RADIO AT THE NORTH POLE

RADIO NEWS

o you want an
UDITION?

I vest pocket
RANSMITTER

EW F. C. C.
REQUENCY
LLOCATIONS

A RADIO
STAR'S DAY

28MC AUTO
TRANSMITTER

PORTABLE
RADIO
STATION

JUNE, 25c

W9ZYB's HAM SHACK
(SEE PAGE 46)

What Readers Say about the New RADIO NEWS

For the first time in my life I've read RADIO NEWS from COVER to COVER.—C. R. C., North Star Radio Sales, St. Joseph, Minn.

* * *

I enjoy your Short Wave Flashes.—N. D. S., Kauneonga Lake, N. Y.

* * *

Personally, I like the new form of the magazine, not only from the standpoint of the information contained in the various departments, but also from the standpoint of improved appearance.—R. H. M., Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.

* * *

I don't believe any comment on the change of format in RADIO NEWS could be as strong as was your newsstand circulation gain for the month.—D. J. F., RCA Manufacturing Co., Inc., Camden, N. J.

* * *

For some time now, I have been trying to write you and tell you of the high regard in which your RADIO NEWS was received around the factory . . . only the best of praise was rendered, and I am sure of your magazine's success.—C. L. P., Standard Transformer Corp., Chicago, Ill.

* * *

The magazine is not only well produced, but is fairly dripping with human interest and valuable information . . . I have never been able to understand why so many people think that a trade paper should be stadgy, dull and formal.—G. E. DeN., National Union Radio Corp., New York, N. Y.

* * *

The cover, the articles, the departments, and the general makeup are all excellent.—H. J. T., Wholesale Radio Service Co., Inc., New York, N. Y.

* * *

I am very much impressed with the new make up, art work, and "practicability" of the radio subject.—T. C. D., Tobe Deutschmann Corp., Canton, Mass.

I want to congratulate you on the freshness and pep that you have instilled into this worthwhile magazine.—A. D. D., Allied Radio Corp., Chicago, Ill.

* * *

What do I think of it? Speaking as a radio columnist, ham and listener . . . here are my five bucks for two years' subscription.—U. T., Chicago Herald and Examiner, Chicago, Ill.

* * *

I believe that congratulations are in order, you have a splendid publication, instructive and entertaining.—C. S. F., Gainsville, Texas.

* * *

It was quite a joy to see things familiar to us so well featured and covered.—E. G. H., Zenith Radio Corp., Chicago, Ill.

* * *

The idea of a book appealing to all classes of radio fans is a happy one and one that I am confident will win.—A. J. K., Branchville, N. J.

* * *

I was surprised how RADIO NEWS has improved, it now contains everything a book should have.—R. B., Lawrence, Mass.

* * *

I believe it is the best all-around radio magazine on the market. —J. G., Port Arthur, Texas.

* * *

In the merger of technical and popular articles, I think that you have a winner that should be of vital interest to all classes.—D. N., Iowa Broadcasting System.

* * *

It's a natural, combining as it does, the fan material with the technical. You've done a swell job of giving the public an all-around radio publication, peppy and informative.—J. F. T., The Burlington Daily News, Inc., Burlington, Vt.

* * *

The improvement is so marked that it seems almost impossible that the whole job could have been done within the brief space of only thirty days.—W. E. B., Standard Rate and Data Service, Chicago, Ill.

* * *

It's great, cannot believe it is the same magazine.—H. A. B., Hudson City Radio Club, Inc., Jersey City, N. J.

Put Yourself on RADIO'S PAYROLL

LEARN AT HOME IN SPARE TIME TO BE A RADIO EXPERT

(Above) SET SERVICING pays good money to N.R.I. Graduates—either for full time or spare time work.

(Below) AVIATION, Commercial, Marine, Police Radio are other fields that have given good jobs to N.R.I. graduates.

(Above) BROADCAST STATIONS: Many of my graduates are employed in fascinating good-pay jobs as operators, engineers, etc. (Right) LOUDSPEAKER SYSTEMS: Many N.R.I. men make good money in spare or full time P.A. work.

Make Me Prove that My Training will fit You to Make GOOD MONEY IN RADIO

J. E. SMITH, President
National Radio Institute

Mail the Coupon Now

I will prove that I can train you at home in your spare time to be a RADIO EXPERT. I will send a sample lesson FREE. Examine it, read it, see how clear and easy it is to understand—how practical I make learning Radio at home. Then you will know why men without a knowledge of Radio or electricity have become Radio Experts and are earning more money than ever as a result of my Training.

I Also Give You This Professional Servicing Instrument

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

(Above) YOUR OWN BUSINESS: Many men I trained operate successful Radio sales and service businesses.

Get My Lesson on Radio Servicing Tips FREE

My sample lesson text, "Radio Receiver Troubles—Their Cause and Remedy," covers a long list of Radio receiver troubles in A.C., D.C., battery, universal, auto, T.R.F., superheterodyne, all-wave, and other types of sets. And a cross reference system gives you the probable cause and a quick way to locate and remedy these set troubles. A special section is devoted to receiver check-up, alignment, balancing, neutralizing, testing. You can get this lesson Free by mailing the coupon.

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

Radio broadcasting stations pay engineers, operators, station managers up to $5,000 a year. Spare time Radio set servicing pays as much as $200 to $500 a year—full time servicing pays as much as $30, $50, $75 a week. Many Radio Experts operate their own businesses. Manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Automobile, police, aviation, commercial Radio, and loudspeaker systems are newer fields offering good opportunities now and for the future. Television promises many good jobs soon. Men I trained have good jobs in all these branches of Radio.

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

Almost every neighborhood needs a good spare time serviceman. The day you enroll I start sending Extra Money Job Sheets showing how to do Radio repair jobs. Throughout your training I send plans and ideas that made good spare time money—from $200 to $500 a year for hundreds. I send Special Radio Equipment to conduct experiments, build circuits, get practical experience.

Get Sample Lesson and 64-Page Book FREE. Mail Coupon

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

J. E. Smith, President
NATIONAL RADIO INSTITUTE
Dept. 8FR Washington, D. C.

GOOD FOR BOTH 64 PAGE BOOK SAMPLE LESSON FREE

J. E. SMITH, President, National Radio Institute, Dept. 8FR
Washington, D. C.
Without obligating me, send your Lesson "Radio Receiver Troubles—Their Cause and Remedy" and free book about spare time and full time Radio opportunities and how I can train for them at home in my spare time. Tell me about the N.R.I. Set Servicing Instrument you include. I am particularly interested in the branch of Radio checked below.

( ) Radio Service Business of My Own
( ) Spare Time Radio Service Work
( ) Retail Sales of Radio Sets and Equipment
( ) Service Expert for Retail Stores
( ) Broadcasting Station Operator
( ) Aviation Radio Operator
( ) Ship Radio Operator
( ) Loud Speaker Systems, Installations and Service
( ) Auto Radio Installation and Service
( ) Television Station Operator
( ) Service Expert with Radio Factory
( ) Commercial Radio Station Operator
( ) All-around Servicing Expert

(If you have not decided which branch you prefer—mail coupon now: for information to help you decide.)

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

Address 14X1

MONTHLY periodicals rarely scoop daily newspapers, but in the April issue which hit the streets on March 10, we scooped the Chicago Daily Tribune by three weeks with the story of the new antenna tower of radio station WGN. In this issue we scoop the country with the frequency allocations as they will probably come about after the Cairo Conference. They are at least 90% accurate, we believe, and have been made at Washington. They will go in effect when the F.C.C. gives the word.

This is in keeping with the RADIO NEWS policy of giving our readers the very latest dope in advance of any other publication whether it is a newspaper or another periodical.

* * *

THE American Radio Relay League—"National Chicago Amateur Convention" pot continues to boil, and threatens to boil over with far reaching results. At this writing, the "Convention" has not been officially okayed as the "National A.R.R.L. Convention" by the Board of the League, though those interested have every hope that it will be. Should official sanction be withheld, the Midwestern backers of the "Convention" are planning to hold it anyway, and in retaliation to this move, it is rumored that the League will officially authorize the holding of "A.R.R.L. Conventions" in whatever sections of the country there may be a demand, providing only that they be held simultaneously with the Chicago "Convention." The effect of this would be to minimize the importance of the "National Chicago Convention" and lessen the attendance, and further to discourage the manufacturers from exhibiting or cooperating there. Many of the Eastern manufacturers, at this time, have signified that they will await official action of the League on the whole matter.

Further in regard to the convention, and in spite of repeated protests to the contrary, the question of the "Direct Representation Referendum" of the A.R.R.L. will come up for vigorous discussion. Many of the amateurs in the midwestern and western sections of the country have long felt that Hartford was not affording them the representation to which they were entitled. Members attending the "N.A.C.C" will probably resolve themselves into a caucus and discuss and pass resolutions in regard to this referendum.

RADIO NEWS is reliably informed that the whole matter of the convention being held in Chicago rests with two Board votes. According to reports, the opposition to Chicago will be led by Acting Secretary A. L. Budlong, who favors either that the "National A.R.R.L. Convention" be held in the East or not at all. Failing to bring it East or to kill the measure, Budlong, it is said, may try and pass a resolution permitting the holding of so many A.R.R.L. conventions that the Chicago Shindig will be wholly local. What is more to the point is that the Board has placed itself squarely in the middle of what seems to be an "East vs. West" manufacturers battle—with the ham holding the bag.

* * *

ON June 6 the F.C.C. will hold a hearing regarding the allocations in the spectrum from 30,000 to 300,000 kilocycles. It is to the credit of the A.R.R.L. that they have arranged for the most direct representation possible at this hearing. They picked individual engineers and hams all over the country to inquire among the amateurs and to make their individual recommendations to Hartford. From these recommendations, the A.R.R.L. will make a blanket recommendation to the F.C.C. regarding the amateur allocation in the spectrum under consideration.

* * *

WE have in our possession a letter received by an American amateur from a British amateur who has reported his signal in England. The letter informs the American that if he does not QSL at once his name will be placed upon a list of those amateurs who refuse to QSL. This would seem to be a genteel form of blackmail which should be squelched at the outset. Whether or not an amateur QSL's is a strictly personal matter and no coercion on the part of anyone should be attempted. As a matter of fact, sometimes this QSL proposition grows to such proportions that it is wholly impossible to comply with the many requests that the American amateurs receive. We hope that our brothers across the sea will desist this type of pressure, because not only is it un-American and un-British, but it is certainly not within the keeping of an amateur spirit.

* * *

RECENTLY the Columbia Broadcasting System sent out a number of charts purporting to show the hearing ability of various of its stars. The charts were accompanied with charming pictures taken during the hearing tests. We are reliably informed that the charts mean nothing, and that they show nothing. The possible exception might be that of one star who seems to have slightly less than normal hearing. To what extent will the press department go next in order to acquire publicity for its charges?

* * *

ONE of the most unusual hobbies has arisen among the DX fans. It is that of the exchange of DX cards. Considering that a DX card is received only as a sign of having heard a station, we are totally unable to understand why, after having one's reception verified, and becoming the possessor of a verification card, anyone would want to swap it for a verification card of a station which they have never heard. With wholesale swapping of DX cards the fact that a man has several hundred DX cards tacked on his walls will be no indication of his ability to receive short wave signals.

* * *

WE are in receipt of word from the NBC system that the United States has finally definitely entered into the propaganda race. Lenox R. Lohr, President of the National Broadcasting Company said, "In this period of world stress and widely conflicting political ideology, it is especially important that NBC be alert to the needs of the United States for communicating its *policy* and actions to all parts of the world. While the licenses under which short wave stations operate are experimental and carry no public obligations *per se*, the National Broadcasting Company feels that it, along with other private broadcasters, must see to it that the United States does not lag behind other nations in international short wave broadcasting." The effect of the short wave broadcast as a means of U. S. propaganda remains to be seen. There is a bill up in Congress to provide the United States with an official propaganda station. This bill is now pending and no action on it has yet been taken.

* * *

WITH most of us buying radio sets from ten dollars to approximately a hundred dollars, it will be of great interest to us to know that the Philco Company produces radio sets listed at a retail price of $3,000.00 and more. These models were originally conceived by Raymond Lowey and are being produced for prospective wealthy Indian Rajahs and merchant princes who like the jewelled cabinets, rare woods, filigree work and other similar refinements. According to some reports, India may be backward, but not in paying heavy prices for luxury radios.

* * *

RADIO NEWS has an imitator. Station WHP, Harrisburg, Pa., plans novel broadcast under the title "Behind the Scenes in Radio." The idea of the program is to acquaint the audience more completely with what goes on behind the broadcast business. Five minutes of every quarter hour of the program is set aside, in which time questions from the listeners will be answered. R. N. always gives the news behind the broadcast.

* * *

CONFIRMING a recent report in RADIO NEWS, in this column, the F.C.C. is making an extensive investigation into the finances of radio broadcasting stations and chains. The purpose behind this investigation has not yet been revealed to the satisfaction of many people who are following it. On the surface the reason is given for "a better understanding," but there are those who believe that this is merely the forerunner of a tax proposition whereby the stations will be taxed by the Government based upon their revenue. Might we humbly suggest to the F.C.C. that if they are contemplating taxing that they do so on the basis of a "listener survey" to be made by engineers. In other words, the station reaching a million people should pay a higher tax than a station reaching a few thousand, regardless of the revenue. If tax is levied on the basis of power, then a great injustice will be done to those stations operating in sparsely settled districts where high power is necessary in order to cover any kind of an audience. We have for a long time been in favor of taxing the broadcasters on the basis of a listener survey, because the B.C. stations use what belongs to the people—the air and ether over the land. In this respect they are not any different than any other user of public property.

* * *

IN view of the present ruckus between the newspapers and the radio, *Fortune's* quarterly survey for April, 1938 indicates that 45.2% of the persons who replied indicated they use the newspapers to get most of their daily news, 23.5% use the radio, and 28.2% use both. On the basis of these figures, we do not believe that the radio has yet completely supplanted the newspaper.

* * *

OVER a year ago we foretold in a Chicago meeting that the amateurs would lose certain of their bands. The move on foot now is to deprive them of the 160 Meter band and recently Chicago Area Council informed us that 75% of the A.R.R.L technical committee were in favor of abolishing this band.

We are now in receipt of a communication from Washington dated March 31 which indicates that the Aeronautical Radio, Inc. of New York, N. Y. has received a license to operate in the 86,000 to 400,000 kc. band. Originally the amateur had an exclusive band in that spectrum. Subsequently they lost it and then recaptured it on a non-exclusive basis. Actually the hams have little or no use for the 112-120 megacycle band and it would seem that the commercial interests are gradually using this band more and more.

If the amateurs are as lax in fighting for their rights as they were in trying to maintain their 2½ Meter band, it will not be very long before the amateur will have, possibly, only two bands left.

Further, concerning the infiltration by the commercials into the amateur bands, the following companies protested to the allocation of the frequencies between 30,000 kilocycles and 300,000 kilocycles, which includes the amateur 56 mc band. They were the Mackay Radio & Telegraph Company, Inc., RCA Communications, Inc., The City of New York Fire Department, the Mutual Telephone Company of Hawaii, and the Press Wireless, Inc.

* * *

FEW of our readers realize how many of the public are actually interested in RCA. There are approximately 242,000 holders of RCA stock.

(*Continued on page* 85)

RADIO NEWS

JUNE
1938

VOLUME 20
Number 12

The Magazine for the radio amateur, experimenter, serviceman & dealer!

The Contents

Annette King, NBC Star, and the new ultra high frequency short haul transmitter will be featured in full color on the cover of next month's RADIO NEWS. The transmitter is one designed to be used where phone lines cannot be run, and a broadcast pickup must be made. It is known as the "Beer Mug."

RADIO NEWS has taken over the subscription list of "The Microphone." All subscribers of "The Microphone" will receive RADIO NEWS on a dollar for dollar basis.

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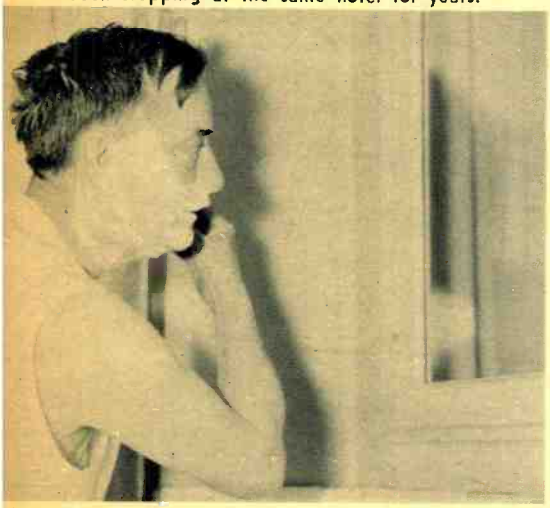
At 7:20 AM Edgar Guest arrives in Chicago. Everyone at the station knows him by name.

A RADIO

by TED LEITZELL

(Pictures of Mr. Guest by M. Lawrence Drucker; of Miss Winkler by Henry F. Kroeger, Jr.)

A mere formality because Eddie Guest has been stopping at the same hotel for years.



The shaving process, done each day, is featured by a nick or cut—even as you or I.

FOR every eager aspirant who descends on Hollywood to find a place in movies, there are a dozen would-be stars knocking at the doors of radio studios. Dazzled by reports that all stars lead a life of glamorous ease punctuated by brief appearances before the microphone, they come in droves. It all looks so very, very easy.

Reality is usually far different. Stars work hard for their money. Their entire life is built around that brief period of broadcasting. An actor or actress in a fifteen-minute show will put in three or four hours of rehearsal, more hours of script study. Most thirty-minute shows take up a full week of planning and rehearsal on the part of several people.

A major difference between radio and stage is that every day brings a new show in radio, where on the stage the same play is presented over and over again.

So exacting is the work, so severe the strain, that studios insist on regular periods of exercise and recreation for stars, keep a close eye on any extra-curricular activities.

Betty Winkler and Edgar Guest are two of radio's top flight stars.

Betty is an actress under exclusive contract with NBC, an outstanding example of the dramatic stars that have been developed by radio for radio. She did not come to the microphone with a big name established on stage or screen. Instead, after two years of stock with the Cleveland Playhouse Repertory Company she broke into radio the hard way by winning the lead in *The Trial of Vivian Ware* in the usual competitive audition.

That was four years ago. Since then she has played a dozen different roles and risen to stardom. For the past two years she has been Patricia in *Girl Alone,* and appears regularly with *Fibber McGee and Molly, Don Winslow,* and the midnight thriller, *Light's Out.*

Edgar A. Guest is known and loved throughout the world for his friendly poetry and homely philosophy. For six years he has been a favorite with millions of radio listeners, but has managed to keep up a busy life of writing along with his weekly appearances before the mike.

For his thirty-minute show over the Columbia network each Wednesday night, Eddie travels from Detroit to Chicago and puts in a strenuous fifteen-hour day. And because she is one of the busiest actresses in radio, most of Betty Winkler's days are scheduled to the minute.

To record the full day's activity of two typical stars, RADIO NEWS sent this reporter and a camera man to spend a day each with Betty and Eddie, with instructions to hang on for every minute.

Day begins for Betty Winkler when her phone rings promptly at seven in the morning. Her time is so tightly scheduled that she can't depend on alarm clocks. They *do* fail *sometimes,* particularly if it is the morning after the last broadcast of *Lights Out* ending at one a.m. So, Betty and her mother live in the Ambassador Hotel in Chicago, and she gets her regular morning call from the desk.

She is a lovely little miss, with brown hair and big black eyes. Five-feet, three-inches tall, she weighs exactly one hundred and seven pounds. She prefers black and white for clothes, with brightly colored accessories, and likes to wear gloves when broadcasting. She likes to swim and ride, insists that bubble baths and cold showers

(Left) The first of the day's preliminaries consists of script discussion with Henry Klein producer of Guest's airshow. (Below) The informal rehearsal which takes place promptly at 11 AM.

STAR'S DAY

Contrary to popular belief, the profession of radio entertainer is gruelling hard work. Every minute of a day must be made to count.

Betty Winkler does not trust alarm clocks; she is awakened by telephone call at 6 AM.

are the breath of life, and is very fond of Mexican dishes and roast duck. She goes to the theater regularly, and spends an occasional evening dancing. In the winter time she prefers flannel night gowns, of all things!

Betty has loved horses since her first pony ride at the age of three, and gets her morning "eye-opener" by a thirty-minute canter through the park on her favorite mare, *Lulu Belle*. This satisfies the studio's demand that she get outdoor exercise, although they do object sometimes when she rides through snow storms or rain.

Breakfast comes at eight, a roll and some coffee. At nine-thirty she steps from the elevator into NBC's Chicago studios, and begins a strenuous period of rehearsal. The entire *Girl Alone* program takes only fifteen minutes, and of this three or four minutes are devoted to commercials. Nevertheless, the whole cast goes over the program again and again until, at last, the director says "Okay," and it is time to go on the air.

Promptly at eleven the show begins, and it is over just as promptly a quarter hour later. But the cast is not through, for they immediately go into rehearsal for the next day's show.

Noon comes, and *Girl Alone* is through for the day, but Betty seldom is. What she does next is determined by what her next role is to be.

If *Fibber McGee and Molly* is on that night, Betty swings right into rehearsal without even a five-minute rest. For two hours they go over their lines again and again. *Fibber* is a thirty-minute show and takes much preparation. At two, Betty has lunch, accompanied by the ever present script. She is back in the studio at three, rehearsing again until four-thirty.

She has now put in a seven-hour day, and has three hours at her own disposal. Usually, it is home for a brief nap, a glance at her mail, and dinner with her mother. At seven-thirty she is back in the studio, rehearsing again until eight-thirty. The show is on the air until nine, and for midwestern and eastern listeners, is all through for the week. Not so for the cast however; at eleven-thirty they do it all over again for the benefit of listeners on the west coast. It is not until after midnight that Betty gets home, already dreading the thought of the telephone call at seven.

On other days Betty's role in *Don Winslow* is scheduled. That comes at four-fifteen in the afternoon. Somehow or other she manages to snatch a sandwich between rehearsals which go on almost continuously from noon until the show goes on the air. Like *Fibber McGee*, this story repeats for the benefit of the west coast, the second shot coming at five-fifteen. On these days Betty gets home before six, and has a full evening for reading, the theater, or other activities.

About once a week, Betty plays in *Lights Out*. This is the most strenuous day of all. She finishes rehearsal of *Girl Alone* at noon, and has a whole hour for lunch and to read that night's script. Then comes rehearsal until three-thirty. During the next ninety minutes she eats a sketchy meal, and sometimes can catch a nap for ten or fifteen minutes, but at five o'clock rehearsal is resumed and continued right on through until eleven-thirty. The show lasts thirty minutes, and is repeated again at twelve-thirty in the morning. Sometime around

An early morning canter on Lulu Belle is a form of prescribed exercise much needed.

Following the age old formula: 40 brushings— before going out to rehearsals at the studio.

(Right) The day's work starts. First rehearsal, then performance on her own Girl Alone show. (Below) Sometimes, within 5 minutes after that the Fibber McGee rehearsal must be attended.

For the last six years, Eddie Guest has been taking the cast of his show to lunch at 1 PM.

Taking time out from his many duties, Eddie pays a visit to our Editor.

A "bus-man's holiday." For relaxation, Newspaperman Guest enjoys reading his paper.

two in the morning Betty finally gets to sleep.

On the day we spent with Betty, she had no afternoon or evening show. It was what she calls a "day off" for she was through at the studio by noon. But it was little more than a chance to catch up with things she had been wanting to do all week.

She dashed home to have lunch with her mother, and then sat down to read and answer fan mail. She gets a lot of it, and has built up some warm friendships with people who listen to *Girl Alone* every day. Only a few weeks ago she was given a beautiful cameo necklace, willed to her by an elderly lady who had corresponded with her for many months.

Betty usually celebrates her "day off" by going out to dinner. That night she decided on the Congress Hotel Casino on Michigan Avenue in Chicago. Even here she is not far from radio, for her close friend and Master of Ceremonies at the Congress, is Nils Thor Grantland, who as NTG was making radio history when Betty was sporting her first pigtails in kindergarten.

In 1923, NTG was the highest paid noncommercial announcer. Famous because of the spontaneity of his ad lib programs (he has never used a script). Originator of the amateur hour, he built WHN, then a little 100-watt station, into the most popular in New York of its time, and discovered dozens of stars who have since made big names for themselves. He and Betty had plenty to chat about.

After an excellent dinner, Betty watched the floor show with real delight, but by eleven-thirty o'clock was home. It was only eight hours until that phone would ring and start her on another strenuous day.

The Edgar A. Guest who stands before a CBS microphone at nine-thirty every Wednesday night is the same friendly and neighborly guy that took his entire cast to lunch that noon, and spent ten minutes discussing the White Sox with Nick, the elevator operator.

He has just put in a very strenuous day of preparation, but he reads his script with the easy lack of dramatics and affectation that have characterized Eddie Guest throughout his life. The entire program is built around his personality and philosophy; his microphone technique, or lack of it, makes it doubly effective.

Few radio stars have such convincing proof of their popularity as Eddie. Most big shows have periodic attacks of clientitis, many of them changing sponsors faster than women change their hats. But Eddie began on the Household Finance Company's weekly show more than six years ago, and has been with the same sponsor ever since. In that time he has missed only three broadcasts.

During one of his shows, Larry Triggs, a member of the orchestra, sent out a CQ message in code, working it into the music. The message read,

"73 de EAG QSL W9—."

Translated from ham slang this means,

"Best wishes from Edgar A. Guest. Acknowledge to Station W9—(the call letters of his amateur station)."

More than eight hundred replies came from this message which the great majority of radio listeners never noticed, and which only a skilled operator could read.

Eddie left his Detroit home at ten o'clock on Tuesday night and went to bed on the Michigan Central for Chicago. We met him at seven-twenty the next morning in the Central Station.

All along the way he had been with friends. The engineer and firemen knew he was among the passengers. He knew the train crew and porters by their first names, and was in animated conversation with the red cap as he came through the station. It was the same at the Drake, where the chef cooks specialties for him.

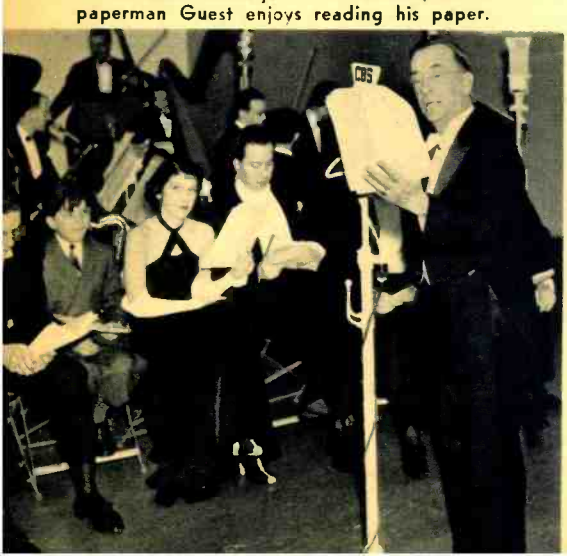
At the hotel Eddie is met by Henry C. Klein of the advertising agency (Batten, Barton, Durstine & Osborn). Klein directs the show, and in three years of close association he and Eddie have become fast friends. Their breakfast together is a custom which they have not broken during the entire years of friendship.

After breakfast, Eddie sits down to read all the morning papers and work the cross word puzzles. Klein, human dynamo, is full of the program schedule for that night, but Eddie has no compunctions about asking,

"Say, Hen, what's a nine-letter word for 'spoon shaped?' "

Guest is not a large man—five feet, eight or nine. He has no sign of a middle-aged waist line, moves quickly, smiles readily, and likes to hear other people talk about themselves. His hair is iron gray, his face rugged, and he doesn't look his fifty-seven years. You can follow his progress with the puzzle by watching the changing ex-

(Lower Left) An actual picture of the opening performance. (Below) Another picture taken during the broadcast. Two musicians sat down causing the blur in the center of the picture.



pressions on his face.

By ten o'clock he has finished his puzzles, shaved, and is ready to select the verses for that night's show. Then he and Klein go to the Columbia studios in the Wrigley Building, and start rehearsal promptly at eleven.

The show features Eddie's verse, music by Frankie Masters Orchestra, and a sketch under the general title, *It Can Be Done,* which dramatizes the real life experiences of someone who has overcome tremendous obstacles to achieve success.

Everyone manages to have a lot of fun during rehearsal, even if it is hard work. They begin by reading through the lines and receiving a few general directions from Klein. Then he retires to the control room, and they begin to work hot mikes.

His direction is a masterpiece. Bit by bit he weaves the hodge podge of scenes into a smooth working unit. By the end of two hours he has the effects he wants pretty well developed. "That's swell. Let's go through it once more." Then everybody has lunch.

This weekly luncheon is a six-year-old tradition. Eddie has a large table reserved for every Wednesday noon, and every person in the show is invited. There is just one rule: everybody does just as he pleases. Some of the cast have appointments that force them to grab a sandwich and run. Others sit and chat for hours. Klein and his secretary, Miss Agnes Hunter, are regular guests. Eddie usually leaves the table about two, spends a little time wandering through the studios for brief visits with various friends, and then goes back to the hotel to check over the script again and try for a short nap.

At six he has dinner. Then for more work. At seven-thirty they begin final rehearsals with dramatic cast, orchestra, and all. This carries right through until nine-thirty when the show goes on the air.

At ten the show is over, and Eddie is tired. He takes a cab to the Central Station and at seven-fifty on Thursday morning leaves the train in Detroit and joins his son, Buddy, for breakfast.

It has now been thirty-four hours since he left home for his Chicago broadcast. Thirty-four hours and a trip of eight hundred miles, just to broadcast a thirty-minute show!

Every radio show on the air goes through the same arduous preparation. It must be planned, written, timed, and perfected. For instance, Jack Benny begins work on next week's show as soon as he has finished this week's broadcast, and he finds its preparation a full week's job. NTG is without equal when it comes to improvising, but he averages more than twenty-six hours of work and rehearsal for every hour on the air. Boake Carter works twelve to fourteen hours a day to gather material for his fifteen minutes' comment on the news of the day.

Everything in a radio show must be fresh and new. A dramatic situation that is tense today is stale tomorrow. The villain who dies tonight can't be resurrected to die again . . . except on that repeat performance "for the West Coast" one hour later.

An actress like Betty Winkler will play more new roles and speak more new lines in a year than great stage stars of other years did in a lifetime. A top flight radio comedian must employ as many new gags in six months as he would in twenty years of vaudeville.

Under any conditions good acting is hard work. It is the ability to pour out so much of himself in so little time that makes an actor great. In radio the intense strain of acting is multiplied a dozen times. Seasoned actors dread the uncertainties of opening night when their new roles will first face the acid test of audience reaction. In radio, every night is opening night.

Boris Karloff, veteran of stage and screen, recently appeared in Lights Out in the Chicago studios of NBC. It is a tense, emotional drama, and his acting was superb. Despite the absence of stage props, he held the small studio audience spellbound. However, the instant it was over, Karloff sat down, limp from fatigue, without even walking away from the mike. He was "all in" from work which took less time than a whole day's performance on the screen.

No radio actor escapes this strain. They all work like dogs at rehearsal to get everything letter perfect, but the real show is always twice as hard.

It would be physically impossible for any person to keep up the work without adequate provision for rest and recreation. That is why the day of a star is always carefully planned, and, since their health depends on it, that is why the average star permits nothing to interrupt the day's routine.

Home for lunch with her mother, Betty prefers salads which she mixes by herself.

Fan Mail comes in for attention after the lunch. The dog does not seem to like it.

Radio Stars are not glamourous. Betty has her hair washed just as any other girl.

(Right) Relaxation at a hotel supper room. Betty is entertained by NTG at her right, with stories of radio many years ago. (Below) Home at an early hour for a little reading.

"STUDIO BRIEFS"

by SAMUEL KAUFMAN

EDDIE CANTOR, who, it seems never has trouble locating a new sponsor willing to meet his constantly growing salary demands, is now on the air Monday nights for Camels.

For the first time in one of his series switchovers, Eddie is starring with a brand new supporting crew. Gone is Jimmy Wallington, survivor of his first radio series, the Chase & Sanborn Hour. And gone is Bobby Breen and Deanna Durbin. And ditto for Jacques Renard. The only permanent part of the show—besides Eddie, of course—at the start of the new series was Edgar Fairchild's orchestra. Deanna Durbin did one guest appearance and it is possible that she may rejoin Cantor at a later date when talkie engagements won't clash with the mike dates.

Eddie launched the Camel series in New York, but it was expected that the program would move to Hollywood at a later date. Actually, Cantor prefers New York but he has had some very rough going with some of the local radio editors. And the New York radio editors are a vital thing in any radio entertainer's career. Cantor lambasted them in an open telegram to a radio magazine a couple of years ago during a season when they panned his programs. As a result the air critics snubbed his show, some of the writers billing the orchestra—it was Dave Rubinoff's then—over the comedian. It was a bitter feud. But most of the writing lads have forgiven, if not forgotten.

Among other accusations in the telegram, Cantor—who, away from the mike, can be a very serious fellow—claimed the New York radio editors were experts at log-rolling; they use their columns for delving into personalities that have nothing to do with radio and—this was a real stinger—their "various rackets are a disgrace to the newspaper profession."

To put it mildly, the radio scribes were sore. That is, all but one "exception" designated by the comedian.

Ben Gross, of *The New York Daily News*, brought suit for libel and after the charges were dismissed in one court, the Appellate Division of the New York Supreme Court reversed the decision in favor of the radio editor by denying the motion to dismiss the complaint.

When Cantor launched his new Camel series, he was host to the New York radio editors at a beefsteak dinner. Oddly, the line-up of radio editors was virtually identical to that of the time of his feud. In earlier radio years, the broadcasting scribes were replaced constantly, but Cantor's return to New York found him face to face with the same crowd he was at odds with a few years before. A few of the fourth-estaters were conspicuously absent. But the comedian did succeed in winning space and attention from most of them.

Eddie was in great comedy form at the party and had the writers roaring with laughter. But the best crack of the night came from an editor and not from Cantor.

Eddie Cantor and Deanna Durbin have parted company, but maybe only temporarily.

Eddie was boasting that Chase & Sanborn never sold as much coffee as during the time he starred on their program.

"You mean they don't even sell as much coffee with Charlie McCarthy?" one radio scribe asked, referring to Edgar Bergen's dummy sensation.

"No, not even with Charlie McCarthy," Cantor replied, "and, I always mentioned that I did not drink coffee myself. The sales broke records, despite my statement that I didn't drink the product."

"Neither does Charlie McCarthy!" the scribe commented.

* * *

IN these days of odd orchestral effects, anything can be expected to happen during a broadcast. And it often does!

Take the case of Lynn Murray, CBS conductor. One recent Sunday night, he featured a composition in which the sound of a typewriter was to play an important part. As a matter of fact, typewriter clicks were written right into the musical score just as if the writing machine was a musical instrument.

Broadcast time arrived and it was suddenly discovered that something was radically wrong. Production men investigated. The trouble was quickly located. The props department had supplied a *noiseless* typewriter!

* * *

A COUPLE of issues back, we wrote of the great pains networks go to in order to obtain the most realistic sound effects. The sound-effects men are never stumped. Never say die is their motto and they live up to it.

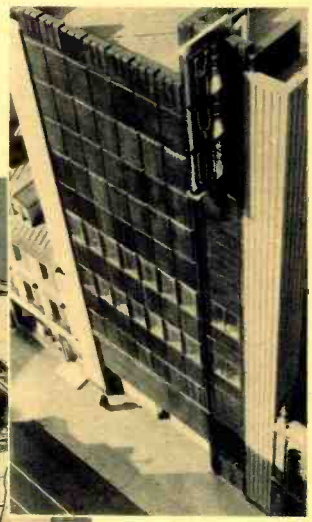
Take the case of the recent CBS Workshop program. It called for the sound of a Greek fountain. Nothing that the sound-effects men could provide satisfied the director that it simulated the spraying of water. After a lot of chasing around and experimenting, the solution was found. The sound of water flushing in a men's washroom in the New York CBS building was just the thing!

* * *

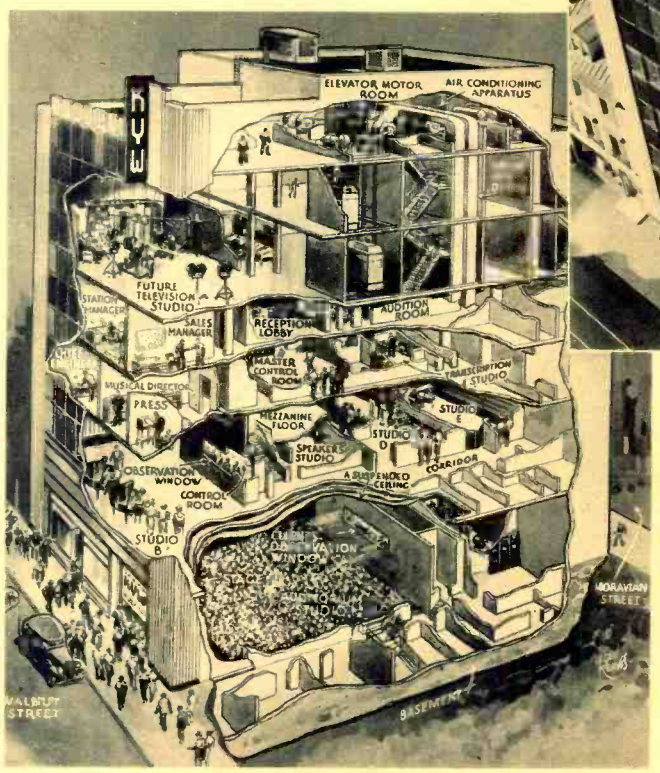
FUNNIEST off-mike story we've heard in years originated in the New York NBC studio just before Jack Benny went on the air with Fred Allen as his guest star recently.

The program was scheduled shortly after the end of Toscanini's symphonic series and

(Continued on page 95)



Exterior view of new KYW, Phila., Pa.



Plans for the future are revealed in this cut-away view of the interior of KYW's new building. Note the television studios on the top floors of the $600,000 structure.

BROADCASTING the NEXT WAR

by GRAY STRIDER

If war should come, will radio bring the sounds of battle into your loudspeaker? The author tells of the startling plans of broadcasting companies.

SHOULD the lamps once more go out all over Europe and civilization shrivel under tons of explosive death and creeping fogs of poison gas, a new factor will be on hand to record it.

Radio, the erstwhile minstrel boy, will be at the front, if war comes, to give it voice.

How is radio preparing for war? How will the broadcasting chains play their parts in the next European conflict?

Those were the questions I took to Paul White, Director of Public Affairs of the Columbia Broadcasting System, following that chain's dramatic work on the eve of Hitler's entry into Vienna. CBS, as you know, had on short notice brought London, Paris, Berlin, and Vienna into American loudspeakers on March 13th at 8 p.m. and let American public opinion serve as its own mixing panel.

Such a job spoke of further preparation. Calm, heavy-set Paul White agreed to discuss this delicate subject with me. I spoke to him at his office on the seventeenth floor of the Columbia Broadcasting Building at 485 Madison Avenue, New York. He is one of the few radio executives who doesn't twiddle his fingers, slew around in his chair, and look at his stop watch every few seconds.

White's position is an important one. As Director of Public Affairs, he arranges broadcasts of news, sports, public events, talks, educational programs, foreign presentations, and religion. He uses the transatlantic telephone as casually as you would call your office. In times of crisis he may go from Saturday until Tuesday with less than nine hours sleep, as he did when Hitler recently acquired Austria. It doesn't seem to get him down. Paul White is not the dramatic type of radio executive you meet in the movies. But a quiet man who does his job with a minimum of words and gestures.

"In time of war," Mr. White said, "the importance of radio as a force in forming public opinion and in providing up-to-the-minute information from the combatant countries can hardly be overestimated. In the recent Austrian crisis," he continued, "we brought the public a speedily arranged five-way international broadcast which may point to our future course of action if large scale hostilities ever materialize."

Since this March 13th broadcast may serve as a model of what will actually happen during war time you may be interested to know how such a round-robin pick-up from Europe was worked out.

"The turmoil which followed Hitler's swift action made contact with Europe extremely difficult on that Sunday," Mr. White explained. "Most of the Continent folds up over the week-end and it was almost impossible to get in touch with the proper authorities in a short space of time.

"In practically every European country —there are some exceptions—communications are a separate ministry and broadcasting in general comes under that classification. The British Broadcasting Corporation is a private organization but operates under a government charter. In France, the Ministry of Post, Telephones, and Telegraphs controls the radio. In Germany, is the *Reich Rundfunk Gesellschaft.*"

In this connection, it should be noted that Columbia's representatives have excellent diplomatic contacts. In getting a short wave broadcast from Europe, the political

(*Continued on page* 85)

Paul White, CBS Director of Public Affairs, arranges radio presentations from abroad.

H. V. Kaltenborn was the first to describe a battle from the actual scene of action. While shown here with the Spanish rebels, he later talked from the other side, also.

The architect's model of the magnificent NBC Hollywood Radio City. Is this the forerunner of a general trek to California?

Construction work is actually started, and since it is the movie capitol, girls are not missing when the first spade is turned.

by ROSA REILLY

Is Radio Moving

UP until a year or so ago, "coast-to-coast" in radio meant from New York to Los Angeles. Now it's in reverse. The tide has been running the other way, with New York on the receiving instead of the sending end, and with movie stars filling your loudspeakers as well as your screens.

Admittedly, one of the toughest problems facing radio today is the future role of Hollywood in the great broadcasting theme. Will America's A-1 glamor city play the leading part with New York limping along in a supporting capacity? Or will Manhattan continue to dominate the aerial picture?

Radio's present theme song seems to be "California, Here I Come." CBS and NBC are each producing—as we go to press—fifteen programs which originate in Los Angeles. The Mutual Broadcasting Company, through its affiliation with Don Lee Independent Network, is also sending approximately fifteen commercial and sustaining presentations from Hollywood.

CBS is spending $1,750,000.00 to erect new studios and transmitting equipment in Hollywood. NBC is meeting this challenge with construction running to a figure of $2,000,000.00—no sucker sums. If programs emanating from the film capital are not going to maintain their positions in the radio firmament, somebody will be minus considerable money.

Certainly much of the work being put forward by the broadcasting networks in Hollywood today has television in mind. When this visual broadcasting gets on a practicable basis, Hollywood will be more in demand than ever. Personable people will be the first requirement of television. Who wants to look at a singer with a wart on her nose?

To get a fair evaluation of the New York-versus-Hollywood situation, many points must be considered.

Programs began to emanate from Hollywood because sponsors—national advertisers—were eager to harness glamor to the cash-and-carry wagons of trade. They wanted to use the Hollywood cuties and comics to help sell their products, as varied as they were. If the movie stars could make the cash register ring as they did at the box-office, it would be dividend time for both Main Street and Wall Street.

Both CBS and NBC claim to have been the first to broadcast radio programs from Hollywood. The first Columbia presentation on record was when Bing Crosby sang in the California Melodies, assisted by Raymond Paige's orchestra on May 28th, 1930.

National followed shortly afterward—in 1932. Radio at first was only a stepchild on the doorstep of the Brown Derby. In that first year, NBC was on the air for twelve hours only and the personnel was one man. In 1937, their broadcasting time was estimated at more than seven hundred radio hours. The staff, including technicians, sound-effects men, writers, producers, and directors increased to nearly a hundred.

But in Hollywood radio, as in everything else, we meet the ultimate question—

Columbia, not to be outdone, has not spared expense in providing the ultimate for its Hollywood Studios. They opened April 30.

Cleaning up Columbia Square in preparation for festivities which marked the inauguration of KNX's new Hollywood studios.

to Hollywood?

In spite of higher salaries, wire charges and other obstacles, will radio move entirely West? The answer can't be told now, but here is what is happening there.

does it pay?

The consensus seems to be that production in Hollywood boosts the overhead to a disproportionate degree. Film stars for the air come high. Also movieland production ideas. There's something in the film atmosphere out there which makes it easy for human beings to spend money faster than they would any place else.

The little matter of salaries keeps rearing its inflated head. Sponsors often pay moving picture stars such enormous sums —anything from $1500 to $5000—for a broadcast, that many of the glittering gals and boys find it hard to keep a sense of proportion.

This is particularly true of two grades of talent. First, the little buds, new come to Hollywood, who were thrilled to sign a contract at what to them seemed a pocketful of money. But when they receive such dazzling weekly checks from their radio sponsors, they get the idea that they must be heaven sent to Darryl Zanuck or Jack Warner. So they—or their agents —knock on the doors of Mr. Warner or Mr. Zanuck and ask for a raise.

Second, many of the big stars of Hollywood don't remain unaffected by the cash they receive. They can go on the air for a few moments and get paid a few thousands dollars. So why bother making a lot of films every year? Some of them may determine to exert themselves, pictorially speaking, just enough to keep the wolf out of the jewel box and his whelps out of the swimming pool.

Another annoying problem is the distance between Hollywood and New York. Although Columbia has sent thirty technicians and eight sound-effects men to Los Angeles, there are many problems which have to be worked out across the continent. This is a terrific wear and tear on creative organizations.

The advertising agencies in the east have cradled a lot of radio ideas and programs. They spoke for the sponsor, and as a matter of fact, most of them either had a West Coast office to begin with or started one with emphasis on radio, when the movie tide began rising.

But Hollywood is the habitat of the ten-percenter, the agent—the artist's representative. This legion not only speaks for its clients—it hollers for them.

