the ship.

Radio conversations are carried on constantly between other lighthouse keepers on identically the same frequency employed by the *St. Clair's* shore keeper, but difficult as it may be to believe, the "reed" effectively screens out all signals except those from the boat. It actually selects only the radio-control signals and permits no others to interfere.

Lighthouse engineers point out that after five full years of painstaking research the problems of maintaining the necessary complicated equipment aboard a small floating structure have been conquered. This new system permits the placing of lightships in actual positions of danger, rather than erecting a lighthouse on shore, which definitely lowers the hazards of marine navigation. No longer will it be necessary for keepers to spend months in complete isolation, without any human contacts other than radio communication.

The radio-controlled lighthouse in Green Bay, Lake Michigan, is similar to the set-up on the *St. Clair*. A duplicate system of radio transmitters and tone generators on shore at Sherwood Point, nine miles distant, control two independent fog signals and radio beacons at the lighthouse on Peshtigo Reef.

The difference in this arrangement from that of the *St. Clair* is that a radio telephone at the lighthouse is placed automatically in operation when the fog signal is started and the shore operator has a radio receiver which permits him to hear the fog signal as well as the clicking of the gears and wheels of other machinery in the lighthouse. Thus he knows if everything is as it should be.

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Remote Amplifier

(*Continued from page 47*)

standard amplifiers.

If an audio oscillator is at hand with an output indicator, a low level in the order of zero can be applied to the input, making sure the output transformer has a load resistor connected across it, and the frequency characteristic found with the comparison of the two Indicators, that is the one at the input of the amplifier and the output V. I. ordinarily used.

The case for the amplifier was custom built by a cabinet maker. It is made of ply wood covered with a tough leather and varnished. The amplifier can be constructed for a cost slightly over $80.00. For the ham or P. A. man, who would have need for a high gain amplifier and not necessarily need the mixers or V. I. it could be constructed for about $40 since these two components cost about half the total amount.

RADIO PHYSICS COURSE

by Alfred A. Ghirardi

(*Continued from last month*)

Energy is being absorbed from the source of electric current in the act of ionization, and radiated when recombination of the electrons and atoms occurs.

The converse of this action forms the basis of the operation of photo-electric cells used extensively in industrial devices, television and sound pictures. When an insulated, negatively charged metallic plate, is illuminated by light of suitable frequency or wavelength, it loses its charge because of a photo-electric emission of electrons. It is supposed that the electrons are knocked loose and emitted from the atoms of the metallic plate by the impact of the small quanta or bundles of energy which constitute the electromagnetic light rays. A certain critical light frequency or color is necessary before the photo-electric emission takes place at all, depending on the material of the plate. For instance, for some metals, red light produces no emission while ultra-violet light is very effective. Only a few of the metals exhibit the photo-electric effect to any marked degree. In commercial photo-electric tubes or *cells* as they are called, various metals are used for the active surface, depending upon the frequency or color of the light the cell is to be responsive to. For instance, zinc does not give off many electrons when exposed to ordinary light, but emits them quite freely when exposed to ultra-violet light. The commonly used metals for these cells are lithium, sodium, potassium, rubidium and caesium. The laws governing the photo-electric effect have been a strong argument in favor of the quantum theory of the corpuscular nature of electromagnetic radiations.

According to the Planck-Einstein theory of radiant energy, it is the scattering or radiating of these tiny units of radiant energy through space that constitutes the radio rays or waves that we commonly speak of. The exact nature of this radiant energy is not positively known as yet, nor is it the exact way in which it travels through space known. We are not certain whether the energy is transmitted by a sort of wave-motion, as in the case of sound waves, or by tiny bundles of energy in a direct motion through space in straight lines like tiny bullets shot from a gun, and whether or not some material substance called the ether is necessary for their propagation through space. It is beyond the scope of this book to enter into an extended discussion of this subject, and even our most brilliant scientists have not yet reached definite conclusions on it. It seems probable at this time that the facts may best be explained by considering the wave theory to be an accurate representation of the facts when we have to deal with the operation of a large number of these bundles of energy (quanta), whereas in processes where an exchange of energy due to a single quantum is concerned, the quantum theory is necessary for a satisfactory explanation of the conditions.