So the advertising agencies back east, accustomed as they are to agents, find the Hollywood ten-percenter a tough hombre, schooled in hysteria, and with Samson-like convictions as to what his starlet will or will not do on a radio program, and how much she will take for it.

Hollering back in dignified agency manner across 3000 miles has not helped to maintain the delicate balance of power, long a birthright of the eastern seaboard.

Periodically, film companies have cursed radio and embraced her. It's either a passionate love scene or a knock-down, drag-out fight. When radio first came along, the picture trade regarded her as an enemy —a rival form of entertainment. Soon, however, they adopted the old slogan: "If you can't lick 'em, join 'em."

Paramount acquired a large interest in CBS which was, in fact, housed in the Paramount Building in New York at the time. Paramount, at one period, was a large user of Columbia's radio time. It has since divorced itself from its holdings in CBS.

RKO-Radio Pictures became the producing unit for a far-flung enterprise, combined not only for pictures and vaudeville but also containing all elements of radio and communications. RCA was the parent organization of which RKO-Radio Pictures and National Broadcasting were corporate parts.

The Loew interests, which include Metro-Goldwyn-Mayer, have WHN in New York, and Warner Brothers for years have had their own broadcasting studio in Hollywood.

Paramount and RKO have been considerable users of radio time as companies. However, they and other film outfits have obtained many more times that amount of publicity through the medium of their stars and directors appearing on programs paid for by outside commercial organiza-

(Continued on next page)

tions.

The movie producer unquestionably finds the broadcasting of radio programs from Hollywood an annoyance. Suppose he is shooting a minor million dollar epic. The big sound stage is embroidered with equipment and technicians eating up overhead at the rate of a thousand dollars a second; thousands of extras stand ready to rush to the barricades at $7.50 a head; cameras and lights are trained on the Glamor Queen.

Suddenly the femme looks at her emerald and diamond wrist watch, lets out a yell, and says: "Oh—I'm due at the studio this minute for a radio rehearsal."

She jumps into her limousine and heads for air headquarters. The producer holds the bag—and overhead—until she returns.

Naturally the producer knows the time of radio rehearsals. But his shooting schedules are more cumbersome than those of the broadcasting studio.

Regardless of the publicity the star gets from the radio, the average movie producer would like to get on with the making of pictures without picking radio broadcasts out of his hair. To tell the truth the poor film producer has got a bear by the tail. Or as the Chinese say, "He who rides a tiger cannot dismount."

What is the point of view of the big broadcasting chains themselves? What about their million-dollar investments in studios and equipment in Hollywood?

Take CBS, for instance. Are they putting on what corresponds technically to chinchilla and pearls for the Hollywood trade?

They are. On April 30th, CBS dedicated its new Hollywood KNX building in Columbia Square, on Sunset Boulevard between Gower and El Centro Streets. In addition, a 490-foot transmitter tower and a building to house the new transmitter, have been erected on a thirty-seven acre site at 190th Street and Hawthorne Boulevard, in the El Nido section of Los Angeles.

This thirty-seven acre tract has marshy underground conditions and is surrounded by a low-lying area which makes for good radio transmission.

"The radiator," says J. L. Middlebrookes, liaison engineer for the Columbia network, "is the most efficient yet devised and should increase the KNX signal materially. Under the tower base is buried a wheel-shaped net with the spokes made of 130,000 feet of copper wire, weighing some 3½ tons, similar to the ground conductor beneath the Columbia Square studios eighteen miles northward in Hollywood.

"Near the foot of this giant tower will be the modern building, constructed in three sections. The central portion, shaped as a 56-foot circle with a 29-foot ceiling, will house the RCA Model 50-D, 50,000 watt transmitting apparatus.

"A 40-foot panel, also in modernistic design, fronts the elaborate equipment and offers a panorama of winking signal lights, fluctuating indicators, and giant tubes. A 6-foot, glass-enclosed observation platform which encircles the room will permit visitors to see clearly all the operations of the intricate equipment."

The entrance to the transmitter building will contain two display cases showing cross-sections and working models of all parts of the equipment, from high water-cooled tubes to small automatic switches.

A standby power plant will be installed to guard against the possibility of a power interruption, permitting CBS to maintain service in any critical emergency.

The studio buildings at Columbia Square consist of two main units; one, a five-story building on El Centro Street, which contains seven studios and two audition rooms; also a theatre seating 1050 persons, as well as parking facilities for 500 cars.

The other unit is on Gower Street. It is a two-story building and will contain the offices of the Columbia Concert Corporation and Columbia Artists.

Many novel features have been incorporated in the five story building. For instance a room has been built which will never house anything but emptiness. It is for echoes. The room is termed a *reverberation chamber* and will be used on occasions when a radio play calls for a speaker to address a crowd in a large auditorium. The voice will be reproduced in the *reverberation chamber* and picked up there again by a microphone as the words echo.

Dr. V. O. Knudsen, professor of acoustical engineering at the University of California, served as acoustical consultant and has designed the walls of the studio.

Also the walls of all studios are floating and not rigidly attached to the floor or ceiling of the building. Jolting of trucks and passing cars will not set up wall vibration to affect the sound of programs being broadcast from the studio.

The window of the monitor room, where the technicians regulate the intensity of sound as they watch the program proceed, is set at a slight angle. Sound reflected from any of these surfaces is thereby deflected from the microphone.

NBC is likewise stepping up its Hollywood broadcasting facilities. On Sunset Boulevard and Vine Street, on the original site of the Famous Players-Lasky film lot, where motion pictures practically were born, NBC is replacing its own studios which were erected two years ago on Melrose Avenue and have now become outdated.

The $2,000,000.00 classical building (NBC's own figures) will provide for National's immediate Hollywood needs with provision allowed for increased studio and office facilities when, as, and if television arrives. Programs will be broadcast from 8 large individual studios, four of which will seat several hundred persons each.

The executive and administrative offices will be housed in a central office building with a vast lobby three stories high. The technical facilities include the most modern RCA equipment.

As in all CBS stations, the new type automatic volume limiter will be installed in the KNX transmitter and will increase the signal coverage.

There is the technical broadcasting set-up in Hollywood.

The final answer to the New York-versus-Hollywood controversy will rest with the listener. If he likes the type of material the film boys and girls are turning out, and if they help to sell toothpaste or cigarettes week-after-week, month-after-month, the financial outlays of CBS, NBC, and Mutual,—to say nothing of the money put out by the sponsors and the creative efforts of the agencies—will be justified.

However, if the listener doesn't buy Hollywood's violets via the loud speaker or corner store, the Beverly Hills brigade will be paying less income tax for a while.

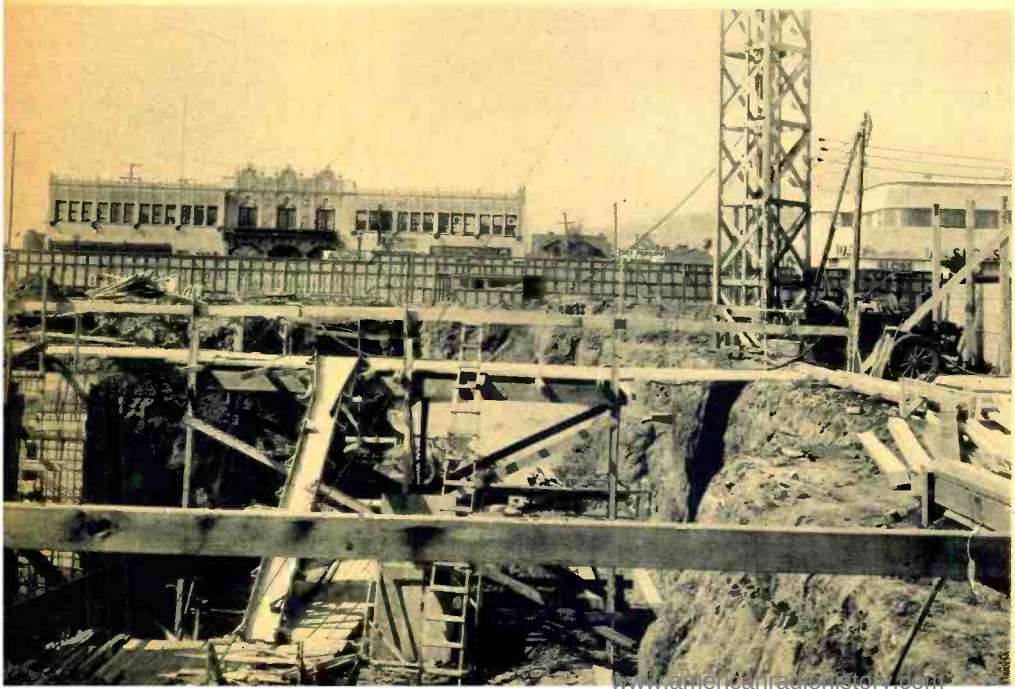
Television will probably pop up just in time to save the Malibu Beach homestead. And when it does, we, the people, will still be kings.

Hollywood is, has been, and will continue to be an important factor in radio entertainment. But don't expect to see ivy growing through the broken roofs of the New York headquarters of NBC, Mutual, and CBS. Nor the present day executives and employees of these networks begging their bread.

Either way you look at it, you can't laugh Hollywood off!

-30-

Delayed by the flood, work was resumed on NBC's new Hollywood Radio City.



SOS IN REVERSE

The S. S. Siboney of the Ward Line leaving Havana harbor. She relayed the SOS to N. Y.

by R. D. HUTCHENS
Communications Engineer

A rare case of land SOS. Usually it is the other way around. A fascinating sea story with a landlubber's tang.

THE Ward liner *Siboney* passed Morro Castle at noon Saturday, September 18, 1926, leaving Havana for New York. The late veteran Captain F. L. Miller had received storm warnings before sailing, but as his course lay close to marine radio stations along the east coast, he gave little attention to the reports. A few frightened persons cancelled passage. Routine calm prevailed on board the 15,000-ton ship as it turned to the northwest and pressed through a moderate sea toward the Keys.

The Miami hurricane had struck its first blow ten hours before. Twisting up from the Bahamas, it left a swath of ruin across Florida. Hundreds were killed; a 20-story building wrecked; a freighter had been washed into a city street. The wind lashed continually from 2 a.m. until 4 p.m.

All transportation was stopped. Roads were latticed with telegraph poles. All communication was stopped. Radio amateurs, usually helpful during such an emergency, were excusably silent. The stricken area was isolated; no one knew what assistance to offer, or where to send it.

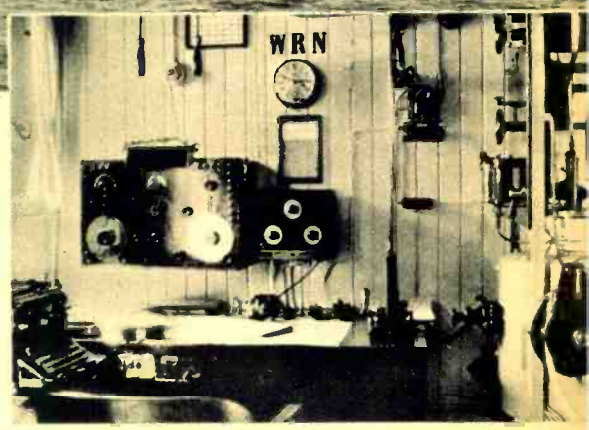
The staff of marine radio station WAX, Miami, realizing fewer lives would be lost if communication was established quickly, began to work toward this end when the storm appeared. The performances of these men during the following twenty hours composed one of the longest series of heroic acts in radio record.

At the beginning of the storm, they hoped to operate in the usual manner from the Miami office, controlling the transmitter—in Hialeah—by landline. The receiving antenna, near the control office, blew away. The wind peeled the roof from the operators' quarters; only the main office remained in place. More than a hundred persons, whose homes had left them, were admitted to its shelter. The staff helped care for the injured.

They collected equipment and started for Hialeah, six miles away. Making their way along an almost impassable road, they saw strands of the useless control line hanging from broken poles. Within sight of the transmitter, they were cheered to see one of the usual five steel towers standing. Before they reached it, it buckled and crashed to the ground.

Those who know the perversity of temporary wiring in normal surroundings appreciate what practical knowledge and courage the men must have had to get the equipment in useful order. They ran an antenna from one side of the station to the stump of a tower; obtained power by start-

(*Continued on page* 84)

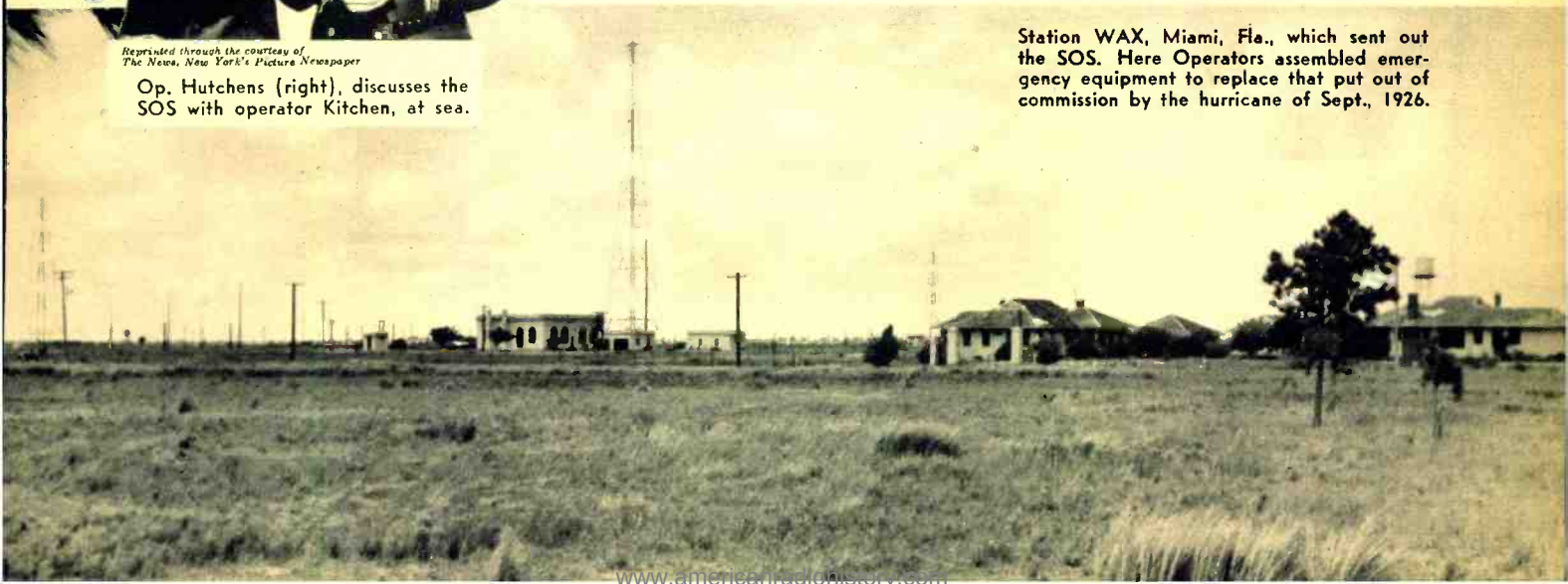


In the radio room of the Siboney, a 2 KW arc transmitter can be seen to the right.

Reprinted through the courtesy of The News, New York's Picture Newspaper

Op. Hutchens (right), discusses the SOS with operator Kitchen, at sea.

Station WAX, Miami, Fla., which sent out the SOS. Here Operators assembled emergency equipment to replace that put out of commission by the hurricane of Sept., 1926.



Noted for the most expressive hands in the popular radio world, as well as a fine comedian is Borrah Minevitch. His Rascals are famous for their rhythm and symphony harmonica music.

The man who made the expression, "And I DO mean YOU!" famous. Movie-critic Jimmy Fidler.

PERSONALITIES

Many children mourned the passing of Su-Lin, the gentle Giant Panda. ↑

Reviving a character she created over 17 years ago, Fanny (Baby Snooks) Brice has scored a personal triumph overnight. ↑

When he "swung" Annie Laurie musician Jimmy Dorsey was cut off the air. →

Potential television material is Lucille Manners, soprano of Cities Service Show.

Outstanding receiver engineer Karl W. Miles has developed many circuit innovations.

Mr. Phil Lenz, president of one of the oldest radio equipment manufacturers.

Husky voiced Frances Langford munches a bite on the way to the coast by air.

Mr. Dan Hirtle was newly elected president of the Burgess Battery Company.

The driving buyer behind Montgomery-Ward's radio business, Peter J. Faber.

(Top) Professor Lyman Bryson, chairman of the Columbia Broadcasting Co. Adult Education Board. (Lower) Dr. Angel, formerly president of Yale University holds a similar position with NBC.

The Andrews Sisters and Sholem Secunda, author (seated at the piano), made the first recording of "Bei Mir Bist Du Schoen."

Radio AT THE

The entire success of the arctic expedition depended on the radio which not only gave out information, but also assisted in the rescue of the scientists.

Given up for lost, radio brought rescue ships to this gleefully waving band.

by LUCIEN ZACHAROFF

BREATHES there a radio operator who has not followed with a mixture of professional pride, envy and admiration the press reports of the recent legendary adventures of Ernst Krenkel, the world's first dot-and-dash man to make his home on a North Pole ice floe for nearly nine months?

From Rheims and Rotterdam to Australia and the Hawaiian Islands radio fans have been communicating with Krenkel during that exciting period, not to mention the "hams" of his own country.

There is neither parallel nor precedent for the ambition of planning, degree of success, importance of findings, or extent of daring to which Krenkel and his three fellow-scientists, accompanied by a dog, treated the world on their 1,500-mile drift. In this breath-taking saga of the Farthest North conquest all the resources of the aeronautical, broadcasting, and other sciences were mobilized to effect the landing of the unique expeditionary force at the Pole for a *prolonged, systematic* study of mysterious Arctic waters, magnetic phenomena, and "the world's weather factory."

It will take years for the learned institutions all over the globe to assimilate the valuable data secured by the courageous quartet.

But the scientists of the world did not have to wait even for the expedition to come back to civilization before learning its significant daily discoveries as well as the life, work, and reactions of the four men and a dog drifting in the gloom of the Arctic night, amid the icy gales and storms of the unknown ocean. The newspaper-reading "man-in-the-street," the experts of the U. S. Weather Bureau, specialists everywhere were well posted as to the activities of the quartet.

This aspect of the expedition has been admirably summed up by the distinguished American correspondent, Walter Duranty:

"One of the most striking features of the whole amazing story has been the way in which radio contact has been maintained with the head offices of the Northern Sea Route Administration. In almost nine months there have been scarcely 10 days when the operator Ernst Krenkel failed to report not merely position, state of wind and weather, temperature and other details, but also to send the most valuable information in the shape of scientific reports and long messages covering the whole scale of scientific investigations. For that alone Krenkel deserves a special niche in Science's Hall of Fame. Much has already been published but there is a great mass of additional data now being studied . . . It can be taken for granted that . . . (the four) . . . realized from the outset the hazardous nature of their undertaking and that they therefore did their utmost to take advantage of radio communication to avert as far as possible the consequences of disaster to their specimens and even to themselves."

Strong indeed is the temptation to dwell at length on the breath-taking events, always on the brink of disaster, from the moment the four had been delivered by plane in the vicinity of the Pole on May 21, 1937, to the time rescue icebreakers removed them on February 19, 1938, in the Greenland waters where their cruising ice floe became a tiny fragment of its former self in the warmer temperature. This, however, is intended to be an account of the radio operator, his equipment and work.

On second thought, it is not so difficult to keep close to the radio aspect of the expedition because it has been so prominent. In all evaluations of the extraordinary enterprise, it is not difficult to agree with the distinguished hydrographer, Professor P. Molchanoff, that "special tribute should be paid to the high skill of Krenkel, who maintained uninterrupted contact with the mainland notwithstanding the difficult conditions for radio broadcasts in the Polar basin."

What was this extraordinary radio equipment that again and again accounted for the safety of the personnel and the faultlessly fruitful outcome of the whole venture? Not even the prolific Soviet industry, at the time the expedition was proposed, was producing such special apparatus that could function without a hitch under the severe Arctic conditions. In making his specifications to the Experimental Radio Laboratory of Leningrad, Krenkel knew that his designs simply had to insure the ability of the novel radio station to transmit to the world daily the bearings of the ice floe as taken by their youthful astronomer and magnitologist, Eugene Feodoroff. Failure to do so meant in substance that in any emergency the rescue parties would not know where to look for the plucky group.

The crews of the rescue ships "Taimyr" and "Murman" dismantle the main tent that had sheltered the Polar quartet during the winter.

The Soviet Polar Station No. 56 on the pack ice. Note the wind-driven propeller used for charging the battery for the radio.

NORTH POLE

Radiop Krenkel sends out the expedition's last message over the rig that served so faithfully throughout the Polar winter.

A needle in a haystack is an easier object to find than a small ice floe in the Arctic Basin, with its position unreported at frequent intervals. Witness the futile search for many weary months by Sir Hubert Wilkins and others for the Soviet airman Sigismund Levanevsky and his five companions lost last summer on their transpolar flight from Russia to America, following the failure of their radio transmitter.

And so, the Leningrad laboratory concentrated on developing the indispensable dependability factor. The broadcasting apparatus weighed more than a half-ton in the total of nine tons of the expedition, including the human cargo of four. Two transmitter-receiver sets were included—one a high-power unit of 80 watts, the other a low-power 20-watt plant. The parts in both sets were made interchangeable.

Because of the risk of irreparable damage or loss of equipment in the splitting up of the floe or in ice blocks piling on each other as they often do in the Arctic, still another emergency set was kept throughout the cruise at some distance from the tent, including accumulators and manually-operated gear.

Frost-resisting accumulators were the principal source of feeding the radio apparatus. Of special construction, they were charged either by the small wind-driven mill or a gasoline-consuming dynamo. In the event of failure of the latter or the absence of wind for the former, the radio station was to derive its power from a hand-driven dynamo. This equipment proved its value many times.

There was another, far more likely hazard—the sharp change in the tent's temperature. In order to economize on fuel, the four decided not to heat the tent which was warmed up only during the hours of food preparation. This led to temperature fluctuations which would have reacted most unfavorably on the radio apparatus had not most of the parts been built in a manner that made them virtually hermetically sealed.

Becoming the 56th Soviet Arctic station, the North Pole Camp was made a part of the regular meteorological service, with Krenkel transmitting weather reports three or four times a day. As noted, he was also charged with the duty of a daily transmission of detailed scientific findings, articles for newspapers, and private messages from members of the unique outpost. Their location was made known frequently to the outside world. In his "spare" time Krenkel listened in on stations in every corner of the globe.

Krenkel loaded reserve radio equipment on a sledge when the ice floe began to break up, so the party could carry on its work even if forced to abandon permanent camp.

Many an amateur operator was thrilled by a contact with Krenkel whose basic wireless connection was with the scientific wintering party on Rudolf Island, 560 miles away from the Pole. The radio experts on Rudolf Island were in turn ordered by the Government to keep a 24-hour watch for signals from the Pole and to reply instantly. This was necessary because due to movements and compression of the ice formations the four expected to be forced to transfer their tent and other equipment from time to time, with the result that they could not be always at their radio receivers. However, Krenkel was determined to hold his absences from his beloved paraphernalia down to an absolute minimum.

From the Rudolf station all of Krenkel's messages went on to Dickson, and thence to Moscow which under favorable circumstances received them within an hour or two. Because of the precision of Krenkel's work, his weather reports and prognostications had become a regular feature of the Soviet, American, and other synoptic maps which are of such tremendous value to modern agriculture, industry, and science.

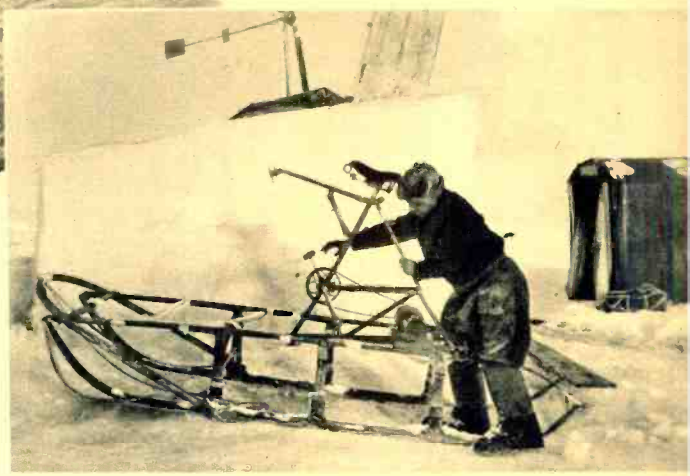
Space limitations in the aircraft which brought them to the Pole compelled the four men to leave behind many books that they were anxious to have on their isolated cruise. To fill this gap they depended on their radio operator to catch broadcasts of news, lectures, concerts, etc.

On one of his numerous invasions of the Arctic, Professor O. Y. Schmidt, "the ice admiral" who heads all work in those parts, had RAEM as the call letters of his radio station in the Chukhotsk Sea. By a special order of the People's Commissariat

The wintering party takes leave of the members of the aerial expedition which is about to return to the civilized world.

← O. J. Schmidt, chief of the expedition returns to the tents after inspecting the wind-driven generator. Terrific gales battered the camp constantly, making necessary frequent repairs to the outdoor equipment.

On those rare occasions when there was not enough wind to drive the generator, this ingenious outfit assured man-supplied current for the always punctual scientific radio reports to those at the mainland base. ↓



of Communications those call letters were assigned to Krenkel. The call letters of the entire camp, assigned when it was named Polar Station No. 56, were UPOL, short for "Union polus."

There were also intangible items in the equipment of the radio operator who sat on the top of the world, items that had at times been of as much service as the all-important receivers and transmitters. They may be briefly listed as a powerful will, staunchness, a superb sense of humor, unfailingly merry spirit, and rigorous self-discipline.

When he was sending out his official reports in the teeth of a 63 mile-an-hour gale, Krenkel did not forget to add a friendly but emphatic suggestion to his two little daughters, Irina and Ludmille, that they ought to mind their mother better than they had lately, and to his wife advice to choose light blue wallpaper for their summer cottage which was then being erected.

And again, after a long wireless to the newspaper *Pravda,* describing a typical day on the ice floe, Krenkel adds:

"Am horrified at the words of the morning-exercises leader—'Open your windows wide, put on your gym trunks.' As for the recommended water-drinking procedure, we fulfill it in the only form available to us—we drink hot tea."

Toward the end of the drift Krenkel's messages grew more terse and laconic; he was conserving power. But his fearlessness and daring lasted to the end of the odyssey, as evidenced by his repeated jests. On the night of February 4th a storm was raging in the Greenland Sea, crumbling swiftly all ice floes in the vicinity, including, of course, the one which served as his domicile. The radiogram which Krenkel marked "Immediate Delivery" simply told his wife:

"It seems we will return sooner than expected. Am impatiently awaiting letters. I warmly kiss my whole beloved collective farm."

"He is always like that," Mrs. Krenkel complains. "Not a word of his difficulties, but thousands of questions about the health of the children. You can never know when anything is wrong with him, when he needs help."

No higher compliment can be paid to any Soviet radio operator than to tell him that he works like Krenkel whose Arctic career may be traced 14 years back. He has wintered several times on Novaya Zemlia. On January 12, 1930, from the northermost radio station in Tranquility Bay he established contact with the southernmost station, that of Admiral Byrd near the South Pole.

"If anyone is interested in my childhood," Krenkel declares, "let him picture a city boy of a poor family who in the evenings used to take off his school uniform in order to preserve it and would put on patched trousers and a worn jacket; a soccer player, an amateur electrician who always burned out the fuses in the entire house, who would bury himself in Jack London's books, dreaming of bold adventures and finding the ordinary home life irksome."

When he was 14 Ernst was compelled by his father's illness to turn his attention to the problems of earning a livelihood and supporting the family. In a small Moscow shop dirty with many years' layers of soot, the boy repaired kerosene stoves, meat-grinders and pots, and daydreamed of distant trips. Later, in cold rooms, without removing his overcoat, munching a piece of black bread and a meager ration of jam, he pored over telegraphy courses which in years to come were to help him realize his ambition to travel.

Eager to sail as a ship's wireless operator, Ernst spent many a watchful day at the headquarters of the Baltic Sea Line Administration. While waiting, he drank in the glowing accounts of other seagoing operators' escapades. Picture his feelings when he was appointed radio operator for the wintering-party at Novaya Zemlia. His dreams were at last to be realized.

Bright ideas were crowding his head. At that time Professor Bonch-Bruyevich was working out many pioneering problems of short-wave broadcasting at the Nijny-Novgorod (now Gorky) Radio Laboratory. Day and night Krenkel was thinking of the possibilities of short-wave in Arctic work. Appearing before the professor, in his sailor's uniform, Krenkel concocted a white lie:

"The Marine Department is interested in experimenting with short waves in the Arctic, but has no apparatus. If you supply it, the Marine Department will provide an opportunity for conducting these experiments."

Bonch-Bruyevich consented. Krenkel, at his own expense, boarded a train for Leningrad where the Marine Department was located. There he calmly reported:

"Professor Bonch-Bruyevich wants to organize experiments with short waves in the Arctic. It's up to you now."

Without suspecting the origin of the negotiations, the two institutions later got together, and by an official order Krenkel was given a short-wave set which he introduced in the polar regions on his second wintering expedition to Novaya Zemlia. Curiously, he was brought there by the icebreaker *Taimyr* which in 1938 was to take him and his three companions off the floe in Greenland Sea.

And so, thanks to Krenkel, Arctica was treated to its first short-wave signals which linked it with Baku and then with Moscow and Leningrad.

Leaving Archangel, the *Taimyr* carried Krenkel across the mouth of the Pechora River, Matochkin Shar and other Far North points. After a brief rest, the trip to Franz Josef Land was resumed, this time aboard the *Sedoff*, with Professor Schmidt in command.

In 1932 Krenkel's part in the *Sibiriakoff's* through trip in a single navigation season over the Northern Sea Route had won him the award of the coveted *Order of the Red Banner of Labor*.

The following year came the epic cruise and disaster of the *Cheliuskin*. For two months following the destruction of the vessel, Krenkel remained at his post, organizing radio communication with Bolshaya Zemlia and with the airmen who were speeding to the rescue. He was the last of the shipwrecked crew to board the airplane which flew him to the mainland.

In those days the world watched breathlessly for the nightly messages which came from the emergency camp on the ice, led by Schmidt who was stricken with pneumonia. On their nearly miraculous return, Krenkel was decorated with the *Order of the Red Star*.

In 1935 the tireless Krenkel set out for Cape Olovianny. Soon he restored the ruined wintering quarters on the Kamenev Island, and spent half a year, in company of Mechanic Mekhrengin, on that faroff little-known patch. One of his messages of that period read:

"For the information of the residents of Moscow: Available for exchange, a kilo of chocolate for a kilo of potatoes . . . on condition that delivery to and from the Kamenev is to be undertaken by Moscow."

It was while he was keeping that lonely vigil in the summer, 1936, that he received the following message from Dr. Ivan Papanin, who was later to become the leader of the North Pole Drifting Party:

"What radio equipment will you need for the forthcoming expedition?"

Krenkel comments: "It was superfluous to explain what expedition was under discussion. I guessed at once." For the project for a more or less permanent settlement at the North Pole had been under discussion for several years. When Krenkel first heard of it, he immediately applied to Professor Schmidt for an appointment as radio operator. It was granted in March, 1937. Schmidt tells us:

"It was clear from the very beginning that only one person could fill the post of radio operator of the drifting station — Ernst Teodorovich Krenkel. Devoted to the study of the Arctic to the point of self-sacrifice, Krenkel for many years before our plans took concrete shape, besieged me and others with projects, one more daring than the other, about some terribly remote and terribly difficult wintering expedition, a drifting one, where no man had yet set foot."

There are no two opinions about Krenkel. Dr. Papanin felt that having him among the camp's personnel, "we may safely declare that communication with the mainland is secure. And communication is the most decisive factor of our expedition."

Krenkel and his comrades were not caught unprepared when, approaching the Denmark Strait, the floe began to break up perilously. While rescuers feverishly sought to reach them by icebreaker, airplane, dirigible and dog-sled, the four calmly packed a reserve radio set and scientific instruments on sledges in order to pursue their scientific observations until the very moment of their removal from the small fraction of the original floe. On the latter they pitched a silk tent and three months' supply of food.

A typical Krenkel radiogram of that tense period:

"When we return we will surely be pulled aside by our coat sleeve and in whispers asked, 'Tell me, frankly, were you very much afraid?' Everyone will expect us to reply in the negative. I must disillusion these comrades in advance—really, we were frightened somewhat. Yet, we pleadingly ask all those who sympathize with us not to run to Otto Schmidt and, on the basis of this sensational news, ask that planes be sent out immediately. Our airdrome is closed until we complete our plan of work."

Krenkel's "plan of work," in addition to the extensive radio activity, barely hinted

(*Continued on page* 94)

The members of the Polar party fix their signatures to the expedition's final report before boarding the rescue ships to return to Russia.

In the lonely Arctic, men value the companionship of animals more highly than ever. The leader of the expedition, Otto Schmidt, feeds two bear cub pets he caught on Rudolph Island.

Twisting a bundle of straw means that something is astir in the underbrush.

SOUND EFFECTS

by ARTHUR J. KELLAR

The author tells how ingenious sound-effects men simulate accurately almost any sound.

A RADIO CITY control-room engineer was exceedingly annoyed one broadcast by crackles, the source of which he couldn't determine. What was worse he couldn't eliminate the disturbance after frantic manipulation of every knob and gadget on his monitor board. Then, with a flash of inspiration, he dispatched his companion in the compartment, the production man, to the studio proper to query a girl singer who had just completed a number.

"Have you got a petticoat on?" whispered the emissary without any preliminaries.

"Yes," she confessed, sotto voce, obviously upset by this impetuous investigation into a rather intimate matter. "Why?" she hissed.

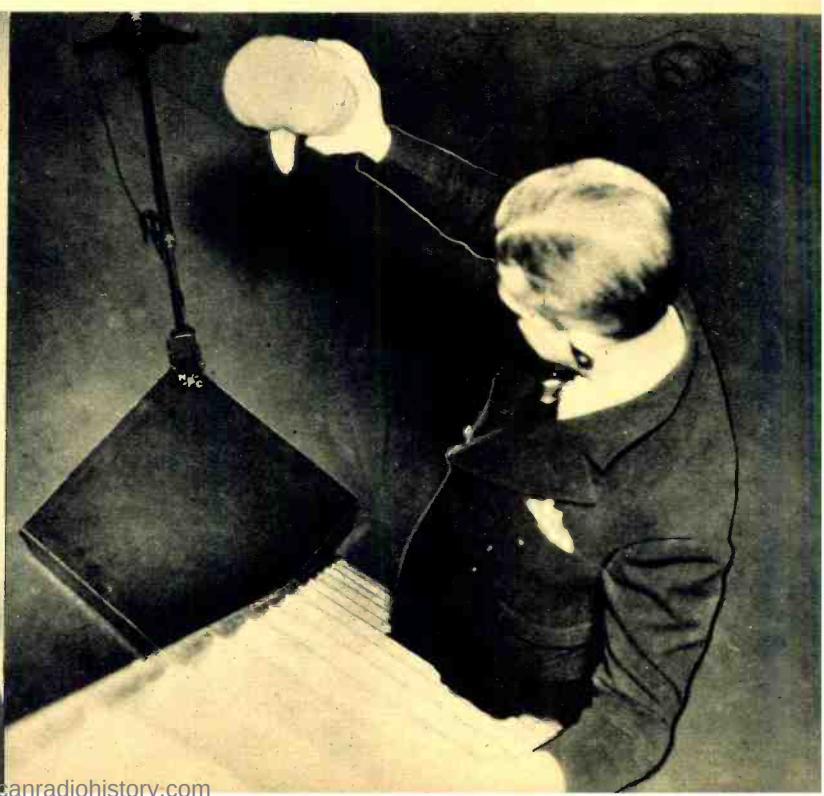
"Get rid of it—quick!" directed the producer.

Bewildered, the lady hastened to comply. She bounced from her chair; her hands disappeared beneath her skirt, fumbled a second or two and a loose garment fluttered to the floor about her feet. She stepped nimbly from its folds and bent quickly to retrieve it. As she straightened up she deftly rolled it into a wad, woman's apparel being what it is these days. Her fingers flashed and the object vanished into a handbag suspended from her wrist. All this happened in a jiffy but not so swiftly but that each movement was followed with fascinated interest by the studio spectators.

By then it was time for the vocalist to resume her place at the microphone. The orchestra struck up the music and she went into her song. Through the glass enclosing his quarters the engineer, his face tense with vigilance, could be seen bent over his instruments. A minute passed—another minute—and a third. Then the control-room man relaxed, a broad grin on his face. The mysterious disturbance was no more.

The crackling sounds had been tracked to their point of origin and silenced, thanks to the perspicacity of the technician and the fortunate circumstance that he was a married man. A bachelor wouldn't have known that women were wearing taffeta petticoats at that time; and ignorant of that fact, he probably wouldn't have known either that taffeta is a fabric that rustles. But any sound-engineer, married or single,

Ray Kelly, NBC's sound effects chief, produces thunder by striking a window screen. The results are truly marvelous.



A squash dropped from a height provides the sickening thud of a body hurtling to the sidewalk, often heard in horror stories.

knows what a sensitive "ribbon" mike can do with rustles. It amplifies them into reports almost as sharp as thunder claps and just as unwelcome to the loudspeaker clan.

They are constantly finding out such interesting things in the studios, the ways of the wireless waves being as mysterious as their godfather, electricity. However, it would be far-fetched to say that the discoveries are always attended by such diverting circumstances. Ladies frequenting the broadcasting chambers do not make a practice of shedding underthings in the presence of large groups of goggle-eyed strangers, even for the advancement of science. But they—and their male colleagues—do have experiences which help to make life in glamorous Radioland anything but monotonous.

There are times, too, when the engineers in their quest for scientific knowledge meet with adventure in places away from the air castles. Such occasion was when they solved the vexing problem of how to sound-proof the National Broadcasting Company's studios in Radio City. It is a story of achievement under conditions so unique as to border on the bizarre. It has been a carefully concealed chapter in the record of the development of the vast Rockefeller Center enterprise in midtown New York, possibly, because it presents the leading characters—the engineers involved—as rather fantastic figures in a sacred setting.

First we must understand the situation existing prior to the grand opening of Radio City in November, 1933. The studios had been completed except in one particular. That was the matter of sound-proofing the walls. Unless that job was done right, programs projected from "the most modern broadcasting plant ever built," to quote NBC's own literature, wouldn't be worth thirty cents, acoustically speaking, of course. The sound-proofing hadn't been done because the architects and engineers, after endless experiments, couldn't find a satisfactory sound-proof material.

Vans were moving furniture and equipment from NBC's old quarters at 711 Fifth Avenue and the time came when a decision had to be made—or else, as the mobsters so quaintly put it.

Now, when an ordinary citizen is confronted with an insoluble difficulty, if a devout man, he is very apt to seek Divine guidance. He might even go to church and pray for help in his moment of stress and uncertainty. And to church two of NBC's ablest engineers did go seeking a solution—but not exactly as communicants.

This strange apparatus reproduces the sound of many soldiers marching.

Clocks of all sizes and vintages are used to give the listener an instant impression of the size of the home in which the broadcast is laid.

Ray Kelly is holding a box of whistles which, when placed in the wind machine can give forth any tone of wind desired.

They went, these two—O. B. Hanson, chief engineer, and his assistant, J. D'Agostino—because somebody told them there was a church over on Fifth Avenue with a domed ceiling equipped with a sound-absorbing composition which might do the trick for them.

Arriving there, then, not in a religious mood but in a scientific frame of mind, they were chagrined to find worshippers kneeled in prayer. They saw right off they couldn't apply the customary tests—singing, whistling, yelling, and stamping of

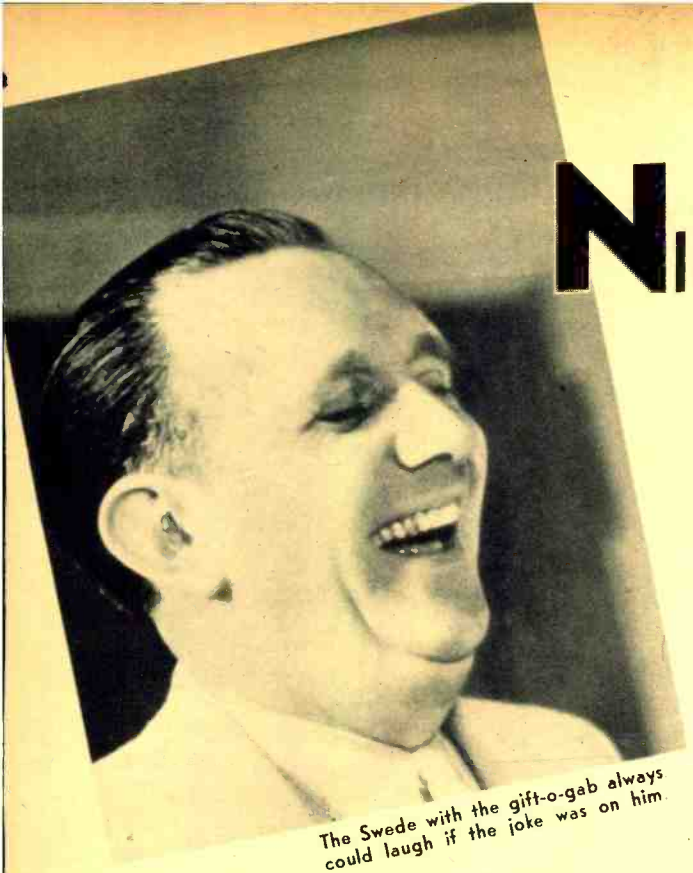
(*Continued on page 87*)

"SET REPAIRING CAREFULLY DONE BY EXPERIENCED SERVICEWOMAN!"

NILS T. GRANLUND

by SAMUEL KAUFMAN

The first to adlib over the air as a regular feature; first to put an "amateur" show on the ether; winner of more popularity polls than anyone of his time; a colorful ex-newspaperman; highest paid announcer of his day; and the maker of many stars—that's N.T.G.



The Swede with the gift-o-gab always could laugh if the joke was on him

WHEN radio was a cooing infant, radio announcers were known by initials rather than names. In those pioneer broadcasting days it was felt that an announcer was merely a studio prop and should not be personally exploited. Hence, when they signed off, they would say "This is ATN" or "This is RGP." However, with the advance of the new art, announcers became more and more important until many of them ranked as high in listener popularity as the vocalists, instrumentalists and comedians they introduced through the mike.

It is many years since the announcers dropped initials. But there is still one of the old announcing clan who not only retains his abbreviated cognomen but is actually better known by it than by his full name. He is NTG. His birth certificate reads Nils Thor Granlund, but very few of his many followers will identify him by that. They will, however, immediately know who you are speaking about if you mention NTG or the equally informal "Granny."

NTG, you may remember, brought Broadway to the air back in 1924 with so much ballyhoo and publicity that he's still remembered for it even though his talents have drifted away from the mike in recent years in favor of the vaudeville stage and night club entertainments. But he told the writer that he is negotiating for a return at an early date and hopes to revive many of the things he did on his well-remembered Bohemian Hour of WHN, New York. But whether Granny can get away with his old formula in these days of advance script requirements and rigid regulations against heckling, is something else. He thinks what radio needs today is some of the old informality that went into the programs that put old WHN on the map in radio's teething days.

Locating NTG for this interview was quite a job. He was busy setting up night-club floor shows in the middle west and flew to New York one day a week to audition new talent. Oddly, in this era when radio is blamed for killing the vaudeville stage, Granny is so busy with personal appearances with his girl shows in the nation's leading theatres that it has curtailed his radio work completely.

So between tap-dance routines, crooning endeavors, hula-hulas, and fan-dances he was watching in a New York hotel ballroom hired for the auditions, we managed to get enough of his time for our interview.

"Programs have not advanced much since 1924," Granny proclaimed. "I did many things then that are heralded as new now. Radio needs some of the old informality. I used to be criticized for heckling performers on my old Bohemian Hour. And don't you think many programs deserve some rounds of choice heckling today?"

In explaining just what "new" things are really take-offs on his old efforts, Granny mentioned that he had an amateur hour on the air back in 1924.

"The program went on the air from the DeKalb Theatre in Brooklyn," he said. "And it was that series that gave me a start in radio—a field most showmen laughed at. And I was a showman then. I was publicity director for the Loew Theatres and ran a series of amateur stage shows in the chain's neighborhood houses. I did it just as a publicity stunt. Right in nearby Ridgewood, a fellow named George Schubel was operating the original WHN and I brought the amateur act to the station—once again just for publicity. Even though there weren't many radio receivers in those days, the telephones at the station were overtaxed with incoming calls when we asked for telephone votes. I was so impressed by this response that I rushed back to New York and told my chief, Marcus Loew, 'Let's take over the station.'

"Loew balked. Like all theatrical executives he feared this new thing called radio. But when I told him I could lease the station for $100 a week for a ten-year period he was interested, the deal, of course, meaning that we would pay all operating expenses."

Granny swung the deal and WHN moved to Broadway and helped make the already famous Great White Way a little more famous. With Bill Boettcher as technical chief and NTG as program head the station moved into cramped quarters on the fifth floor of the Loew's State Building. Today, incidentally, Boettcher is in charge of talking picture installations in all Loew's Theatres.