(*Continued next month*)

Marine Manners for Seagoing Ops

(Continued from page 13)

tion which would make it unethical to accept tips. Should he insist, tell him to turn the money over to the Seaman's Fund.

There will be at least one pest on board who will ask you: "Well, sparks, what's the weather forecast?" in a presumptuous tone that shows he considers such information was included in his fare. The stock reply is: "Fair winds and falling seas." This will fill his ears satisfyingly at the time, but leaves him later with a feeling he just missed a train. Such treatment is not discourteous, for idle conversation concerning the weather ashore becomes the source of alarming rumor on board ship. The information is semi-confidential: in respect to the skipper, do not violate your trust by turning the shack into a weather bureau.

Learn the commonest shipboard words as soon as possible. Avoid the landlubbery *downstairs, rear, wall, roof;* use *below, aft bulkhead, deck, overhead.* They might seem mouthy to you at first, but the lowest deckhand uses them fluently, and so must you.

Do not become alarmed if one of the mates tells you Johnny Noble was washed over the side; *Johnny Noble* is the thin smoke stack from the galley stove. If the bulkheads in your quarters is dirty, you might ask the steward to *soogie them down. Kumshaw* is side-money. If you work ashore in a factory, a chimney is over you; at sea, a *stack. Give it the deep six* is a phrase of disparagement; literally, *throw it into the ocean.* You are not in a boat, but *on a ship.*

There are many contractions, mixtures, and corruptions of the legitimate radio, landline, nautical, and International terminologies. While they are not important, they are very colorful and often extremely apt. If an operator stops sending abruptly with a *13,* do not tune him out. *Thirteen* is a numerical equivalent of *QRX*—stand by, but carrying a more specific connotation. *Channel fever* is not contagious, but endemic; it is the dolor which possesses sailors when they hang wistfully over the rail, looking in the direction of home just before land heaves into sight. *Glass arm* is an occupational disease which keeps an operator from sending. Its effect does not reach high enough to prevent elbow-bending.

No matter how rough the sea, the ship never rocks. Its sidewise movements are described as *rolling.* Fore-and-aft movements, *pitching.* If the ship does both violently, it will *labor;* the screw will rise from the sea, the engines race with a reduced load, and the ship will shake from stem to stern. The chances are you won't care, for you'll probably be too seasick to name anything properly, except the person who recommends greasy food for its therapeutic value.

Fear is the major cause of *mal-de-mer.* While there is but one cure for channel fever—exercise—there are a thousand for seasickness. Disregard them all, and work on the assumption that the alleviation of fear will eventually conquer the discomfort. Stay in your bunk when you are off watch, and relax; don't fight the motion of the ship. Go on watch punctually, although the stint is enervating. Force yourself to handle traffic. Occupy yourself by learning to type with the right hand while you control the carriage movement with the left. There is no need to take food if you can't handle it, because you'll get around to eating before you starve.

Finally, when you get sea legs, and have passed through many seizures, you will find you can sit at the officers' mess and eat Bismark herring for breakfast, whether or not your shipmates refer to it as dead snake. When that time comes, make it a point to get out on deck in the roughest weather; the exercise will give you an easy familiarity with a heaving ship, and condition you against a heaving stomach. Seasickness is especially trying to an epicure, for it means giving up so many things he likes.

Never show emotion before passengers. Years ago, even before it was fashionable to make a distinction between the courage of American and foreign crews, I have seen joviality analyzed as drunkenness, and dignified silence as insolence.

No matter what emergency exists, never show emotion before your shipmates. I have known a young ship's officer, on board for his third trip, resign with tears in his eyes because he mistook a star for the running light of an expected 'plane. The steamship company could forget the mistake, but he could not forgive himself after he had happily announced by bell, whistle, and finger that he was first to see the light from the bridge. All men at sea visualize the ideal seaman as of the "always on the alert," and "every inch an officer" type; an imperturable source of proper commands, regardless of the good fortune or disaster attending his vessel.