So there was Granny with a station. What to do about programs? The solution was easy. Just keep the door open! Anyone who came in went on the air. The broadcast itself was the audition. If the program was rotten, Granny would give it a Bronx cheer and the listener would be in on the laughs. Even the entertainers themselves didn't mind the Granny razzberry.

Pretty soon some regular programs were shaping up out of the morass of material

(*Continued on page* 84)

Few know Broadway or Hollywood as does NTG. He introduced Jack Dempsey to his wife, shown here.

On arriving for the general audition the prospective radio star is asked to sign a card describing her experience, etc.

The author makes some notes on the personal histories of those taking the general audition at the NBC Studios.

DO YOU WANT AN *Audition?*

by NORMAN D. MODELL

For anybody who thinks that they should be on the radio, it is easy to get an audition. The author tells what to do, and what not to do. By following the suggestions,—if you have talent—you have a good chance for success.

A GENERAL audition is something like sifting a school of minnows through a coarse-holed net which retains only the giants and lets the pee-wees slip back into the obscurity of the lake. To the uninitiated spectator, it is a drama charged with thrills. The career of a future radio star may be in the making. To the auditioner, it is a nerve-tautening ordeal. The mike leers at him like a hobgoblin escaped from the nether regions.

The story goes round that only the select have the privilege of getting the wits scared out of them. I decided to investigate this grave situation, and made a tour of the major studios. The rumor was altogether untrue. Anyone and everyone is admitted to the general audition. And for a very good reason too, which will be disclosed at the end of this article, unnecessarily of course, because by that time the reason will be as evident as the hammy flavor of some of the amateur acting.

The audition is held in any studio that happens to be unscheduled at the time. The room is carpeted, the walls lined with soundproofing materials and covered here and there with thick, plush draperies. In one corner of the studio is a concert grand piano with an upright microphone standing guard beside it. Another mike for the dramatic talent reigns over the center of the floor. The back wall is a pane of thick plate glass through which the production director and the audition committee peer at you and scribble notes. The engineer twiddles the microphone faders on the control panel.

But before you get to these inner sanctums, you have to register several weeks or months before at the outer desk. "You do character parts? Well then," says the girl in charge of applications, "be prepared to bring several *short* selections. Try to make them as varied as possible so that we might get an all-around idea of your ability." Or if you're a vocalist, you will be advised not to sing only swing songs.

She's very sweet in instructing you. That's the trouble. She is too afraid of hurting your tender senses to tell you everything you have to bring. Your courage, for instance. Your self-assurance. Like everybody else who takes an audition, you'll park them at home on the parlor mantel along with your good sense, judgment, and microphone manners. Very probably you will be like the young lad who quivered like a seismograph recording an earthquake while he sputtered his way through his piece. Finished with it at last, he was so oblivious of the rest of the world that he walked straight into a hanging mike which hit his forehead a resounding smack, and proceeded out of the studio as though he didn't realize how silly he had looked.

Finally you get your notice to come down to the station. If your audition is at NBC, you find yourself sitting along the wall right in the studio beside a dozen others like yourself. Columbia and Mutual have you wait your turn outside. But the National Broadcasting Company has a theory that you will perform better if you have an audience. You can focus your performance upon visible listeners, as in a friendly theatre. This helps tremendously. You see, you are given every opportunity to entice your hidden talent out into the open.

You practically expire from tension as you hear without comprehending the efforts of the other auditioners. The voice of the production director is very kind. You grow calmer and you concentrate with

Be yourself when your chance comes. Only by doing this do you give yourself the opportunity to show what you can do.

The director at NBC sits alongside the engineer. With the "talk-back," he gives out helpful constructive criticism.

dogged determination upon the script before you to make sure you'll give the correct interpretation to the lines. Your name is called!

Suddenly courage pumps into your blood. You are no longer timid. In much too dulcet tones you go into a school child's version of the speech that starts "To be or not to be that is the question!" You are too absorbed in histrionics to observe that the men in the control room have turned their masked faces aside for momentary relief. In the throes of drama, you have a feeling that this was the way you acted that night when Uncle Joe and Cousin Charlie applauded so heartily. Your time is up. The production director says "Thank you" very graciously, and "We'll call you if we need you." You go home, proud of the fact that you sparkled up there before the mike. You wait and wait and wait and you think maybe the station misplaced your name. You cannot understand why they forgot to call you.

Well, I'm sorry. You were putrid! You ought to have heard what the production director said about you.

If only you could have been instructed before you took your audition! If only you could have seen this list of don'ts!

Don't stand too close to the microphone. It is likely to distort your voice. Crooners have given the public the idea that the only way to broadcast is to crawl inside the microphone. That is not true with the present equipment. A position of from one to three feet away from the mike is usually better.

Don't rattle your paper. Amplification in the equipment will make it sound like tearing down a house.

Don't wear a taffeta dress. The rustle of the cloth will sound like static. Don't wear beads, either.

Don't throw your voice at the microphone. Use your voice in a normal manner and let the power of the equipment be responsible for picking it up.

Don't sing or talk as if you were before a large audience. There is no balcony in radio and your audience consists of persons all in front row seats. Sing or talk to them as you would to a person close to you.

Don't be content merely to read the lines. Characterize. The story should be told so vividly as to stimulate pictures in the minds of your audience.

Don't try things that are out of your line; either as an actor or as a singer.

Don't insist on reading long passages or singing several songs of the same type. An experienced listener can get a good idea of your ability in a very short time.

Don't forget that radio is auditory. What you do in front of the microphone is not important. It is what you sound like that counts.

Don't leave out the imagination. Inject the character's entire make-up into your reading, song or act.

Don't be angry if the man who hears you tells you the truth about your voice or your acting.

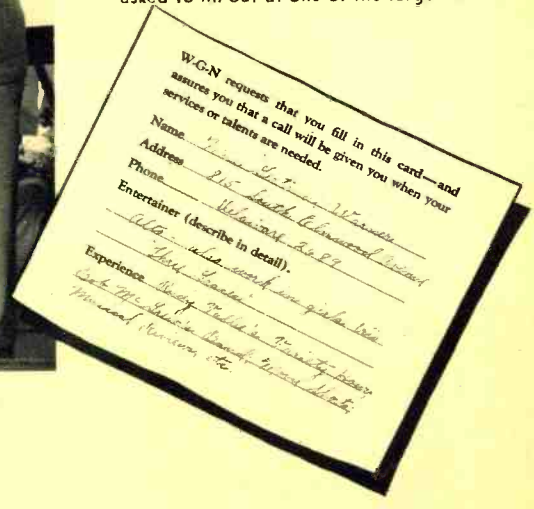
Sitting in the control room during an audition, I solicited a few words of constructive criticism from Gordon T. Hughes, director at the NBC Chicago studios. He had just gotten through instructing the aspiring actors not to waste their limited time by prefacing their selections with an introduction. It's his business to be acquainted thoroughly with almost every play produced or published.

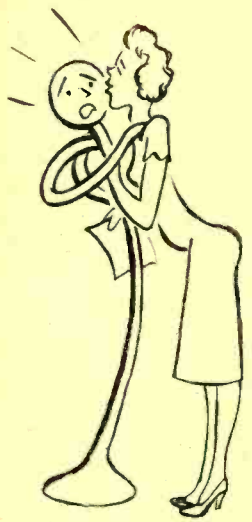
No sooner had he spoken than a lad of about twenty stepped before the mike and said:

"This is from the movie *Parnell*, a story

If you are successful, you may find yourself at the last rehearsal before going on the air for the first real broadcast. Even old-timers say nothing surpasses this for thrills.

This is the type card that you will be asked to fill out at one of the large chains.





Don't Hug the Mike

Don't Rattle Your Papers

Don't Blast at the Mike

about the Irish revolution. I'm taking the part Clark Gable played, the part of Parnell." Then after a further synopsis, again he announced "Parnell" by way of entitling the piece, like a toddler reciting his elocution lesson before his mamma's bridge guests.

Mr. Hughes shrugged his shoulders in despair. Thirty seconds ticked off on his stop watch. Then the boy read from his paper. It was a bad choice.

"Here's an example of selecting the wrong material," said Mr. Hughes. Of course, only we in the control room could hear him. "This boy's trying to act the rôle of a man thirty years his senior. He has neither the voice nor the dramatic ability to play the part. He isn't even mature enough mentally to interpret the character properly. If he *could* act, he should have taken material on teen-aged characters."

The next to audition was a girl who started with something from *Elizabeth The Queen,* played a colored rôle and an Irish washerwoman, and ended up with a monologue about how she shot a Frenchman. Now this girl would be a rare treat at a fagging house party, but over the radio—!

Said Mr. Hughes: "Here's an excellent elocutionist. But she stops there. Someday she may learn to act. Now she's just reading. That defect is true in at least 80% of the cases. They don't make their characters come to life. They're lacking in spontaneity."

A middle-aged man came to the mike. The fact that he was minus a set of uppers was nothing against him. You half way anticipated his "Lionel Barrymore" and "Edward G. Robinson." They were even done well enough to win seventy-five dollars and a seventeen jeweled watch on an amateur hour. He had an acute sense of timing.

Mr. Hughes agreed with me. "Yes, he has a sense of timing. And that's a quality that a majority of amateurs lack sadly. They don't know when to put their point across with a sock. They don't know when to shade their voice and when to put feeling into it. But—" The production director stopped and drew my attention back to the actor.

If the elder Barrymore had ever waved his arms dramatically before the camera, this man would have flailed them wildly as though he were threshing wheat.

"That alone," continued Mr. Hughes, "would keep him from getting into radio. Not his gestures, but his voice. He's making a character into a caricature. The best indication of a bad actor is that he draws a character too broadly. It's either that or drawing it so fine that it falls flat."

The audition was over. Mr. Hughes asked several of the participants to remain. A few minutes of friendly advice could do wonders for them.

Muriel Landers, a high school junior, who had attempted Luise Ranier's *Anna Held* from *The Great Ziegfeld,* was told that she had a really fine voice for radio, but she had no business trying anything but ingenue parts from 14 to 17 years of age. She went away very much encouraged, and justly so, because she was invited to return for another audition in several months.

Herbert Zimmerman, a young man who graduated recently from the University of Chicago and is now going after his teacher's certificate, was praised as the best of the group. He had a little experience on small stations and amateur shows. His voice was excellent; he had a fair sense of comedy and timing. With a little coaching he may find himself earning his daily cake from a live mike instead of a school classroom.

Encouragement is very good as long as it is given to the right people. Many a non-professional artist, who is not yet ready for radio, may in a couple of years blossom into a celebrity. However, discouragement would be better medicine for the multitude of "parlor" players who bring no more than a fervent wish to the general audition.

At WBBM, Columbia's key station in Chicago, over 50 auditions are heard each week. In a six months' period of auditoning only one potential artist landed a microphone job. She is Shirley Sadler, now staff blues singer.

WBBM takes every precaution to give a fair hearing to the thousands who flock to the Wrigley Building, Chicago, for general audition. No matter who they are, or what their life has been, they are given their chance, because *maybe* one out of the entire bunch may have the voice or do the dialect needed. In one day, several school girls, a housewife, a butcher's apprentice, an NYA actor, a dramatics teacher, a Broadway actress, a man who was hoping to sing his way through optometry college, and a Lettish baritone who had sung in the Milan opera house were auditioned.

In order to judge the artists without being swayed by their personal appearance, the audition committee often sits in a special lounge, remote from the studio, and the voices are piped over. While the judges relax upon comfortable chairs and couches, they make notations on the talent. Their recommendation may mean a job for some hopeful artist. Occasionally they observe the audition from the control room. But in order to avoid the criticism that sex appeal is often the deciding factor in auditioning, WBBM assigns women staff members to talent of the same sex.

Kaye Brinker, the head of this committee and in charge of program production research, commented on the vocalists.

"It's pathetic," she said, "but either they have beautiful voices and they can't express their souls or they know how to put their feelings across perfectly and they haven't the instrument with which to sing. And on the rare occasions when they have both, they're utterly lacking in that certain something that makes for box office appeal."

In 1934, 1935, and 1936, WBBM tried to "discover" the one voice in a wilderness of voices that could command the attention of millions. Through competitive auditions of the public, it found Rowena Williams, former Minneapolis opera singer, who won the regional audition, then the national contest, in the famous *Hollywood Hotel* talent quest in 1934. Miss Williams was signed to star opposite Dick Powell as the result of the contest. Her candle

Don't Sing as Before an Audience

Don't Be Boring

Don't Turn Your Back on the Mike

was bright but woefully brief. She stayed with the CBS *Hollywood Hotel* program for just 13 weeks. Then after a short spell with NBC she dropped out of sight.

The second "find" of the Chicago Columbia station was Vivian della Chiesa, 19-year-old Italian girl who won WBBM's *Unknown Singer* contest in the spring of 1935. More than 3200 girl singers were auditioned in this contest. Vivian shot to stardom overnight, headlining her own coast-to-coast program.

Pleased with the success of the *Unknown Singer* contest, WBBM launched a new *Twin Winners* contest in the 1935-36 winter season. Winners of the twin contests were Alida Sturman, a legal stenographer, and Phil Crane, an office boy. Although they represented the best talent among 5,600 men and women auditioned, the *Twin Winners* lasted only 13 weeks on the air, and soon returned to their former occupations with their $1300 prize money tucked away in the bank.

Does this suggest anything? It should.

In the general audition, luck is a word without meaning. You have to depend solely on talent—the kind of talent the public goes for in a big way. And still not one in the *fifty-six hundred* contestants mentioned before was able to keep John Q. Public interested for more than a few weeks.

What is the why and the wherefore about this deplorable failure of the general audition to discover a greater number of commercially worthwhile artists? I think the reason may have lurked in the back of Lou Jackobson's mind when he commented on the vocalists who came to audition before him. He is production director at WGN, Chicago's MBS station.

"They won't start at the bottom," he said. "They think they're too good to begin on the little hundred watters. They want a big station, and so they come up here before they're really prepared to audition.

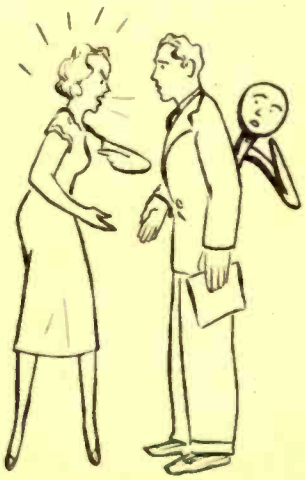
"Understand, they're not all hopeless, as far as ability is concerned. Many of them have a very high grade of talent. But they

(*Continued on page* 90)

Don't Read Long Passages

Don't Forget the Audience Can't See You

Don't Leave Out Your Imagination



Don't Argue with the Director

Jack Benny's jokes in person. Morrow & Beloin.

by HAL TATE
"Broadcasting Advertising"

When we hear a joke over the air, we do not realize that it is all part of a business. Not only does it pay highly but several have made gag writing a life's career. Who are the real funny-men? The author tells all about it.

Man BEHIND THE JOKE

↑ The man whom you hear. It is his delivery which "puts the funny situation over."

Jack Haley seems dubious of the material furnished him by Gagmen Finberg & Davis. Davis is a former New York taxi driver. ↓

YOU'RE sitting at home listening to one of the top notch comedians on the air.

Fibber McGee—No sir. I don't ride in no 10-dollar jaloppie—I want a good car. When I get a car I'm gonna pay at least 30 or 40 bucks. Why do you realize, Sil, what the most dangerous vehicle is on the highway today?

Silly Watson—Yassuh. A motorcycle wif a cop on it.

And thousands of listeners all over the country roar with laughter and exclaim, "Aren't they funny!" It's true—Fibber McGee, Silly Watson and all the rest of the radio comics are funny. But what the average listener doesn't know is that a goodly portion of their success can be attributed to their gag-men—the men behind the scenes—the men who concoct the jests which the comedians deliver to your loud-speaker. Listeners seldom hear about these joke-makers. But, as a matter of fact, they are so essential to the success of a comedian that they might rightfully be called "The Real Comedians of the Air."

Years ago the comedians attempted to create an illusion among the public that all their wise-cracks were their own brain-children. Today, however, the air jesters graciously acknowledge the toil of their punsters-in-waiting. Jack Benny makes no bones about the fact that Ed Beloin and Bill Morrow concoct the Jello Jester's scripts. He even puts them on his program doing bit parts—a continuation of his habit of putting on the air everybody who has any connection whatever with the show.

Even Benny's personal secretary, Harry Baldwin, does not escape this Benny trait. Next time you hear a knock on a door in the Jello program followed by a young man questioning, "Mr. Benny?"—that's Jack's secretary. Other writers are gradually becoming known to the public.

You're probably familiar now with such names as Don Quinn, author of the Fibber McGee & Molly shows; Harry Conn, ex-Benny scripter who recently started writ-

ing Cantor's Camel show; and others of the gaging fraternity, George Jessel even goes so far as to acknowledge his writer, Sam Carlton, publicly on his program, theorizing that if motion picture writers receive a credit line on the screen, air writers are certainly deserving of credit over the air.

The funny thing about gag writers is that while they may write the funniest jokes on paper they are unable to "deliver" them at all. Harry Conn, for example, is considered one of the most able gagsters in the business, having written Benny's stuff for years, but recently when he went on the air himself with a program, *Headaches of 1938,* the show actually lived up to its name.

Of course there are comedians who either write all their own material or have contributors sending them a little material which they weave into the final script. The top comic of 1938, Edgar Bergen, writes all his own double talk. Fred Allen writes all his own material although he accepts contributions from various gagsters and has paid assistants feeding him ideas for gags and sketches. Harry Tugend was at one time a salaried man on the Allen payroll, as was also Al Morey who still contributes jests for the edification of Allen listeners. Tizzie Lish, the "cooking expert" on Al Pearce's program, whose real name is Bill Comstock, writes all his own stuff, though when the Pearce troupe was sponsored by the Pepsodent Co., in Chicago, I cooked up some dizzy recipes for him. His room at the Hotel Sherman was filled with real recipe books of every vintage from which he used to concoct his own hilarious dishes. Goodman Ace authors the *Easy Aces* scripts and is also the author of those movie shorts in which he appears with his wife.

I have often been asked whether comedians are really funny off the air. Allen away from the mike is even funnier than when broadcasting and is conceded to be the King of Ad Libbers. In Hollywood Bob Hope is considered the funniest of the comedians away from the mike. George Burns is supposed to be quick witted away from the mike even though he's very exasperated with his wife on the air. Cantor, considered the most energetic of the comedians, can usually be depended upon to pull a few nifties when not broadcasting; whereas Benny is a very serious minded man when not plugging for the Jello people. Bill Comstock, like Allen, is a very sad-faced individual but unlike Allen does very little ad-libbing away from the mike.

One of the highest paid joke-makers in business is Don Quinn of the "Fibber" shows.

Billy Wells has written longer than any other gagman in the business. He is 54.

A gag staff varies from one to six writers. Most comics have at least two men writing their material. Ever since Fibber McGee & Molly went on the air in May, 1935, Don Quinn has written the entire show.

Only recently he hired a youngster, Paul Henning, formerly at KMBC, Kansas City, to aid him in the research work necessary for the show. Benny has two writers; Phil Baker has three, while Cantor has as many as five or six contributing material for his program.

Because it is such a very highly specialized profession, gag-writing is very highly paid. The average salary for top flight gagsters is around $600 a week. The two Benny writers, Beloin and Morrow, together receive $1,000 a week. The late David Freedman, considered by many the ablest of the gagging fraternity, demanded and received 10% of whatever the comedian earned. Although from time to time some gag writers might have surpassed Don Quinn, Fibber McGee author, in weekly salary, (for instance, Frank Gill received $1200 weekly as a writer on *Your Hollywood Parade* show), for consistent week-in and week-out earnings, Quinn is the highest paid of all the gag men. His current contract entitles him to $750 a week, and when his option is taken up it will be closer to the neighborhood of the four figure mark.

You're no doubt thinking, "Well, if gag writing is such a highly paid job I think I'll take a whack at it." A noble thought. But if you've never done any comedy writing—for newspapers, magazines or shows —you might as well forget about your gag writing aspirations for the radio. The radio gag writer today has served a hard and gruelling apprenticeship. Every single one of them had "humor training" in some

(*Continued on page* 91)

Former vaudeville actor Phil Baker gives credit to his joke writers over the air. ←

Sam Perrin (left) and Arthur Phillips are the men to whom Phil Baker turns for jokes. ↓

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.

BRITISH diplomats have a knotty radio problem on their hands.

A short-wave transmitter has been installed in the German embassy in London and is used day and night, presumably in exchanges with Berlin.

Members of Parliament don't know what to do about it. The Embassy is regarded as German territory and is immune from the laws of Britain. Many MP's feel, however, that at a time like this—when relations between the two countries are so strained—the ambassador isn't playing cricket by turning "ham."

* * *

CARNEGIE TECH-NIQUE?

Into NBChicago's Studio B marched a battalion of the city's elegant "400," bent upon meeting Dale Carnegie, that Prince of Personality.

Each lady was an especially-invited guest, there to watch the Sultan of Smiles win friends and influence customers via radio. Each expected any moment to be greeted by some courtly gentleman who would marvel at their hair or eyes. But there was no sign of Carnegie. Only a medium-sized studio person lying flat across several chairs.

In a moment the silence was broken by an attache who rushed in, shook the relining figure and shouted, "Get up, Mr. Carnegie! The guests are here!"

* * *

AN "ARNOLD" BETRAYS FRIENDS:

Into Chicago NBC studios, weeks ago, walked a heavy-jowled brunette chap who introduced himself as "Charles Arnold, little brother of screen actor Edward Arnold."

Next day he posed with Jim Ameche, Don's younger frater. Publicity pictures went out, captioned with the identifying "younger brothers get together" angle.

Soon, "Charlie" said he was to be married.

Friends introduced him to a State St. jeweler. The jeweler delivered to "Arnold" in the studios, an $850 sparkler—gave him the ring and $50 for a $900 check.

They're still looking for "Charlie."

Anent Ameche's Kid Brother, he has not yet learned the sacredness of his contract with the public. You cannot get up in radio without John Q., and you owe your everything to him. Appointments made other than for a broadcast should be kept with the same meticulousness. Recently Jim kept people waiting for over three hours for him, and then didn't show up at all. The persons waiting for him would never have known, had his wife not told NBC press that Jim would not show up.

* * *

PRIDE GOETH BEFORE THE FALL!

I've heard several scribes remark, lately, that Bing Crosby and Wayne King are high-hatting the scribblers and, through them, the radio public.

Latest complaint about Crosby comes from Hollywood. Seems that the representative of a top radio star magazine asked for a short interview and some pictures of Bing and was told no go. The scribe went to Bing's agency which turned him down with the remark, "All photos we have of Bing are months old. We can't do anything with him, either!"

Wayne King has long felt that writers in general are not to be recoghized when they ask interviews for magazines, radio, or the newspapers.

Which brings up an interesting question: How is the public which built these stars up to keep in touch with them?

After all, the only reason the writers ask interviews is that the public shows a demand for such matter. Surely it isn't the personal charm of either the Croon Prince or the Waltz King that lures the scribes. I have found little personality in either of them—particularly Bing. The public doesn't know that, of course, and for Bing's sake (and the sake of Kraft cheese) I hope his fans never learn to view him the same way.

In a way, I can sympathize with folk whose domestic privacy is disturbed by newshawks . . . but refusing any interviews at all is not exercising the right of privacy.

Announcer-Comedian Bob Hawk whose star is on the rise. He drew a tremendous audience to come at 7:30 AM to hear him play records.

A star owes his or her public *SOMETHING* . . . and a photo of their adonis-like features plus a few words as to how he plays golf is *SO LITTLE TO ASK!*

In all fairness to the Bing, let it be said that at this writing he has indicated that he has reversed himself. . . . Whatever the reason for this revision in his views, I think that on sober thought, Bing will be OK. On the other hand, all attempts to budge the Waltzer have failed.

All radio stars should remember that while they have climbed to the top the hard way and that it has taken lots of time . . . the road back is a greased slide. They'll slip into oblivion silently, quickly, and without anyone's notice!

* * *

CROSS COUNTRY:

Police in two NORTHERN N. J. towns have asked radio listener survey groups to stop bothering taxpayers via telephone. . . . **New York:** Announcers at municipally-owned WNYC are hired through civil-service. . . . WASHINGTON: National Labor Relations Board has okehed Columbia's company union, ABT, as bargaining agency for technicians—despite kicks from CIO's ARTA (reliable reports have it, however, that of NEW YORK'S 80 employees, 60 have switched to ARTA—and that of WASHINGTON'S 14, all are now ARTA. CHICAGO'S technicians are still 100% ABT).

Philadelphia: Boake Carter griped radio eds coast-to-coast by mentioning in one of his aircasts that Father Coughlin would go on air that night. Coughlin net is limited, not outletting in many spots. Eds. were blue in face—and hoarse—explaining to Coughlin listeners. (Please make yourself plainer next time, Boake!)

Cincinnati: WCKY has cut news periods to five minutes, believing fifteen is too long. . . . CHICAGO: AFL's "voice," WCFL, took a speech period from NBC to fill a half-hour spot. Cut it five minutes later when they discovered they had aired CIO's Phil Murray who was lambasting the AFL! . . . State's Attorney staff raided the swanky Chicago Chez Paree one recent night while NBC dance pickup of Lou Breeze's orch was in progress. Gambling paraphernalia was smashed, but listeners heard none of it, of course.

New York: NBC is being sued for alleged libel by a firm named Arnold & Frese. Plaintiffs complain damaged rep as result of script use of similar name on the *Love in a Rush* story. It was a General Foods aircast, so sponsor and agency are named, too.

Hollywood: Charlie McCarthy has replaced Mae West as the target of blue gags.

* * *

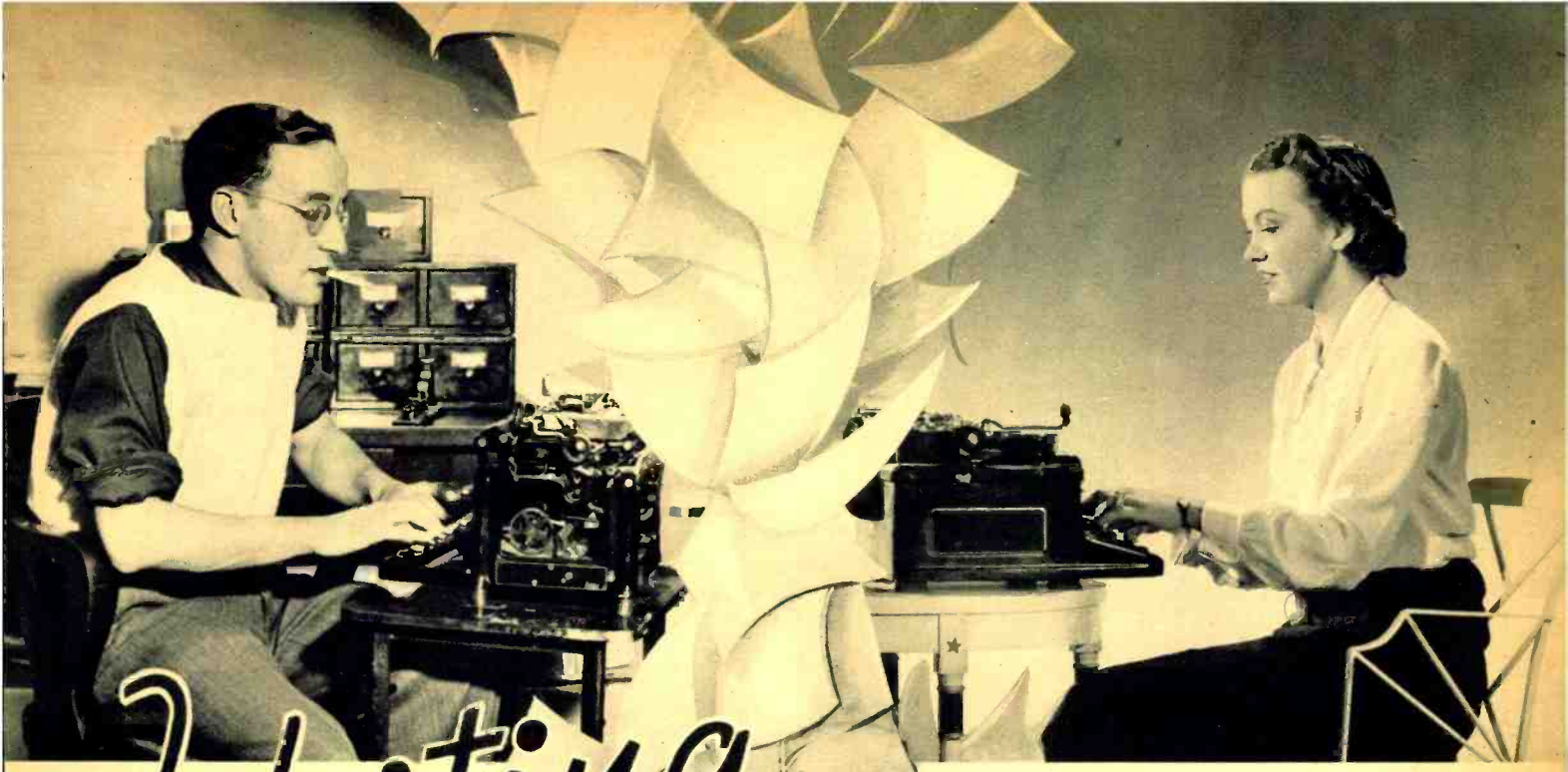
RADIO VS. THE PRESS:

Radio and the Newspapers are at it again!

Harder times with their resulting slimmer advertising appropriations, shifting of some concerns to radio entirely (firms like Chase & Sanborn) and radio's invasion of the news gathering field has the Fourth Estate burned up again.

Los Angeles papers have, by mutual agreement, done away with radio columns, pictures, etc., print nothing but programs

(*Continued on page* 90)



Writing FOR RADIO

by VIVIAN SORRELLE & FRED L. PREU
Script Writers

Arch Obeler & Fayette Krum (above) are only two of the large group of successful radio script writers. By following the instructions you might also be one to join this group.

YOU have heard about the big salaries of script writers. You have listened to programs on the air and you just *know* you could do as well or better. All you need is an idea!

And to that end, you ought to study just as many programs as you can. Listen critically. Learn the type of thing popular at the moment. Just now it is skits—family plots ad infinitum. Lucky for you if you live in a small town somewhere East of San Francisco or West of the Hudson. Your own family or your neighbors' families may furnish you characters and plot. There is no need to strain for effect—the simple, honest, psychologically true material is most likely to click and to run on indefinitely. Take time to study a program like "One Man's Family," which many concede to be the best skit on the air.

But perhaps you really have an idea, interesting and unusual. Such things do happen. Duke University a year or two ago carried on research into telepathy and thought transference, and someone was clever enough to translate the idea into a radio program. The Voice of Experience, Professor Quiz, the March of Time, were all somebody's idea once.

But new ideas are rare, and besides it is always easier to sell a program similar to those already on the air than to crash in with something brand new. But if you really do have an original idea, don't be discouraged if it is turned down. Try it again in six months or a year. The radio audience is fickle. You never know when the public taste (and especially the taste of those who buy programs) will change.

But suppose you, either through genius or persistent effort, have developed an idea. You are ready to write—or think you are. Ask yourself, "Do I have the enthusiasm to turn out programs on this subject at the rate of perhaps five a week fifty-two weeks of the year?" Your program must not only be self-starting. It must be self-perpetuating. Today's script must "enthuse" you for tomorrow's.

If your answer is "Yes," you are ready to prepare your material. Radio programs run in multiples of 13, 26, 39, 52 and so on. Usually it is sufficient if you work out a thirteen-week schedule in some detail both for your own clarification and the information of your prospective client. If it is a family drama, or other continuity, outline your plot, briefly sketching in its development from program to program.

Having done this, write two or three scripts, exactly as you expect them to be given over the air. Put your level best into them. No matter whether you do think your most tremendous climax should come in Script No. 7, remember it is Script No. 1 you are selling. So make it a wow! Don't rely too much on sound effects. A good radio drama, like a good stage show should carry itself along without too great reliance on scenery.

Remember dialogue is to be talked not read. So beware of mouth filling phrases. Talk it to yourself as you hammer your typewriter, and it will seem more human. Stay away from profanity and vulgarity. It is only doomed to the blue pencil. Don't be too subtle about your humor. Remember it can't be reinforced with a shrug or a wink.

Don't have too many characters. The advertiser's budget may be small. Besides too many characters are confusing in a radio program. You may suggest music, if you have something really applicable. Otherwise, don't bother.

Now as to length of a script. Assume it is a 15-minute program. Two or three minutes must be devoted to announcements and music. Ten or 12 minutes is all your skit will consume. You can reckon approximately its length this way: It takes about five minutes to read 3 double-spaced completely filled typewritten pages. If your speeches are short (and they ought to be) a page of dialogue is only about

(*Continued on page* 92)

The final thrill of scriptwriting—hearing your play produced. Shown are the principals of NBC's "Dan Hardings Wife." Originally, this was only an *idea* of a script man, now it is known to millions of listeners.

Assignments are posted on the KWSC blackboard. Students never "cut" broadcast class.

KILOWATTS AT WASHINGTON STATE COLLEGE

by JOHN BIGELOW
"Spokane (Wash.) Press"

A college course in radio. That is a modern idea. So sound is it, that many graduates are now employed in big stations.

THERE'S one class at Washington State College that students don't skip and don't come even a minute late. It's broadcasting over KWSC, the most popular activity on the modern, progressive little campus.

KWSC, the voice of W.S.C., was the trail-blazer among America's present 23 educational radio stations and it continues to lead the way. Out of this "constantly experimental station," which is their motto, has been graduated a steady stream of technicians, announcers, continuity writers, speakers and radio entertainers. They click in "big time" commercial radio work because they have had actual, practical experience.

The experience of preparing and presenting a 15-minute program and timing it to the dot is worth more than a semester of classroom work, the professors agree. They give the students a free hand in radio station work, and there is never a dearth of willing hands around the station.

Here at W.S.C., students look upon KWSC as the extra something that makes college life mean more than a round of dates and cramming in classrooms. As the only college radio station in a wide area of the Pacific northwest, it has a distinction to lord over friendly rivals.

KWSC has an interesting history. It started in 1922 with a historic broadcast on a 5-watt transmitter when there were less than 1000 radio sets, mostly crystals, in the entire state. Today, the station's daytime power is 5000 watts, and nighttime, 1000 watts, and it has listeners in all parts of the Pacific northwest as far distant as Alaska.

From the beginning, the station belonged to the students. They raised the money to finance the building of a 250-watt station. Actually H. V. Carpenter, dean of the college of mechanical arts and engineering, and Homer J. Dana, a specialist in experimental engineering, constructed it mostly out of telephonic equipment.

There has never been a time when student engineers at KWSC have not been at work improving the station's equipment. Every new class wants to make an improvement.

The latest major improvement was the introduction on November 4, 1936, of the first shunt-fed antenna in regular service in the United States. In the winter of 1935-36 a permit was secured for a 5000-watt transmitter, but a new federal regulation required the installation of a vertical radiator not less than 233 feet high. There were no funds available to build a new, properly insulated tower. Fortunately at this time, J. F. Morrison demonstrated at Detroit's pioneering station WWJ that almost equal results could be obtained with the base insulators shorted out, for a tower of uniform cross-section.

It was decided to undertake the application of this newly discovered principle in this new way. 83 feet were added to one of the two existing 140-foot steel towers. The driving lead at KWSC was then attached 48 feet above the ground. A series condenser in the lead to the tower was adjusted to give a non-inductive matched load and so serve to deliver the power direct to the antenna. The adjustable tap points in the coupling unit where the transmission line joins the transformer primary and the adjustable series condenser make it unnecessary to adjust the height at which the driving lead was connected to the tower. The matching unit was placed 100 feet from the center of the tower.

Two student engineers spent long lonely nights between midnight and dawn (the only hours in which the work could be done legally) in making numerous adjustments to the antenna.

KWSC was assigned to various places on the dial before its present place of 245.8 meters (1220 kilocycles) which it has kept since October, 1930.

In 1935 the main building and much of the special equipment were destroyed by fire. Two months later, in September, the station went back on the air and every day since, from 6:45 a.m. to 8 a.m. and from 11 a.m. to 10 p.m. through the college year and vacations alike, student announcers have been saying: "This is KWSC, the voice of Washington State College."

Dr. Frank Nalder, director of the general college extension, was director of KWSC until his death in 1937. He was beloved by the students because he was the spirit of modern radio, always experimenting to make better programs and better broadcasting equipment. He was succeeded by Kenneth Yeend, a graduate student who was trained in the Nalder school of continuous open mindedness.

This year KWSC is more popular than ever among the student listeners and performers. More new programs are aired than ever before. Every department of the college cooperates in the technique of imparting information and enjoyment on the air.

The biggest program hit was scored by the WSC Radio Guild's *The Globe Turns*, a dramatized presentation of world news produced with the cooperation of student continuity writers and dramatic students. Being a widely-popular program, it was analyzed.

To produce the 15-minute weekly program, seven students worked a total of 40 hours in research and writing the script. Nine other student actors added another 20 hours in rehearsing the program for presentation.

New programs are constantly being built up. Grade school, high school, and college students form a large group of those interested. In the last two months, a total of 750 high school students from outside visited the college station and went on the air. Scores of college students get actual and extensive broadcasting experience. From the University of Idaho at Moscow, ten miles away, visiting groups come to broadcast.

No listeners are neglected. When a poll revealed that more than half of the rural radio listeners in the region tuned in on

(*Continued on page* 83)

The Piezo-Electric Calibrator

by ZEH BOUCK

When a receiver is calibrated with the crystal unit described, it will log stations accurately. An article of interest to every serviceman and amateur who wishes to possess exact instruments.

The pre-calibrated crystal oscillator which should be in every serviceman's kit. It has two fundamental frequencies, 100 and 1000 kc.

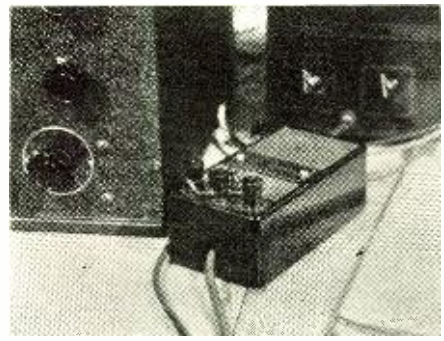
WITH DX bands becoming more crowded, and the hunting of DX a national sport, a well calibrated receiver is almost a necessity. There are many calibrator receivers on the market, but few of them, unfortunately, are accurate. The RCA Piezo-Electric Calibrator is a distinct asset toward calibration.

If you figure its cost in dollars per ounce, or dollars per cubic inch, it comes pretty high! Actually, its cost is about half that of a good all-wave oscillator, and in value per dollar it is, in the estimation of the writer, the best buy in radio test equipment today. It consists of a 955 acorn tube, a special circuit, and a crystal with two frequency nodes. This provides a wealth of harmonics with an accuracy as high as two parts in one million. The instrument is of equal value to the serviceman, the short-wave fan and the amateur.

The crystal's fundamentals are 100 and 1000 kilocycles. A toggle switch selects either frequency. Operated from 115 volts 60-cycle a. c., raw a. c. is applied to the plate of the 955 providing a 60-cycle modulated output. With the removal of a jumper across two posts and the substitution of 90 volts of "B" battery, a pure d. c. output is obtained. The 1000 kc. harmonics are readily detectable as high as 30 megacycles—the thirtieth harmonic—and the 100 kilocycle harmonic at 15 megacycles—the 150th harmonic! Ordinarily the device is merely placed near the receiver—no input necessary. With closer coupling one can go even higher.

This instrument will fit readily even into a small service kit, and therefor provides the quickest and most simple check on a receiver's calibration in the home as well as in the shop. Plugged in on any a. c. line, 11 frequency checks are supplied on the standard broadcast band employing the 100 kc. fundamental, plus one check right in the center of the band, at 1000 kc. on the 1000 kc. fundamental.

On the higher frequencies there are many more checks per band—every 100 kc. and every 1000 kc.—up to the limits of the harmonics which are above the range of the average set. Naturally every 1000 kc. harmonic coincides with a corresponding 100 kc. harmonic. For instance, on 9 megacycles, on the high position, the 9th harmonic of the 1000 kc. fundamental will be heard.



The Piezo-Electric Calibrator set up to measure the efficiency of the receiver.

On flipping the toggle switch to the low position the 90th harmonic of the 100 kc. fundamental will be received—"right on the nose!"

The 1000 kc. steps are used for spotting rather than calibration. It might often be impossible to identify a 100 kc. harmonic. For example, several 100 kc. harmonics will be located close to 9 megacycles, but only that one coinciding with the 9th harmonic of the 1000 kc. fundamental locates 9 mc. It is then possible to count in either direction in 100 kc. steps, and calibrate the receiver or oscillator in a series of 9.1 mc., 9.2 mc., 9.3 mc., etc. *Care, however, should be taken to observe and reject image frequencies on the wavelengths below 25 meters.*

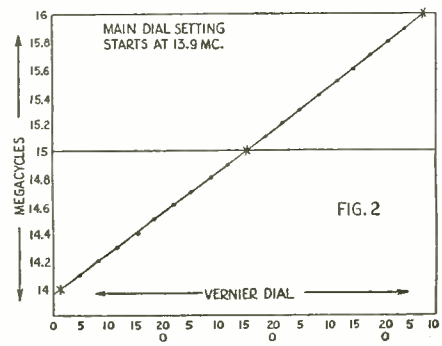
While the all-wave oscillator is one of the serviceman's most useful tools, its utility is considerably lessened when it gets out of calibration. Such oscillators are readily calibrated with the aid of the Piezo-Electric calibrator. The set-up is shown in the figure—a Hickok oscillator in the background, an all-wave receiver to the left, and the calibrator in the center. The frequencies to be checked are located on the receiver, and the oscillator tuned to zero beat. Needless to say, the all-wave oscillator should be given ample time to warm up. The same holds for the crystal oscillator—but to a much less degree.

To the serious short-wave experimenter, the crystal calibrator affords accurate calibration of vernier dials, greatly facilitating the identification of stations by their known frequencies. Start counting in 100 kc. steps from a positively identified 1000 kc. harmonic. These steps will be consistent—evenly spaced—and relatively weak signals between these steps are spurious and should be disregarded.

A similar curve on an amateur receiver provides an immediate answer to a request for a frequency check. Explanation of the use of the calibrator will furnish the answer to the inevitable government license examination question, "Explain how you would determine whether the frequency of your transmitter was within the amateur band?"

The quartz crystal and plates should be cleaned frequently. As soon as the harmonic output of the 100 kc. fundamental begins to weaken around 20 meters, or when a tap against the side of the instrument is required to obtain a vigorous response, the crystal holder should be dismantled and the plates and crystal cleaned with carbon tetrachloride or alcohol. Do not disturb the 1000 kc. trimmer. After cleaning do

(*Continued on page* 75)



A receiver calibration. The vernier dial setting graphed.

A 28 MC

Spring means outdoors; summer means that vacation time is here. If the amateur has transmitter and receiver with him, he will enjoy both just that much more.

Note the placement of the receiver A and the transmitter control panel at B above.

The transmitter installed in a Ford trunk, relays on a panel above, generator alongside.

AMATEURS in the U. S. and possessions are granted the privilege of operating mobile transmitting equipment in the 28 to 30 mc. bands, as well as 56 to 60 mc., but most of us hesitate to do anything about it as we do not like a lot of loose junk in the car, a view emphatically stated by our XYL or YL. With this thought in mind I constructed a mobile transmitter. The following article discusses the new compacted form of a 30 watt rig, with a modulation system able to give good quality.

All of this equipment was to be in a cabinet 7½"x7"x14". First came the chassis, which I made 6"x13⅞"x2½", allowing 1" clearance in front for the controls, 2½" being deep enough to allow all of the component parts to be mounted under the chassis. Each stage was to be shielded and baffle shields both above and below chassis deck were used. Refering to the picture of the complete transmitter, you will notice the cabinet is mounted on a shock-proof frame, which was obtained from an old airplane receiver. Now that I had the chassis and cabinet, the layout is to be considered.

R. F. Section

In selecting the r.f. lineup, I wanted one with the least number of tubes, still having an isolating tube between the modulated stage and the crystal oscillator. The 6A6 proved to be a very good tube for this purpose, and by only using 250 volts on the plates, plenty of grid drive was obtained for the RK39 in the final amplifier. Also, the low voltage allows just that many more ma. of current for our modulator and final stage.

In my previous transmitter I had used Raytheon tubes. After a year of bouncing around in the rear trunk of our car, these tubes still tested OK. Since very sturdy tubes are needed for mobile work, the construction of the Raytheon tubes seemed most adapted for my use.

It will be noted that all r.f. circuits are isolated by separate baffle shields which add to the stability of the line up.

The tank condensers are mounted on each socket and held in place by being soldered to the socket clips, eliminating long leads. The first section of the 6A6 operates on 20 meters, and the second section doubles to 10 meters driving the RK39 as a straight class C amplifier. The screen voltage is taken from the voltage divider for better regulation, and the 200 v. and 250 v. for the 6A6 are also obtained from the divider. A fixed bias of 45 volts was selected in connection with the 5000 ohm resistor in the RK39 circuit to give cutoff in case of crystal failure.

The small 5 prong isolintite forms were selected for their size and insulation. The final tank plugs in above the tank condenser and is coupled to the concentric feeder by means of a small variable link at the cold end of the coil. Jacks in the center of the chassis read the currents on the various stages and modulator. Most of the supply leads are shielded giving better r.f. isolation. The small Cardwell condensers were the only type small enough for the limited space with the correct spacing for the voltage used.

Modulator Section

My desire to obtain good quality even in a mobile transmitter caused me to use more tubes in the modulator than one would think necessary, but each tube works on a very conservative rating, which kept overload and distortion at a minimum.

As the RK39 was to be plate and screen modulated, a transformer was selected with a 5000 ohm plate and a 500 ohm screen grid winding, so that both plate and screen would be modulated in proportion. A regular transformer was selected, designed to match the 6F6G driver to the pair of 6F6Gs in class AB. The 6C5 could be left out but in my opinion takes such small amount of current to operate it, giving you a real reserve drive in case an insensitive microphone should be used.

The lineup, as selected, consisted of 6C5 -6F6G and a pair of 6F6Gs in class AB, with fixed bias obtained from a 22½ volt C battery.

Construction Details

It will be noticed that the modulation transformer and tube sockets are submounted to conserve space. The small baffle shields underneath the chassis isolate each stage and most supply leads are separately shielded. Closed circuit jacks are provided in the return circuits of the main tube and mounted on the front panel for current measurement.

Two sockets mounted in the rear of the chassis carry all the supply leads. Considerable time was spent in planning the chassis layout since every inch counted.

All parts are bolted, and lock washers are used as well as lock nuts. A mobile rig, even though shock-proof, gets plenty of jars. The antenna coupling unit is made of two pieces of bakelite mounted close to the cold end of the final tank coil, with a small piece of bakelite between them, having a screw through it with a lock nut on it to allow adjustment. The two turn link is fastened to binding posts on this small piece of bakelite, which has a hinge effect for adjustment.

The link coil is brought out of the cabinet through an amphenol crystal mike fitting, which serves very nicely for the concentric feeder attachment.

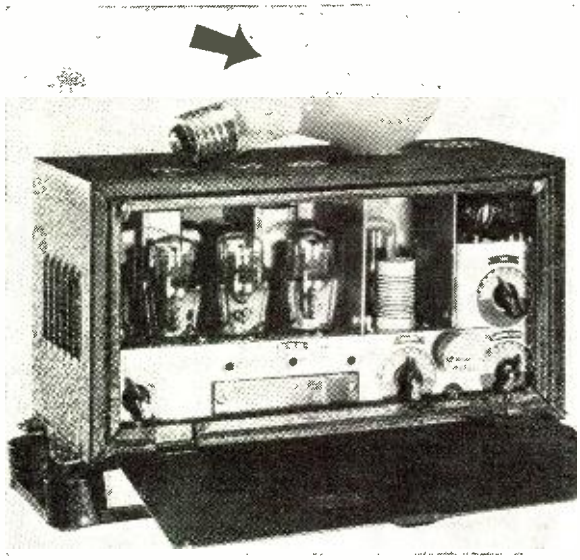
Installation

The construction of the small bakelite panel for 2 meters, a "start" switch, a "key" switch, a mike jack, is the first step. It is mounted to the right side of the steering post. After all the necessary leads are attached, the panel is then bolted to the rear flange of the cowling, and the control leads are pulled through the dash panel and fed along the auto chassis frame back to the rear trunk, along with a No. 6 heavy stranded conductor for the battery in front (Ford

DELUXE AUTO TRANSMITTER

by HARRY HARRISON, W9LLX

Henry F. Kroeger, Jr. Fotos



The transmitter compared to a bulb. It runs at 32 watts input and is crystal controlled.

installation). The cable is bonded to the chassis frame in a number of places for rigid installation.

On a small bakelite panel mounted in the trunk above the transmitter there are mounted two control relays, one, a filament relay, the other controls the genemotor. Also, this panel serves as a terminal block for the cable. Three 6 volt batteries are used in parallel to give plenty of reserve power. Two are mounted in a special wooden box on the left side of the trunk, and each has a special breather hose attached to carry the battery fumes out of the trunk compartment. There is a special 40 amp. auto generator installed on the car for charging purposes.

The rear bumper holds two fishpole antennas, one used for transmission, the other for reception. The transmitting fishpole is fed by a piece of 34 ohm Bassett cable, and the receiving fishpole has a partially shielded lead from the receiver back about 8 feet toward the aerial. This shielding is very large to reduce capacity and is approximately ¾" diameter outside, having a small conductor centered inside. The receiving fishpole worked very well at a heighth of 7 feet on 10 meters, and at 7 feet will not resonate with the 8 foot transmitting antenna.

The transmitter is powered with a Carter 400 volt 200 ma. genemotor, one which is used for police two-way work, and has a very fine filter circuit, also bearings which will stand up under long use.

Receiver

The receiver used is one of the new Hallicrafter Champions, covering from 10 meters through the broadcast band, and works very fine. This receiver is powered with a small Mallory vibropack, which is entirely free from noise on the higher frequencies. The usual by-passing and shielding of high tension coupled with the use of a noise silencer circuit which was later built into the receiver makes reception while in motion practically noise free.

Adjustment

A seperate zero-to 100 millammeter with a standard phone plug is kept on hand to be used at the transmitter when tuning up as well as a plate control switch mounted on the trunk terminal panel.

After the filaments have heated the HF2 Bliley 20 meter crystal is plugged in also the 20 meter tank coil in the front socket, and the 10 meter tank coil in the rear socket of the 6A6 stage. With 10 meter plate tank of the RK39 in place the genemotor can be turned on.

Adjust the oscillator tank until maximum increase is noted with the meter plugged in the doubler jack, which shows the stage is being excited and indicates that the crystal is oscillating. Next, adjust the doubler tank until a slight dip in the meter is noted, which will indicate 10 meter resonance. Plug the meter in the RK39 grid return and check the grid current, which should be around 5 ma. If it is low, readjust the oscillator and doubler tank until maximum grid current is obtained. By the use of a pick up loop and a six volt pilot light adjust the RK39 tank for resonance and couple the link coil until approximately 80 ma. of current is being drawn by the RK39 plate, which is the proper load for the 5000 ohm modulator secondary.

By removing the RK39 tank coil and noting the reading on the 0-400 ma. total plate current meter on the dash panel, and then replacing the RK39 plate tank and adjusting to 80 ma. plus the reading that you had taken without the plate tank, the RK39 will be loaded to 32 watts. This loading is accomplished by adjusting the antenna to approximately 8 foot if transmitter is to operate above 29 mc., and tightening the link coupling. Adjust gain control until proper percentage of modulation is obtained by either neon bulb or modulation meter.

The currents and voltages are indicated in the chart accompanying the diagram.

5 Meter Operation

Five meter output can be obtained by inserting the small 5 meter tank in the RK39 stage and using the RK39 as a doubler.

The output checked up very well for a doubler and did a nice job of lighting a 15 watt lamp, running 32 watts input. Ten or 12 watts output on 5 meters with only having to change one coil should prove interesting to those who like to work on 5.

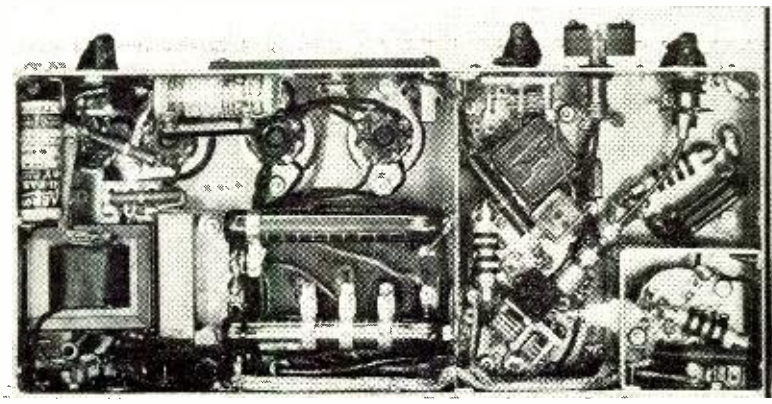
A 10 meter crystal can be used and the RK39 used as a straight amplifier.

Modulation of the 5 meter doubler will be somewhat different than with the transmitter running on 10. Due to the lowered output the gain will need to be reduced as only about one-half of the audio power is needed on 5.

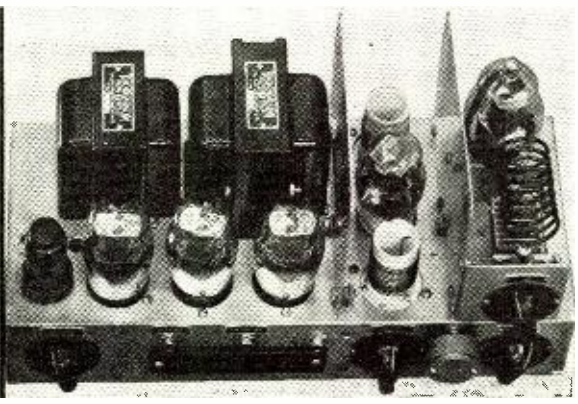
Many interesting contacts can be made with a rig of this type and will enable the fellow ham to radio a bit all year round.

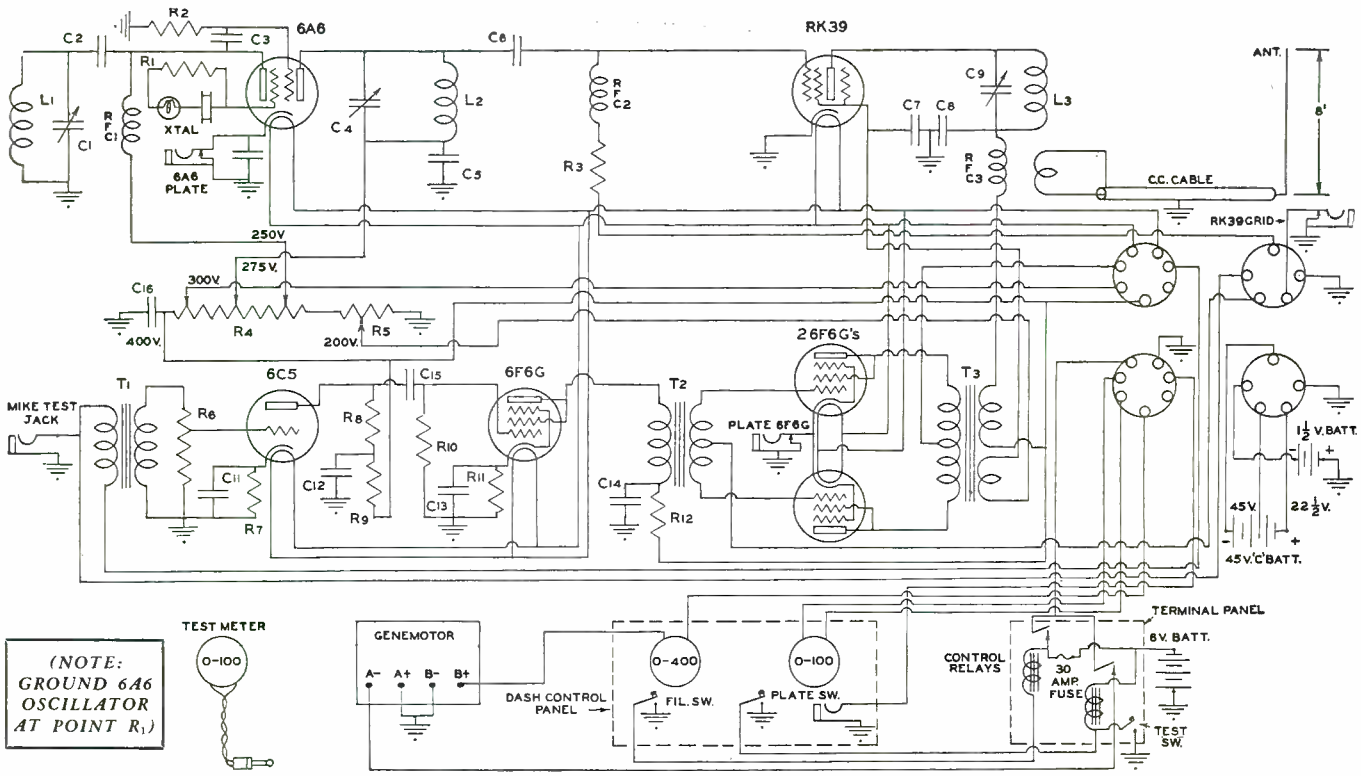
(Diagram on next page)

Underside the transmitter chassis shows careful consideration given to the proper placement of parts with short leads.



Modulators and speech to the left. Crystal stage in the center and final amplifier on the right is the layout.





Circuit diagram of the 28MC deluxe auto transmitter.

R_1—10,000 ohms—1 w. IRC
R_2—50,000 ohms—2 w. IRC
R_3—5,000 ohms—2 w. IRC
R_4—5,000 ohms—50 w. Ohmite
R_5—30,000 ohms—50 w. Ohmite
R_6—25,000 ohms—Centralab
R_7—2,000 ohms—1 w. IRC
R_8—10,000 ohms—1 w. IRC
R_9—25,000 ohms—1 w. IRC
R_{10}—600 ohms—10 w. Ohmite
R_{11}—1,000 ohms—10 w.
R_{12}—3,000 ohms—10 w. Ohmite
C_1—25 mmfd. ZR25AS Cardwell
C_2—.002 mfd. Aerovox
C_3—.0001 mfd. Aerovox
C_4—25 mmfd. ZR25AS Cardwell
C_5—.01 mfd. Aerovox
C_6—.0001 mfd. Aerovox
C_7—.005 mfd. Aerovox
C_8—.015 mfd. Aerovox
C_9— 30 mmfd. Variable
C_{10}—8 mfd.—450v. Aerovox
C_{11}—5 mfd.—50v. Aerovox
C_{12}—2 mfd.—450v. Aerovox
C_{13}—5 mfd.—50v. Aerovox
C_{14}—2 mfd.—450v. Aerovox
C_{15}—.01 mfd.—400v. Paper Aerovox
T_1—86A02—Thordarson
T_2—65D78—Thordarson
T_3—79M74—Thordarson
L_1—12T No. 18 enam. Winding length 1⅛", 1" dia.
L_2—4T No. 18 enam. Winding length ¾", 1" dia.
L_3—8T No. 10 enam. Winding length 2½", 1½" dia.
5 Meter tank coil 2T No. 10 enam., 1½" dia. spaced, ¼" between turns

CURRENTS AND VOLTAGES

6A6—250-275v.—40 ma.
6F6G—300v.—50 ma.
6F6G—275v.—30 ma.
RK39—400v.—80 ma.
RK39—Screen 200v.

HOW TO GET AN AMATEUR LICENSE

by Chas. H. Kinsley, Jr.

I JUST took the examination for the Class B Amateur Radio License. Here's how I did it—maybe it can be of help to some of you who now are struggling along but getting exactly no place.

In the first place, there's nothing like learning by listening. The amateur regulations require a transmitting and receiving speed of 13 words per minute. Don't let this scare you, 13 per is slow, very slow. If you don't believe me ask any ham.

To learn by listening, the first step is to build a simple receiver. This should bolster your interest up and at the same time will give you some valuable experience. In my own case, the receiver really was simple—the old combination of a 30 detector into a 30 audio. Nothing simpler, and this combination has been giving good results for years.

Now assuming that your receiver is built, you have a knowledge of how to tune, and are raring to go; pick out any amateur c. w. band. 80 meters is an old favorite of mine. Find the slowest signal you can. Does it seem very, very fast? It did to me too. Listen for a while—did you hear that single and distinct dash? "Dah" we call it. That was a T. Keep at it in your spare time, and I'll wager that inside of two weeks you'll be able to copy any man's 13 per.

But we can't just listen to the code—somehow we have to acquire a so-called technical knowledge of the art of radio communication. For this I recommend two books. First a handbook—this may be either of the current amateur issues; they're both good. Read this at night in bed, or in your spare time during the day.

The next book to get is a license manual; any radio parts store will handle this. It contains questions and answers, which although they may not be the exact questions you will have to answer in the government examination, will give you an excellent idea of its scope and nature.

A word to the wise: get the penalties for both violations of regulations, and violations of the basic act clearly in mind.

Your code speed should be coming along nicely and you can now get away from the amateur bands and copy press or weather reports from the commercial stations. These can be found at varying speeds, slow or fast enough to suit anybody.

Now the next step is to buy a key and a few parts and build yourself an oscillator. Hook this up and devote an hour each day to practicing sending. Don't try to send too fast; concentrate on sending each letter properly and with the proper wrist motion. If your arm tires quickly, you are not sending properly, but are using the old pump method.

Diagrams are liable to give you some trouble, and here's a hint for their solution. There are just four different types of diagrams for you to learn: shunt feed, series feed, electro-magnetic feed-back. and capacity feed-back. These are the basic diagrams for all transmitter circuits. Practice drawing them during odd moments during the day. Explain them to the family, sleep with them, learn all about them, because you will have to draw at least one of them in the examination.

Get your license manual out frequently and have some member of your family give you the "works"—they'll probably enjoy it immensely.

Now you should be just about ready for the examination. Do you feel that you know your subject thoroughly; are you able to explain the electron theory, the theory of an amplifier, the theory of a vacuum tube oscillator? If you can do this and know your laws, bands, types of emission, penalties, distress frequencies, you and I will soon be chewing the rag over the air—Brother Hams.

—30—

FOREST FIRE PATROL

by S. R. WINTERS

The author paints a vivid picture of the heroic part radio plays in the work of the National Park Service.

Radio equipped cars are used by the park patrol. Note unusual rear construction.

WHILE fire-fighting remains the chief function of radio in the National Parks and Monuments, it is proving more and more important in promoting efficiency in park administration and has shown itself to be invaluable in communication between isolated stations.

There are now nineteen separate areas with their own individual radio systems. These comprise sixteen National Parks, two National Monuments, and one National Park Project—the Isle Royale, in Lake Superior. More than sixty thousand dollars was spent on the establishment and upkeep of radio systems in government territories last year. The semi-portable sets, most frequently used in the National Parks, usually run around six or seven hundred dollars, while a small portable set (of the type carried by the rangers) can be had for as little as a hundred and forty dollars. These sets are built by the regular commercial radio companies.

Rangers use these portable radio sets for emergency work while fighting forest fires.

Carlsbad Caverns, Wind Cave, Hot Springs, Arcadia, Hawaii, and Shenandoah National Parks are now the only six units in which the radio system have not been established. And it is only a matter of time and finances before these, too, will be radio-equipped. Certainly, the short wave sets, which have been in experimental use for two years, have proved themselves useful and necessary, not only in the saving of time, but in the saving of lives as well.

Only a short time ago, during the week of February 13th, 1938, radio again played the part of rescuer to the rangers stationed in an isolated part of the Yosemite National Park. Storm smote the Yosemite with all the fury of snow and wind, bringing down nine cross-arm telephone poles and many large trees. Both telephone and telegraph wires went out, and the only road to civilization and help was blocked by terrific snow slides. The station's radio, operating on 2604 kilocycles, was the only means of communication left. Possibly death, and certainly privation and hardship, would rapidly have descended upon the rangers thus bottled up, miles from any other human being, had it not been for the radio set, which had been installed only a short time previously. Through this expedient, aid was immediately started across the snowy wastes.

The frequency, 2604 kilocycles, in use at this time was only a temporary measure, since it exceeded the government limits. The headquarters station had been established for communication with McKinley, and the Yosemite station secured permission to use the same base temporarily.

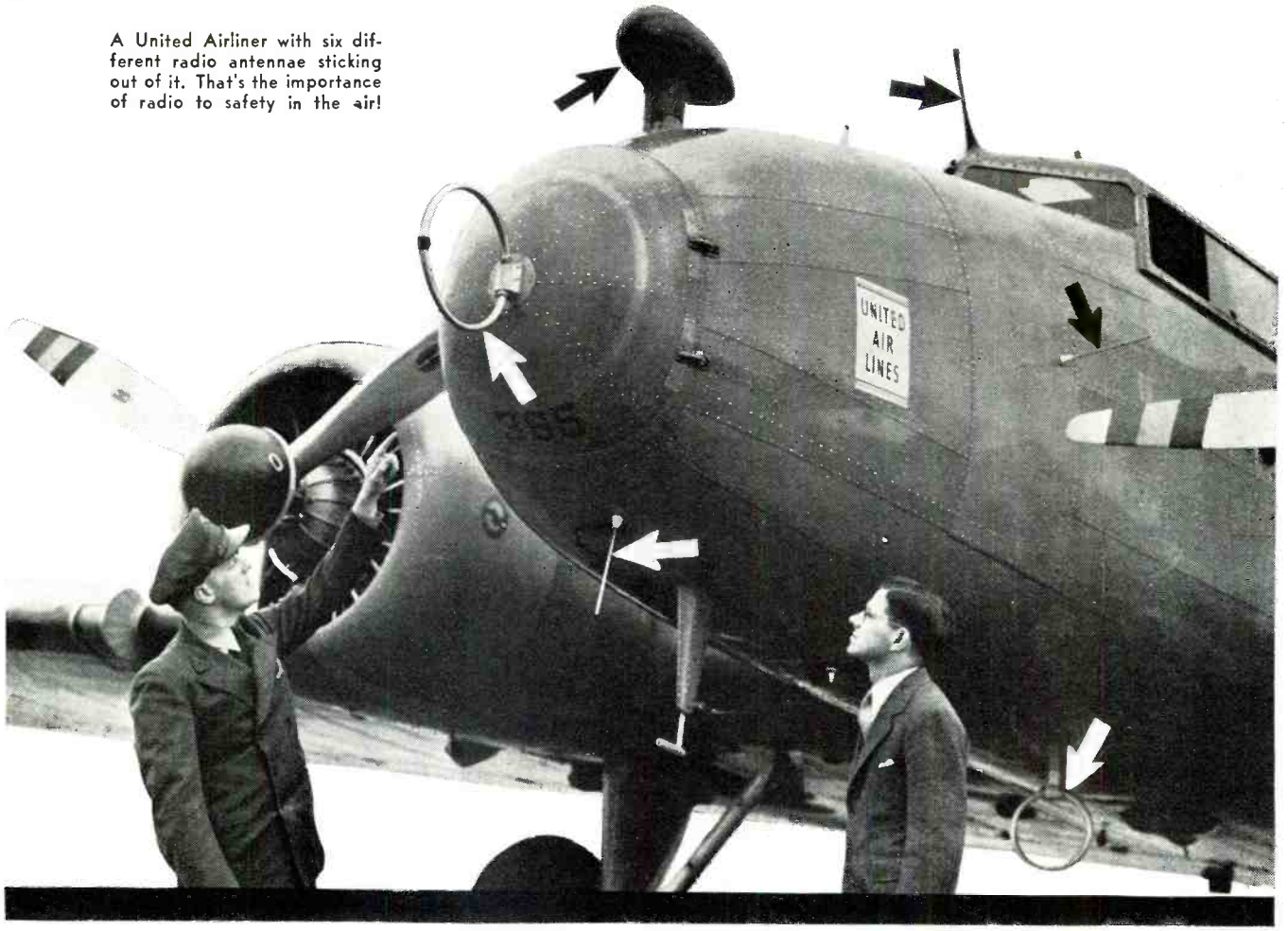
Mr. Hilgedick, radio engineer, with the National Park Service, was instrumental in designing a portable radio, which is in constant use in the parks. These portable sets have, on occasion, been borrowed for use on the Coast Guard cutters, in preference to all other sets of their type. A headquarters station, of fifty watts, sends and receives calls, both from ranger stations, of fifteen watts, and from outlying stations, of two or three watts.

Most extensive of all the radio systems used in the National Parks and Monuments is that established in the Smoky Mountains, which lie in North Carolina and Tennessee. In this system there are thirty-three radio-telephone transmitters, located in lookout towers, park headquarters, fire stations, etc., and covering approximately six hundred and eighty-seven square miles of forest and mountain land. The chief uses of these stations are, as has been said, in the prevention and control of forest fires. Communication concerning supplies, equipment, and emergencies is also facilitated by the use of these sets.

Perhaps the most used of all of the park systems is that on Isle Royale, in Lake Superior. Since there is no other means

(*Continued on page 79*)

A modern "home" station of the National Parks System located at Mount Rainier National Park. It has all the latest equipment and is manned by experienced radiops.



A United Airliner with six different radio antennae sticking out of it. That's the importance of radio to safety in the air!

Federal Avigation Aids

From U. S. Government Data

This article was compiled from the U. S. Government book on Airway Radio. It is authentic, and every prospective airway radioman should read and digest it.

Jack Knight, first to use radio in flying the air mail. Note the oldtime mike.

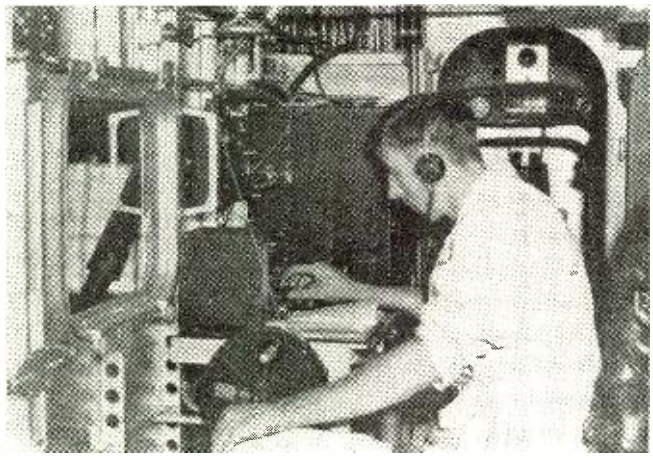
PLANES leave and arrive with the regularity of trains. They keep schedules, and barring the unexpected, they arrive on time with their passengers. Mail schedules are kept, and even the itinerant flyer is able to determine with a fair degree of accuracy, the exact time of his arrival at his destination. While aviation has progressed rapidly, it owes it to the aid of radio. "Aeronautic radio" is the term applied to that branch which concerns itself wholly with radio as applied to aviation.

Aeronautic radio provides "fixes" to serve in lieu of landmarks for airmen flying in poor visibility, (2) carries to airmen the weather bulletins assuring that conditions still are favorable to flight or warning of changes which will require revisions of flight plans, and (3) provides channels for communication between pilots and persons on the ground who are concerned with the safe and orderly progress of flight along the airways.

There is still another function of aeronautic radio in which the pilot is not directly concerned, but which is carried out for his benefit. That is point-to-point communication between radio stations on the ground for collection and dissemination of weather information and relay of other messages having to do with flight operations. The point-to-point radio communications generally, but not necessarily, utilize radiotelegraph. On the Federal Airways System this purpose is served in most cases by teletypewriter circuits.

Radio aids to air navigation on the Federal Airways System are operated by the Bureau of Air Commerce of the Department of Commerce for the use of all flyers who are equipped to take advantage of the service. The scheduled air lines also have their own radio systems for communicating with their

Newark, N. J., Radio Control tower is the same as most others. Ships land at the order of the "op."



Radio shack aboard *China Clipper.* Code supplants mike because of the terrific tropical static.

pilots and for point-to-point communication on the ground.

The radio aids to air navigation which serve the pilot in flight are indispensable to present-day aircraft operations. Their very existence has enabled aviation to push back weather barriers. Flights take place today in weather conditions which would have been prohibitive a few years ago, and which are prohibitive today on routes having no radio equipment.

So long as there is sufficient visibility at airports for taking off and landing, the radio-equipped airplane can continue to operate over the Federal airways, even when the pilot has to fly many miles without ever seeing the ground. It is essential not only that the airplane be equipped with radio but also that it have all necessary flight instruments and power-plant dependability obviating the possibility of a forced landing through clouds.

The tendency toward operation at high altitudes, with air planes making long flights at very high speeds—another practice in which the air lines are taking the initiative—puts more responsibility upon radio aids, with less reliance upon observation of ground landmarks.

At altitudes and speeds of which airplanes now are capable, it is difficult, even when visibility is good, to spot many of the landmarks which serve as check points for slower airplanes flying closer to the ground. When clouds, mist, fog, or smoke completely obscure the ground, landmarks which would serve for visual flying naturally are without significance. This applies even to the beacon lights on the Federal routes. The high-altitude flyer usually is more interested in radio directional service than in beacon lights, except in the few minutes when he is beginning a journey or approaching its end.

In high altitude flying the pilot frequently is above the clouds when it would be possible to fly underneath them. In former years, if the cloud level was, say, at four or five thousand feet, the airplane would operate beneath the clouds and the pilot would watch for lights at night or characteristics of terrain by day. Today, for a long flight, he would climb through the layer of clouds and fly on top if this would give him an advantage of tail wind or smoother air. As this practice is more or less general with the newer types of airplanes, it means that there is more and more flying by instrument and radio.

For the future, all indications are that long-distance air line operations and non-air-line operations conducted in aircraft of comparable power and capabilities, will seek even higher levels. Certainly pilots will push upward to the substratosphere, and perhaps further design development will enable them to go on to the stratosphere itself. This will further augment the necessity for the usefulness of aeronautic radio.

The role of radio in modern flying is so important that there sometimes is a tendency to overemphasize its powers and responsibilities. The radio aids are just what the term implies. They are aids, offering assistance to the pilot in cross-country air navigation. In no sense are they guaranties of safety. Safety is a function of the airplane and pilot. It is founded upon airworthiness of the airplane and competency of the airmen who are responsible for its operation. Radio aids were developed and established to widen the sphere of the airplane's usefulness by enabling it to continue in operation when weather conditions are such that visual flying no longer is possible. However, there still are weather conditions which ground airplanes. Severe thunderstorms accompanied by violent and turbulent air currents have to be avoided. Zero ceiling and visibility at the landing areas still call for cancellation of schedules, although research and tests now going on hold promise that this obstacle eventually will be overcome. Radio has not yet been developed to the point where it is sufficiently dependable to guide planes through these conditions but it can and does warn of them so that they can be avoided.

Radio aids to air navigation maintained by the Bureau of Air Commerce are of three types. Communications stations broadcast weather information and are available for radiotelephone communication with aircraft in flight. Radio range stations mark the airway routes by signals which are particularly valuable when clouds, fog, haze, or smoke obscure the landmarks or lights which would serve as guides in clear weather. Radio marker stations indicate the locations of strategic points on airway routes and frequently are established at important intermediate landing fields.

Point-to-point radio is a part of the Bureau's ground comunication system. Each airway has a weather reporting service on the ground consisting of Weather Bureau and Bureau of Air Commerce observation stations, together with a communications network for collecting and disseminating these reports which on some airways consists of teletypewriter circuits, on others point-to-point radio stations.

A communications station broadcasts weather information each hour for each airway on which it is located. Broadcasts for several airways may be included on its schedule. For example, Station WWX, at Washington, D.C., goes on the air at 50 minutes after each hour with reports of weather conditions along the route from Richmond to New York; on the hour with reports for Washington to Pittsburgh, plus a report on weather at Cleveland; at 10 minutes after the hour with weather for Washington to Nashville and Cincinnati to Washington; and at 29 minutes after the hour with local weather at

Washington. Some stations have as many as five such schedules each hour, others have only two or three.

After taking off, the pilot may keep himself advised of any changes in weather ahead on the route by listening to the scheduled broadcasts of the radio communications stations. Information regarding ceiling and visibility, barometric pressure, temperature, wind direction, and velocity may be of great value to a pilot in effecting a safe and successful flight. The radio broadcasts also are utilized by airports which do not have teletypewriter weather reporting service. Weather broadcasts have been so arranged and timed by the Bureau of Air Commerce that a pilot flying a route with which he is at all familiar knows what time these broadcasts are made and to what frequency he must adjust the radio receiver for proper reception.

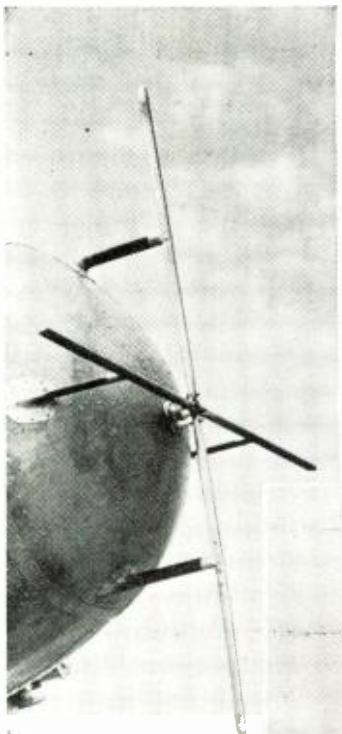
This arrangement was accomplished by grouping all airways' radio stations into three networks or chains, in accordance with the airways they serve, and timing their broadcasts so as to eliminate overlapping or conflict within chains.

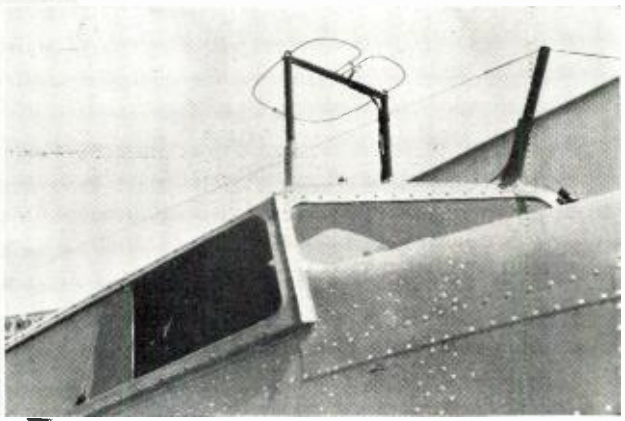
Before the adoption of this chain system of broadcasting, radio-communications stations along an airway broadcast on individually assigned schedules at various times during the hour. This made it necessary for a pilot en route to refer to a schedule to find the time of broadcasting for a station to which he wished to listen, Now, however, he knows that the route he is flying is covered by one of the chains, and is prepared to listen for the weather broadcasts at a certain time each hour. Bulletins are available to pilots showing times of broadcasts and frequencies of all stations.

Schedules for operation of the communications stations provide for them to broadcast for only a few minutes at various times during each hour. At all other times the frequency assigned to the station is open for radio range operation. The directional signals of the radio ranges are kept on the air with as little interruption as possible, so that they will be available when needed by pilots. At a number of stations special arrangements have been made to reduce interruptions or eliminate them altogether when necessary, as will be explained hereafter.

The Federal airway routes are marked by directional radio range stations which assist airmen to navigate in poor visibility, and serve as a verification of other methods of air navigation when weather is good.

Flying by radio guidance, the pilot listens for the Morse Code letters A (.—) and N (—.). If the two letters are heard in equal volume, they blend together into a continuous monotone, which is the signal to the pilot that he is on the course. If he moves to one side of the course he hears the letter A predominantly, if to the other side, he hears the letter N. Knowing the orientation of the off-course signals, or determining it by reference to his air navigation map, he changes direction to get back to the line of flight where "on course" is heard.





Blind landing and directional antennae installed for test purposes on an airliner. Experiments must go on.

For station idenification, the directional signals are punctuated at intervals of about 30 seconds by another Morse Code combination, distinctive for each radio range. The radio range station near Washington, for example, has the identifying signal WA (.— —.—). It is transmitted twice, first into the N quadrants and then into the A quadrants. Flying on course, the pilot hears the two transmissions of the identifying signal with equal intensity. As he moves away from the course one of them begins to fade into the background until finally only one is heard. This affords another guide for quadrant identification. If the pilot moves into the N quadrant, say, the N signal predominates as the A fades out, and in addition the first of the two station identifying signals becomes more prominent —both indicating to the pilot that he is off course in an N quadrant.

Radio markers indicate the locations of definite points on airway routes, and are in operation at a number of important intermediate landing fields.

A marker station's signals consist of dot-and-dash combinations identifying the station which may be heard for a distance of 5 to 7 miles. They are transmitted on the frequency of the adjacent radio range station. Since the power and range are limited, the pilot flying in or above the clouds and hearing these signals knows that he is close to the transmitter, and can determine his approximate position by reference to the location of the station as shown on his air navigation map.

All three types of radio facilities, radio communications stations, radio range stations, and radio marker stations, are used by the airman in a radio-directed flight. Keeping on his course by following the radio range signals, he listens to the periodic broadcasts of weather information, and from time to time checks his progress and position by reference to the signals of the marker stations. He may also call a radio communications station or an intermediate field for additional weather information.

When the Bureau of Air Commerce was installing its first radio range stations and radiotelephone stations for weather broadcasts, in 1927 and 1928, the practice was to provide radio range service on one radio frequency and radiotelephone communications on another frequency removed from the first by approximately 30 kilocycles. Under this arrangement directional service was continuously available to the pilot, but if he wished to listen for weather broadcasts it was necessary to tune to the other frequency; also, it was difficult to reach him with a special, unscheduled broadcast.

As more stations were established

another difficulty arose. The number of frequency channels available for Bureau of Air Commerce radio range stations and voice stations is definitely limited, and at the same time it is necessary that the frequencies be far enough apart from each other so that there will be no interference. Stations may be operated on the same frequency, or on frequencies close to each other if there is sufficient geographical separation, but even when this is considered, there are not sufficient channels to allow each of the more than 100 stations to have two distinct frequencies.

In 1929, therefore, a new arrangement was adopted at the request of air line operators. The radio range and weather broadcast stations at a particular locality were assigned the same frequency. The radio range station would be in operation continuously except when it was time for a scheduled or special broadcast. At such a time the range would be silenced for a brief period, not exceeding 3 minutes, while the voice broadcast was on the air. This arrangement, with some variations, is the one still in general use as this is written.

Alternate transmission on the same frequency does away with the necessity for the pilot to retune his receiver and assures that every special broadcast will come to his attention, and relieves to a certain extent the difficulties presented by the limited number of channels. However, the directional signals may be interrupted at a time when a pilot flying in or above the clouds urgently needs guidance. For example, he may be approaching the airport, listening for the cone of silence which will notify him that he is passing over the radio transmitter and should maneuver to get down through the clouds and make his landing, when the range stops for a weather broadcast. This may make it necessary for him to turn back and start a new approach after the broadcast has been concluded.

To take care of such situations the Bureau announced that it would give continuous radio range service, when this was requested by pilots, postponing broadcasts until the necessity for continuous range service had passed. Then a number of stations were equipped with additional transmitters to operate on 236 kilocycles. This channel has been set aside as an alternate frequency, to be used for broadcast of weather information when it is necessary to keep directional signals on the air continuously. If a pilot asks such a station for continuous operation of the radio range, this is given him. At the time for a scheduled broadcast there is a brief announcement on the range frequency that weather will be available on 236 kilocycles, so that other pilots may tune to the alternate frequency for weather information.

In 1935, at the request of the air lines, continuous radio range service was inaugurated at six terminal stations on their respective assigned channels, with all voice broadcasts on 236 kilocycles. The times of broadcast schedules were staggered so that a minimum of interference existed. This method has proved satisfactory for these few stations, but could not be applied to the entire airways system because of the intolerable interference that would result. What is needed is a system which will provide for continuous radio range service, along with weather broadcasts, without the use of too many frequencies, and without requiring the pilot to return his receiver. These requirements are met by the simultaneous radio range and broadcast system which has been developed by the Bureau of Air Commerce, and which has been thoroughly tested under service conditions at Pittsburgh, Pa.

The Pittsburgh station transmitted both radio range signals and voice at the same time, on the same frequency channel. Pilots could receive only one or the other, or both together, as they chose.

To accomplish simultaneous, transmission, advantage is taken of the modulation characteristics of radiotelephone transmission.

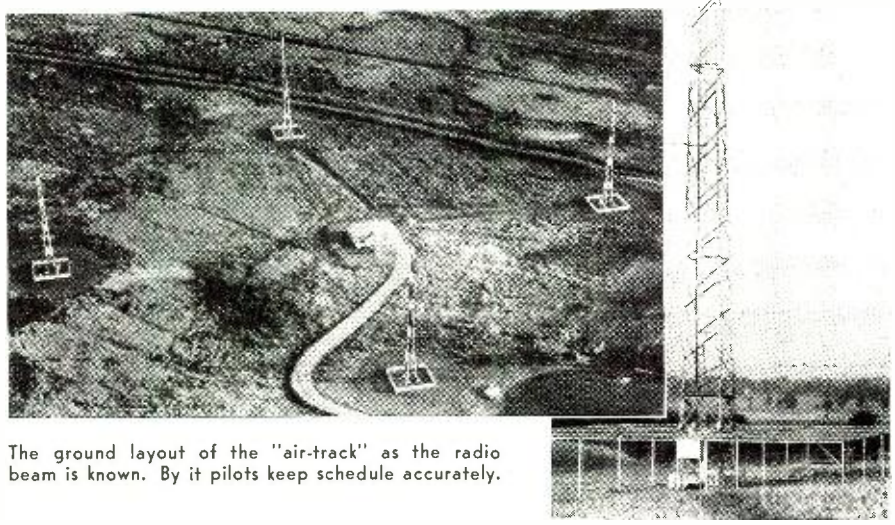
The carrier waves transmitted from a radio station radiate on an assigned frequency, usually measured in kilocycles. For the Pittsburgh simultaneous stations, the carrier frequency was 254 kilocycles. When voice is superimposed on the carrier, it makes slight variations in the amplitude of the radio wave as the speaker enunciates different vowels and consonants and changes the pitch of his voice. These variations or modulations, are measured in cycles —a cycle, of course, being $\frac{1}{1000}$ of a kilocycle. Voice accounts for a wide range of frequencies imposed on the carrier wave. The radio range signals are also modulated but at only one modulation frequency, namely, 1,020 cycles.

Fundamentally, the system used at Pittsburgh called for transmission of all voice modulation frequencies from 50 to 4,000 cycles, with the exception of 1,020 cycles, which was the radio range frequency. Practical limitations make it necessary to eliminate the band of frequencies from approximately 830 to 1,252 cycles from the speech transmissions.

This is accomplished with filters. Voice is transmitted on 254 kilocycles, modulated in the frequencies from 50 to 829 and from 1,253 to 4,000. Radio range signals are transmitted on 254 kilocycles with 1,020-cycle modulation. Filters are required in the airplane receiver as well—one to admit the radio range signals and reject the voice, the other to admit the voice and reject the radio range signals.

A set of filters for use in the airplane receiver has been developed which is contained in a small box 2½"x3¼"x5" in size and weighing only 3¼ pounds. This is the only equipment needed by

(*Continued on page* 96)



The ground layout of the "air-track" as the radio beam is known. By it pilots keep schedule accurately.

A Serviceman's Diary

by JOHN H. POTTS

Sometimes high pressure salesmanship does not close the sale—especially when the customer uses the store radio demonstration set to drown out the salesman.

FRIDAY—pouring rain, but luckily a chauffeur gave me a lift from the station to the shop. Jerry was already at work, taking advantage of the gloomy day to dress the show-window. He does a nice job when he is left alone. But the boss sauntered in earlier than usual, wearing a raincoat and his "sold-a-set" smile so often missing these days. Ever willing to help, he advised Jerry regarding the window-dressing. This price card, for instance, why not move it a little to the left so as to display to better advantage the nicely-turned legs of this new console model? And the toy train, wouldn't it be wiser to have the locomotive heading toward the store entrance rather than away from it? Then passersby would do likewise. The fine points of advertising psychology, my boy, are based on a keen appreciation of the power of suggestion. Poor Jerry!

When they had finished, Jerry drifted back to the shop, muttering something under his breath. I tried to cheer him up.

"Nice-looking window you've got there," I told him. "Quite a bunch of people standing out front."

"Don't kid me," he growled. "They're just parking under our awning to get out of the rain until the bus comes along." He went downstairs and brought up the rubber doormat. Perhaps some muddy-footed salesman might fail to pass us up. Or a chronic kicker might pick this day to favor us with a personal appearance. But he's more optimistic—he expects customers.

The boss was back at his desk, finishing the last chapter of Dale Carnegie's book on winning friends and influencing people. His copy has a serial number, just like a radio set. He studies the book carefully, applying its lessons in his daily work. To be sure, not all of it. Though Mr. Carnegie points out that one salesman put over his biggest deal only because he was speechless from an attack of laryngitis and couldn't crab the sale, the boss still gargles regularly during disagreeable weather. The results bear out Mr. Carnegie's dire prophecy.

No calls on the hook, so I spent the morning fixing up some trade-ins. An old Radiola 86 combination, revamped by installing a 55 in place of the 27 so as to get a.v.c., came out very nicely. Jerry helped me move it into the show-room. The boss tried it out.

"If anyone comes in to buy a midget," he said, "show him this set first. No customer ever knows what he wants and it's up to us always to give him something better than he thinks he wants."

Around noon an elderly man walked in. He wore a pocket-type hearing aid. At the counter, he shoved the mike toward Jerry.

"I'd like to have you show me some of your smaller radios, if you will. I'm rather hard-of-hearing, and would appreciate it if you will speak up and show me something with plenty of power."

Following orders, Jerry demonstrated the trade-in console, shouting its merits at the top of his voice. No go. The man still wanted a small set. But he was patient and polite.

The boss relieved Jerry. Loosening his collar, he sounded off at full blast for the Stromberg combination at seven hundred bucks, tuning in an orchestra at high volume. The customer shoved his mike close to the speaker.

"Don't worry, dear, we can sit down in a moment!"

"Have you got the radio turned on?" he asked rather innocently. The boss gave up. He beckoned to Jerry.