This picture, I believe, has much to do with the excellent record of radio operators during times of marine distress. Some of them must have stuck to the key, not alone because they had courage, but also because they weren't brave enough to risk shame by leaving. Such opinion is not expressed in aspersion, but is a positive indication that those who gave their lives gloriously were imbued with noble traditions of the sea.

At least one operator was ridiculed out of his profession by his shipmates. His vessel caught fire near shore, and was run aground in a calm sea. All hands were safe in the hands of a well-disciplined crew. The operator stopped to commend a passenger for her bravery, in a grandstand speech beginning: "Little girl, I, as an officer of this ship, pay tribute—" A fellow officer interrupted to remind him the captain had given orders to abandon ship. Then, instead of leaving the ship in his amidships lifeboat, he walked to the grounded stem, waved a dramatic farewell, and jumped. He came down in two feet of water, and was the only casualty. Broken ankle.

There will come a day, after you have

spent many years on many ships, when you will not see romance and majesty in the lines of any hull. You will have had occasional experiences with vermin; with the heat of an upper bunk alongside a stack in the tropics; with the cold of a drydocked freighter in winter; you will avoid being blown to death by quitting a tanker the trip before it explodes at the dock. The lines of the trimmest yacht will appear as prosaic as those of a steam laundry, and your thoughts will turn to life ashore.

Like the traditional skipper with his anchor, you will carry an antenna inductance inland until someone stops you and asks: "What is that?" You will drop the coil, build a house around it, and settle down.

"Fools and fishes go to sea,
But fishes have no choice."

You will be left with nothing nautical except nostalgic memories and yarns which will bore your children mightily.

But, *bon voyage!*—you have a lot of interesting living to look forward to before you sign your final.

—30—

One Tube Transmitter

(*Continued from page* 43)

books for complete information.

A neon bulb, the ½ watt size is excellent, is necessary for tuning the transmitter. Connect the power supply to the transmitter. Close the key and turn the antenna (larger) variable condenser until it is almost closed. Touch the neon bulb to one end of the coil and rotate the plate (smaller) variable condenser until the bulb glows, indicating that the transmitter is tuned to resonance.

With the power supply shut off, ground the transmitter to a cold water pipe or other good ground with as short a lead as possible. Now connect the antenna to the antenna post on the stand off insulator. Turn the power supply on again, wait a moment for the tube to heat up, and then close the key and touch the neon bulb to the antenna post. Again tune the plate condenser to resonance. It will be noticed that the resonance point has shifted slightly with the antenna connected.

Now, a few degrees at a time, open the antenna tuning condenser, each time restoring resonance by returning the plate condenser. Opening the antenna condenser, decreasing the capacity of it, tightens antenna coupling and puts power into the antenna. As the coupling increases, the bulb touched to the antenna post will glow more brightly. Eventually, it will be found that additional coupling does not increase antenna current, as indicated by the neon bulb. This means that the optimum coupling has been reached and that the tuning process is complete.

The transmitter should be checked for keying by listening to it with a receiver tuned to a harmonic. A regenerative receiver in the same room will pick up the transmitter on a receiver harmonic; for example, a 40 meter transmitter can be heard on the 80 or 160 meter coils of the receiver. A superheterodyne must be tuned to a transmitter harmonic, 10 or 20 meters with a 40 meter transmitter. Some well shielded superhets can be tuned to the actual 40 meter signal although other sets may "block" and make it impossible to judge the keying.

If the keying is "clean," the transmitter is ready to send out its first "CQ." Poor keying usually can be corrected by loosening the antenna coupling. Readable keying is more important than maximum output.

The coil and antenna dimensions given in this article are all for the 40 meter band. The band is the best year around band for the beginner. Eighty meters is preferred during the winter months, since the interference from other stations is usually less, but during the summer 80 is almost worthless because of the severe static. With suitable coils and crystals, the transmitter can be used on any of the more popular amateur bands.