"I've got to go to lunch now," he said. "Better let this fellow point out what he wants and give it to him. He can try it out in his own home. We'll have the riot squad down here if we run any set loud enough for him." At the door, he stopped a moment, thinking.

"I've got it!" he shouted joyfully. "Sell him our 100-watt public-address system to hook on to the output of the big Stromberg. Connect it to the eight-foot exponential horn. He can crawl inside and listen to the music." He opened the door and rushed out. He acted enthusiastic.

Jerry got a pencil and pad of paper.

"Pick out what you want," he wrote, "and I'll have our radioman take it out to your home on trial."

The customer chose a thirty-five-dollar midget. He'd take it in his own car, he said, and I could come along and hook it up. An aerial was already installed, he assured me, so the job would take but little time. He'd be glad to drop me off at the store when everything was completed.

I chucked the set in the back of the car and climbed in front with him. His home, on top of a hill, well away from the road, certainly could house a high-power amplifier without disturbing the neighbors. But trying to sell under such severe handicaps was a job I didn't care to tackle. After all, if he needed such apparatus perhaps he might ask me about it.

We made the entire trip in silence. This was quite a relief, as shouting is certainly embarrassing to all concerned. And it's a nuisance to write everything out on paper. Perhaps he was a lip-reader, but you can't drive a car and watch your companion, as he undoubtedly knew.

We pulled up in the driveway and he led me into the sun-parlor. As we passed through the living room, I noted a big Stromberg somewhat similar to the one we had at the store. No wonder he wasn't interested!

I hooked up the midget and skimmed over the broadcast band. It was ok, but I wanted it better. Checked the adjustment of the r.f. coil trimmer and got it set at the proper point for his antenna. Kept the volume moderately low for convenience. Then tuned in a high-fidelity station at the high-frequency end of the band. They were broadcasting a nice recording and I left it on for a few moments for pure enjoyment. He watched me and I suddenly remembered that I had the volume turned rather low. I shoved it on full blast so he might be able to hear it too.

"Turn it down where you had it," he said. "That's much too loud."

I looked at him, astonished.

"But you couldn't hear it at this level down at the store," I protested.

He smiled. "My handicap is a blessing at times," he pointed out. "I only hear what I want to hear. And I don't like high-pressure salesmanship. In the words of the estimable Charlie McCarthy, I 'wear them down'."

Ho-hum! Next time I have a big bill of goods to sell, I'll gargle some very powerful laryngitis germs.

—30—

Vest Pocket Transmitter

by J. CLEMENS, W9SUX

Pictures by Author

We have miniature cameras, airplanes, ships and toys. The author describes the mini-rig. But it actually does a man-sized transmitting job.

The V. P. Xmtr compared to a T200.

MY young nephew is quite an enthusiast of model airplane building and watching him work gave me the idea of building a miniature transmitter. Hams who have seen pictures of this little rig have remarked that it looked so much like the usual six foot rack and panel job they were prone to doubt its actual dimensions.

In laying out the plans my first thought was that no trick circuit should be used, such as a single tube oscillator transmitter, for then it would not be a bonafide model. The rig, therefore, must have a power supply, crystal oscillator, buffer, final amplifier, and an antenna coupler. If all of these stages could be incorporated in a miniature relay rack, constructed to look and operate as much as possible like an ordinary transmitter, it would then be a real model rig.

In the selection of tubes the acorn tube seemed to be ideal, however, the rig pictured in my mind would need four of them and after figuring the cost of the tubes alone my baby rig almost died in infancy. The power limitation of the acorn tube was also taken into consideration, and this, as well as the cost, outweighed anything that could be seen in their favor, so now it looked like the metal tubes, due to their small size, were going to get the job. An important factor in favor of the metal tube was its complete shielding, a necessity if the parts were to be crowded. Of the large selection of metal tubes the 6N7, due to the two triodes in one envelope, was unquestionably the one to use.

The tube selection now settled, the relay rack, panels, and bases became the next thought. It was first decided that to follow the lines of a commercially built rack it would be necessary to use channel iron for the frame and heavy angle iron for the base, however, many hams having built racks using nothing but wood have turned out jobs which looked as good and in some cases better than many of the commercial racks. Also, not having the proper tools for handling heavy iron, the frame of my rack was made out of ¾" x ½" wood strips which were purchased at the neighborhood lumber yard and the base of the rack was made out of some scrap wood found in our woodpile. Measurements were then taken of the transformer, filter choke, tubes, coils, condensers, etc., and with no amount of juggling of parts could I figure the rack to be less than 13½" in height and 6" in width. This, in my opinion, was small enough when considering the fact that the ordinary rack is 72" in height and 21" in width. With the rack built, the panels and chassis bases were purchased, and after all were mounted the overall dimensions were as follows:

Rack .....height, 13½"; width, 6"; depth, 4"
Power Supply..panel, 4"x5½"; base, 4" x5"x1"
Oscillator and
Buffer .....panel, 3"x5½"; base, 3½"x5"x1"
Final Amplifier .....panel, 3"x5½"; base, 3½"x5"x1"
Antenna .....panel, 3"x5½"; base, 3" x5"x1"

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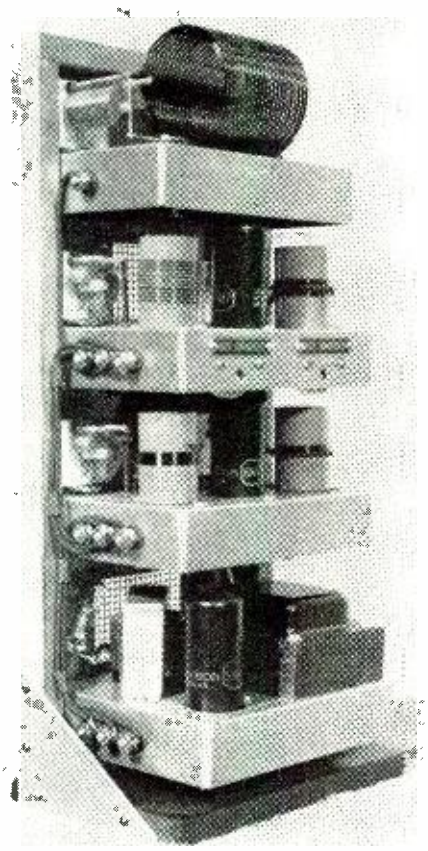
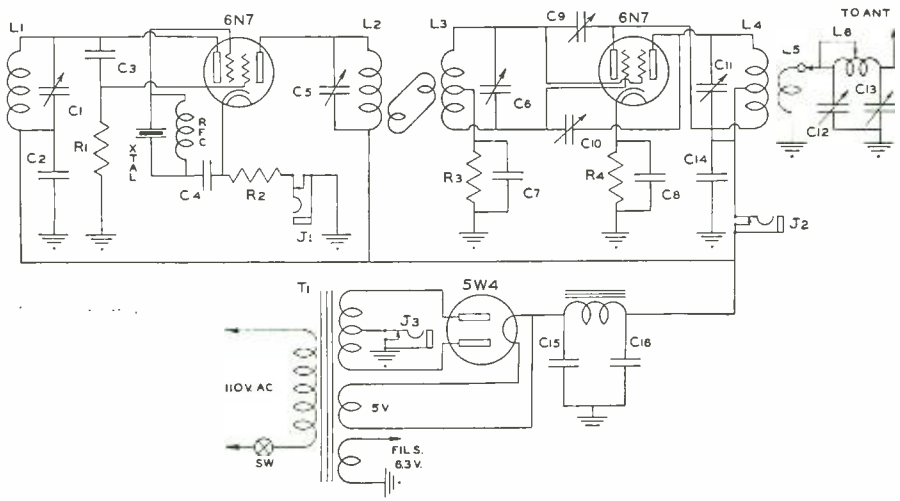


Back of the panel shows fine craftsmanship.



The Circuit of the V. P. Transmitter.

C_1, C_5, C_6, C_{11}—50 mmfd. var.
C_2, C_4, C_7, C_8, C_{14}—.01 mfd. paper.
C_3—.00005 mfd. mica.
C_9, C_{10}—3-30 mmfd. trimmers.
C_{12}, C_{13}—140 mmfd. var.
C_{15}, C_{16}—8 mfd. electro.
R_1—50,000 ohm ½ w.
R_2, R_4—400 ohm 2 w.
R_3—1500 ohm 1 w.
L_1, L_2, L_3, L_4, L_5, L_6, (See coil chart).
L_7—30 hy. choke.
T—Receiver type power transformer.
J_1, J_2, J_3—Closed circuit jacks.
Sw—Switch.
Coil forms—(National Type XR-1).
RFC—2.5 mh. choke.

Zenith's Radio Nurse

Why worry about the baby? You can hear he is sleeping peacefully. An electric babywatcher.

Wired radio transmits sounds picked up on mike over the house light lines.

Loudspeaker with concealed amplifier brings sounds right to your seat.

WHEN year-old Marianne McDonald wakened from her naps at unexpected moments, she was apt to find herself alone in the room. Like any other little girl, she voiced her feelings in no uncertain tones. But, Marianne lived on her daddy's yacht, the *Mizpah*, and sometimes the heavy doors would prevent her cries from being heard.

Marianne did not like that at all. Nor did her daddy, Commander E. F. McDonald, Jr. He felt there should be some way of listening to his daughter's every move, without having somebody in constant attendance.

At first, McDonald tried an ordinary communications system, but it was not sensitive enough. After considerable experimentation he developed the highly sensitive wired radio device.

The pick-up unit plugs into any electric light socket in the nursery or sick room, and the speaker in any other room. At maximum volume, the sensitivity is so great that a pin dropped on a glass table sounds like a spike falling. Such faint sounds as foot falls on rugs, or the rustling of covers when baby turns over the crib, are plainly audible. Both units have an off-on switch, and there is a volume control on the speaker.

The pick-up unit has three tubes: 1—79, 1—41, and 1—84. The speaker is equipped with the following: 1—6F5G, 1—41, and 1—84. Sets are adjustable so that two or more sets in the same building can be tuned to separate frequencies.

RADIO'S DIPSY DOODLES

by Jack Tierney

"THE Dipsy Doodle will get in your hair. . . . The Dipsy Doodle's the thing to beware. . . ." So say the words in the popular song. But radio has its own brand of dippy diddles, dopey doodles and daffy dillies. Call 'em what you will, these slightly strange and sometimes screwy happenings in radio are worth a bushel of laughs to those on the inside. What is a radio Dipsy Doodle? It's any strange, unusual incident that, by its character and action, provokes chuckles and grins, or moans and groans, as the case may be, to folks in the radio profession.

For example, in Washington, D. C., Frank M. Russell, NBC official got out of bed to receive a telegram he had sent himself; the day before he had instructed his office to send telegraphed messages to the entire Washington personnel of NBC.

That's a radio Dipsy Doodle.

In Spokane, Wash., Curt Roberts had the leading part in that city's Little Theatre production of "Fresh Fields." During a 45-minute wait between the first and second acts, Curt dashed to radio station KGA, announced a quarter-hour program and then dashed back to the theatre performance.

Nearly every radio station in the country has its own dipsy doodles and a collection of them would fill a fat volume. They're not all absurd; some are merely funny happenings, or off-the-beaten-path stunts of interest to radiomen.

In Fort Wayne, Indiana, news commentator Bob Wilson of radio station WOWO, who signs off his program with "73," got his "doodle," when he applied for and received for his automobile, license plate number 73.

And a listener to station WMT, in Waterloo, Iowa, contributed a "doodle," to that station when he wrote in, asking for rates on announcements. He said he was expecting a blessed event in his family and wanted to announce it to friends via radio.

Another such "doodle" is chalked up for radio station KIRO, in Seattle, Wash., where a man walked into the station, claimed he was the unknown soldier, showed affidavits to prove it and cornered Chief Engineer Maury Rider for an hour, trying to get permission to tell his story.

Radio doodles are sometimes headaches, sometimes hearty laughs to radio station staffs. Take the one at radio station WIP in Philadelphia, Pa., where an orchestra leader received a letter from a listener asking the baton waver to "please keep that heavy drum off the air as it shakes all the glassware in our closet."

Unusual guest artists are the big thing in radio today, but it took the following to produce a "doodle" for radio station WHBF in Rock Island. A giant hoot owl, a foot and a half high and with a wingspread of more than 45 inches, flew in the window. The owl was grabbed and brought before the microphone, but it wouldn't talk.

In Philadelphia, Tom Smith, of radio station WPEN was interviewing Charles H. Ingersoll, famed dollar-watch king. Said Ingersoll in his talk, "Time is the very vital force of the universe." The program ran more than a minute overtime.

Down in Norfolk, Va., last December, three enterprising department stores each had a Santa Claus on the air during the same hour. It became a "doodle," for parents who worked up headaches trying to answer the kiddies' questions on who was who.

Yes, radio "doodles," are frequent and funny. —30—

ON THE COVER WE HAVE . . .

THE owner of Amateur Radio Station W9ZYB, Bert Heuvelman busy at the controls of his rig located in Norwood Park, a suburb of Chicago, Ill. Believe it or not, Bert has mounted his transmitter on a panel of blue tiled linoleum which is as novel as it is attractive.

The tube lineup is as follows: 6F6 xtal oscillator, T20 first buffer, T55 second buffer, two T200's final amplifier running at a kilowatt. Speech input is standard for a crystal mike and ends up with a pair of 2A3's driving a pair of 822's in Class B modulators. Twenty and Eighty meter fone bands are those most used.

Changeover from one band to another is by relays. Full protection is afforded by the same means.

The receiver is one the Hallicrafter line, which has given excellent service in helping Bert to WAC.

Monitoring of the transmitter is done at all times with an oscillograph as well as a percentage meter indicator.

Bert kindly consented to pose for RADIO NEWS' cover with Miss Naomi Anderson. That was the hardest part of the work. She is a professional model borrowed from our sister publication, POPULAR PHOTOGRAPHY. The cover was made from a kodachrome transparency; and over 3000 watts of photoflood lights illuminated the scene. Mr. Henry F. Kroeger, Jr. of Chicago, who has taken many pictures for us was the photographer. He used a Kodak Retina II, F2 lens stopped f5.6 at .2 second shutter speed.

Oh, yes! Bert sports a meter for every circuit which would need attention. The reason behind that is that he is the local manufacturer's representative for the Triplett Co.

C. B. S. ROBOT TIMER

by ANGUS DUNCAN McCUSKER

Faced with the problem of delaying the signal on station KFAB to synchronize with WBBM, the CBS engineers devised a unique solution.

Row on row of impedance matching coils which delay the signal long enough to synchronize.

THOSE of us who listen to our broadcasts in the big cities rarely have anything to complain of in the way of reception from the local stations. Little do we know or care what reaches the "wide open stretches" between cities, between broadcast stations. The farmer, the rancher, and all of those who do reside in the space between cities are, however, a source of revenue to the advertisers, and hence a worry to the stations.

Recently people living between Chicago and Lincoln, Nebraska, were annoyed by a barrel-like effect that linked the WBBM or KFAB programs from either or both stations. They complained to CBS, and set in motion the engineering force. Eventually a queer contraption resulted, and the problem cleared up. RADIO NEWS presents an exclusive article on how the barrel effect was overcome.

It took twenty-three thousandths of a second for an electrical current to travel the five hundred miles of telephone wire between stations WBBM in Chicago and KFAB in Lincoln, Nebraska. Consequently, a program piped from WBBM to KFAB would go on the air just twenty-three thousandths of a second later in Lincoln than in Chicago.

Ordinarily, a delay of this kind would make no difference. But, with both stations operating on a frequency of 770 kilocycles, there was a fifty or sixty mile strip of territory between them where a receiver set at 770 kilocycles would bring in both stations.

This presented no problem of heterodyning, because the precision equipment at both stations kept both transmitters exactly on the assigned frequency. However, the overlapping area was nearly midway between the stations, and since radio waves travel with the speed of light (less than three thousandths of a second for five hundred miles), reception from KFAB coming in twenty-three thousandths of a second behind WBBM gave a hollow, barrel-like quality that is so unpleasant.

Frank B. Falknor, chief engineer of Columbia's central division, tackled the problem. The only cure was to get exact time synchronization. The problem reduced itself to delaying WBBM's broadcast by exactly twenty-three thousandths of a second. This was much more difficult than it sounded, for the delay had to be effected without reducing the tone quality of the broadcast. For this the tone frequencies ranging from 50 to 6000 cycles had to be equalized.

It was impossible to buy equipment, for the good and sufficient reason that nobody had ever faced the problem before. The nearest approach was in trans-Atlantic telephone work, where the telephone company had installed equipment to delay the voice long enough for an automatic volume control tube to function and control fading.

This meant that CBS would have to devise its own electrical equipment, a job that would take several months. In the meantime, Falknor went to work on a makeshift mechanical delay to fill in while the electrical delay was being developed and installed.

Sound travels through air at the rate of 1080 feet per second. Hence, if WBBM's program were to travel through twenty-three feet of air before reaching the mike, it would be delayed by the necessary twenty-three thousandths of a second.

Falknor had a section of lead sewer pipe cut to the proper length, and set it up with a loudspeaker at one end and a dynamic mike at the other. He killed echoes at the speaker end by installing an exponential matching unit made of an aluminum casting. It was designed to match the impedence of the speaker with that of the pipe. This functioned so well that sound leaving the speaker went into the pipe without distortion.

However, there was sound reflected from the mike diaphragm. These waves, meeting those coming from the speaker, caused a series of beats that distorted the sound picked up by the speaker.

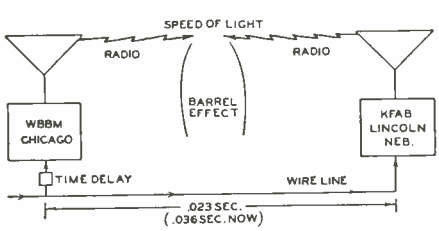
The cure for this was a terminating network of cloth placed in the pipe near the mike end. Because of the wide range of audio frequencies encountered, Falknor began by putting gauze near the center of the pipe. Working toward the mike end, he used heavier and heavier fabrics, concluding with some pieces cut from a mechanic's overalls.

This improvized dampening equipment worked quite well, but there were still humps in the sound. These were eliminated by feeding the output from the mike through electrical equalizers, one equalizer for each hump. Since each equalizer cut the total volume, an amplifier was installed after every equalizer.

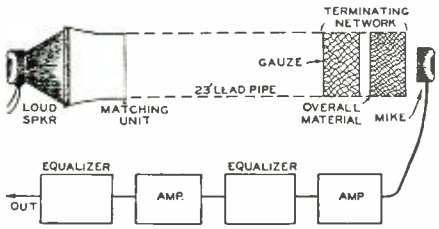
The finished contraptions worked like the diagram above. Programs were fed into the loudspeaker at the same time they left for KFAB. Sound from the speaker went through the matching unit to the lead pipe, and at the end of twenty-three thousandths of a second had reached the mike. The cloth network eliminated most echoes, but cut the entire volume enough so the mike output was fed through an amplifier. It then passed through a series of equalizers and amplifiers to eliminate all humps, and then to the transmitter. While all this was happening the identical program was traveling the wires to Lincoln, and was broadcast from KFAB at the exact instant it left the antenna of WBBM. It gave satisfactory results over a tone range from 100 to 5000 cycles from the day the two stations were synchronized, and was used for several months.

The electrical delay system that was put

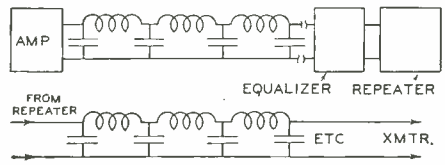
(*Continued on page 82*)



The physical problem.



The First Solution.



The Final Solution.

Scoop! NEW FCC B. C. ALLOCATIONS

FOR the third time the radio spectrum has grown so unwieldly a serious upheaval and reassignment of wavelengths must be made. This time, the situation deals with the whole of North America, and stations have been juggled so the high power transmitters in Canada and Mexico, which did not exist when the 1927 terms went into effect, may be included in the spectrum, without jamming their American neighbors.

The FCC and many independent engineers have been working for the past three years attempting to find a solution for the conditions which grow more chaotic every day. At present there is no longer room to accommodate the numerous applications for station permits, so the high fidelity channels, 1510 to 1600 kc. are to be utilized. Many of the clear channels are to be shared daytimes with low powered locals, and by use of directional antennas and adequate protection it will be possible to accommodate many new stations.

Under the Havana Treaty conditions the following new allocations have been agreed upon for all of North America. Just when the plan will go into effect is undetermined at this moment. It is impossible to state with positive authority that all the allocations here presented will be correct. However, confirmation from Washington leads us to believe the following table to be at least 90% correct.

540 Kc. Canadian Stations which will not place strong signal in U. S.
550 Kc. Unchanged.
560 Kc. Unchanged, but Newfoundland stations must use directive antennas to protect U. S. stations.
570 Kc. Unchanged but Santa Clara, Cuba must use directive antenna.
580 Kc. Unchanged but maximum power must be less than 1000 watts (1. kw.).
590 Kc. Unchanged but Havana, Cuba (10 kw.) must protect U. S. stations.
600 Kc. Unchanged.
610 Kc. Unchanged.
620 Kc. Unchanged.
630 Kc. Unchanged but Havana, Cuba (15 kw.), must protect U. S. Stations.
640 Kc. KFI, shared days by WGAN, WHKC, WOI.
650 Kc. WSM.
660 Kc. WEAF, shared days by WAAW.
670 Kc. WMAQ.
680 Kc. KPO, WPTF, WLAW, KFEQ.
690 Kc. KGGF, WNAD, (Quebec high power stations, calls unknown).
700 Kc. WLW.
710 Kc. WOR, KIRO, KMPC.
720 Kc. WGN.
730 Kc. (Mexican high power station, call unknown.)
740 Kc. KQW, (Canadian stations to be assigned, calls unknown).
750 Kc. WSB, KMMJ, KTRB, WHEB.
760 Kc. WJR, KGU.
770 Kc. WJZ, WEW, WBAL, KXA.
780 Kc. WBBM.
790 Kc. WTAR, WMC, WEAN, KWLK, KGHL, KFQD, KFDY, KEHE.
800 Kc. (Ontario 5 kw. and Sonora, Mexico, 50 kw. stations, calls unknown.)
810 Kc. WGY, KGO, KOAM and Tamaulipas, Mexico (call unknown).
820 Kc. WBAP, WFAA, WTBO.
830 Kc. WCCO, WNYC.
840 Kc. WHAS.
850 Kc. KOA, WEEU, WHDH, WRUF.
860 Kc. (Ontario high power stations, calls unknown.)
870 Kc. WWL, KIEV, WESG, WKAR.
880 Kc. WABC, WHB.
890 Kc. WENR, WLS.
900 Kc. (Quebec medium power stations and Mexican High power stations, calls unknown.)
910 Kc. KFKA, KLX, KPOF, WCOC, WGBI, WQAN, WRNL, WSUI.
920 Kc. KARK, KFNF, KFPY, KUSD, WBAA, WGST, WJAR, WMMN.
930 Kc. KGBU, KHJ, KSEI, WBEN, WELI, WFMD, WJAX, WKY, WLBL, WTAD.
940 Kc. (Quebec medium high, 5-20 kw., and Mexico City medium high, calls unknown.)
950 Kc. KFEL, KOMO, KPRC, KVOD, WAAF, WORL, WPEN, WSPA, WWJ.
960 Kc. KMA, KROW, WBRC, WDBJ.
970 Kc. KOIN, WAAT, WAVE, WCSH, WDAY, WHA, WICA.
980 Kc. KFWB, KMBC, WHAL, WRC.
990 Kc. WNOX, (Manitoba high power stations, calls unknown).
1000 Kc. WCFL, KJR, (Cuba medium and Jalisco, Mexico, medium high, calls unknown).
1010 Kc. (Alberta and Havana high power stations, calls unknown.)
1020 Kc. KDKA.
1030 Kc. WBZ, WBZA.
1040 Kc. WHO.
1050 Kc. WHN, (Nueva Leon, Mexico, high power stations, calls unknown).
1060 Kc. KYW, WDZ, (Alberta medium and Mexico City medium high, calls unknown).
1070 Kc. KNX, KFBI, WEAU, WGVA, WAPI, (Maritime Provinces, medium, calls unknown).
1080 Kc. KRLD, WTIC, KWJJ, KYOS, (Manitoba 15 kw., Haiti 10 kw., calls unknown).
1090 Kc. KTHS, WBAL, WJAG, (Lower California, Mexico, medium high, call unknown).
1100 Kc. WTAM, WCAZ, KJBS.
1110 Kc. WBT, KFAB, WCBD, WMBI (Mexico City, medium high power, call unknown).
1120 Kc. KMOX.
1130 Kc. KWKH, WBIL, WPG, KGDM, (British Columbia, medium high power, call unknown).
1140 Kc. WRVA, KSOO, (Chihuahua, Mexico, medium high power, call unknown).
1150 Kc. KFIO, KFSG, KRKD, KRSC, KTBC, WCOP, WDEL, WISN, WJBO, WTAW.
1160 Kc. KSL, WJJD, WOV.
1170 Kc. KVOO, KEX, WWVA, (Dominican Republic, 10 kw., call unknown).
1180 Kc. WHAM.
1190 Kc. WOWO, (Havana 15 kw., Sinaloa, Mexico, medium high power, calls unknown).
1200 Kc. WCAU, KOB, (no figures available for WDGY, WINS, WMAZ reassigned frequency).
1210 Kc. WOAI, WSAZ, WATR, KTKC.
1220 Kc. (Yucatan, Mexico, high power, call unknown.)
1230 Kc. (1200 kc. locals moved bodily.)
1240 Kc. (1210 kc. locals moved bodily.)
1250 Kc. KFKU, KTMS. KTW, KWSC, WCAD, WCAE, WDAE, WREN.
1260 Kc. KGBX, KGGM, KYA, WFBM, WNAC.
1270 Kc. KGCU, KLPM, KTAT, KTFI, WKAQ, WXYZ, (10 kw. Havana, must protect U. S.).
1280 Kc. KFOX, KIT, KXOK, WAIR, WCAL, WDSU, WHBI, WLB, WNEW, WTCN.
1290 Kc. KGVO, KHSL, KOIL, KPAC, KRGV, KUOA, KVOA, WHIO, WNBX, WTOC.
1300 Kc. KGCA, KOL, KVOR, KWLC, WOOD, WASH, WFBR, WJDX.
1310 Kc. KFBB, KLS, WCAM, WCAP, WDOD, WIBA, WORC, WRR, WTNJ.
1320 Kc. KDYL, KLCN, KTRH, WEBC, WJAS, WNBZ, WNEL.
1330 Kc. KALE, KFAC, KFH, WBBR, WEVD, WFAB, WFBC, WHAZ, WHBL.
1340 Kc. (1310 kc. locals moved bodily.)
1350 Kc. KGHF, KGMB, KID, KRNT, WADC, WORK, WSMB.
1360 Kc. KGB, KMO, KRIS, KSCJ, WDRC, WSAI, WTAQ.
1370 Kc. KDTH, KGDY, KGIR, KGNO, WCOA, WFEA, WSPD.
1380 Kc. KIDO, KWK, WAWZ, WBNX, WMBG.
1390 Kc. KCRC, KGER, WCSC, WFBL, WGES, WQBC, WSBT.
1400 Kc. (1370 kc. locals moved bodily.)
1410 Kc. KOH, KQV, WALA, WKBH, WNBC, WSMK.
1420 Kc. KLRA, KOY, KRLC, WHK, WQDM.
1430 Kc. KHBC, KLO, KTUL, WARD, WBBC, WHDL, WIRE, WLTH, WVFW.
1440 Kc. KFJM, KGNC, KMED, WAAB, WBCM, WHIS, WROK, WSFA.
1450 Kc. (1420 kc. locals moved bodily.)
1460 Kc. KECA, KGNF, KSO, WBNS, WHEC, WHP, WMPS, WOKO.
1470 Kc. KDFN, KELA, KXYZ, WBIG, WCBA, WMBD, WSAN.
1480 Kc. KGCX, KIEM, KTBS, WAGA, WGAR, WHOM, WSAR.
1490 Kc. (1500 kc. locals moved bodily.)
1500 Kc. KSTP, WJSV.
1510 Kc. KGA, WLAC.
1520 Kc. KOMA, WHIP, WKBW.
1530 Kc. WCKY, KFBK.
1540 Kc. (Santa Clara, Cuba, high power, call unknown.)
1550 Kc. (Ontario and Vera Cruz, Mexico, medium high power stations, calls unknown.)
1560 Kc. (Havana, medium high power, call unknown.)
1570 Kc. (Nueva Leon, Mexico, high power, call unknown.)
1580 Kc. (Quebec, high power, call unknown.)
1590 Kc. (New regional channel for U. S. No stations assigned yet.)
1600 Kc. (New regional channel. Old high fidelity stations will probably be located here and on 1590 Kc.)

"Boiled ham for dinner. I caught an amateur radiop."

The allocations for Canada, Mexico and Cuba are available by channel only. The individual governments have not yet designated which station will occupy which frequency, neither have they specified how the remaining low power stations are to be divided among the channels occupied in the main by the U. S.

The setup as here presented is the most practical solution to the QRM problem ever worked out, divides the stations evenly, and gives Mexico and Canada the opportunity to expand without encroaching upon existing stations. It also opens new channels which till now have been considered "unusable."

—30—

A PORTABLE Radio Station

by OLIVER T. READ, W9ETI

Engineer, Utah Radio Products Co.

A complete radio station for use with six volts DC or 110 v. AC. It is the ideal rig to take on a camping trip vacation.

Henry F. Kroeger, Jr., Foto.

The author tries out the rig. Transmitter on top, and receiver on left bottom. 30 watts of 100% modulated signal on 5 major bands.

MOST transmitter equipment classified as "portable" is designed for power outputs of but a few watts, usually not more than ten, and a great many fall into the "Transceiver" class. The latter rely on the audio system of the unit for part of the tube complement and the r.f. portion of the receiver is not very selective or sensitive. The rig herein described makes use of independent units for transmitting and receiving of which both are capable of high efficiency.

Many tests were made with mechanical vibrators and results show that a maximum of 100 ma. at 250 volts d.c. is all that can be expected, therefore the motor generator unit has been selected which permits ample voltage and current to be delivered to the transmitter for real output. Another argument in favor of generator supply is that a 6 volt car battery may be obtained on short notice in any town or hamlet; which is not true of heavy B batteries.

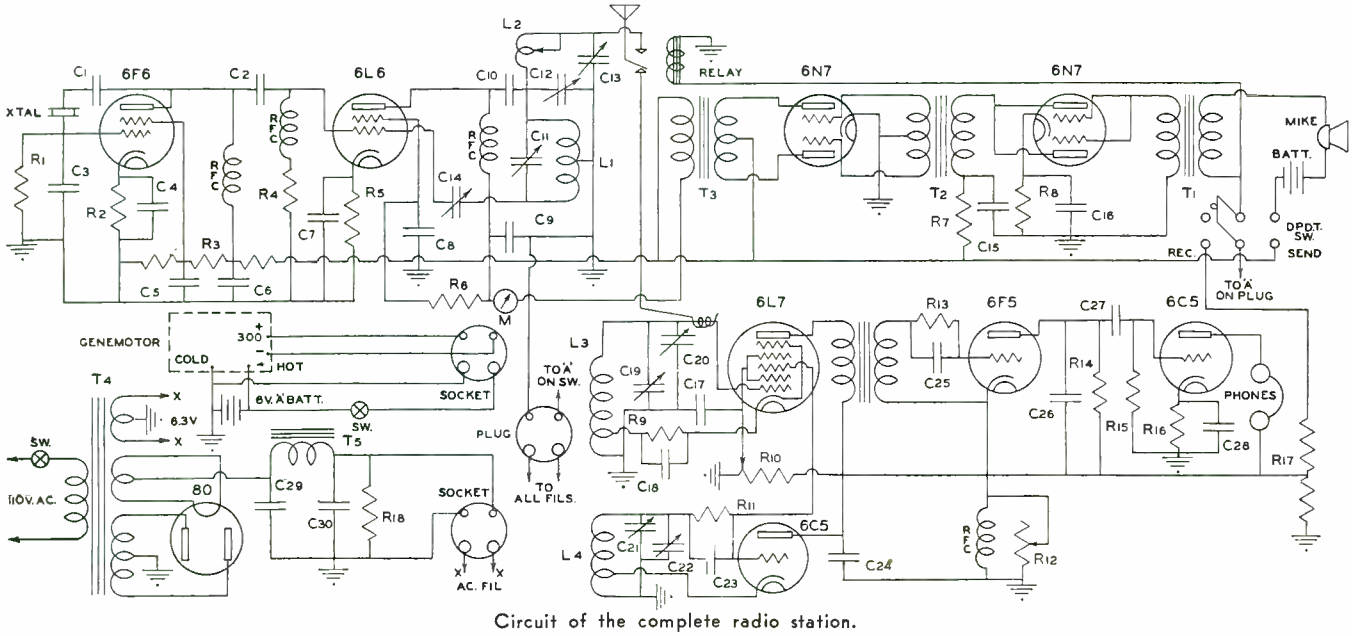
Various disasters have shown that the most reliable frequencies for amateur communication over reasonable distances are the three lower frequency bands. This unit is designed for the vacationist or operator performing emergency service.

This transmitter-receiver operates either from a six volt storage battery or 110-120 volts 60 cycle, so that it may be used at a permanent or semi-permanent location where power is available, or from the car or separate battery for vacation spots, etc.

The Transmitter

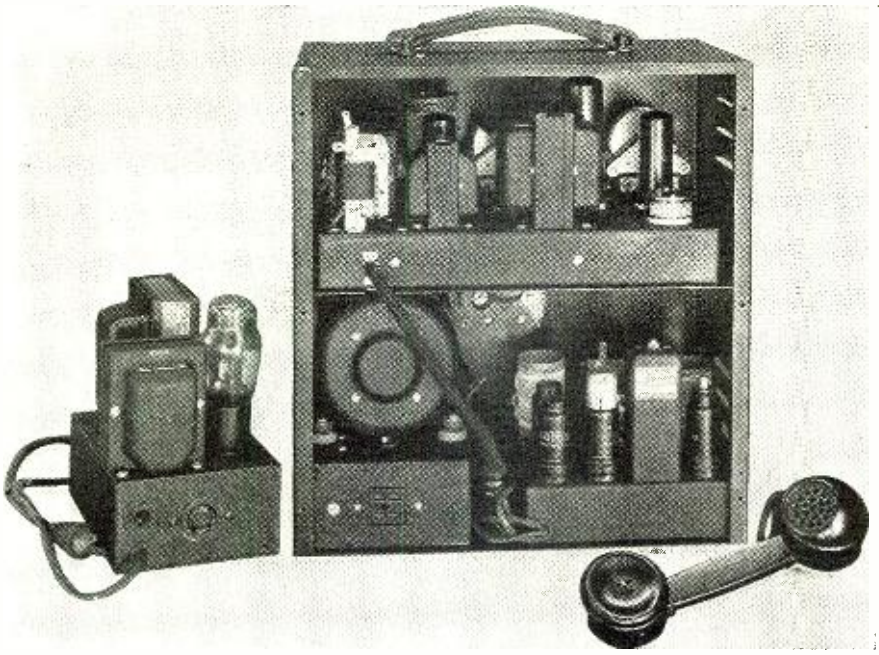
The unit consists of a Pierce Oscillator circuit, which requires no tuned coil-condenser and oscillates readily upon insertion of a crystal on fundamental frequency. The output is fed into a type 6L6 "obtainable everywhere" and this amplifier stage operates with a plate voltage of 300 at 75 ma. or better than 20 watts input on 20-40-80-160 meters. This stage is modulated by a type 6N7 tube class "B," providing 10 watts of audio for phone. Efficiencies of about 75% may be had on the lower frequency bands or 15 watts output.

Care should be used in placing all of the parts exactly as shown in the photos so that



Circuit of the complete radio station.

L_1 to L_4—See text
T_1—Utah No. 7804 Mike to grid
T_2—Utah No. 8643 Class "B" Input
T_3—Utah No. 8644 Class "B" Modulation
T_4—Utah No. Y612 Plate and filament
T_5—Utah No. 4509 Filter Choke 150 ma. or D-4667 Filter Choke 175 ma.
Relay Utah No. R111 Changeover Relay
R_2, R_5—Utah No. CC-250 250 ohms 10 w
R_3, R_{17}—Utah No. KKA25M 25,000 ohms 50 w Adj.
R_4—Utah No. CC-10M 10,000 ohms 10 w
R_6—Utah No. EE-15M 15,000 ohms 20 w
R_{12}—Utah No. RCP 5M 5,000 ohms Pot.
R_{18}—Utah No. KK 50M 50,009 ohms 50 w
R_1—50,000 ohms, 2 w
R_7—10,000 ohms, 1 w
R_8—1,500 ohms, 1 w
R_9—500 ohms, ½ w
R_{10}—Utah No. RCP 50M 50,000 ohms Pot.
R_{11}—50,000 ohms, ½ w
R_{13}—2 megohms, ½ w
R_{14}—10,000 ohms, 1 w
R_{15}—100,000 ohms, ½ w
R_{16}—1,500 ohms, 1 w
C_1, C_2—.01 mfd. 1,000v. mica
C_3—.00015 mfd. 500v. mica
C_4, C_5, C_6, C_7, C_8, C_{10}—.001 mfd. 1,000v. mica
C_9—.0001 1,000v. mica
C_{15}, C_{17}, C_{21}—.1 mfd. 600v. paper
C_{16}, C_{28}—10 mfd. 25v. electro.
C_{18}, C_{27}—.01 mfd. 400v. paper
C_{23}, C_{25}—.0001 mfd. 500v. mica
C_{29}—.005 mfd. 500v. mica
C_{24}, C_{30}—8 mfd. 450v. electro.
C_{11}—.00015 mfd. Var. National TMS150
C_{12}, C_{13}—.00025 mfd. Var. National TMS250
C_{14}—6L6 Neut. Cond.
RFC—r.f. Chokes



Rear view of complete radio station. Six volt supply in bottom left of cabinet, 110 v. AC supply outside alongside.

r.f. losses are kept at a minimum. The variable condenser on the left facing the chassis is the amplifier plate tuning condenser. The single coil is so placed that short direct leads may be used to the tube as well as to the two 250 mmf. antenna tuning condensers shown in the center and right hand corner.

The mike transformer is directly in back of this latter condenser, followed by the class "B" input and outputs.

Steatite sockets are used for the r.f. tubes, crystal, and coil to reduce moisture loss when used in damp country. Only one coil is needed per band which greatly simplifies tuning and extras. The antenna network consists of two variable condensers and a tapped coil. This provides an accurate impedance match to be made to practically any type of antenna, the simplest of which would be a single length of wire which could be stretched between two trees, etc. for portable or home operation.

The Amplifier plate is first tuned to resonance as indicated by a sharp dip in plate current as read on the meter. This adjustment must be made without the antenna coil or condensers connected. The writer suggests that the builder wind a complete set of coils and pre-calibrate on the dial just where resonance is found. Then the antenna network may be connected without disturbing this setting. Do not retune the Amplifier plate after obtaining this resonant point. The two antenna condensers may now be adjusted to bring the plate current up to approximately 75 ma. which is the normal r.f. load. A flashlight bulb may be temporarily connected in series with the Antenna to indicate maximum r.f. radiation after which it must be removed.

The audio and modulator is self-explanatory and no trouble will be had in wiring this unit. The plate voltage to the 6L6 passes through the secondary of the modulation transformer and this secondary may be shorted out by means of a toggle switch when the rig is being keyed for c.w. The microphone is a single button handset type having 200 ohms for the mike and 2000 ohms in the headset. A cable connects the transmitter and modulator to the power supply located on the lower deck beside the receiver.

Care should be taken to wire these connecting leads to avoid damage to the tubes or parts.

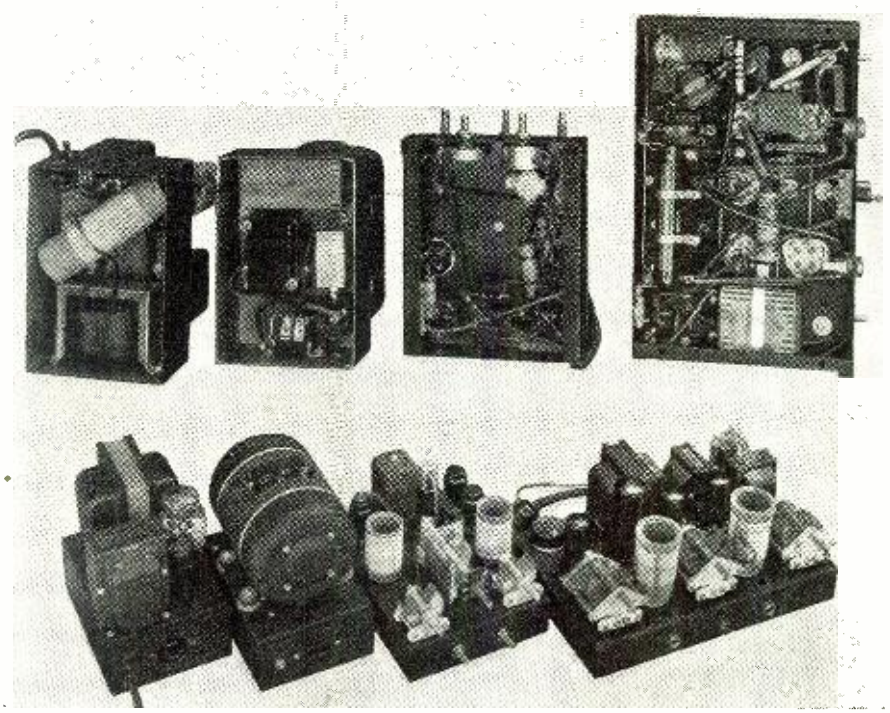
The voltage divider is located under the audio transformers and the various taps furnish the following voltages. Oscillator screen 100v, oscillator Plate 200v. r.f. Amplifier plate 300v., with a separate screen dropping resistor which is essential for good modulation characteristics. *Caution:* never operate the 6F6 Oscillator at higher voltages than those specified.

The relay used in this transmitter-receiver has been especially designed for the purpose. The exciting voltage for this relay is obtained from the same 4½ volt battery which supplies the current to the microphone. The relay is normally in the receive position and upon closing the switch to the transmit position, the relay will close, thereby placing the antenna in circuit to the transmitter. A connection of the antenna lead to the receiver is made by twisting four or five turns of the connecting wire around the 6L7 control grid lead. This affords a small capacity coupling to the receiver and this coupling will depend somewhat upon the amount of regeneration used in the type 6L7 tube. The d.p.d.t. switch also provides the means of transferring the 300v. of plate supply from receiver to transmitter and this switch must be wired exactly as shown. When the switch is thrown to the receive position, the antenna relay will close and at the same time apply the voltage to the receiver from the other section.

The various parts used in the construction of this portable should be chosen with care and values should not be changed unless absolutely necessary. Many tubes are now available to the amateur, which may be used in the 6L6 amplifier such as the type 6V6 RK39, 807, etc. These tubes are all of very similar construction and characteristics, with the exception that those made for transmitting purposes, such as the RK39 or 807 will require only a change of socket to one of five prongs in place of the octal sockets used.

The constructor may alter the physical

(*Continued on page* 94)

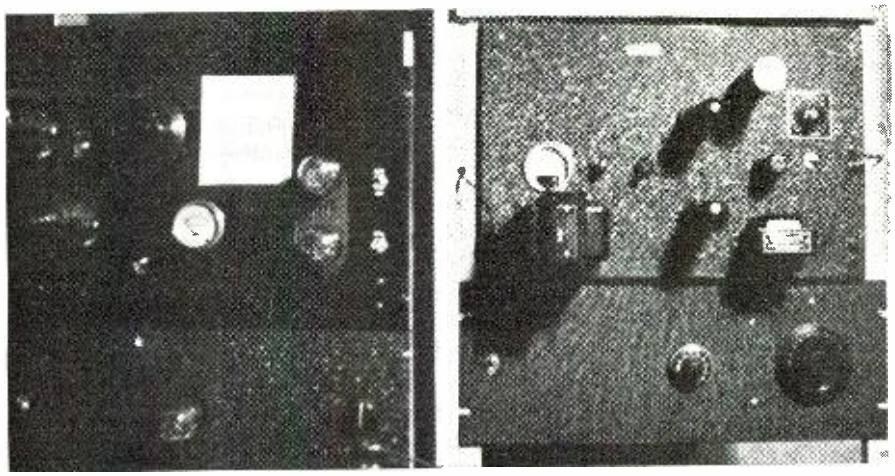


Separate chassis make inspection or repairs very easy. Underside views show careful planning and part placement.

High Fidelity Amplifier

by DON C. DUNCAN
Illinois Bell Telephone Co.

With the broadcasters increasing the audio limits of their transmitters, a high fidelity amplifier is needed to bring out the best in the programs.



The amplifier is shown to the right of the receiver. The meter is used to balance the output circuit. Inverse Feedback is used.

THE primary requisites of a high fidelity amplifier for reproduction of speech and music are as follows: (1) sufficient reserve capacity to prevent overloading on intermittent high-peak voltages, (2) less than 5% harmonic distortion and (3) uniform frequency response from about 30 to 10,000 cycles per second.

By the proper choice of tubes and careful circuit design, the first and second requirements can be met without much difficulty by the average home builder.

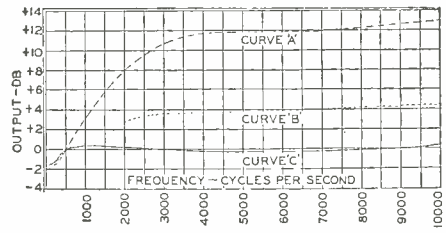
The third requirement (wide range, flat frequency response) can be satisfied by equalization of the completed amplifier, or by the use of high fidelity audio components, which cost about three times that of the corresponding "standard" or "public address" grade audio transformers.

Equalization of the frequency response of an amplifier requires the application of a corrective network to reduce the gain at those frequencies most efficiently amplified, to the approximate level of amplification of those frequencies least amplified. Equalizing networks usually consist of inductance, capacity, and resistance. An audio oscillator of good wave form and a vacuum tube voltmeter or cathode-ray oscillograph are necessary, however, to make the tests in conjunction with such equalization.

The schematic diagram gives the circuit of a two-stage amplifier built by the author, using "standard" grade audio transformers, and which was equalized to within plus or minus 1 db (2 db variation) from 30 to 10,000 cycles per second.

The particular combination of audio transformers which were used, combined with the inverse feedback circuit in the output stage, resulted in a favorable gain characteristic which gradually rose with frequency. As a result, a single capacity resistance network, consisting of R_3 and C_3, was all that was required to effect equalization.

If the circuit diagram is followed closely, it should be possible for anyone, without testing facilities necessary to make equalization tests for himself, to build the amplifier described herein and be assured of high fidelity performance. The exact type transformers T_2 and T_3, as specified, and the same resistance and capacity values shown in the diagram for the audio paths must be used if the results, with respect to frequency response, are to be duplicated. Appreciably changing the plate voltages also has a measurable effect on the frequency response.



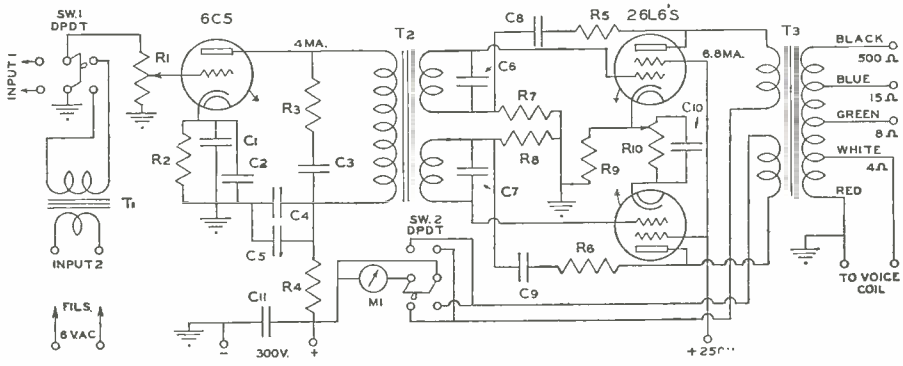
Response curves for the author's amplifier.

Reference to the frequency response curves show how effectively the amplifier has been equalized. These curves were obtained from voltage measurements taken across the speaker voice coil (connected to the appropriate taps of the secondary winding of T_3) with a variable frequency source (held constant at 4 volts) impressed across Input 1. The volume control R_1 was set for maximum gain. The power output at 500 cycles was arbitrarily chosen as reference power (zero db).

Points on the curve representing the power levels at frequencies other than reference power were obtained by substitution in the well known formula: gain or loss (db) $= 20 \log V_2/V_1$, where V_1 is the output voltage measured at 500 cycles and V_2 is the output voltage measured at any other frequency for which a point on the curve is desired. Had a reference output power other than that at 500 cycles been selected, the shape of the curves (and total db variation) would have remained unchanged, but the entire set of curves would have been shifted up or down on the chart.

Input 1 is the connection for which the amplifier has been equalized and is intended to provide the normal connection to a radio or phonograph pickup. Input 2, utilizing audio transformer T_1, was provided for convenience in connecting appa-

(*Continued on page* 80)



The circuit diagram of the high fidelity amplifier.

C_1—25 mfd. 50 volt electrolytic
C_2—.1 mfd. 200 volt paper
C_3—.004 mfd. mica
C_4—8 mfd. 450 volt electrolytic
C_5—.1 mfd. 400 volt paper
C_6—.001 mfd. mica
C_7—.001 mfd. mica
C_8—.5 mfd. 1000 volt paper
C_9—.5 mfd. 1000 volt paper
C_{10}—2 mfd. 200 volt paper
C_{11}—4 mfd. 600 volt paper
M_1—milliammeter, 0-150 MA, D.C.
R_1—500,000 ohm volume control
R_2—1750 ohm, ½ watt
R_3—20,000 ohm, ½ watt
R_4—25,000 ohm, 1 watt
R_5—45,000 ohm, ½ watt
R_6—45,000 ohm, ½ watt
R_7—5,000 ohm, ½ watt
R_8—5,000 ohm, ½ watt
R_9—130 ohm, wire, 10 watt
R_{10}—30 ohm rheostat
T_1—"junk box" audio transformer
T_2—Thordarson No. 8459 transformer
T_3—Thordarson No. 8458 transformer
SW_2—D.P.D.T. switch

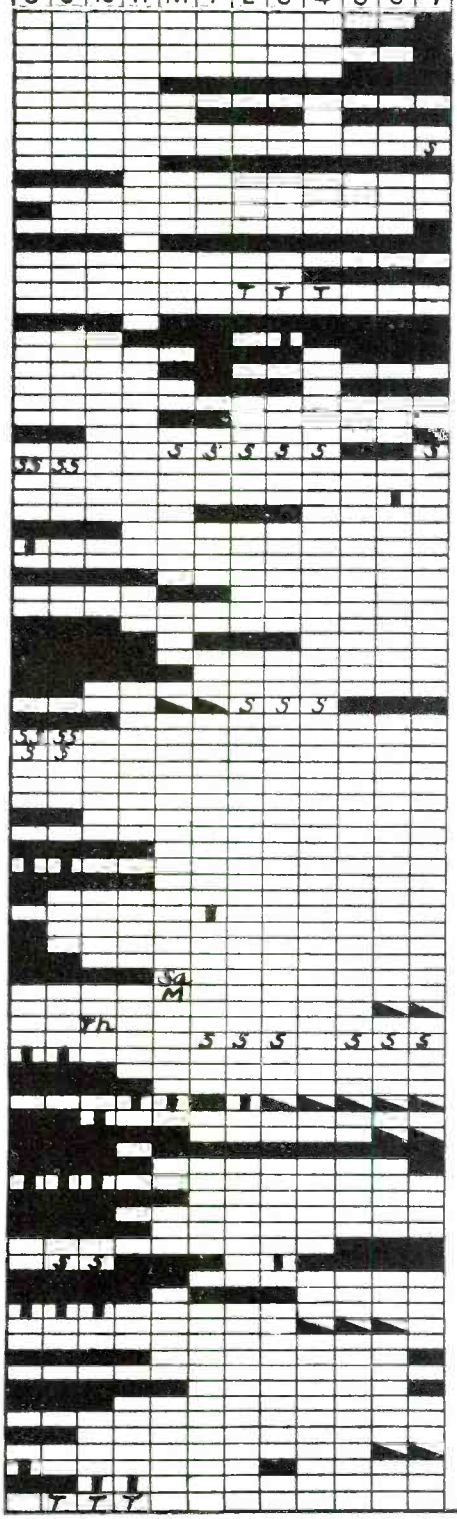
WORLD SHORT WAVE TIME-TABLE

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

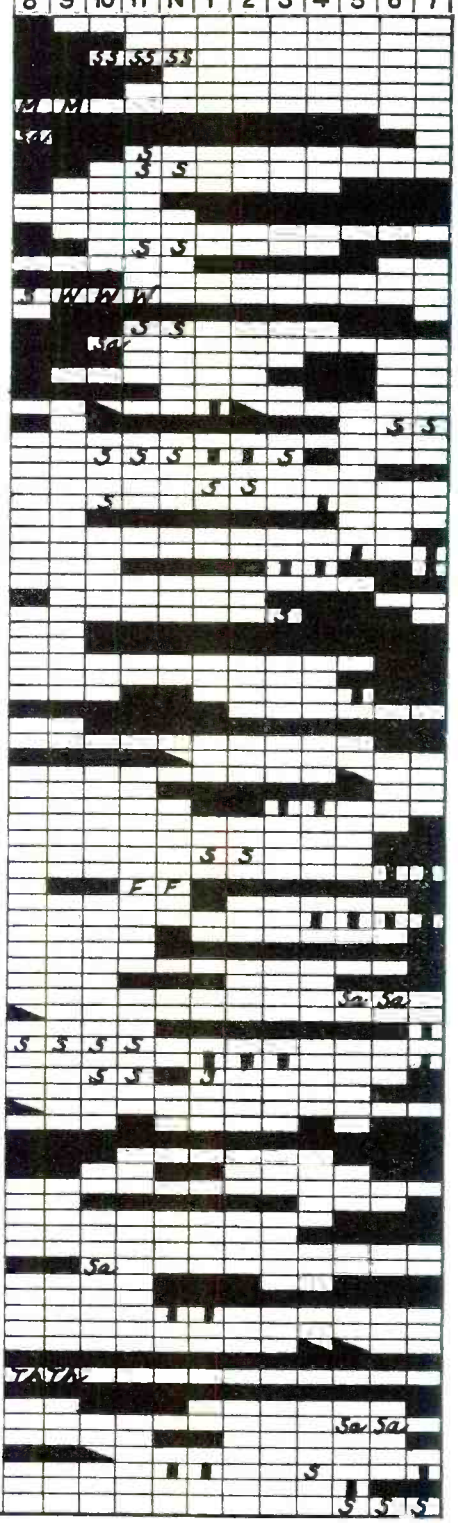


EASTERN STANDARD TIME

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	PHI	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.
19.68	TPA2	15243	Pontoise, France
19.71	PCJ	15220	Huizen, Holland
19.72	W8XK	15210	Pittsburgh, Pa.
19.74	DJB	15200	Zeesen, Germany
19.75	ZBW4	15190	Hong Kong, China
19.76	GSO	15180	Daventry, England
19.79	JZK	15160	Nazaki, Japan
19.82	GSF	15140	Daventry, England
19.84	HVJ	15121	Vatican City
19.85	DJL	15110	Zeesen, Germany
19.88	RKI	15090	Moscow, U.S.S.R.
20.04	LZA	14970	Sofia, Bulgaria
22.16	SPW	13635	Warsaw, Poland
24.52	TFJ	12235	Reykjavik, Iceland
25.00	RV59(RNE)	12000	Moscow, U.S.S.R.
25.24	TPA3	11885	Pontoise, France
25.27	W8XK	11870	Pittsburgh, Pa.
25.34	OLR4A	11840	Podebrady, Czech.
25.36	W9XAA	11830	Chicago, Ill.
25.36	W2XE	11830	New York, N. Y.
25.42	JZJ	11800	Nazaki, Japan
25.45	W1XAL	11790	Boston, Mass.
25.49	DJD	11770	Zeesen, Germany
25.53	GSD	11750	Daventry, England
25.58	CJRX	11730	Winnipeg, Canada
25.60	TPA4	11720	Pontoise, France
25.62	HJ4ABA	11710	Medellin, Colombia
25.63	SBP	11705	Motala, Sweden
25.64	HP5A	11700	Panama, Pana.
26.01	SPD	11535	Warsaw, Poland
26.24	COCX	11435	Havana, Cuba
26.60	HIN	11280	Trujillo, D. R.
27.17	CSW	11040	Lisbon, Portugal
29.04	ORK	10330	Ruysselede, Belgium
29.35	PSH	10220	Rio de Janeiro, Brazil
30.18	CSW	9940	Lisbon, Portugal
30.43	EAQ	9860	Madrid, Spain
30.31	IRF	9830	Rome, Italy
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
31.25	RAN	9600	Moscow, U.S.S.R.
31.25	HJ1ABP	9600	Cartagena, Colombia
31.27	HBL	9595	Geneva, Switzerland
31.28	VK6ME	9590	Perth, Australia
31.28	W3XAU	9590	Philadelphia, Pa.
31.28	VK2ME	9590	Sydney, Australia
31.28	PCJ	9590	Huizen, Holland
31.28	HP5J	9590	Panama City, Pana.
31.32	GSC	9580	Daventry, England
31.32	VKVLR	9580	Lyndhurst, Australia
31.33	HJ2ABC	9575	Cucuta, Colombia
31.35	W1XK	9570	Millis, Mass.
31.38	DJA	9560	Zeesen, Germany
31.40	TIPG	9559	San Jose, C. R.
31.42	OLR3A	9550	Podebrady, Czech.
31.42	XEFT	9550	Veracruz, Mexico
31.45	DJN	9540	Zeesen, Germany
31.48	W2XAF	9530	Schenectady, N. Y.
31.48	LKJ1	9530	Jeloy, Norway
31.49	ZBW3	9525	Hong Kong, China
31.51	OAX4J	9520	Lima, Peru
31.55	GSB	9510	Daventry, England
31.55	HJU	9510	Buenaventura, Colom.
31.55	VK3ME	9510	Melbourne, Australia
31.58	PRF5	9500	Rio de Janeiro, Brazil
31.82	COCH	9428	Havana, Cuba
32.09	HS8PJ	9350	Bangkok, Siam
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.
43.99	XGOX	6820	Nanking, China
44.14	HIH	6796	San Pedro, D. R.
44.71	TIEP	6710	San Jose, Costa Rica
45.22	HC2RL	6635	Guayaquil, Ecuador

HOURS OF TRANSMISSION

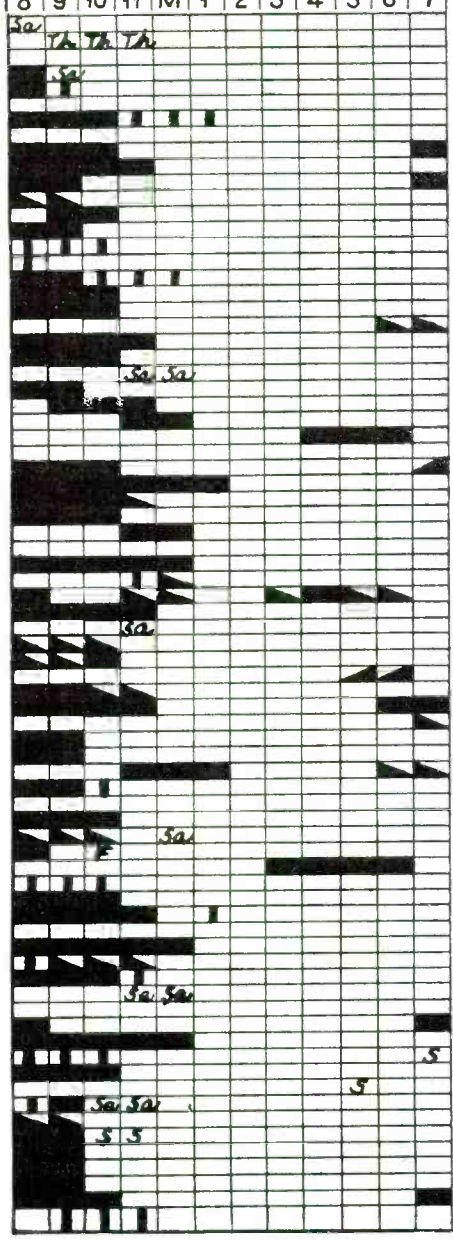
8 9 10 11 N 1 2 3 4 5 6 7



WORLD SHORT WAVE TIME-TABLE

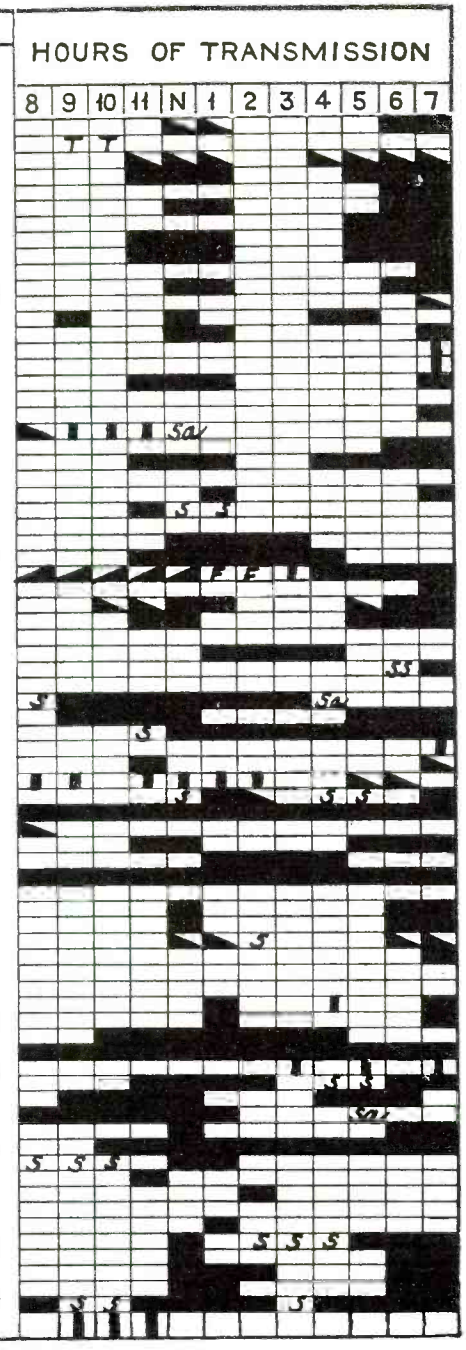
Compiled by the Editors of RADIO NEWS

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



EASTERN STANDARD TIME

Wave-length Meters	Call Letters	Frequency Kc.	City Country
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	Cancti 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
48.70	VPB	6160	Colombo, Ceylon
48.70	CJRO	6160	Winnipeg, Canada
48.72	YV5RD	6158	Caracas, Venezuela
48.78	VE9CL	6150	Winnipeg, Canada
48.78	HJ2ABA	6150	Tunja, Colombia
48.78	HJ5ABC	6150	Cali, 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
49.20	HJ4ABE	6097	Medellin, Colombia
49.26	CRCX	6090	Toronto, Canada
49.30	HJ5ABD	6085	Cali, Colombia
49.31	HJ3AVF	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	5015	Mexico, D. F., Mexico
49.90	HJ3ABH	5012	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
50.50	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	HI1J	5865	San Pedro, D. R.
51.46	TIGPH	5830	Alma Tica, Costa Rica
51.72	YV5RC	5800	Caracas, Venezuela
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

SHORT WAVE FLASHES

BY CHARLES A. MORRISON

EACH month this department will feature 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.

All frequencies in the column are given in *megacycles* and all time is *Eastern Standard Time.*

TI4NRH'S 10th Anniversary Programs

Pioneer broadcaster TI4NRH (9.7), "The Voice of Costa Rica," which, while using the call NRH, became world-famous with a power of but 7½ watts, shares along with G5SW, PCJ, W8XK and W2XAF, the distinction of being one of the first five regular short-wave broadcasting stations in the world. During the month of May it will celebrate its 10th anniversary on the air by broadcasting several gala programs dedicated to leading radio clubs and publications.

The most outstanding programs of this series, to be broadcast between 9 and 10 p.m., will be as follows: on May 5th dedicated to RADIO NEWS ("which taught me the way how to make and enjoy radio," says Senor Cespedes); May 7th to Chicago Short Wave Radio Club; 10th to International Short Wave Club; 16th to KDKA; 18th to International Dx'ers Alliance; 22nd to Quixote Radio Club; 24th to Newark News Radio Club; 27th to British Short Wave League; 29th to the A.R.R.L. and 31st to WGY.

Those sending in reports (preferably by airmail), enclosing a dime for handling, to Armando Cespedes Marin, TI4NRH, Heredia, Costa Rica, will receive a beautiful three-color lithographed diploma (14x18"), suitable for framing.

"Paris Mondial" Makes Its Debut

The new 25 kw. French short-wave transmitter, at Essarts-le-Roi, near Paris, which together with the older Pontoise stations, is now known as "Paris Mondial," replacing the former call of "Radio Coloniale." It went on the air for initial tests last November, and officially inaugurated a regular broadcasting schedule on April 1st as follows: 1 to 3 a.m., directed to eastern Mediterranean and N. Africa, on 9.57 mc's, in parallel with TPA3 (11.885), Pontoise, directed to Africa. Near East and Australasia; 8:30 to 10 a.m., to Indo-China, on 17.78, in parallel with TPA2 (15.243), which starts this transmission at 5 a.m.; 10:15 a.m. to 5 p.m. to eastern Mediterranean and N. Africa, on 9.57, in parallel with TPA3 (11.885), directed to Africa and South America; 6 to 8:15 p.m., to South America, on 15.13, in parallel with TPA4 (11.714), directed to North America, eastern Central America, and northern South America; 8:30 to 11 p.m., to North America on 11.885, in parallel with TPA4 (11.714), directed to North America, and western Central America. On this last transmission, which is heard with excellent strength in the United States, the news in English is given nightly at 10 p.m.

Complete calls, and frequencies assigned to the new transmitter are as follows: TPB1 (21.49), TPB2 (17.78), TPB3 (17.765), TPB4 (15.295), TPB5 (15.24), TPB6 (15.13), TPB7 (11.885), TPB8 (11.845), TPB9 (11.72), TPB10 (9.585), TPB11 (9.57), TPB12 (9.55), TPB13 (9.52), TPB14 (6.145), TPB15 (6.09) and TPB16 (6.04).

New Short-Wave Stations (On the Air)

ARGENTINA—LRA (9.69), "Radio Medistaro," Buenos Aires, broadcasts nightly from 7 to 9 p.m. A clock similar to Big Ben strikes at 7 p.m. Send reports to LRA, "Palacio de Correos y Telegrafos," Buenos Aires. . . CAMEROONS—A station at Duala, is broadcasting irregularly on 12.712. . . COSTA RICA—TIRS, or TI2RS, "Radio Athenea," San Jose, broadcasting nightly on 7.445, 7 to 11 p.m., signs-off with Ted Lewis', "Good Night Melody." . . DOMINICAN REPUBLIC—HI5E (9.55), Trujillo, 10 watts; HI5G (6.66), La Vega, 30 watts, owned by Jose J. Secin; HI5P (6.565), "Ecos del Isabel de Torres," Puerto Plata, and HI6H (6.6), Trujillo, 25 watts, owned by Luis A. Prince, are all broadcasting irregularly.

INDIA—The new Madras station was inaugurated in April. . . LIBERIA—ELM (5), reported to be broadcasting daily at noon and 4 p.m. . . PERU—"Radio Rancho Grande" (12), Trujillo, first heard on March 12, is now broadcasting from 6 to 7:45 p.m. . . U.S.S.R.—An anti-Stalin Soviet station on 10.03, location unknown, came on the air March 28. Has been heard on 10.225, at 5 p.m., on 9.69 at 4:57 p.m., and on 11, at 5:51 p.m.; signs-off with the "Internationale."

(Under Construction)

ABYSSINIA—A 1 kw. station at Addis Ababa, will come on the air in 1939. . . GERMANY (AUSTRIA)—The new station under construction at Vienna, will operate on 6.073, and 11.8, when completed. . . IRELAND—A 2 kw. station is being built near Moydrum. . . LITHUANIA—A station under construction near Kaunas, will utilize the following calls and frequencies when completed: LYZ4 (15.3), LYZ3 (11.9), LYZ2 (9.523) and LYZ (6.125). . . PERSIA—A 25 kw. station, under construction by the Marconi Co. to be installed near Teheran in 1939, will utilize directional aerials to Europe, North America, and Australia. . . TURKEY—"Radio Turkey," nearing completion near Ankara, reported heard in Havana, Cuba, while conducting preliminary tests on 10.71.

Notes of Interest

AUSTRALIA—Reports on VK3ME, should be sent to Amalgamated Wireless, Wireless House, 167 King St., Melbourne. . . BECHUANALAND—ZNB (5.905), Mafeking, has resumed broadcasts, transmitting daily from 6 to 7:30 a.m. and 1 to 2:30 p.m. . . BELGIAN CONGO—OPL (20.04), Leopoldville, phones Brussels near 2:15 p.m. . . BURMA—XYO (6.007), Rangoon, is installing a new 1 kw. transmitter. . . CANARY ISLANDS—EAJ43 (10.37), Tenerife, is now relaying "Radio Nacional," Salamanca, Spain, nightly from 8 to 8:45 p.m. . . COLOMBIA—Reports to HJ7ABB (4.82), "Radio Santander," should be sent to P. O. Box 37, Bucaramanga.

COSTA RICA—TIGPH2 (5.813), San Jose, is off the air at present. . . DENMARK—The Danish Short Wave Station, thus far broadcasting as OZF on 9.52 mc. only, is adding two new frequencies, namely, OZH (15.165) and OZI (17.75). Initial tests on 15.165 were intercepted on March 30, from 6:15 to 6:30 a.m., by M. W. Soplop of Alleghany, New York. . . FRENCH INDO-CHINA—"Radio Saigon" (6.24), is being heard with good signals in California, from as early as 6 a.m. on Sundays to sign-off at 9:30 a.m. Announcements are in French and English.

GERMANY—DJO (11.795), Zeesen, is now broadcasting nightly from 7:15 to 10:50 p.m. The news in English at 10:30 p.m. is being radiated by DJO and DJB, while DJD transmits the news in Spanish simultaneously. . . AUSTRIA—OER3 (11.79), Vienna, signs-off with "Germany, Germany, Over All." . . HAITI—HH3W (9.645), Port-au-Prince, signs-off nightly at 9 p.m. with a bugle call. . . HONG KONG—ZBW3 (9.525) heard testing one afternoon near 7 p.m. on a new frequency of 9.59, and requesting reports.

MARTINIQUE—"Radio Martinique (9.7)," Fort-de-France, is now verifying reports. . . MEXICO—XETM (11.73), Villahermosa, is off the air; XEWW, Mexico, D.F., is broadcasting irregularly on its optional frequency of 15.16. Recently inaugurated station XEYU (9.602), Mexico, D.F., signs-off a little after 11 p.m. with 2 strokes on a soft-toned gong. . . NEW CALEDONIA—"Radio Noumea" (6.122), operated by Charles Gaveau, 44 Rue de C'Alma, Noumea, 25 watts, broadcasts Tues. and Sat. 3 to 4:30 a.m. and all correct reports will be verified. . . PITCAIRN—VR6AY, formerly VR6A (14.346), is now being operated by Andrew Young, the American engineers having left the middle of April. Reports of reception, which should be accompanied by a New Zealand mint stamp, should be sent to VR6AY, Andrew Young, Pitcairn Island, South Pacific.

SPAIN—"The Voice of Republican Spain," Madrid (9.855), thought to be the old transmitter of EAQ, is now transmitting to Europe daily 2:45 to 3:15 a.m. and 3:40 to 4:10 p.m. and to North America, from 6:30 to 7, and 7:40 to 8:10 p.m. . . STRAITS SETTLEMENT—Recently inaugurated station ZHP (9.53), Singapore, is being heard irregularly between 5:30 and 6:30 a.m. . . TAIWAN—In recent verifications, the call of the short-wave station at Taihoku is given as JFAK, while the authorized frequency is given as 9.636. News in English given daily at 10 a.m. . . U.S.S.R.—"Radio Center Moscow," has been logged from 5 to 6 p.m. and from 10 to 11 p.m., while making experimental transmissions on a new frequency of 6.03.

UNITED STATES—Orison Hungerford, operator of VP3THE, amateur base-camp station of the Terry-Holden Expedition, who thrilled hundreds of listeners with his interesting broadcasts from the interior of British Guiana, arrived back in New York, in April, after a hazardous 600 mile trek through the jungles to Georgetown.

Transmissions of Interest

YUGOSLAVIA—14th and last day of each month, 7 to 8:15 p.m., a special broadcast for North America, radiated by YUA (6.1), Belgrade, DJP (11.885) and DZC (10.29).

Daily—at 12:35, 7:05, 8:55 a.m. and 6:05 p.m., news in English over JZJ (11.8), *Tokio;* 12:10 to 12:55 p.m., Arabic hour from *Rome*, over 2RO4 (11.81) and IRF (9.83).

Sundays—To 2:30 a.m., DX programs over HJ1ABG (6.042), *Baranquilla*, and HJ1ABP (9.618), *Cartagena, Colombia;* 7 to 7:45 p.m., "League of Nations" broadcasts for North America, over HBO (11.402); 4:30 and 9:30 p.m., short-wave mail bag, over VE9HX (6.13), *Halifax, Canada.*

Mon., Tues., Thurs. and Fri., 8 to 10:40 p.m., North American program from *Prague, Czechoslovakia.*

Wednesdays, at 8:30 p.m., short wave hour, over W1XAL (6.04), Boston.

Thursdays, 10:45 to 11 p.m., "The SWL Chatterbox," over W8XWJ (41), *Detroit.*

Alternate Fridays (May 6, 22, and thereafter), at 10 p.m., messages from home to the Waldeck Expedition searching for Paul Redfern, somewhere in the wilds of *British Guiana.*

Saturdays at 3 p.m., a special broadcast from *Brazil*, over PSE (14.935); 5 to 5:30 p.m. a special broadcast directed to Brazil, over DZC (10.285), DZG (15.36) and DZH (14.46), all in *Zeesen, Germany.*

Revised Schedules

ENGLAND—From May 1 to Sept. 1, trans. I, from Daventry, will be broadcast daily from midnight to 2:15 a.m. . . PORTUGAL—CS2WA (9.65), Lisbon, Tues., Thurs., Sat., 3 to 6 p.m. . . SPAIN—*EAR* (9.488), Madrid, daily 6:30 to 7, and 7:40 to 8:10 p.m. . . SWITZERLAND—"Radio Nations": Sundays, 10:45 to 11:30 a.m. over HBH (18.48); 1:45 to 2:30 p.m. over HBQ (6.675) and HBJ (14.535), and 7 to 7:45 p.m. for North America over HBO: Mondays, 1 to 1:15 over HBO, and 1:30 to 1:45 a.m. over HBJ, and 6:45 to 8:30 p.m. for North America over HBO and HBJ.

UNITED STATES—General Electric stations at Schenectady, N. Y.: W2XAD on 21.52, daily 7 to 11 a.m. to South America; on 15.33, daily 11:30 a.m. to 5 p.m. to Europe, and 5 to 6 p.m. to South America; on 9.55, daily 6:30 to 10 p.m. to South America; W2XAF on 9.53, daily 3 to 5 p.m. non-directional, and 5 to 11 p.m. to South America. . . ITALY—2RO4 (11.81), Rome, daily 5 a.m. to 2:56 p.m. and 6 to 7:25 pm.; on 9.635, daily 3 to 5:55, and 7:30 to 9 p.m.

Frequency Changes

COLOMBIA—HJ2ABJ, Santa Marta, to 4.76. . . COSTA RICA—TIWS, Puntarenas, jumping from one spot to another, last heard of on 5.738. . . CUBA—COGF, Matanzas, to 11.8; COBC,

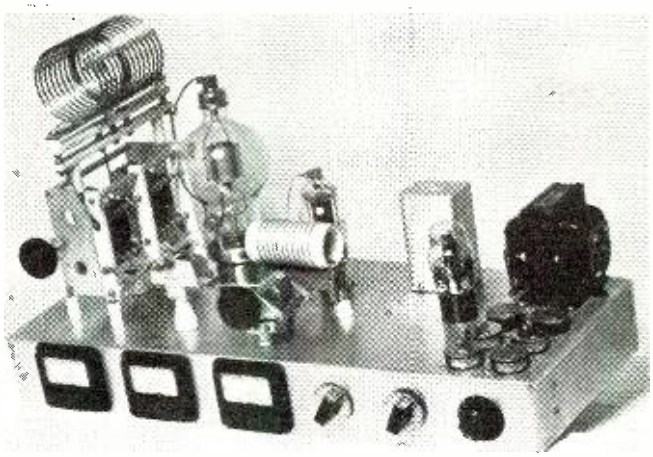
(*Continued on page 76*)

Transmitter Construction Simplified

by M. P. FIELDMAN

Photographs by the Author

The author describes a 500w CW rig, using but 3 tubes, and having 6 different xtal controlled frequencies.



Metalized bread-board construction was followed by the author, but rack and panel design can be used.

ALTHOUGH the following article is not presented as a scientific revelation, it is felt that the utter simplicity of the 500 watt transmitter to be described is of interest to many who desire moderately high power, occupying a minimum of space, at comparatively low cost.

In the process of design, the author set out to incorporate the following features:

1. Efficiency.
2. Small space requirements.
3. Minimum number of circuits and controls.
4. Ease of operation. Freedom from critical adjustments.
5. Frequency flexibility.
6. Fairly high power.
7. Least expenditure for above items.

As all of the items listed above are interdependent upon each other to various degrees, it was first necessary to decide upon just what kind of efficiency is desirable to evolve a transmitter having these characteristics. There are several angles from which to view transmitter efficiency, such as, plate circuit efficiency, overall power gain per stage, or watts output per dollar invested. It is apparent that no one of these precepts could be pursued religiously as in so doing it would not allow answering all of the seven desirable features set forth at the beginning.

If only high plate circuit efficiency in the final amplifier is to be considered, it is found that a large driver tube, preceded by several stages, is necessary to supply the enormous quantity of excitation required. To accomplish this, the expense, size, and number of circuits and controls of such a transmitter have become great. If only high power gain in the final amplifier is to be considered, it is found that an amplifier tube with low bias can be excited by a few watts from an over-loaded oscillator stage, as long as the amplier tube is not called upon to dissipate more electrical energy in the form of heat than its anode is able to safely dissipate. Although the plate circuit efficiency is comparatively low, a high power gain is provided. A transmitter fashioned on this principle certainly represents low cost for the power obtainable, small size, and a minimum of circuits, but the tubes and crystal are working under a strain, adjustments are very critical, and frequency flexibility, as far as multi-band operation is concerned, is minimized.

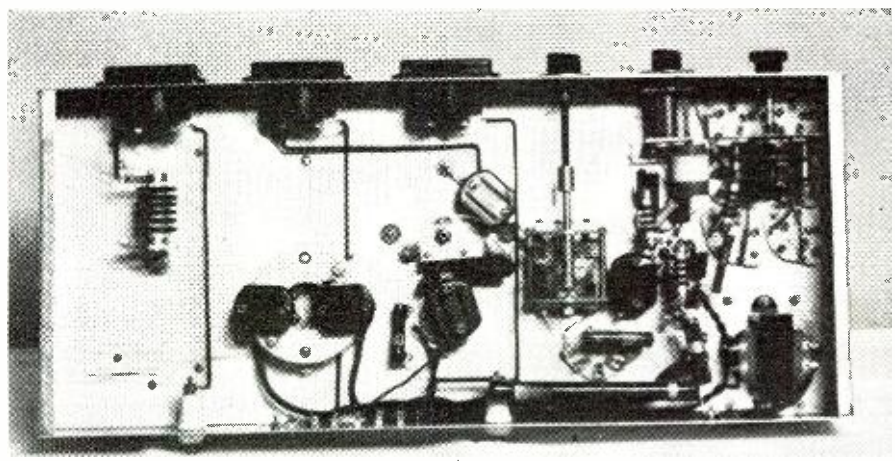
For example, an experiment with a 150T as an amplifier at 500 watts input revealed that a power gain of over 70 could be attained by biasing the grid so the angle of plate current flow was 180° and the driving power only 5.5 watts. This was at a plate circuit efficiency of 70%. Another experiment with the same tube at the same power input revealed that a plate circuit efficiency of 83% could be attained by biasing the grid so the angle of plate current flow was 110° and the driving power about nine times that required by the previous experiment. The power gain in this case was about 10.

Although it is realized that the two instances cited are the extremes of both plate circuit efficiency and overall power gain, these tests show that the comparatively great difference in driving power required in each case makes a small difference of only a few percent in plate circuit efficiency. Again, a difference of only a few watts output, between the two transmitters, represents a vast difference in size, expense, number of circuits and controls, and frequency flexibility.

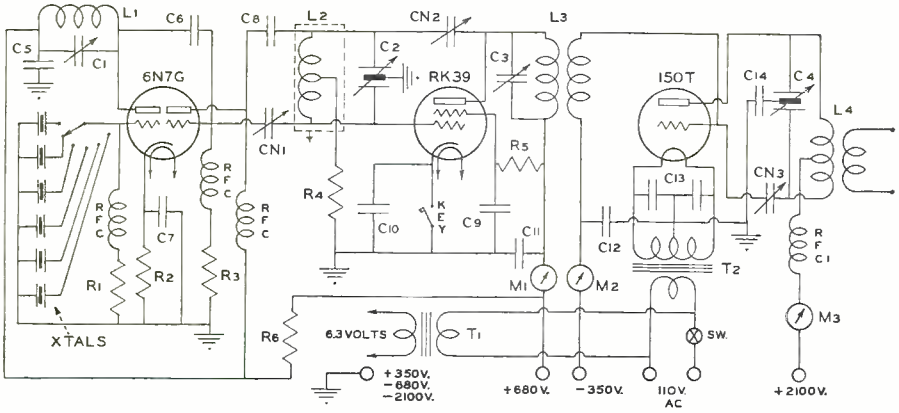
As far as expense is concerned, power supplies must be considered. Because of the prices placed on power supply components that make up a 3,000 volt supply, it is much cheaper to employ a power supply in the region of 2,000 volts. The difference between the 600 watts and 500 watts input, made available by using either the 3,000 volt or 2,000 volt supply, is not enough to warrant the great difference in cost or infinitesimal difference in effective signal strength at a distant receiving point.

Fortunately there is a happy medium where all accounts are satisfied. By incorporating the proper circuits, an inexpensive buffer-driver tube, and a 2,000 volt supply, it is possible to attain reasonably high plate circuit efficiency, frequency flexibility is realized, the size of the transmitter may be kept small, and the cost is about half that of a large, multi-staged, 3,000 volt array.

The transmitter depicted here possesses all of the seven features mentioned in the beginning. It is by no means presented as the absolute ideal in transmitter design as an attempt was made in its construction to utilize as much material as possible which was already owned by the author. It runs continuously at 500 watts input at reasonably high plate circuit efficiency, employs the cheaper 2,000 volt power supply, and requires only one large tube. In addition it has a minimum of circuits and controls, is flexible to the extent of having six frequencies in each of three bands (7, 14, and 28mcs.), occupies small space as the entire unit is contained on one chassis. Also it



Underside the 500w — 6 frequency transmitter chassis.



The circuit of the 500 watt CW transmitter.

C_1—100 mmfd. (Cardwell ZR100AS)
C_2—100 mmfd. per section (National TMS-50)
C_3—50 mmfd. 2,000 volt spacing (National TMSA-50)
C_4—50 mmfd. per section 6,000 volt spacing (TMA-50DA)
C_5—.005 mfd. mica 600 volt
C_6—.00005 mfd. mica 600 volt
C_7—.005 mfd. mica 600 volt
C_8—.0005 mfd. mica 1.000 volt
C_9—.005 mfd. mica 600 volt
C_{10}—.01 mfd. mica 1,000 volt
C_{11}—.002 mfd. mica 1,000 volt
C_{12}—.002 mfd. mica 1,000 volt
C_{13}—.002 mfd. mica 600 volt
C_{14}—.002 mfd. mica 5,000 volt
CN_1—30 mmfd. mica trimmer (National M30)
CN_2—Two pieces No. 14.B. wire 1 inch long running parallel .25 inch apart
CN_3—2-4 mmfd. 6,000 volt (Cardwell NA4NS)
R_1—5,000 ohm 1 watt carbon
R_2—400 ohm 10 watt wire-wound
R_3—20,000 ohm 2 watt carbon
R_4—50,000 ohm 3 watt carbon
R_5—30,000 ohm 10 watt wire-wound
R_6—10,000 ohm 75 watt adjustable wire-wound
M_1—0-200 d.c. milliameter (Triplett model 326)
M_2—0-100 d.c. milliameter (Triplett model 326)
M_3—0-300 d.c. milliameter (Triplett model 326)
T_1—6.3 volt 2.5 amp. trans. (Thordarson T61-F85)
T_2—5.25 volt 12 amp. Ct. trans. (Thordarson T74F23)
RFC—2.5mh. rfc. (National R-100)
RFC—2.5mh. rfc. 500 ma. (Hammerlund CH-500)
Coil data for 7, 14, and 28 mc. operation
L_1—All bands 18 turns 1" dia. close wound
L_2—7mc.—28 turns 1" dia. No. 14 spaced and air-wound. (See text)
14 and 28mcs.—16 turns 1" dia. No. 14 spaced and air-wound
L_3—All dual windings. (See text)
7mc.—each winding 28 turns No. 18 on National UR13 form
14mc.—each winding 11 turns No. 14 space wound on UR13 form
28mc.—each winding 5 turns No. 14 space wound on air and supported by a National PB5 plug-in base
L_4—All coils center-tapped and equipped with 3 turn link coil
7mc.—24 turns 3" dia. No. 10 wire air and space wound to a 6" coil length
14mc.—14 turns 3" dia. No. 10 wire air and space wound to a 6" coil length
28mc.—8 turns 3" dia. No. 8 wire air and space wound to a 6" coil length

is free from any tricky circuits or critical adjustments, and represents comparatively little expenditure considering the results obtainable.

The line-up consists of a 6N7G in the familiar dual triode circuit using one of the triodes contained therein as a crystal oscillator and the other triode section as a buffer-amplifier or buffer-doubler, depending upon which amateur band is being used. The oscillator employs a switch allowing the selection of any one of six 7mc. crystals. The buffer section works into a split-stator tank circuit which simultaneously provides means for exciting the following RK39 and permanently neutralizing both the 6N7G buffer section and the RK39 by capacitors CN1 and CN2, respectively. The 6N7G output section is neutralized so that it may be operated on the crystal frequency when so desired, but the RK39 is neutralized as a precautionary measure although it is a screened tube.

Too many instances of trouble from this source have been noted where neutralization has been omitted from tubes of this type. A little foresight in applying the minute amount of capacity necessary to neutralize this stage was found to be a well worth while contribution to trouble free operation. From here, the RK39 driver is *unity-coupled* from its plate circuit to the grid circuit of the 150T. This type of coupling has been found to be highly efficient and eliminates another tuned circuit as is necessitated by link coupling. The plate circuit of the 150T is the conventional split-stator condenser and center-tapped coil arrangement, so requires no explanation. This output circuit is link coupled to whatever antenna system is employed.

Lately, newer tubes than the 150T have been placed on the market, such as the 100T and 250T series, which may be used to advantage. In the case of radiotelephony, whether or not the high or low mu tubes would be used to replace the 150T would be determined by the type of modulation to be used. For a system of high level modulation, it would be better to employ the high mu type of tube because of its low excitation requirements. For a system of low level modulation, it would be better to use the low mu type because of its superior output linearity. However, for purely c. w. work, the low excitation necessary for the high mu type of tube is an advantage.

The whole radio frequency portion of the transmitter is mounted on one of the popular cadmium plated chassis measuring 10"x23"x3". Three square type meters are each permanently connected in their respective circuits as shown in the diagram. No meter is shown in the plate circuits of the 6N7G as it was not considered a necessity. However, these circuits have been metered when the transmitter was originally put into operation.

The power supplies, of which there are three, are built on another chassis of the same dimensions as that supporting the radio frequency unit. There is a 2100 volt supply for the final amplifier, a 680 volt supply for the RK39 driver, which is dropped by a resistor to 280 volts for the 6N7G, and a 350 volt supply to provide a negative grid bias for the 150T. The circuits used for the power supplies were chosen to utilize as much equipment that was already on hand as possible. The two filament transformers necessary to provide 5 volts for the 150T and 6.3 volts for the RK39 and 6N7G are mounted on the radio frequency chassis, one on top and the other directly below it under the chassis.