It should be mentioned that for the operation of this, or any other, amateur transmitter, *a federal license is necessary. The license costs nothing and is not difficult to obtain although the penalties for illegal operation are severe.*

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2-5 Voltmeter

(*Continued from page* 41)

be measured, trouble in any stage of the amplifier isolated, and the stage by stage gain of the amplifier measured. Other uses are measuring the hum voltage in receiver and amplifier outputs, outputs of a.f. and r.f. oscillators, voltage gain of receivers and many other quickly seen uses. In conjunction with an oscillograph, almost any analysis can be made. The meter may be connected across an r.f. circuit as readily as a low frequency one. For work of this type, it is necessary to keep the leads very short. Then, if the circuit is resonated, retune to resonance after the meter is connected.

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The Nerve Center of a Broadcast Network

(*Continued from page 7*)

the program on the east-bound Blue leg (MID). The program also takes a Blue leg west (COUN). Another Blue leg will go to south central stations (LOU). The broadcast will also go over the lines to WTMJ, Milwaukee, and WIBA, Madison, Wis. (NTX). The final route tied in on this broadcast is the Hoosier leg (HOS)."

For the next 15 minute period of the *Breakfast Club*, the engineer will have approximately the same type of order, with such additions or changes as may include more or fewer stations on the broadcast. At the end of the order for that second 15 minutes there will be a notation reading "CGM," which means that Chicago will ring chimes for the network.

With that work order in front of him, the switchbank engineer in the main control room pre-sets his relays to wheel the right channels into line. Outlets from the studio where the *Breakfast Club* is to be produced are all tied across the six legs which will take the show (they could hook nine channels across if they had to). Somewhere, in a radio studio, an announcer gets ready to wind up a broadcast that goes off the air at 9:00 a.m. He pushes the chimes button on his own small switchboard, setting off a relay system that operates the chimes machine. The next instant he pushes another button, clearing his studio and the channels that studio was using. Almost simultaneously that same operation is going on for other channels that will now be concerned with the *Breakfast Club* broadcast.

In main control, a buzzer sets up a clamor and continues to buzz until all channels have been properly set up, and the *Breakfast Club* is ready for piping down all the lines. The buzzer is there just in case somebody happened to forget the cues, and if the necessity arises the engineers are ready to slip in a few patch cords or make whatever changes are necessary to get the routings right.

With everything ready to take the broadcast, the network channels are automatically transferred to the bus from the studio where the *Breakfast Club* will originate, and the show goes out to the network. While it takes some time to give a rough idea of how the setup works, the switching takes practically no time at all because the relays are ready to make an instantaneous change-over. With the program started, the switchbank engineer makes a lightning checkup, using a row of buttons, lights, meters, and monitoring loud speakers to tell him if all the required channels are getting the broadcast and at the proper level. Meantime, down at the other end of the main control desk, the control supervisor is monitoring the output. Under his hands are enough relay buttons to cut loud speakers in on anything that may be moving locally or on the networks. There are four speakers mounted behind a screen at the top of the control panel so that it is possible to have an auditory check in addition to the visual check provided by the meters in front of him.

Taking a look at the main control room itself is like taking a look at a well ordered kitchen between mealtimes. Nothing is out of place, there is no disorder visible anywhere, and there is very little to indicate the true importance of the place. Along the east wall are located the local studio amplifiers and buses—the terminals bringing the local shows in for rerouting to local stations, or to the networks. The main control desk stretches across the north side of the room, and the west side is taken up with an orderly row of line amplifiers. Just to forestall failure, provision is made for emergency feeds to take care of any amplifiers that may go out.

To complete the picture of the four walls, the south side of the room has a concentration of plug-in panels and patch cords to handle special hookups, or for emergency service. During a national election that part of the control room is a busy spot indeed, but it serves an interesting function in its daily routine too. There are *telephone effects* filters that can be plugged in there for studio use. It also has facilities for tying up the echo chambers, and for special interconnecting studio hookups. There are outlets also for special variable filters that produce weird voice effects, such as the ones Arch Oboler writes into the *Lights Out* scripts when he wants a dead man to speak. On each side of this equipment terminal board are the windows fronting on two very tiny studios. Fact is, the term for these two cubicles is "nemo booths." Each is provided with an announcer's control panel, somewhat more complex than the usual studio panel, a microphone, a studio speaker and amplifier, and a chair. In these booths the local announcements are handled for programs that originate elsewhere on the networks.

Getting back to the figures on the equipment, the system at the NBC Chicago studios requires a total of 152 amplifiers of various types, broken up into preamps, studio amps, line amps, monitoring amps, headset monitoring amps, and house monitoring amps. It takes a total of 3,160 jacks, 2,148 of them in the main control room, to handle all the possible contingencies that may arise. Besides the switch buttons at the command of engineers in the main control room, it takes about 300 more buttons to care for boards operated by announcers and studio engineers. Indicating lamps about parallel the switch buttons in location and number. Not counting generating and battery equipment, there are 104 other miscellaneous items of equipment that make broadcasting possible, including microphones, line equalizers, and volume indicators. It's a tidy collection of apparatus, dependent on a constant maintenance system for its functioning.

Incidentally, the studio air conditioning system takes one headache out of operations in an odd way. The terminal board at the south side of the main control room, as has been indicated, is a point at which it is possible to cut in on anything coming or going. The jacks used on this board are all spring contact type, and

ordinarily would be subject to some trouble through normal corrosion of the contact points. However, the air conditioning system purifies incoming air to an extent where corrosive elements are practically eliminated and the jacks, as a consequence, are trouble free.

Supplying the power for all the amplifier operations is the job of a duplicated set of generators and batteries designed to insure transmission under any conditions. Two sets of motor-generators are used for both A and B voltage supplies. For the A side, 440 volts of DC is piped to the motor generator from the city lines. The generator feeds direct to the storage battery bank where, through a floating hookup, 14 volts at 250 amps is fed to the A lines. This entire setup is available in duplicate equipment, and it is standard practice to use alternate power supplies on alternate days of the month. City DC mains also supply the motor-generator units for the B current. A similar generator and battery arrangement is also used to deliver 400 volts at 4 amps to the B terminals. The storage batteries alone would be able to supply A and B current for operations during a considerable period of time following any power line interruption.

Speaking about those safeguards against possible power breakdown, since it would be rather difficult to continue operations in the dark, the studio lighting circuits can be switched instantly from AC to DC.

No picture of this Chicago radio switchtrack would be complete without some mention of the organization that it takes to make it work. Under Howard C. Luttgens, division engineer, there are just exactly 95 people in the NBC Central Division Engineering Department. Included in that small army are station engineers, operation supervisor, control supervisors, transmission engineers, studio engineers, field engineers, maintenance engineers, the operating staffs of WMAQ and WENR, and two young ladies who are the department's secretaries.

An overall picture of main control room operations at NBC Chicago is probably best summarized in terms of programs that have to slide through that all-important switchboard in a given period of time. During the month of May, 4,932 programs were routed through it for a total of 1,843 hours. Out of this total, 449 hours came from Chicago studios of NBC, 71 hours originated in field broadcasts from points in or near Chicago, and the balance was made up of programs relayed through from east, west, north, and south. Add it up this way if you like—in May, there were 31 days, or exactly 744 hours to be ticked off on the clock. For each one of those 744 hours, the engineers at the main control desk saw an average of 2.5 hours of programs slide under their fingers and before their eyes.

—30—

OOPS! SO SORRY!

In the August Issue of RADIO NEWS in the component parts list on the "Ham Shack" page, T2 was inadvertantly left out. It should be a Stancor A-5528 output transformer, or any pp plates of 6L6's Class A to 4, 8, 15, & 500 ohm line Trans. To Mr. Gamache, our apologies!

A Radio Bug in the Tropics

(*Continued from page 9*)

The usual antenna is an umbrella type. The mast is a jointed affair made up of sections which are of the right length to fit into the carrying case. The guy wires, which radiate in all directions from the top, form the radiating portion of the antenna, and are, of course, insulated at a distance of about two feet from ground. The feeder (single wire), runs from the transmitter up through the mast and feeds the radiating portions.