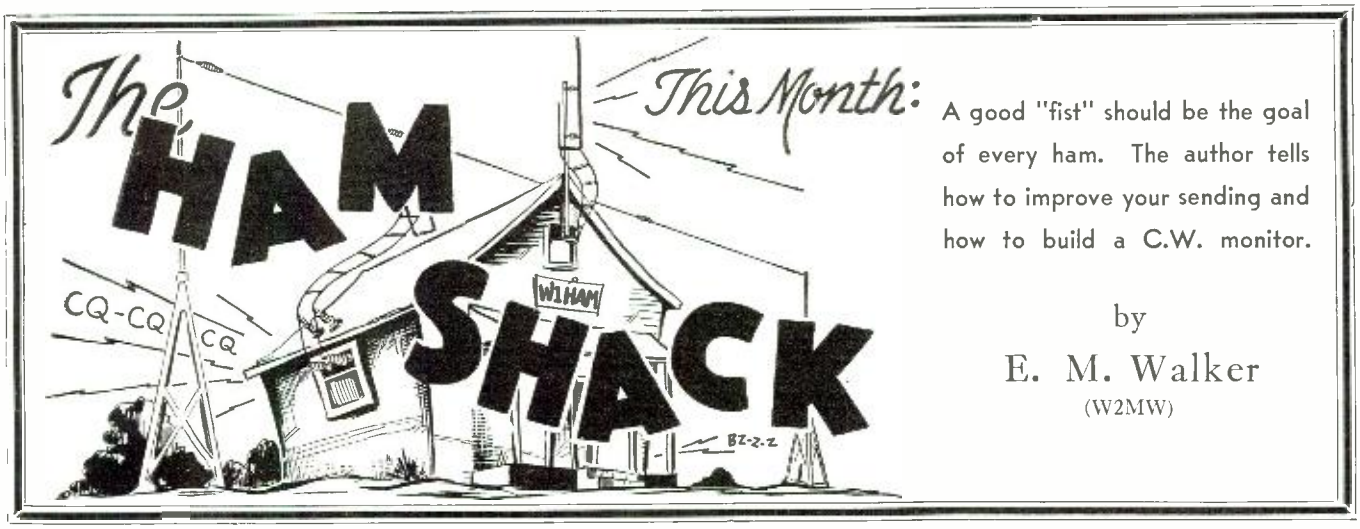
As this particular transmitter is not used on frequencies below 7 mcs., the crystal oscillator plate coil was mounted permanently on its tuning condenser under the chassis. For those who desire to use this type of transmitter on 3.5 mcs., as well as the higher frequency bands, this oscillator coil can be made on a plug-in form so that the proper inductance for the lower frequency crystals may be used. The coil used between the 6N7G output circuit and the grid of the RK39 is a shielded plug-in unit. For operation of the transmitter on 7, 14, and 28 mcs., only two coils are needed for this position, one wound for 7 mc. for operation on that band and one wound for 14 mcs. for operation on 14 and 28 mcs. These plug bases and shield combinations are the National PB10 five prong type, and the inductances constructed therein are air-wound, self-supporting coils of No. 14 wire. When the transmitter is used on 28 mcs., the RK39 functions as a doubler. The plate circuit coils for the RK39 are the unity-coupling coils and are each made up of two windings of equal number of turns interwound between each other turn to turn. Here, three coils are necessary for 7, 14, and 28 mc. operation. Those for 7 and 14 mcs. are wound on National UR13 plug-in forms, while for 28 mcs., the form is left out and only the plug-in base is used to support the air-wound 1:1 ratio coils. The final amplifier coils are interchangeable and, as usual, one coil is needed for each band used.

Under fully loaded operating conditions, the potentials and currents applied to each stage are as follows: 6N7G plates, 280 volts at 65 ma., RK39 plate, 680 volts at 85 ma., 150T grid, —350 volts at a rectified grid current of 55 ma. on 7 and 14 mcs. and 35 ma. on 28 mcs., and the 150T plate, 2100 volts at 235 ma. The anode of the 150T shows no color when operating on the two lower frequency bands, but on 28 mcs. it shows a faint, dull red.

The transmitter is keyed, for c. w. work, in the cathode of the RK39. For radiophone operation, the RK39 driver is modulated and the final amplifier is run as a linear. Those who desire to employ the usual methods of high level plate circuit modulation, will probably find it necessary to use a final tank circuit condenser of higher voltage rating than the one shown because of the extremely high peak voltages developed. The condenser used in this transmitter is entirely adequate for c. w. and low level forms of modulation, and was also used because it was already on hand.

Exact constructional details are not given as the foremost purpose of this article is to provide a nucleus from which other combinations of tubes and circuits may be arranged to appease individual tendencies, rather than to present an ideal mechanical layout. Many will prefer to use their own pet harmonic oscillator cir-

(*Continued on page 77*)



A good "fist" should be the goal of every ham. The author tells how to improve your sending and how to build a C.W. monitor.

by

E. M. Walker

(W2MW)

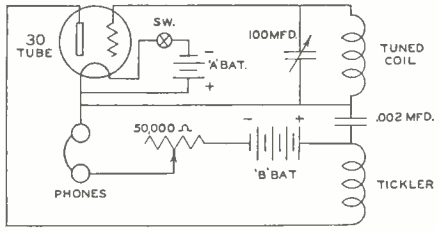
WHAT is it that makes a good C. W. operator? That is a question that is difficult to answer. One listen on any C. W. band reveals a wide variety of "fists" ranging from the beginner who is diligently attempting to master his key, to the "old timer" who is still "not so good"; to the amateur who sounds like a commercial and perhaps is an ex-commercial!

In observing operating conditions on the C. W. bands, whenever a poorly operated station was heard, an attempt was made to contact the operator to find out how long he had been an amateur. Strangely most of the poor operators were persons who had been in the game some time. Their chief fault seemed to be they attempted to send too fast, with the result they acquired the sloppy habit of running dots and dashes together, and leaving insufficient space between words to help the man on the receiving end to read his signals easily. On the other hand, most beginners were inclined to be more careful with their sending. Their only fault was they transmitted a little slowly, and that is really not a fault except to the good receiving operator who becomes a little impatient with the slow sending operator. Most persons in this category forget they were beginners once, too.

Every amateur should learn to use a straight key first. One important rule is that at no time should an attempt be made to send faster than can be received. This seems to be a common fault. The slow, direct sender usually can be understood easier through interference than the one who attempts to send too fast.

There seems to be no cardinal rule on how the key knob should be held. The way it is the easiest to send dots and dashes is best. However, the majority of persons grip the key firmly with the first three fingers and allow the thumb to slide slightly under one side of the knob. The wrist should be free several inches above the table. The elbow may be rested at the edge of the table. By pressing the key with a wrist motion rather than a finger one, once this motion is mastered, it will be possible to send for long periods without tiring.

The beginner should practice sending by the hour before he goes on the air. He should adopt a definite spacing practice, and send to himself until this degree of spacing becomes an unconscious habit. Arbitrarily, he should make his dots about one-third as long as his dashes. Spacing between letters should be equivalent to about two dashes, and about three dashes between words. Spacing between words is of great help to the man on the receiving end, even though he may be an exceptionally good operator. This spacing is extremely helpful on a QRM'd signal. It permits the receiver to pick up the continuity much more quickly than he could if he had to copy a series of letters until he got a complete word before he picked up the sender's thoughts.



The battery operated CW monitor helpful in improving your "fist."

Every C. W. operator, good or bad, should send to himself occasionally. This is best done with an audio oscillator or buzzer of some kind. He should take a newspaper, and send two or three columns, and at the same time pay careful attention to his spacing. It is much easier to check the characteristics of one's sending by using printed matter than by "talking" to one's self.

"Bug" keys are an excellent help to a poor sender, once they are mastered. Here again however, considerable practice is required, and no operator should attempt working a station until he is sure he has mastered its intricacies. One thing "bug" key operators seem to forget is that it is just as easy to send slowly with them as is is to send fast. Listening to the "bug" key operators on the C. W. bands, one gleans the impression that too many are being used without weights. The result is jerky sending.

Learning to use a "bug" key is something like learning the code. It may seem almost impossible to master, then suddenly it seems easy—almost a second nature. Here again the "grip" is a matter of comfort. The thumb is used on the knob side, and the first two fingers on the bar side.

Learning to send properly is only a matter of practice. Any one can master it. He should set as his goal a speed of between twenty-five and thirty words a minute. There is little call for faster speeds in amateur work. It is not so much that amateurs cannot copy fast, but because of crowded conditions prevalent on the bands, interference limits the ability to copy. Sending practice is necessary to keep the finger and wrist muscles limber. The beginner should practice until his fingers "learn" to "think" is the codal equivalent of a letter, i.e. when he thinks the letter "a" his fingers will make a dot and dash on the key without him having to go through the reasoning process of thinking "a — that's 'dot' 'dash'." When this point is reached speed and accuracy come quickly.

Sending often can be improved by providing a monitoring device of some kind, so the signal may be heard by the sender as it is being heard by the receiver. Too many operators sound as though they have no way of telling what they are sending. They transmit mistakes without bothering to correct them. It is extremely difficult, particularly for the beginner, to send accurately by listening only to his own key clicks. On the other hand it is practically impossible to listen to a signal in the receiver when it is adjacent to the transmitter due to the power tending to block the operation of the detector.

There are a number of methods that may be devised for listening to one's own signal. Perhaps the most practical is to provide a simple regenerative monitor that will give an accurate reproduction of the signal as it sounds on the air. Such a unit may be built around a type 30 battery operated tube. It consists merely of a tuning circuit, tickler coil, tube, and batteries. It costs only a few dollars to make. For best results it should be mounted in a metal cabinet which has space enough to accomodate the batteries.

The schematic wiring diagram for such a unit will be found elsewhere in this department. It consists of a coil tuned with a 100 mmfd. condenser, and a small tickler coil, both wound on a standard 1½ inch tube base coil form. The tuning coil for using the monitor on 80 meters should have

(*Continued on page* 83)

What's NEW in Radio

Columbia Broadcasting System has recently installed an intricate "stabilized negative feedback" system which results in increase in high fidelity characteristics of musical programs.

Raytheon Producton Corp. of Newton, Mass., has issued a bulletin No. 51 dealing with "Noise in Vacuum Tubes and Associated Circuits." Every engineer should read this.

Philco of Philadelphia announces a new 400 cycle output filter to block all signals going into the output meter except that of 400 cycles. A simplification of alignment is claimed.

NBC announces that by means of its new "reverse feedback" circuit, harmonic transmission is reduced to minimum on all of its network stations. The circuit was developed under the direction of O. B. Hanson, NBC vice-president and chief engineer.

Allied Radio Corp., Chicago, has brought out a new Knight 60 watt amplifier featuring the following: AVC, AVE, dual tone control, master gain control, 6 input channels, universal output, 5 channel mixer, inverse feedback, etc.

Dumont Electric Co., New York, N. Y., introduces the first dry electrolytic condenser which will operate continuously up to 585 volts. It can stand a peak of 700 volts and automatically heals if broken down by momentary overload above that point.

A new line of small etched foil tubular dry electrolytic condensers to be known as "Sprague" Atoms has been introduced by the Sprague Products Co., North Adams, Mass. An 8 mfd. unit with 450 v. measures 1⅝" long by ¾" diameter.

The Clarion Institute of Sound Engineers, by the Transformer Corp. of America announces a new line of "unified" sound systems from 5 to 70 watts in both fixed and portable models. The line features beam power tubes, dual stage reverse feedback, luminous "glo-dials," multi-output transformers, and dual line input voltage transformers.

Bud Radio, Inc., Cleveland, Ohio, announces a new type 6L6 neutralizing condenser for use with such tubes as the 6L6, 6V6, RK39, 807, etc. Heavy aluminum plates 1" in diameter highly polished with rounded edges are used.

Clarostat Mfg. Co., of Brooklyn, N. Y., has extended its line to include tapped controls and auto-radio controls. The correct total and tapped resistance values are assured to match any existing set requirements.

Automatic Devices Manufacturers, Chicago, have brought out the "B-6" unit. It is an automatic push-button unit which has been life tested by operation in excess of 100,000 times. Of the self-cleaning wiping type it can be attached to any superheterodyne.

The Transducer Corp., New York City, has just released a new metal display stand to feature its 4 microphones. A widespread survey made by the manufacturer indicated a demand for this method of display.

I. R. C. has added the Silent Spiral Connector to all IRC Metallized Type Controls. This makes the controls permanently quiet and trouble-free, it is claimed.

The same corporation announces a completely new and attractively printed 12 page catalog detailing the complete merchandise line of IRC Standard Resistors and Volume Controls.

A 300 watt power plant, especially suitable for radio receivers, transmitters, sound amplifiers, and other AC equipment, is announced by the Kato Engineering Co., of Mankato, Minn. Model 21A furnishes 300 watts at 110 v. AC and also about 25 Amp. DC at 6 v. Quiet in operation, its speed is about 1,800 rpm. It is gas driven.

A new series of Carbon and Crystal "Military-Type" Hand Microphones has been brought out by Shure Brothers, Chicago. The type is small, light and compact, and may easily be slipped into the pocket when not in use. "Press-to-Talk" button is optional; and exclusive new anti-noise close talking models based on new principles are also available.

The Bell Sound Systems, Columbus, Ohio, has just announced a new combination mobile system, Model M-24. It offers for the first time a system that may be used for mobile and fixed use. Inputs for 6 volts DC and 110 AC are provided. No internal changes are needed to go from one line to the other, and the change is taken care of with the shifting of cables.

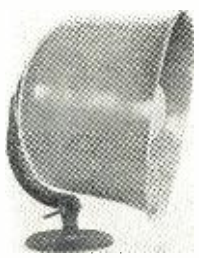
Wholesale Radio Service Co. of New York announces the new Lafayette 70-100 watt "Trans-Portable" P.A. system. It features 4 beam power tubes, AVC, AVE, Cathode ray "Eye" output indicator, mixing and fading facilities, etc. 14 tubes are used in the 5 stage circuit. Also a newer and more powerful line of "coordinated" Sound Systems ranging in size from the "Ultra Compact" 5-8 watt system to the new super power 125-180 watt rig. The latter is the first of its size to be included in any standard line of P.A. equipment.

Thor Radio Co., established 1920, has moved its quarters to 60 Dey Street, N. Y. C.

Emerson Radio & Phonograph Corp. of New York City have released Service Notes for the Chassis AW and Chassis AR of their 1938 Emerson Radio sets.

Aladdin Radio Industries of Chicago announce the new Aladdin PBH Pushbutton Tuner specially designed for stability and elimination of frequency drift. The tuner is designed for use with superhets with IF's set at 456-465 KC. The unit has 6 buttons and provides coverage from 540 to 1630 KC.

Crosley Radio Corp. announces that they have applied for a patent on a new type automatic tuner auto radio to sell for about $25. The feature of the unit is that it is looked at as a safety device in line with the drive by municipalities to reduce driving hazards. The trade name of the set is "Crosley Safety-Tune Fiver Roamio."



Atlas Sound Corp. of Brooklyn, N. Y., releases a new type outdoor speaker unit which is storm proof. They claim that the horns will resist any rain and will operate without the cone getting wet. They are ideal for police work.

Pierce-Airo, Inc., of New York City, have released a new DeWald Model 531 "pee-wee" radio and phonograph combination operating from 110 v. AC or DC. Ideal for the camper or traveler.

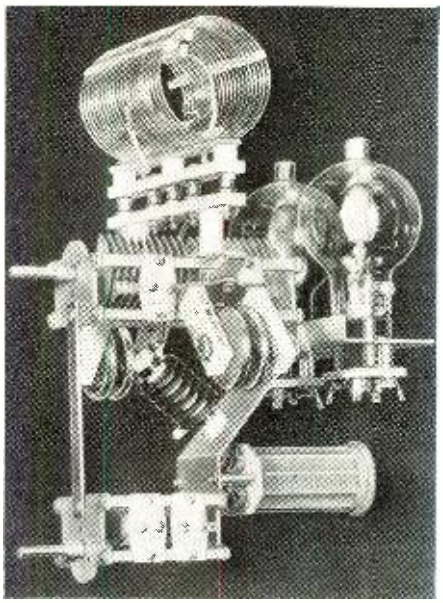
New mutual conductance tube testers, models numbered T-53-P and T-53-C have been brought out by the Hickok Electrical Instrument Co. of Cleveland, Ohio. These have illuminated meter dials, with indication in Micromhs as well as "good, bad, and doubtful." Only one setting is necessary. Sufficient plate current and voltage to check tubes accurately is furnished.

R. C. A. of Camden announces a new C.R. tube No. 902. It has a 2" screen and operates with anode voltages as low as 400 and 600 volts. It is provided with 2 sets of electrostatic plates for deflection of the electronic beam. The screen furnishes a green trace.

Hammerlund Mfg. Co. of New York City have released a unit for use in the construction of amateur transmitters. It is designed to accommodate circuits of the power amplifier or final stage of the ham transmitter with tubes having ratings of from 100 to 300 watts per pair.

Utah Radio Products Corp. of Chicago announces 2 new speakers, one a PM dynamic and the other an Electro-dynamic. Both are 3½" units. Specifications: Field coil 450 ohms, voice coil 3½ ohms, output 5 watts, frequency range 200-8000 cycles.

Glenn H. Browning of Winchester, Mass., has brought out a new receiver kit for the experimenter, ham and serviceman. The finest parts are featured and extreme selectivity and good frequency output are results obtained if the manufacturer's instructions are followed.



The new Hammarlund Transmitter unit.

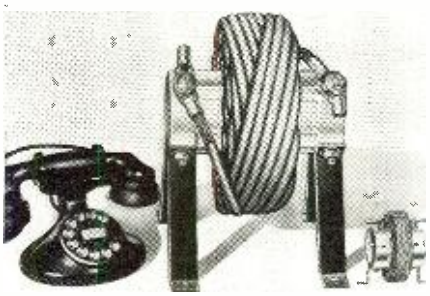
Webster Co. of Chicago releases a new amplifier model 2L-25 featuring multi-stage inverse feed back. Distortion at 25 watts is 2½%, frequency characteristics, plus or minus 1½ db. 50-10,000 cycles.

Amperite Company, New York City, N. Y., have brought out the smallest complete velocity mike ever manufactured. Size: 1¼" x 2⅜" x 1⅜", weight 1 lb. Frequency response 60-7500 cycles, plus or minus 2 db. Usual velocity mike output.

A new precision tuner has been announced by the Franklyn Mfg. Co. of New York City. It is readily adaptable for all types of home and auto receivers.

RCA of Camden, N. J., has released a "local" receiver featuring high fidelity reception and known as the "Symphony" model. Stylized cabinets of period design are used.

Same corporation has brought out a new AC operated signal generator for the serviceman incorporating one of the largest dials ever used on such an instrument. Frequency range is from 100 to 30,000 kc., with a maximum output of 1 volt. The pointer travel in the scale is over 50".



A heavy duty duo-lateral wound radio interference filter choke has been developed by the Miller Radio Products Co. of Los Angeles, Calif. They are used to eliminate interference from large neon and flasher signs. They weigh approximately 30 lbs. for the larger unit and 1 lb. for the smaller one. The former is rated at 150 amp., the latter at 5 amp.

(*Continued on page 78*)

Henry F. Kroeger, Jr. Foto

Installed in a Taylor Cub, the best location for the rig is on top of the dash. ←

AIRPLANE 56 MC Transceiver

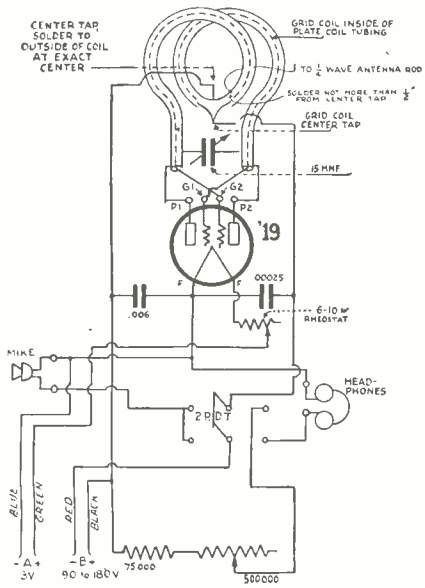
by M. N. Beitman
Engineer, Allied Radio Corp.

There is no thrill quite like that of contacting someone from a plane you are flying. The light-weight transceiver described is ideal for just that. Up to 40 miles range possible.

SINCE the Department of Commerce has changed the regulations enabling all who wish to pilot a plane under the direct supervision of a competent pilot to do so, many amateurs will want to fly themselves this summer. And they will want to tell their friends on the band about it. What better way than to make "skeds" with some on the five meter band and contact them from the air. Under the FCC "regs" this is possible without a special license other than that of the regular amateur!

The 56mc rig described in this article has the advantage of being very light and having the batteries in a separate compartment so that the weight may be divided, an important thing in flying.

The installation in the plane is simplicity itself. The set may be held on the lap, or may be fastened down on the cowling with cord. A shielded wire cable reaches to the battery box which may be installed in the baggage compartment. A trailing wire of 12' or one of 8' suspended between the wings, or between wing and tail empenage will suffice as an antenna.



The wiring diagram of the 56 mc. transceiver.

Although the input is less than .3 watts, contacts up to 40 miles have been accomplished with ease. With a plane at an altitude of over 5000 feet, this range will be materially increased. It is pleasant to fly cross country and contact amateur after amateur in the town you pass over. And do not worry about being able to make contacts! Any ham will be willing to test with you and that much more will be gotten from your flight.

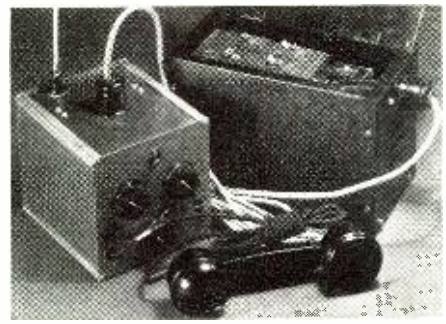
The little rig is also useful in boats, at regattas, and wherever light weight communication apparatus is needed. Can acts up to 5 miles over water are possible.

Since the distance covered by an ultra high frequency transmitter depends almost entirely on the height of the antenna above ground and very little upon the power, a simplified low powered circuit is used. A type 19 dual triode tube is used as a push-pull oscillator for transmission, and as a push-pull, super-regenerative detector for reception. The double pole double throw is employed to make the necessary circuit changes from "transmit" to "receive."

Grid modulation is employed, the microphone varies the grid bias at modulation frequency. The transmitter will not oscillate with the microphone lying flat. This phenomenon may be illustrated by holding a single turn of wire attached to a pilot light near the tank coil. With the microphone in the upright position, the unit will oscillate and the light will light brightly.

The plate coil is made of two turns of 3/16" copper tubing. The diameter of the coil is two inches. For unity coupling the grid coil is placed inside the plate coil. The center tap of the grid coil is brought out through a hole in the tubing. The tuning is accomplished with a 15 mmfd. variable condenser. Since both the rotor and stator plates of the condenser are above ground potentials, the unit is mounted away from the control panel to eliminate possible body capacity. An insulated extension shaft permits the control of the condenser.

The complete transceiver shown below includes a shielded cable to minimize fire.



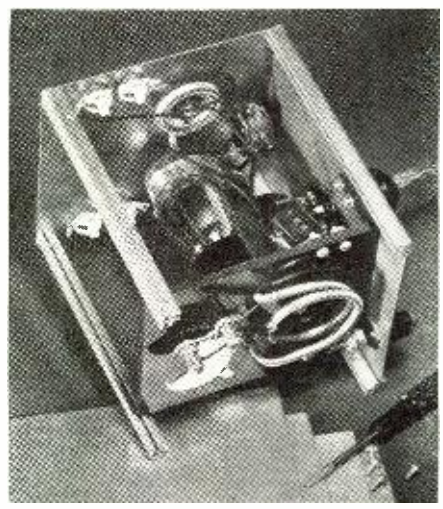
The rheostat control on the right of the panel should be adjusted to apply two volts to the filament of the tube. This control should be advanced about one-third of the way for efficient operation and long tube life.

The 500,000 ohm variable resistor placed on the left side of the panel is used in connection with reception and has no effect on transmission. The setting of this control is critical, but once found will require little further change.

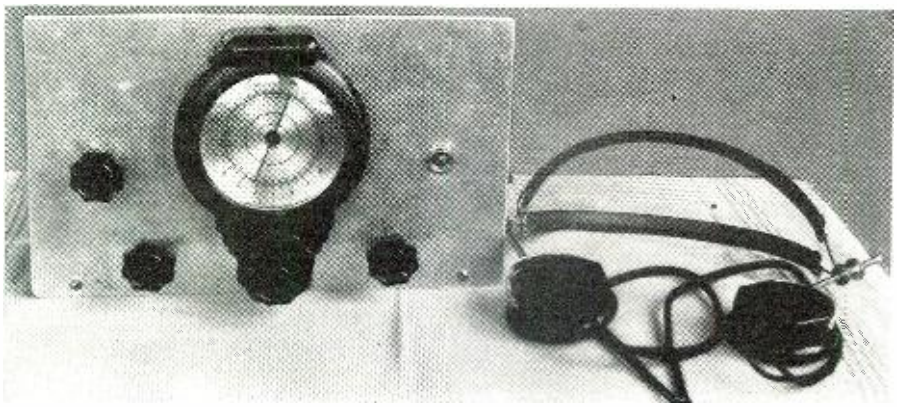
The batteries are kept in a separate container and connected to the transceiver with a four conductor shielded cable. Common ground to the shield of the cable, and the metal cases eliminates the possibilities of sparks starting a fire. A three-volt "A" battery should be used and from 90 to 180 volts "B" battery. The higher plate battery will increase the power output. The antenna may be a rod 4 feet long, or a hanging wire 12 feet long.

Before placing the transmitter portion in

(*Continued on page 77*)



Short tube socket leads are very necessary.



Compact and simple to operate, the AC Skipper will bring in those DX stations with a decent antenna. A good standby rig.

The A. C. R. N. Skipper

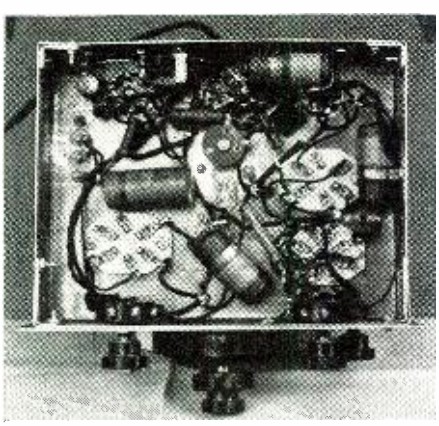
by HARRY D. HOOTON, W8KPX

Photographs by author

The author describes the AC operated counterpart to the battery "Skipper." Complete constructional details are included. Something for every DX fan.

SINCE the publication of the article on the four-tube, battery-operated "Skipper" receiver in the December, 1937, issue of RADIO NEWS, the author has received a number of letters from readers asking for an article describing the construction of an a.c.-operated model. The basic circuit of the receiver to be described here is the same as that of the original "Skipper" except for certain essential modifications and a more permanent type of construction. If carefully built of good quality parts, this little receiver is capable of really extraordinary performance and is ideal for either the ham beginner or the short wave listener. In fact, for several weeks the author actually used the model set shown in the photographs for 20 meter c. w. work.

As the photographs and drawings show, the circuit has been trimmed down to its bare essentials. No frills, gadgets or trick arrangements have been incorporated; all parts used are of standard manufacture and easily obtainable anywhere.



Underside the chassis shows short leads.

Electrically, the circuit consists of a 6K7 as tuned rf. stage, a 6J7 as electron-coupled regenerative detector, a 6C5 as resistance-capacity coupled audio amplifier and a 6F6 pentode as output.

The coils are the Hammarlund "XP-53," six-prong. plug-in type. A detachable coil shield covers the rf. coil and, therefore, eliminates any possibility of intercoupling between the two tuned circuits. Although designed primarily for headphone use, this receiver will produce sufficient volume on most short wave stations for comfortable speaker operation. The power unit, using a type 80 rectifier, is built up on a separate 6x4½x2 inch chassis in order to prevent any hum or noise which might emanate from that source.

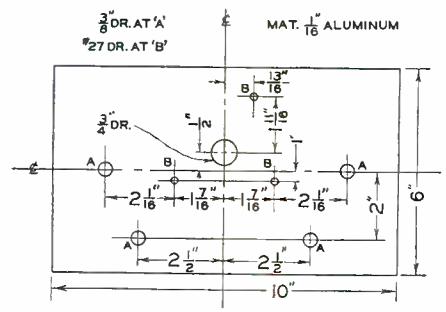
The receiver is built up on a 7x9x2 inch electralloy chassis and a 6x10 inch aluminum panel. These are cut and drilled to the specifications given. The layout shown is the result of considerable study and experimental work in an effort to obtain the shortest and most direct rf. wiring and any re-arrangement of the parts should not be attempted unless the constructor has had some previous experience in designing and building short wave sets.

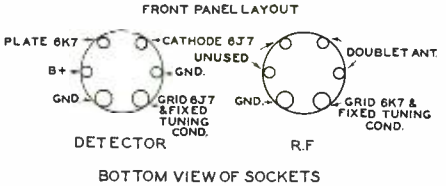
The construction of the set is not at all difficult. Lay out the chassis first as shown. Drill a small hole at the intersection of the lines and draw out the outline of the socket holes. The holes may be punched out with a commercial punch purchased for that purpose or cut with a circle-cutter or, if none of these are on hand, may be reamed out and then dressed down with a half-round file. Be sure to drill and cut *all* of the holes before any of the parts are mounted; the isolantite insulation is very easily ruined if metal filings or dust becomes imbedded in its pores. Cut the coil socket holes large enough so that there will be no danger of a short-circuit to chassis when the coils are being inserted or removed. Before mounting any of the parts, go over the socket holes and the other drillings with either a file or 00 sandpaper and remove all burrs and sharp points of metal that might possibly cause a short-circuit.

Mount the various parts, as shown in the photographs, fastening them in place with machine screws. The tube and coil sockets should be placed in the positions that give the shortest and most direct wiring between them and the other parts of the circuit. The various carbon resistors and paper condensers are mounted directly on the parts terminals themselves, their tinned leads being of sufficient stiffness to hold them in place.

Beginning with the heater circuit, connect the parts together with either the usual stranded or solid hook-up wire and solder each joint with a clean, hot and well-tinned iron and rosin-core solder. *Never use acid core solder on electrical wire.* Make sure the connections are really soldered and not merely stuck together.

The a.c. heater leads should be twisted together and placed directly against the chassis in order to prevent any hum from feeding into the audio amplifier. This is particularly annoying when using headphones with a high-gain audio system such as the one in this receiver. Do not allow the melted solder or rosin to run down over the insulation of the sockets, the coils or the tuning condensers. Wipe each joint with a clean cloth moistened in either carbon tetrachloride (Carbona will do) or alcohol to remove any excess flux. When soldering the connections to the paper bypass condensers be careful that these are not damaged by the heat from the iron. This is especially true of the 0.05 mfd. blocking condenser between the plate of the 6F6 tube and the crystal headphone circuit; *any small amount of d.c. leakage through this condenser will damage the*





crystal headphones hopelessly beyond repair.

After the wiring has been completed, go over each circuit carefully and check each and every connection against the diagram. If everything appears to be correct, place the tubes and the coils in their respective sockets and connect up the power supply unit as shown. Turn the a.c. (on the rear of the regeneration control) and B minus (at the upper right corner of the panel) switches to the "on" position and set the audio volume control about one-third way full-on. Adjust the regeneration control until a slight hissing sound is heard in the phones or speaker or until a sharp click is obtained when the *fixed plates* of the detector tuning condenser are touched with the finger.

If no hiss or click is heard even though the regeneration control is advanced fully-on, the tickler has probably been connected in reverse and it will be necessary to change these leads at the terminals of the coil socket. If a loud whistle or squeal is heard when the control is fully advanced, this would indicate too many tickler turns. Most manufactured coils have slightly more tickler turns than are necessary for cathode-regenerative detector circuits, especially those covering the lower frequency ranges. It will, therefore, be necessary to remove one or two turns at a time until the circuit just "slides" into oscillation when the regeneration control is advanced to about three-fourths way full-on. The adjustment of the 35 mmfd. r.f. trimmer is not at all critical and a single setting for each range is usually all that is required.

The power unit 6"x4"x2" chassis is cut, bent and drilled as shown. The three-section, 8-8-8 mfd., electrolytic condenser and one filter choke are placed underneath the chassis; the power transformer, '80 tube and one filter choke are placed above the chassis. This allows an extremely compact and neat constructional job.

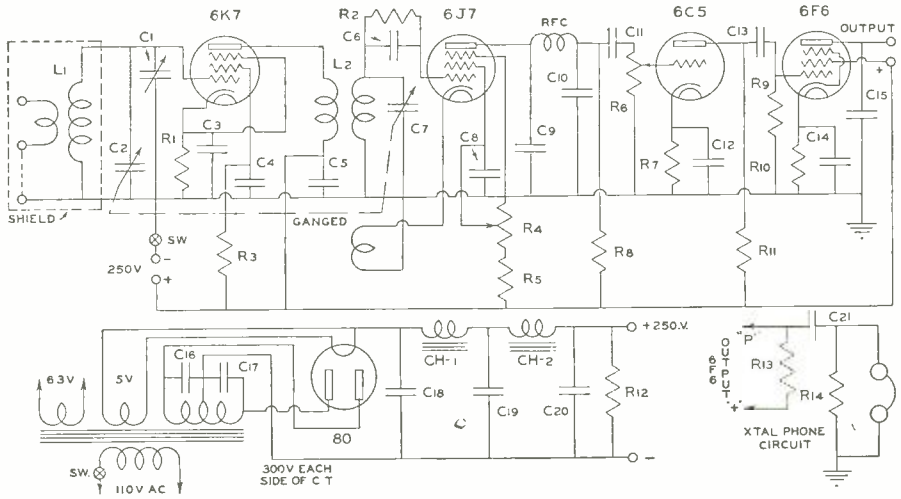
It is highly important that the electrolytic condensers, both those across the cathode-bias resistors of the 6C5 and 6F6 audio tubes and the filter condensers in the power unit, are connected exactly as indicated in the diagrams; if the polarity of an electrolytic condenser is reversed, the condenser will not only have no filtering effect but will be burned out immediately due to the heavy current flow through it. The paper dielectric condensers used throughout the set have one end marked "outside foil" or "ground" or have a colored ring or band; this terminal should be connected to "ground" (chassis) or, in the case of an audio frequency coupling condenser, to the grid of the tube. Use only good quality condensers of reliable manufacture. The use of "bargain" or odd-size condensers and resistors is always to be condemned as these are certain to be of doubtful quality and likely to "go out" at any time, perhaps causing considerable damage to the receiver or power unit. The extra few cents cost of the better units is a worth-while investment in trouble-free service.

The Crowe type 525 dial used on this receiver is a decided help in tuning for weak or DX stations. The two-speed planetary mechanism with its tuning ratios of 30:1 and 165:1, allows precision adjustments to be made with very little effort. Another desirable feature is the front-of-panel mounting which simplifies the panel drilling job considerably.

When the set has been wired coils for the respective bands may then be inserted and the set tested. The proper coil for the band may be found from the coil chart.

In copying code, the regenerative fea-

(*Continued on page* 88)



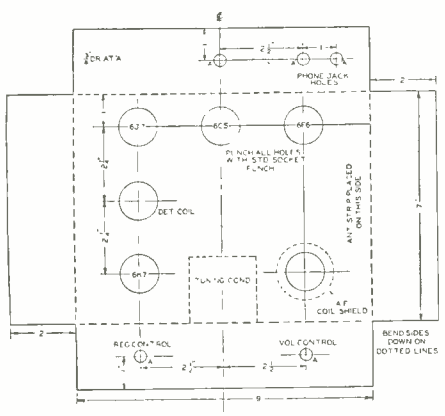
Circuit diagram of the AC Skipper.

C_1—35 mmfd. var.
C_2—140 mmfd. var.
C_3—.1 mfd. paper 50v.
C_4—.1 mfd. paper 200v.
C_5—.1 mfd. paper 200v.
C_6—.0001 mfd. mica.
C_7—140 mmfd. var.
C_8—.1 mfd. paper 250v.
C_9—.001 mfd. mica.
C_{10}—.0005 mfd. mica.
C_{11}—.01 mfd. mica.
C_{12}—10 mfd. paper 50v.
C_{13}—.01 mfd. mica.
C_{14}—25 mfd. paper 100v.
C_{15}—.006 mfd. mica.
C_{16}—.01 mfd. 600v. mica.
C_{17}—.01 mfd. 600v. mica.
C_{18}—8 mfd. 600v. electro.
C_{19}—8 mfd. 600v. electro.
C_{20}—8 mfd. 600v. electro.
C_{21}—.05 mfd. 600v. mica.
R_1—300 ohms 1 watt.
R_2—2 megohms ½ w.
R_3—100,000 ohms 1w.
R_4—50,000 ohm pot.
R_5—¼ megohm 2 w.
R_6—½ megohm ½ w.
R_7—2,000 ohms 5 w.
R_8—¼ megohm 2 watt.
R_9—½ megohm 2 watt.
R_{10}—500 ohms 10 watt.
R_{11}—50,000 ohms 2 w.
R_{12}—15,000 ohms 10 w.
R_{13}—50,000 ohms 2 w.
R_{14}—1 megohm 1 w.
CH_1—30 hy. choke.
CH_2—30 hy. choke.
SW—AC switch.
RFC—Radio Freq. Ch.

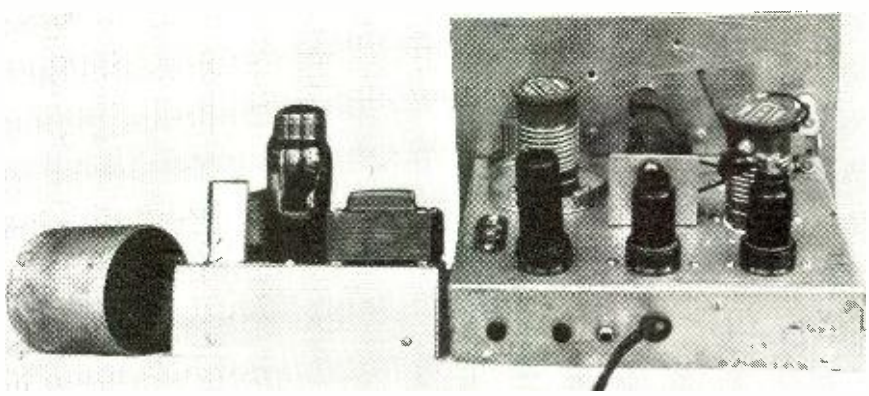
ALL COILS—HAMMARLUND "XP-53" 6 prong type

Range (meters)	* Space	Grid Coil Turns	Grid Coil Wire	Tickler Turns	Tickler Wire	Primary Turns	Primary Wire
17-41	1¼"	9	No. 16	5	No. 30	6	No. 30
33-75	1½"	18	No. 24	6	No. 30	12	No. 30
66-150	1⅝"	38	No. 26	11	No. 30	25	No. 30
135-270	1⅞"	82	No. 28	16	No. 30	47	No. 30
9½-20	1¼"	3	No. 14	3	No. 30	3	No. 30

** Spacing refers to length of winding on the coil form. All forms are 6-prongs, 1½" diameter. Ticklers on the filament end, ¼" from grid coil. Primaries wound between turns at filament ends of grid coils.*



Chassis construction details.



Coil cover on left; then power supply, and AC Skipper on right.

"RADIO Gadgets"

Fuses Save Dollars

A GOOD guess is that burned out transformers represent one of the largest single items of replacement cost in the radio game. Yet we radio experimenters go right on building receivers, transmitters and other equipment without fuses or other protective equipment to protect the relatively expensive power supply parts when, at a cost of only a few cents we could gain such protection.

An automobile fuse rated at 1 ampere, connected between the line and the power transformer primary, will do the trick for medium and small receivers. For larger receivers and small transmitters the same kind of fuses but rated at 2 amperes will do the trick and for larger transmitters the fuses should be proportionately larger in current rating. These fuses cost five cents each and the mountings about a dime. Certainly safety is cheap at these prices.

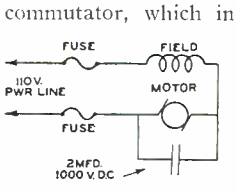
The proper place for the fuse is in the line input as mentioned. Then if a short circuit occurs anywhere in the filament or plate circuits of the receiver the fuse will go before the transformer can be damaged.

In equipment which employs more than one power supply, as in transmitters where the exciter, modulator and final stage may each have its own power supply, the line supply to each power transformer should be separately fused. Not only does this provide protection but when a fuse goes it will show the portion of the rig in which the trouble exists.

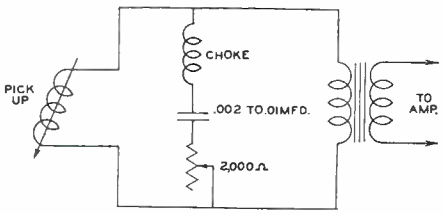
The best plan in selecting fuses for a given job is to figure the actual power drawn from the transformer, including all filaments, plates, pilot lights, etc. under conditions of maximum operating load. The power on the primary side will be somewhat higher than this, due to transformer losses. You will be safe to double this figure, convert it into terms of primary current by dividing this value (in watts) into the line voltage. Then use a fuse having a current rating nearest to this value. Doubling the power value as suggested avoids blowing the fuse as a result of normal surges that may occur.

Tips on Radio Noises

THE basic cause for the interference from small motors is due to dirt on the commutator, which in turn prevents the brushes from making correct contact, resulting in sparking. The first job to do is to clean the motor. If the frame of the motor is ungrounded make this connection, it helps greatly in minimizing this type of noise. If there is still some interfenence marring your reception, traceable to the motor, connect a 2 mfd.—1000v. condenser across the brushes. For very small motors, such as are used in hair driers, vacuum cleaners, and soda mixers, 0.5 mfd. condenser will do the trick.



In the case of a refrigerator or furnace control, try connecting an 0.25 or 0.5 mfd. condenser across the input. From hard usage the thermostat contacts of these devices, often become mechanically defective, resulting in sparking and considerable radio noise.

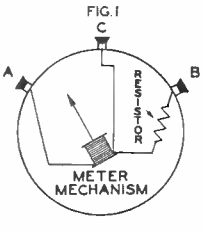


Homemade Scratch Filter

A SCRATCH filter generally consists of a choke, condenser and a resistance connected in a series-resonant circuit. It is connected directly across the input transformer of the pick-up and is employed to attenuate the hissing frequencies caused by the needle scratch. The choke can be a 1500 turn honeycomb coil or a standard 125 or 85 millihenry choke. All three units are obtainable from any radio store but if the reader wants to roll his own, wind approximately 1800 turns of No. 28 d.c.c. wire on a form 2 inches in diameter by 1½ inches long.

Increasing Voltmeter Utility

EVERYONE who experiments with radio or electricity is equipped with a voltmeter of some type but many are not fortunate enough to own milliammeters—or at least so they believe. If you are one of this latter class you are due for a surprise because your voltmeter is a milliammeter as well. If you open it up and look inside you will find the meter mechanism and a resistor. Short circuit this resistor and the instrument becomes a straight milliammeter. Its range will be 0 to 1 milliammeter if the voltmeter is one with a 1000 ohms-per-volt rating. If a 100 ohms-per-volt rating the current range will be 0 to 10 ma., etc. Instead of short-circuiting the resistor, you can bring out a lead from between one side of the mechanism and the resistor and mount another binding post on the meter case to which to connect this third lead. Then you can use the instrument either as a current meter or a volt meter, depending on which of its terminals you employ. All of this is illustrated in Figure 1. (A) and (B) are the original voltmeter terminals while (C) is the added one. Terminals (A) and (B) are used for voltage measurements; terminals (A) and (C) for current. The range of either meter may be increased in the usual manner. Shunting suitable resistors across (A)-(C) will increase the current range. Inserting suitable resistors between (B) and the voltage to be measured will increas the voltage range.

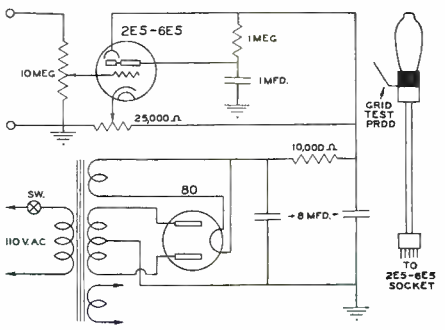


New Application for the 6E5

THE 6E5 or 2E5 tuning indicator tube can be used as a voltage. It differs from the conventional circuit as it does not employ a diode rectifier but is actually a vacuum tube voltmeter measuring a.c. or d.c. voltage without placing a load on the circuit to be measured.

The operation of the voltmeter is as follows: The cathode tap on the voltage divider is permanently adjusted so that the shadow angle of the 6E5 tube is zero. When d.c. is applied to the terminals (negative to ground) the shadow angle will increase with an increase in voltage to a maximum of 90° with approximately 8 volts applied. For voltages over 8 volts the 10 megohm, uniform tapered potentiometer may be set to calibrated points thereby multiplying the range indefinitely.

When an a.c. voltage is applied, a pulsating d.c. voltage appears in the plate circuit, because the tube is biased to nearly



cut-off. The condenser from the plate to ground holds these pulses to the peak value making the shadow angle change with voltage exactly as if there were d.c. applied to the terminals. The .1 mfd. condenser from plate to ground is very important as values less than this will cause the line of the shadow to be fuzzy on frequencies as low as 60 cycles, and a condenser with higher capacity will make the change of the shadow angle too sluggish for abrupt changes in voltage.

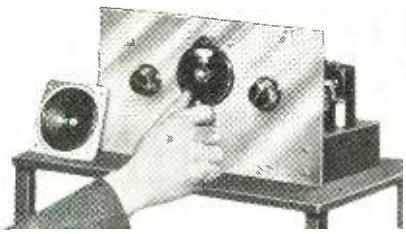
The diagram as shown is fine for all d.c. or audio frequency measurements such as an output indicator, detection of grid current or positive peaks on grids of a.f. amplifiers or measurements of impedance of choke coils, condensers and resistors at low frequencies. As the capacity of the test leads cause too much loss

(*Continued on page* 79)

A HOMEBUILT UNIVERSAL RECEIVER

by JOHN T. WILCOX, W2CLS
Engineer, Wholesale Radio Service Corp.

The author describes an inexpensive universal superheterodyne receiver for the amateur and serviceman. It produces three watts output.



Only three controls to tune, makes the set simple and easy to operate. Tone is good.

THIS receiver is a superheterodyne of unusual merit and simplicity. It should appeal to every amateur and short wave listener planning to build a set. It is comparatively cheap to build, and the results are up to par.

Faced with the problem of squeezing a good receiver into a compact arrangement at the lowest possible cost, the writer tried all the usual hook-ups. As a result of these experiences, it was finally acknowledged that a simple superheterodyne with controllable regeneration would be the best solution to the problem. The finished product is shown in the picture. In all probability this detailed procedure is the real reason why the final results were so very gratifying, therefore, it is suggested that the circuit constants be strictly adhered to when building this receiver.