The transmitter and receiver are in the same case. The hinged front of the box forms the operating table. The tubes are VT-25s (210, to you) in parallel, self excited, with six hundred volts on the plates, from the portable hand generator.

The net control station fixes frequency at around thirty-two meters. Portables tune their frequency to the net control, as picked up by the receiver, so that all stations in the net are on approximately the same frequency. Reception is amazingly good up to ten miles with little interference due to the high signal to noise level of the receiver and the short distances over which we usually operated. Usually reception was 100% perfect, with few slip ups. One night we did forget to put bulbs in the BC scope so that we had to take the range readings by candle light, but such instances are the exception rather than the rule.

There are adventures for the radio man in the tropics along with the regular duties. Some days there would be from twenty to thirty messages to get off to amateurs in the States. The Army contacts only amateur operating in the twenty meter band. Almost all districts in the U. S. can be worked any day from K5AA. A kilowatt input is used on a pair of 860's and almost every country in the world has been worked at one time or another.

One day in particular, I remember, dawned with a clearness characteristic of the tropics. The first rays of the sun forecast the heat to come. Within an hour after dawn there was a stiff breeze blowing in from the ocean, and out to sea, toward Tortola, were flakes of white which we knew on closer inspection would prove to be waves, lashed to frothy fury. And today was our day to set up a range detail there.

As soon as our launch had cleared the protection of the causeway, I knew that we were in for more than our usual amount of trouble. The waves handled us pretty roughly. One second we were poised on the crest, then with a suddenness that was startling, our watery foundation would disintegrate under the bow. Downward we would plunge, burying the nose deep in the froth, while breakers swept over us. Upon arrival off Tortola, we could see that she was swathed in white spray at her base, as the booming waves pounded her sides.

Getting the rowboat loaded with equipment proved to be a torturous task. The landing was even more difficult, though we knew it would be worse in the evening when the tide was high.

For some reason known only to the powers that be, drill was called off for the day but the disheartening news was flashed to us, that firing drill would be held that night. It was finally decided that we should remain on the island, rather than attempt the resultant loading and landings again.

Lunches were thrown ashore at noon. Scraps were thrown into the water and soon sharks began to gather. Within an hour, eight or ten of the evil looking monsters were slinking through the crystal clear water.

As the afternoon advanced and night approached, the storm at sea increased in fury. By the time we had completed night drill and were again ready to undertake the hazardous trip by rowboat to the launch, the storm had reached near-gale proportions.

We radioed headquarters for further instructions, as we were reluctant to undertake the hazardous task of trying to make contact with the launch and risk the loss of such valuable equipment as well as the possible risk to life. There was no shelter where we were, and no place to leave the instruments, so it was finally decided that we would have to take the chance.

The sharks were still hanging around and the nearer we came to embarkation time the less we liked it.

A Panamanian fishing boat had tied up to the island, and an old fisherman entertained us with the story of, "how he lost his arm when a hungry shark nipped it off."

The story did little to cheer us up as some of the man-eaters were still hanging around.

After much difficulty the rowboat finally succeeded in landing and was loaded with the equipment and some of the men. I was in the first boat.

Far off shore the bouncing lights of the launch were the only objects to be seen in an eternity of blackness, as clouds obscured the moon. How far off those lights looked to us then.

As the next breaker boomed ashore we cast off in the ebb, in a shower of spray. The man in the bow gave a shove and we were out on the boiling waters. The next moment there was a splintering crash as the frail rowboat was hurled against the rocky barrier. We had waited a moment too long and the next incoming wave had caught us before we were clear of the island. Frantically our oarsman worked at his oars. It was the fraility of man against mighty nature on a rampage. The next wave caught us a broadside and we were hurled into the shark infested waters. Half choked from the salty water; more than a little afraid of the sharks, we nevertheless did have the presence of mind to hold on to the boat. I don't know yet how we managed to save the equipment but while some climbed into the boat, others steadied it from the water. Half-an-hour later, tired and wet, we were headed back for the post.

As the boys in the service say, "it was just one day less for us, and one day more for the government."

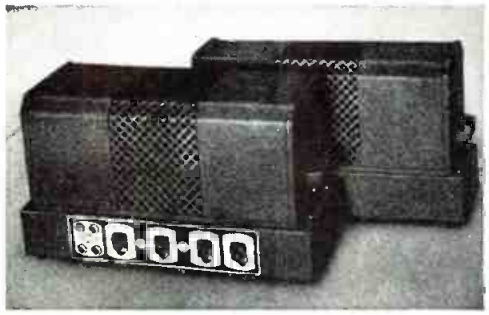
-30-

New BEAM POWER-COMPRESSOR AMPLIFIER KITS

The new improved UTC P. A. amplifier and modulator kits, incorporate every advanced circuit feature desirable for P. A. and amateur work. They are without doubt the leaders in their field. A stable system of volume limiting (compression) is used on all amplifier kits to maintain a relatively constant output level with sudden increase of input levels.

VOLUME LIMITING

Volume limiting in amplifier equipment is ideal for the home and PA application inasmuch as the equipment can be operated at high levels without any fear of blasting on peaks of power. The actual maximum power output is limited to the capabilities of the amplifier or speaker equipment. An important feature for PA service is the fact that the changes in level encountered when a speaker moves toward the microphone are minimized by the amplifier compression. In modulator work the limiting action minimizes the tendency for over-modulation due to sudden increase of input signals. Simultaneously, the signal level setting can be appreciably higher due to the compressor action with the result that higher percentages of modulation are obtained, and the actual effective power of the transmitter may be increased to the equivalent of a TRANSMITTER OF TWICE THE RATING.



The kits are provided complete with panels, covers, resistors, condensers, sockets, jacks, etc. All components are completely mounted and ready to wire. Complete constructional details and diagrams are furnished.

COMPONENTS

The new UTC PA amplifier kits are unusually trim in appearance, employing black-chrome etched panel contrasting with the gray commercial wrinkle finish of the chassis and perforated metal cover. Bottom plates are provided on all units for shielding and to protect wiring.

All kits are furnished with four input jacks providing for dual input (high or low gain) to both channels of the mixer. The mixing system is completely cross-talk proof. The unique UTC VARITONE equalizer is incorporated to equalize high frequencies or low frequencies, as desired. VARIMATCH output transformers are employed in kits for PA, modulator and driver service.

The output impedances on PA kits are 500, 200, 15, 8, 5, 3 and 1½ ohms.

TECHNICAL CHARACTERISTICS

PA-1A

Public address amplifier kit, self bias, 30 watts undistorted output, audio and power units on separate chassis for rack or cabinet mounting. Four jack, dual channel, high impedance input, two high gain (120 DB), two low gain (80 DB). VARITONE equalizer and volume limiting (compression) controls. Output impedance for line and voice coil as above.

List price $87.50. Your net cost **$52.50**

P-1M Modulator amplifier kit, same as above but for modulation purposes. VARIMATCH modulation output has the following impedances: 200. 405. 1180, 2350, 2400, 3000, 4000, 4670, 4750, 5650, 7000, 9100, 9500.

List price $87.50. Your net cost **$52.50**

Tubes required for PA-1A or P-1M kits are: two 6J7, one 6N7, two 6C5, two 6L6, one 83, one 6H6.

P-2A

Public address amplifier kit, fixed bias, 50 watts undistorted output, audio and power units on separate chassis for rack and cabinet mounting. Four jack, dual channel, high impedance input, two high gain (120 DB), two low gain (80 DB). VARITONE equalizer and compression controls. Has VARIMATCH public address output for line or voice coils, as specified.

List price $97.50. Your net cost **$58.50**

P-2M Modulator amplifier kit, same as above, but has VARIMATCH modulation output having impedances of 380, 660, 2050, 3740, 4100, 7000, 7500, 8200, 12000, 12600. 15000, 16400, 21500, 29800 on the 3800 ohm plate to plate terminals. Also has 237, 1300, 1750, 2700, 3270, 5200 ohms on the 4000 ohm plate to plate input terminals.

List price $97.50. Your net cost **$58.50**

Tubes required for the P-2A or P-2M kits: two 6J7, one 6N7, two 6C5, two 6L6, one 83, one 80, one 6H6.

P-3A

Public address amplifier kit, fixed bias, 100 watts undistorted output. Audio and power on separate chassis for rack or cabinet mounting. Four jack, dual channel, high impedance input, two high gain (120 DB), two low gain (80 DB). VARITONE equalizer and compression controls.

List price $142.50. Your net cost **$85.50**

P-3M Same as P-3A, but has VARIMATCH modulation output having impedances of 270. 500, 1440, 2760, 2900, 3700, 4900, 5650, 5800, 6900, 8400, 11000, 12000.

List price $142.50. Your net cost **$85.50**

Tubes required for the P-3A and P-3M kit: two 6J7, one 6N7, two 6C5, four 6L6, two 6F6, three 83, one 80, one 6H6.

P-4D

10 watt compressor driver amplifier, self bias. 10 watts undistorted output, sufficient to drive any class AB, or class B amplifier of 100 watt to 350 watt rating. The ideal driver, incorporating: compression, low reflected drive impedance, multichannel input, high gain, and VARITONE equalizer. Audio and power units on one chassis for rack or cabinet mounting. Four jack, dual channel, high impedance input, two high gain (117 DB), two low gain (77 DB). VARITONE equalizer and compression controls. VARIMATCH driver transformer incorporated as output unit.

List price $65.00. Your net cost.. **$39.00**

P-4A Ideal 10 watt home amplifier. Same as above, but with PA VARIMATCH Output transformer to 500, 15, 8, 5, 3, 1½ ohms.

List price $65.00. Your net cost **$39.00**

Tubes required for the P-4D and P-4A kit: two 6J7, one 6N7, one 6C5, two 2A3, one 5Z3, one 6H6.

P-5A

Public address amplifier kit, self bias, 15 watts undistorted output, audio and power units on one chassis. Four jack, dual channel, high impedance input; two high gain (120 DB), two low gain (80 DB). VARITONE equalizer and compression controls. Output impedance for line and voice coils, as specified.

List price $62.50. Your net cost **$37.50**

P-5M Modulator amplifier kit, self bias, 15 watts undistorted output, same as P-5A but with VARIMATCH modulation output having impedances of 270, 500, 1440, 2760, 2900, 3700, 4900, 5650, 5800, 6900, 8400, 11000, 12000.

List price $62.50. Your net cost **$37.50**

Tubes required for P-5A or P-5M kit: two 6J7, one 6N7, one 6C5, two 6V6, one 83, one 6H6.

P-7A

AC operated pre-amplifier kit designed especially for amateurs and PA service. This pre-amplifier kit is entirely AC operated, with very efficient filtering assuring freedom from hum. It has a gain of 70 DB, and a two channel high impedance, high level mixer with jack input for each channel. Includes attractive perforated metal cover, bottom plate and etched front panel with gain controls, all hardware, sockets, resistor and condenser strip, mounted ready to wire. The output impedances available are 50, 200 and 500 ohms.

List price $30.00. Your net cost **$18.00**

Tubes required for the P-7A; two—6J7, one 6N7, one 6X5.

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The SKYRIDER DIVERSITY is the result of several years of research and experiment by Hallicrafters engineers, and is the first Dual Diversity system built with single control and that offers Diversity Reception in easily operable form.

Its advantages may be briefly presented as follows:

1. The reduction of fading to negligible proportions.
2. An increase of average Signal Strength over any single receiver.
3. An increase of Signal-to-Noise ratio over any single receiver.
4. The reduction of Heterodyne Beat Note Interference.

With these advantages, the SKYRIDER DIVERSITY offers the amateur and short wave listener a quality of reception entirely beyond comparison with any ordinary receiver. See it at your Hallicrafters dealer or write for complete description. *All Hallicrafters Receivers sold on Liberal Time Payments.*

Cabinet shown in illustration is optional. It includes a Jensen Giant Bass Reflex Speaker and shelves for mounting Plate Supply and Power Amplifier.

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