All parts used are conventional, and no odd values of condensers or resistors will be found. In fact, the only difference between the cost of parts for this superheterodyne and the average regenerative receiver is due to the i.f. transformer.

The i.f. transformer should be the one specified to provide maximum gain, otherwise one should be selected having a closely coupled primary and secondary. A "tickler" coil must be wound on the lower end of the coil form. This consists of 25 turns of No. 30 d.c.c. wire, jumble wound close to the i.f. coil. The direction of winding is not critical; if the set does not oscillate after it has been completed, reverse the connections to the regeneration coil.

A three-inch dynamic speaker has been selected for reasons of economy, however, a larger speaker could easily be used as the 6F6 output tube can produce about three watts of audio power.

The parts layout is not critical as each tube circuit operates at a different frequency. This reduces the possibility of instability caused by interstage coupling. The noise level is exceptionally low, and even very weak signals are received almost as loud as strong ones. The set is stable and no hand capacity effect whatever has been noticed. A major part of the selectivity is due to the high conversion gain in the oscillator-mixer stage, and the balance through the use of regeneration in the second detector.

The construction of the set is begun by drilling the chassis and front panel, after the parts layout has been decided. The model shown uses a dynamic speaker in a separate small cabinet, but the speaker can easily be mounted on the front panel, if desired, by using a proportionately larger panel. The arrangement of parts shown will keep all leads quite short, which is an important point when constructing any receiver.

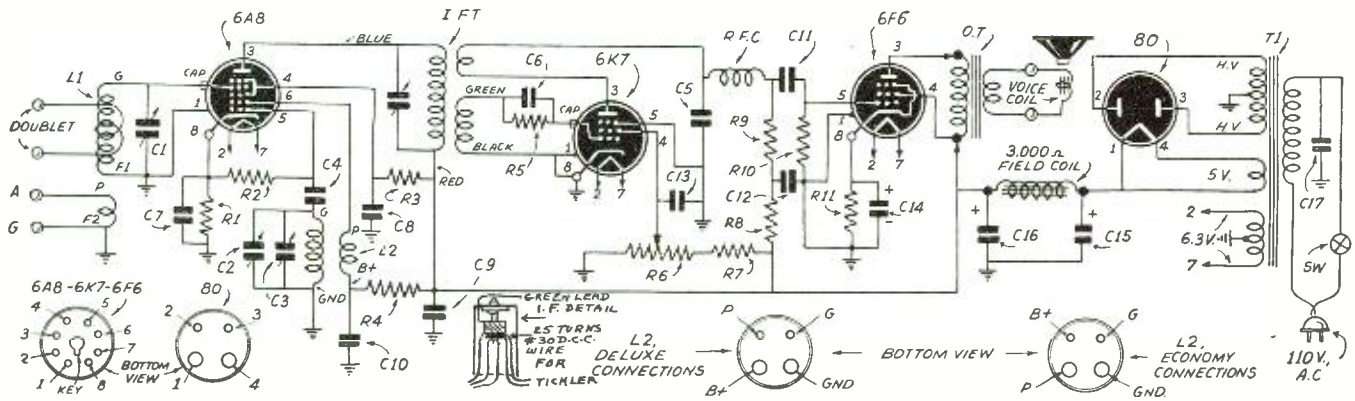
After the chassis and panel have been drilled and all parts are mounted in place, the next step is to wire carefully as shown in the schematic diagram. The suggested procedure to follow is as follows: first make all connections between the power transformer and the "80" rectifier tube, then put in the wiring for the heater circuits of all the other tubes. The high voltage plate supply circuit, dual 8-8 mfd. filter condensers, and wiring to the 4-prong speaker socket should then be connected. Primary of power transformer and switch (on regeneration control) may be wired next, but it would be a good idea to leave the power cord and plug off until the receiver is completely wired.

This completes the basic power circuits, and the high frequency signal with associated resistors and condensers circuits may now be started. All connections to the two coil sockets and the socket of the 6A8 tube should be made substantially as shown on the original.

The last few leads to the tuning condensers and regeneration control on top of the chassis complete the wiring, and with the tubes and coils inserted in their sockets and the speaker connected, the set is now ready for a test.

The initial adjustments and operating procedure will be as follows: turn on the switch and slightly advance the regeneration control; adjust band spread condenser C_2 to about half maximum capacity; rotate oscillator condenser C_3 until a station is heard, then adjust antenna condenser C_1 for maximum volume. There will be more than one setting of the oscillator condenser C_3, at which the same signal will be heard; select the one at which the condenser plates are farthest *out* of mesh. Once adjusted, these controls will not need

(*Continued on page 77*)



Circuit diagram of the Universal Receiver.

C_1, C_3—140 mmfd. variable, Hammarlund
C_2—25 mmfd. variable, Hammarlund
C_4—.00025 mfd. mica, Sprague
C_5—.0005 mfd. mica, Sprague
C_6—.0001 mfd. mica Sprague
C_7, C_8, C_9, C_{14}—.1 mfd. tubular, Sprague
C_{11}—.01 mfd. tubular, Sprague
C_{12}, C_{13}—.5 mfd. tubular, Sprague
C_{11}—25 mfd. 25V. electro. Sprague
C_{15}, C_{16}—Dual 8 mfd. electro. Sprague
C_{17}—.05 mfd. tubular Sprague
R.F.C.—R.F. Choke
I.F.T.—I.F. Transformer, Meissner No. 6762
P.T.—Power Transformer, Thordarson
L_1, L_2—4 prong coils, Hammarlund
R_1—300 ohms, ½ w. I.R.C.
R_2-R_8—50,000 ohms, ½ w. I.R.C.
R_9—75,000 ohms, ½ w. I.R.C.
R_{10}—25,000 ohms, ½ w. I.R.C.
R_{11}—5. megohms, ½ w., I.R.C.
R_6—25,000 ohms, Pot. Yaxley
R_7—100,000 ohms, 2 w. I.R.C.
R_9—250,000 ohms, ½ w. I.R.C.
R_{10}—500,000 ohms, ½ w. I.R.C.
R_{11}—500 ohms, 2 w., I.R.C.

Antenna Mast for $7.50

by E. B. LYFORD

An ideal receiving antenna mast. With slight changes it will make a fine vertical transmitting antenna for use on 20 meters.

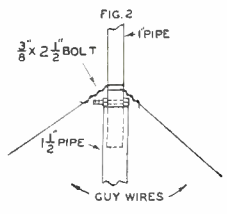
WHEN radio reception was confined to the broadcast band, the aerial did not present much of a problem. Any length of wire from 50 to 150 feet in length and attached to a convenient housetop, tree or barn would suffice. Now, however, with short wave reception very much in the picture, the call is for all-wave doublets, double-doublets, spiderwebs, and other complicated forms of antennae, all laid out to the most precise specifications. It is much more difficult to find supports just the right height and just the right distance apart, and it is usually necessary to erect a special support for at least one end of the antenna.

Attempts to put up thirty or forty foot wooden or metal masts or towers have often proven to be expensive failures for the inexperienced, but it is really no trick if you know how. This article will describe a 38-foot metal mast which is simple to construct, easy to erect, and which is inexpensive—the whole job can be done for about seven dollars, and will literally "last a lifetime."

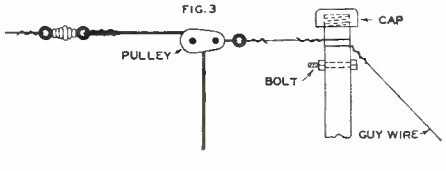
This mast is constructed, fundamentally, of two lengths of galvanized iron pipe, one of somewhat smaller diameter than the other, so that it will telescope within the larger section at the joint between the two. A galvanized iron cap and pulley are provided at the top of the mast and a galvanized mounting flange at the bottom—these together with suitable guy wires, are all that are necessary to provide a strong, sturdy and professional-looking antenna support.

A complete list of materials, with approximate costs, follows:

Material	Approximate Cost
1—20 foot section 1" iron pipe	$2.10
1—20 foot section 1½" iron pipe	3.30
1—1" pipe cap	.10
1—1½" floor flange	.25
2—⅜"x2½" machine bolts and nuts	.05
1—Galvanized iron clothesline pulley	.10
200 feet No. 10 galvanized iron wire	.60
20 "Egg" strain insulators	.50
Total	$7.00



Joint construction details.



Pulley and Top details.

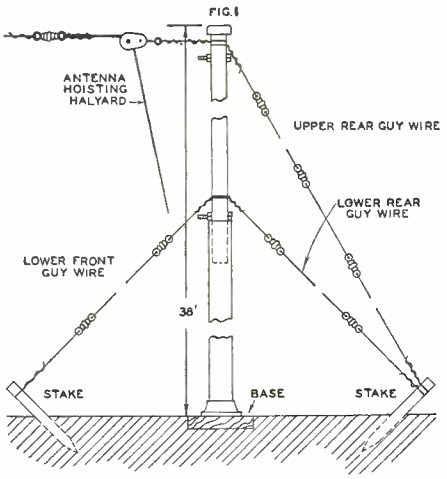
The actual costs of these materials will vary somewhat in different localities, but the prices given are about average, and the actual total cost should not vary by more than half a dollar from the estimated cost as shown. The two sections of pipe, the pipe cap and the flange can all be obtained from any good plumbing shop, the machine bolts, pulley and galvanized iron wire from any hardware store, and the strain insulators from any radio shop. Iron pipe such as this is always referred to by *inside* diameter, so the two lengths of pipe may be larger than you would expect. The actual outside diameter of those two sections are approximately 2" and 1⅜" respectively, but the plumber won't know what you are talking about if you order them this way.

The general appearance of the completed mast is shown by the sketch. Allowing for a two-foot overlap, and with 20-foot sections of pipe, the height of the completed mast will be 38 feet, as shown. Similar masts of lesser height can easily be constructed, of course, by using somewhat shorter lengths of pipe—two 16-foot lengths will make a mast 30 feet high, allowing the same overlap, and two 12-foot lengths will make a mast 22 feet high. The constructional details given here can easily be modified if masts of lesser heights are desired.

A ⅜" hole should be drilled through the smaller pipe about two feet from one end, and one of the machine bolts put through it and tightened securely. This bolt prevents the smaller pipe from slipping down within the larger one further than desired, and also provides a convenient spot to attach the lower guy wires, as shown.

Another ⅜" hole should be drilled in the smaller pipe about four inches from this end, and the other machine bolt secured in this. This bolt serves as an anchor for the top guy wires, as well as for the wire by which the pulley is attached, and prevents any of them from slipping down. This end of the smaller pipe should be threaded when you buy it, to take the cap as shown. This cap is not absolutely necessary, but it does keep rain and snow out of the upper section, and gives it a finished appearance.

The end of the larger pipe should also be threaded, to take the floor flange, which in turn may be bolted or screwed down to a block of metal or hard wood set into the ground, to give the mast a firm footing.

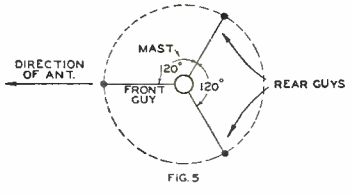


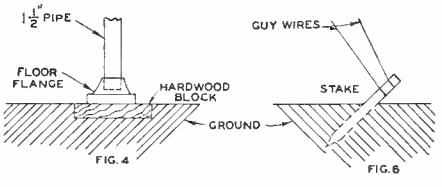
How the mast is put together.

Masts of this type not more than twenty feet high may be guyed with a single set of guy wires radiating from the top of the mast only, but taller masts should have two sets of guy wires as shown. One set is attached at the top of the mast, and one set at or just above the center. These should be arranged in triangular fashion, as shown. One wire forward, in the same direction as the antenna, and two toward the rear, all equally spaced around the circumference of an imaginary circle. All three are necessary at the middle of the mast, but only the two back guys are needed at the top—the antenna itself will serve as the front guy at this point.

Both top and middle guy wires may be brought down to the same point, which should be a stake or pipe driven into the ground at a distance from the mast of not less than half the total height. This stake or pipe should be two or three feet long, and should be driven into the ground at an angle, to provide the maximum resistance to strain. All guy wires should be made fast to the mast before raising, and after the mast has been raised the lower set should be drawn up to the stakes, loosely at first, and then gradually tightening first one and then another until the mast is absolutely vertical and all wires are taut. The two guy wires from the top may then be drawn up, but these cannot be finally adjusted until after the antenna is erected and has put its strain on the mast.

(*Continued on page 78*)





Base and Guywire details.

A Beginner's Receiver

by STANLEY JOHNSON, W9LBV

Photographs by the Author

A three tube receiver covering from 15 to 3000 meters with six plug in coils. Compact and fool-proof, it makes an excellent set for airplane and ship's signals.

Note two controls on receiver. Speaker is on separate panel to eliminate vibration.

THIS receiver is ideal for the DX fan who wants an "easy-to-build" set which will tune for practically every station on the air. Thanks to a novel tuning condenser arrangement, the compact set covers the 15-200 meter short wave band, the 200-500 meter broadcast band, and the 500-3000 meter long wave band—all with six plug-in coils. Few receivers cover the last named band, although it is interesting both for its powerful ship and shore code stations and for its airway "beams" with their frequent and very complete weather broadcasts.

The heart of the set is the type 6C6 electron coupled detector circuit. As will be seen in the diagram, this type of detector uses a coil which requires three connections: grid, cathode tap, and ground—leaving two extra prongs which can be used as a means for changing the tuning circuit on the different bands. This solves the problem which has always been difficult in the design of multi-wave receivers—that of using a variable condenser of small enough capacity for easy tuning. Efficient operation on the short wave bands is had and at the same time enough tuning capacity to cover the broadcast and long wave bands without broad tuning, is available. An impossible number of plug-in coils is thus eliminated.

On the short wave bands, tuning is done with a standard .00014 mfd. midget variable condenser. For the longer wavelengths, connections are made to the coils so that the .000365 mfd. tuning condenser is switched into the circuit in parallel with the midget condenser, giving a total tuning capacity ample for the broadcast and long wave bands. Proper connections to the coils also make it possible to change the antenna coupling from a fixed condenser on long waves to a trimmer condenser on short waves.

The 6C6 detector is followed by a type 76 first audio and a type 42 pentode power audio stage. The pentode has sufficient output to drive a six-inch magnetic speaker. A phone jack, wired to the output of the type 76, provides for the headphone reception of late-at-night "DX." The builder who must economize can build up the detector and first audio portion of the receiver and use it with headphones, later adding the second audio stage and the loudspeaker.

To save needless metal work, the set is built up on one of the new crackle-finish "panel-bases," which consist of a metal panel spot-welded to a base. These attractive units are ideal for small receivers and cost less than the metal which the builder would have to buy to make them. The one illustrated has a seven by eight inch panel.

The first step in building is to drill the holes and mount the parts. Exact placement is not important so long as the same general scheme, as shown in the photograph, is followed. Wiring is simple, thanks to a minimum of parts and the use of transformer coupling between the first and second audio stages. All "grounds" in the detector circuit should be made to a single point on the chassis although audio stage wiring may be grounded wherever convenient. Notice that the a.c. heater leads are twisted and are run at the outer edge of the chassis.

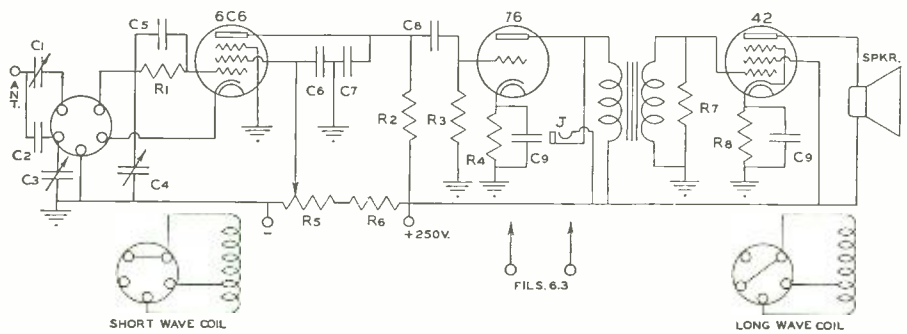
The builder should be very careful to make the connections to the coil socket exactly as shown in the diagram. There is an inexpensive set of five-prong manufactured coils available which is suitable for use in a circuit of this type. It is very probable, however, that it will be necessary to modify the coils somewhat in order to obtain satisfactory oscillation.

If a coil will not oscillate, more turns on the tickler (smaller) winding are in order. To prevent a "gap" in the broadcast band, it may be necessary to add turns to the 94-270 meter short-wave coil—which, by the addition of the large tuning condenser also serves on the broadcast band—or to remove turns from the 500-1500 meter long wave coil. An alternative scheme would be to mount a regular broadcast receiver coil in a five-prong tube base, making the connections as shown in the diagram of the long wave coil. If this is done it will be necessary to reduce the number of turns on the primary winding in order to prevent excessive oscillation.

A piece of the new crackle finish composition material is used to mount the six-inch magnetic speaker, thus providing a baffle which matches the receiver in appearance. The five-inch hole is cut with a key-hole saw. A piece of bright copper screen protects the speaker cone.

Any power supply capable of furnishing

(*Continued on page* 83)



Circuit of the 3 tube, 15-3000 M. receiver.

C_1—0-30 mmfd. trimmer
C_2—.00004 mfd. fixed mica
C_3—.000365 mfd. variable
C_4—.00014 mfd. variable
C_5—.0001 mfd. fixed mica
C_6—.5 mfd. fixed paper
C_7—.0005 mfd. fixed mica
C_8—.1 mfd. fixed paper
C_9—12 mfd. 25 volt electro
R_1—2 meg ½ watt
R_2—100,000 ohms 1 watt
R_3—.5 mg. ½ watt
R_4—3000 ohm 1 watt
R_5—0-100,000 ohm variable
R_6—250,000 ohm 1 watt fixed
R_7—1 meg ½ watt
R_8—600 ohm, ten watt
L—Special 5-prong coils
J—Phone jack
S—Speaker

Note the size compared to the hand. The back of the receiver panel.

Dual Auto Receiver Control

With dual controls installed on the auto set, passengers riding in the back can tune in too.

RADIO accessories play an important part in increasing the radio dealer's source of income. Properly handled these items carried in conjunction with the regular line of merchandise enable the realization of a substantial profit on not only the direct sales but also on the usually necessary and connected installation jobs.

An encouraging factor to note is that certain radio accessories have an expanding business effect in that an entirely new market is opened up. Radio equipment which may have been sold only recently, and from which the radio dealer could not expect any further source of income outside of an occasional service job in some distant future, suddenly comes within the scope of a new sales objective due to a newly invented appliance. It is common knowledge that the successful radio dealer keeps himself informed of the improvements and applications continually being made, and is, therefore, in a position to make instant arrangements for efficiently supplying any newly created demand.

There has long been a need in the auto-radio industry for dual control of the automobile radio. This need, heretofore, has been answered by installing two separate auto-sets. One auto-set was installed at the front of the car in the regular way with the remote control head terminating on the dashboard while the extra auto-set was mounted in some convenient space at the rear of the car with the remote control head terminating on the arm rest. It is needless to say that only one auto-radio was played at a time, and although this arrangement made it possible for either the driver or back seat passenger to conveniently tune in a desired radio program, it was an expensive procedure because it entailed the purchase of an extra auto-set. The demand for such installations was, therefore, confined in most cases among cars in the higher price bracket.

In many chauffeur-driven cars and all radio cabs the convenience of the back seat passengers was given first consideration and a single auto-set was installed wherein the auto-radio could be controlled only from the rear of the car. This expedient had one greatly undesirable result in that the driver of the car was left with no control whatsoever over the auto-radio at any time. The owner of the chauffeur-driven car, consequently, was forced to do without the convenience of an auto-radio, although there was an auto-set installed in the car, when he himself was driving.

In contrast to the above inconveniences as well as the problem of cost in connection with the installation of two auto-sets in one car, are the advantages of the new dual remote control system by means of which it is possible to control a single auto-radio from either the driver's or the back seat of the car.

The dual controls consist primarily of (1) a universal type remote control head with a suitable flush mounting escutcheon kit, (2) two coupler units one of which is with or without a self-contained switch, and (3) the necessary interconnecting flexible shafts and casings with suitable end fittings and parts.

The units properly connected to an original installation comprise in effect a mechanical means for controlling the auto-radio from two different points such as from an original remote control head mounted on the dashboard as well as from an additional remote control head mounted in the rear compartment of the car. An important feature is the fact that both heads are synchronized at all times so that regardless of which head is manipulated to control the auto-radio, both heads will indicate the exact station tuned by virtue of the gear action in the coupler units.

A study of the illustrations will show that the entire system is centered around the coupler units. One of the coupler units is attached to the tuning control threaded extension and a similar coupler unit is attached to the volume control threaded extension located on the auto-radio. The latter coupler unit is furnished with or without a self-contained switch depending on whether a switch is utilized externally or internally of the auto-radio.

In an original installation which is being adapted to a dual control and on which a switch is utilized outside of the auto-radio, the external switch must be disconnected and a coupler unit with a self-contained switch must be used. The switch on the coupler unit is wired up in place of the one which was disconnected so that the radio can be turned on or off from either the front or rear control heads.

Auto-radios having a switch mounted on the volume control shaft do not need anything further to be done than to properly attach a coupler unit without a self-contained switch to the volume control threaded extension.

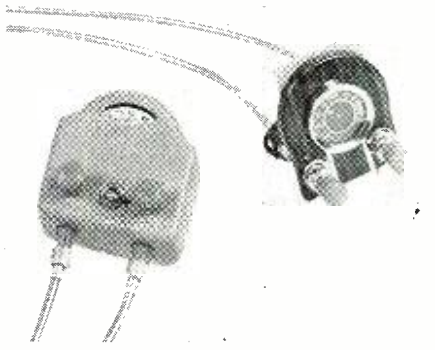
In making this attachment one thing is important: that is, the flexible shaft end fittings as well as the size of the threaded extensions on the auto-radio on various models differ, making it necessary in some cases to replace both the end fitting on the flexible shaft extending from the coupler unit as well as the casing nut with a proper fitting and casing nut matching a particular auto-radio.

Provision is made to enable the service man to make these and other changes easily, such as adapting the coupler units for use on sets in which the extension for holding cables are not threaded. With an assortment of fittings and, perhaps, a swedging machine on hand for cutting the flexible shafts and casings to any desired length, the service man can attach the coupler units to any auto-radio utilizing a manually operated remote control device that may come in for a dual control attachment.

Referring to the illustrations it is seen that the novel remote control head permits an installation flush with the wall surface or upholstery of the car.

In both the surface or flush mountings,

Dual controls are attached at the set proper.



Black head goes to driver, grey one in back.

the cables are run between the rear mounting control head and the coupler units with the minimum number of bends. It is better to use an extra foot of cable in order to avoid making a sharp bend than to run into difficulties by laying the cables taut. The best practice is to run the cable beneath the carpet inside the car.

Coming back to the rear mounting remote control head, it is well to state that the front remote control head may have any one of six different gear ratios and, unless a head with a correct gear ratio is available, it may be necessary to change the gear ratio on the rear head.

To determine the ratio needed, it is necessary to count the complete revolutions of the flexible shaft required to move the condenser rotor from minimum to maximum position. The ratio required is the number of revolutions multiplied by two. These ratios are expressed in terms of 360°. For example, 8 revolutions x 2 = 16 to 1 ratio.

The six different ratios that the service man will undoubtedly run into are: 6 to 1, 8 to 1, 10 to 1, 12 to 1, 16 to 1, and 20 to 1. The most commonly used ratio is the 16 to 1.

There is no doubt that the new market which these dual controls will open up will enable a great many radio dealers to avail themselves of an opportunity to add to their source of revenue. Judging from the interest aroused by preliminary showings of these units to date, it is certain that a majority of the service men will welcome an opportunity to increase their profits by making these installations.

—30—

They Harnessed the Wind

by TIMOTHY V. HOLLEY

Sometimes farmers become manufacturing tycoons. Two of them, faced with a situation of how to keep their battery radio going, founded a large corporation which bases its business on harnessing the wind. Thanks to them the farm now has radio equal to his city brothers.

The first of the long line of Windchargers. It was an old revamped windmill.

JOHN ALBERS was mad, good and mad. Here it was, only fifteen minutes before the kickoff in the Iowa-Minnesota game, and the radio was dead. Albers particularly wanted to hear that broadcast, but there was nothing to do about it now. The radio would be out of service until the battery was charged, and that meant a trip to town.

"There's not much sense in having a radio," he said to his brother, Gerhardt, "if it's dead every time you really want it."

Gerhardt agreed. Their radio battery had to be taken to town for charging about once a month, and this always seemed to happen just when there was some broadcast of particular importance.

The boys decided then and there to do something about it, to develop some method of keeping farm radio batteries charged at all times. That was ten years ago when Gerhardt Albers was in his twenties and John had just turned twenty-one. They were typical farmer boys, living on their father's farm near Sioux City, Iowa.

Like thousands of other farmers, the Albers had been using a windmill to pump water for many years. There was an old mill in the farm workshop, and the boys bought an automobile generator at a junk yard. They mounted the mill on a tower that was standing on the farm, and hooked up the generator. Then their troubles began.

Windmills are designed to start against a heavy load and do a hard job at relatively low speed. The blades are set close together, and no matter how light the operating load, wind can't get through fast enough to revolve the wheel at really high speed. However, by installing gears to speed up the generator, the Albers boys did get a wind-driven charger that would work.

But their windmill charger did not satisfy them. It was too bulky and the gears made it noisy. What they needed was a lighter, smaller, faster, and cheaper charger.

They decided to try airplane propellers. They reasoned that if great power behind a small, rapidly-revolving "air screw" blade could pull along an airplane, why not reverse the operation and let a good wind spin the propeller at high speed to drive their generator?

They had a good farm workshop. Their father was a good mechanic and carpenter, a real handy man when it came to building things. So all three went to work.

They conducted many experiments with airplane propellers. There was no wind tunnel, of course, but they did have a family car. By mounting a propeller on the car and belting it to the generator, they could make their own wind. With one boy driving, and the other watching the ammeter and speedometer, they drove around the countryside. Neighbors thought they were crazy, wasting good time on such outlandish foolishness. But, crazy or not, they learned the performance characteristics of different types of blades at varying speeds.

The propeller idea was an improvement on the windmill, but it still did not meet their requirements. Their final answer came from the principle of an airplane wing.

When a plane is in flight, air moving over the wings creates a partial vacuum above the upper surface that accounts for from sixty to ninety percent of the lift. The remainder comes from air pushing up from below.

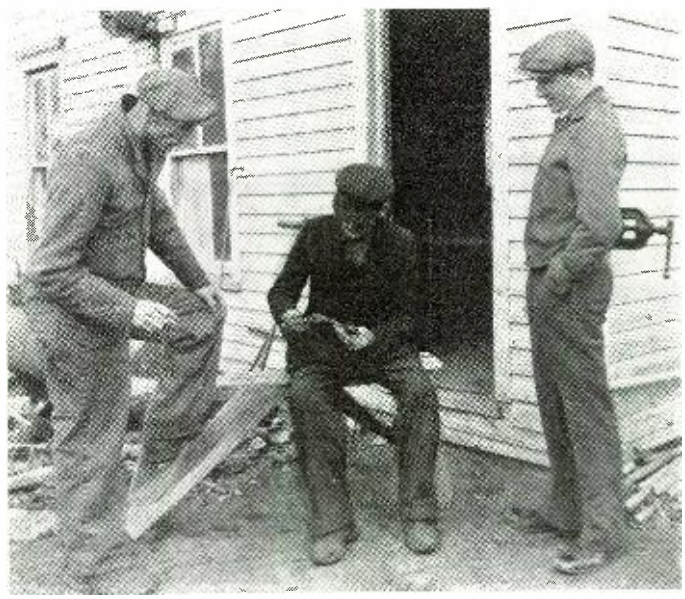
Using this airfoil principle, the Albers boys developed a six-foot blade that would operate a generator at charging speed, even in a light wind. So far, so good; there would be few days without enough wind to run the charger. But in high winds this early blade whirled so fast it flew to pieces. And that wasn't so good.

They solved this problem by developing an automatic brake. The finished result was an air driven charger that would operate in light winds, but which would revolve only at moderate speed in a high wind.

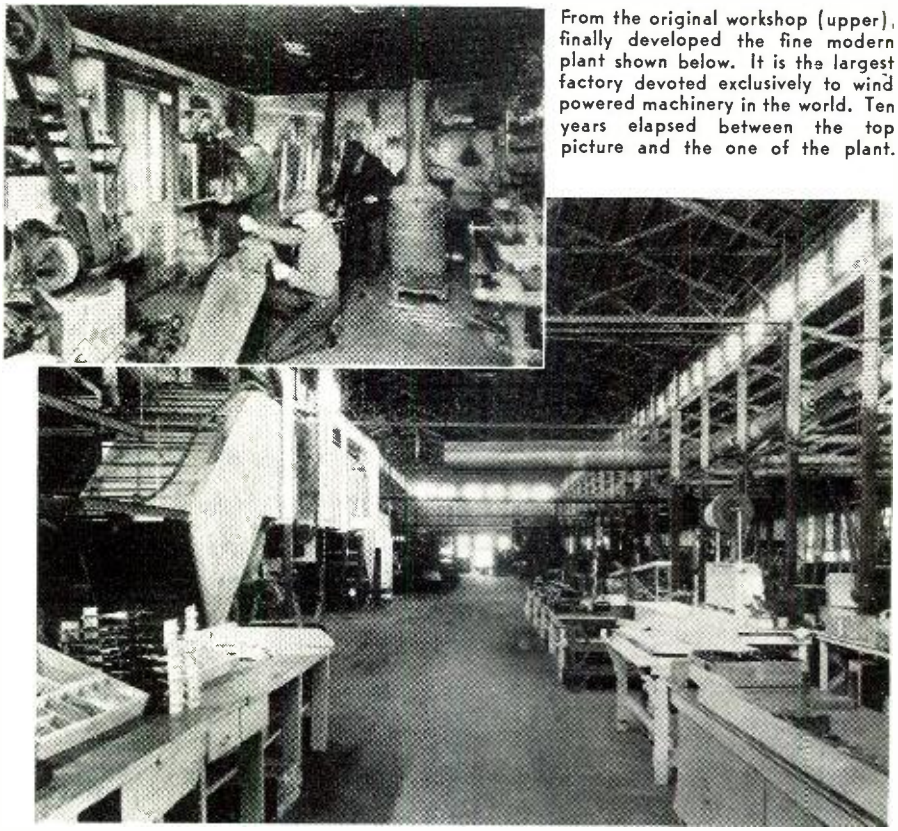
They began advertising their home made contraption in the classified sections of farm papers. The response astonished them—orders poured in too fast to be handled. At that time they were making the blades by hand.

They developed a machine for making the blades, and rented a small factory in Sioux City. It was here that a famous capitalist found them.

This man, president of a large company, had just developed the first radio



Barney Albers (seated), father of Gerhardt (left), and John (right) in front of the first workshop.



From the original workshop (upper), finally developed the fine modern plant shown below. It is the largest factory devoted exclusively to wind powered machinery in the world. Ten years elapsed between the top picture and the one of the plant.

ever to run on a single six-volt automobile type storage battery. He was quite concerned when friends in Labrador and Greenland wrote that the radios he left with them while on the MacMillan Arctic Expedition were no good after the batteries had worn out. If ever a man wanted anything, he wanted a practical wind-driven generator for radio batteries.

Albers' device was the answer. When his engineers investigated and found that it would do the job, an initial order was placed for fifty thousand sets, and the Albers boys shown how to organize for mass production.

The rest is quickly told. Winchargers (that was the name given the device) are now in use on every continent of the globe, running six-volt generators for radio batteries, thirty-two volt outfits for farm lighting plants. The Albers brothers are on the highway to commercial fame, but it has not gone to their heads. They remain the same homey, good-natured Iowa folk. Gerhardt is still a bachelor, but John is exceedingly proud of his charming wife and two young sons. Their factory is now the largest in the world devoted to wind-driven machinery.

—30—

INVISIBLE CHECKERS

by J. T. Ohmer

SINCE short wave hams started "invisible checkers" some 15 years ago, the hobby of games played by phone and code has slowly grown in popularity, but now a race appears to be on with certain eastern hams to invent and instigate new games which can be played on the 20, 40, and 80 meter bands.

Charley Tamm, amateur operator W2BAQ of Port Chester, N. Y., who is currently stationed in Burlington, Vermont, as code operator for Trans Radio Press, is chewing pencil ends and running fingers through hair these nights figuring out possible stunts to replace checkers as the national indoor sport of veteran hams.

"Checkers," said Charley in an interview for RADIO NEWS, "is almost an unknown quantity with youngsters today. Sure, we old timers have played it for years but we're in the minority in ham radio now-a-days. Kids today haven't been brought up with a red and black squared board on their knees; it's a game of the past and amateurs need a rejuvenated sport to wile away their hours at the transmitter.

"With some 47,000 ham operators throughout the United States," Charley went on, "it seems to me that tournament games in some new sports could be worked up, with the entire country divided into zones.

[Have you played the women's world's champion, W2HXQ of Rye, N. Y., Charley?—Ed.]

—30—

TECHNICAL BOOK & BULLETIN REVIEW

Principles of Radio, by Keith Henney, Third Edition, 495 Pages, Price $3.50, Size 5¾ by 8 inches, Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York City. This third revised edition has been prepared for both home and class study. New practical problems have been added dealing with circuits and constants which every radio engineer encounters. Included are features of present day receiver design, recently developed devices, brief treatments of television, and facsimile transmission.

The 1938 Radio Handbook, by Frank C. Jones and Technical Staff of Radio, Fourth Edition, 512 Pages, Price $1.50, Size 6 by 9 inches, Published by Radio, Ltd., 7460 Beverly Blvd., Los Angeles, Calif. The 1938 edition of the Radio Handbook is published in an enlarged and revised form. Several pages are devoted to completely built transmitters. Some of the chapters' titles are Fundamental Electrical Principles, Radio Theory, Vacuum Tubes, Antennas, Receiver Construction, etc.

Radio Engineering, by Frederick E. Terman, 813 Pages, Price $5.50, Size 6 by 9 inches, Published by McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York City. This book provides a comprehensive treatment of all phases of radio communication, written from the viewpoint of the engineer. The contents include sections devoted to Television, Wave Propagation, and other topics.

Both Sides of the Microphone, by John S. Hayes and Horace J. Gardner, 180 Pages, Price $1.25, Size 5¼ by 8 inches, Published by J. B. Lippincott Company, Washington Square, Philadelphia, Pa. A book written especially for the average listener and for all those who are interested in various phases of broadcasting from a vocational angle. Divided into two sections. The authors discuss such branches of radio work concerned with programs, sales, publicity, engineering, etc., in the first part. In the second section well known radio notables tell the listeners what to expect from the radio in the way of news, sports, music, etc.

How to Pass Radio License Examinations, by Charles E. Drew, 201 Pages, Price $2.00, Size 6½ by 9 inches, published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York City. A useful guide for students, operators and anyone interested in taking examinations for a radio operator's license. This new edition has been expanded and revised with a great deal of technical matter added to broadcast and radiotelephone. In the commercial radiotelegraph section a certain amount of geography has been added in the form of listings giving the location of principal seaports along the coast line of the United States and important ports of call in foreign countries.

ANTICS of SHORT WAVES

by A. L. WHITE

The complete transmitter can be held in one hand. Batteries are used for power.

With spot broadcasts becoming more and more frequent, NBC has devised a tiny transmitter operating on 300 MC.

AMATEUR radio experimenters with ultra high frequencies in the New York area were surprised and elated late one night by being able to pick up transmissions on the five-meter wave from as far west as Illinois. Now, that just is not done by well regulated ultra high frequency waves, which are not supposed to be picked up much beyond the horizon when transmission is across land.

Work in the ultra high frequency realm of radio is classed as still very much in the experimental stage. But it is a fascinating adventure in a new field and every freak and antic of the tiny waves is observed and studied by radio engineers. A distinct line is drawn between ultra-short waves and micro waves. Ultra high frequency can be considered anything between 30,000 and 300,000 kilocycles or wave lengths of from 10 meters down to one meter. *Micro* waves are those of one meter or less. Micro wave transmitters, usually of the reflector type, operate in the range above 300,000 kilocycles.

Several experimental transmitters for the ultra short wave class have been licensed and the big radio companies are constantly doing work to determine the nature and possible use of these waves.

They have worked out several theories and discovered certain important peculiarities of ultra short waves. These tiny waves have some characteristics similar to those of light waves; consequently they are sometimes referred to as "quasi-optical." Transmission is believed to be possible only between points in line of sight; that the waves will stop at the horizon, and then are supposed to dart off into space on a tangent. If radiated from the aerial on top of the Empire State Building in New York, the ultra short waves would, in theory, spread out over an area visible to the eye.

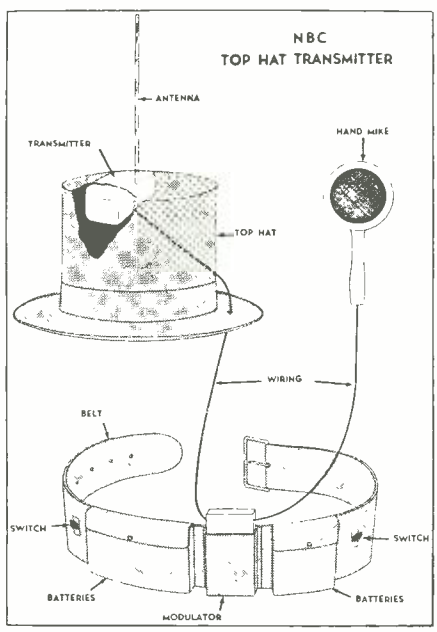
But they do not always act that way. Sometimes radiations from the Empire State tower have been picked up in New England. And it has been reported that transmission from an ultra short wave station near Rochester, N. Y., operating in the 31.6 megacycles channel, were heard as far away as Utah. Notwithstanding these freaks in performance, it is agreed that the usual range is from fifteen to twenty miles in all directions, offering a means of supplying strictly local service.

The full possibilities of the very high frequencies for local broadcasting are developing slowly because of the very limited number of broadcasting receivers that will tune to this band of frequencies. The average radio set is out of tuning range of ultra short waves.

Because of the line-of-sight nature of these waves, aerials are usually placed on lofty sites such as the tower of the Empire State building. When there is a clear range, as between the top of the Empire State building and a high place on Staten Island, transmission on these ultra short waves can be farther than, for instance, it would be down on the street level in the city. Steel buildings act as screens to absorb signals.

One established fact is that transmission over these tiny waves is not affected by static. In one studio an engineer was listening to radio programs during a thunder storm. On the program coming from the 50,000 watt transmitter of the regular broadcasting circuit every flash of lightning caused heavy static crashes, but the program from the 50-watt experimental ultra high frequency transmitter came in clearly all during the storm.

The schematic hook-up of the 300MC NBC transmitter. It fits into a hat.



The ultra short wave is a ground wave characterized by a minimum of fading. These tiny waves seem to be almost entirely unaffected by atmospheric conditions such as fog, rain, or day and night. In broadcasting, on account of the extremely low wave band, there is practically no interference from congestion of the ether.

On the other hand, another type of interference has been disclosed which is especially troublesome in urban sections. That is interference caused by the ignition systems of automobiles. One radio expert living just outside of New York City often experiments in picking up transmissions from the 50-watt ultra short wave transmitter of the broadcasting company. He found the interference caused by the ignition systems of passing automobiles very pronounced. He even got to a point where he could distinguish the approach of the bus because of the type of interference it caused on his radio receiver.

A great advantage in the use of ultra high frequencies is the diminutive antenna systems that are required, and apparatus can be made without trailing wires and cumbersome equipment. Recently experiments have been made with portable ultra high frequency transmitters. The first of these operated on waves of the order of 7 to 10 meters, but the latest developments are micro-wave transmitters, operating in the band of 300,000 kilocycles and more.

One micro wave set is a three-inch cube, with two ten-inch rods as antennae. It transmits at a power of two-tenths of a watt, and current is fed to the set by an extremely small battery unit of 90 volts. The transmitter proper weighs less than a pound and the battery unit less than four pounds. Distances up to four miles have been attained by this midget radio station.

Both in appearance and in use these micro-wave transmitters seem to be toys, but they are in reality practical transmitters—in fact, midget "radio stations." They do not, of course, broadcast directly to listeners' radio sets but transmit to the control room of a broadcasting studio whence they are amplified for general broadcasting. They are used for little intimate talks and observations in parades, corventions and other large gatherings.

One performance with such a transmitter was on Easter Sunday on Fifth Avenue, New York, when an announcer walked among the throngs and broadcasted a description of the "Easter parade." The transmitter was concealed in his silk hat and the batteries which supplied the power were in a belt. At the National Conventions these tiny radio transmitters were busy, giving on-the-spot reports.

This spectrum of the ether is still largely unexplored territory, but it is believed by radio engineers that ultra high frequency channels offer great possibilities.

—30—

QUESTIONS and ANSWERS

J. W. D., Seattle, Wash.: In my experimental work it is often necessary for me to replace fixed resistors and I notice that they come with different colors in the center and at the end. This I understand is a code designation to determine their resistance value. Can you supply the code?

Answer: The code you have reference to is the standard resistor color-code adopted by the Radio Manufacturers Association and is used for identifying the values of small carbon type resistors. The code is presented herewith with the basic numbers represented by the following colors:

0—Black	5—Green
1—Brown	6—Blue
2—Red	7—Violet
3—Orange	8—Gray
4—Yellow	9—White

Each resistor has three colors to identify its particular value. There is a body color which represents the first figure of the value; a color at one end or tip to identify the second figure; and there is a colored band or dot in the center of the resistor which gives the number of zeros following the first two figures. For example, a brown resistor with a green tip and orange dot would be (1) for the body color, brown; (5) for the green tip and (000) for the orange dot, the total 15,000 ohms.

* * *

A. P., Battle Creek, Mich.: I am planning to build a simple power supply to deliver approximately 250 volts at 100 ma. d.c. output current. I have a power transformer on hand that can deliver this output but I don't know whether I should use an 80 or an 81 type rectifier.

Answer: Check specifications further and you will probably find that the transformer has a filament winding of 5 volts and is intended for use with a full-wave type 80 tube. The type 81 is a half-wave rectifier requiring 7.5 volts for the filament, has a d.c. current output of 85 ma., and 700 volts maximum a.c. plate voltage, and it is not the tube for your purpose.

* * *

M. A. H., Jersey City, N. J.: I am about to purchase a two-band receiver covering the broadcast range and the short-waves to 7000 kilocycles Please advise where I should tune in for the police calls.

Answer: For the municipal and State police radio stations tune between 1596 to 1712, and 2344 to 2490 kilocycles. You should be able to tune in any number of police calls on these bands and you will find it quite unusual and exciting.

* * *

S. Q., Buffalo, N. Y.: I would appreciate receiving information for connecting a crystal type tweeter speaker to my receiver. The output tube is a single 45, transformer coupled to a standard dynamic type speaker.

Answer: The simplest method for connecting a high frequency crystal type reproducer to your receiver is to connect a potentiometer in series with a .05 condenser across the crystal with one end connected to ground and the arm of the potentiometer connected to a .25 mfd. condenser with the lead of this unit brought over to the plate of the output tube or primary side of the output coupling transformer. The resistance should be approximately 25,000 ohms and is used in combination with the .05 mfd. condenser to block out all but the high frequencies from the speaker.

* * *

C. A. C., Detroit, Mich.: Is it true that the tires of an automobile can cause interference in a motorcar radio receiver?

Answer: Yes. This is due to the friction between the tires and the road. You can purchase hub spring contacts which ground this type of interference and are especially made for this purpose. They are known as wheel static eliminators.

* * *

F. J. V., Fairhaven, Vt.: Please tell me how I can determine the amount of power drawn from the a.c. line by radio equipment which I use. I do not possess any a.c. meters except a rectifier type voltmeter. Can this be used?

Answer: The most simple way, and an accurate one, is to check the power consumption by watching your electric light meter. The method is to first see that all lights, etc., are turned off except a single bulb. With this lighted count the revolutions of the disc in the meter for a period of one minute. Next, turn off this light and turn on the radio set and again count the revolutions per minute of the meter disc. If the lamp was a 100-watt type and showed, let us say, 12 revolutions per minute, and the radio set showed 24 revolutions it would mean that the radio drew twice as much power as the lamp, or 200 watts. The speed of the disc is always directly proportional to the amount of power drawn.

* * *

N. T. U., Delafield, Ohio: Do amateurs and commercial stations use the same code in their dot and dash transmission? Do stations of different countries use this same code?

Answer: Yes to both questions. The code now universally employed in radio work is known as the "Continental Code."

* * *

K. H. P., Newark, N. J.: Some of our youngster's favorite programs are on during our dinner hour. Our only radio set is in the dining room but at this hour he is in his room some distance away. As a result we either have to dispense with conversation or he has to go without his programs. One is bad; the other is worse. Can you offer any solution to this domestic tangle?

Answer: There are two thoroughly satisfactory ways in which your problem can be solved. Perhaps the most logical is to purchase one of the small receivers which sell for a few dollars at any radio store or mail order house. This will not only allow the youngster to enjoy his programs without disturbing the rest of the family but as he grows older and listens later in the evening he can continue to have his choice of programs and the rest of the family theirs. The other alternative is to have a serviceman run an extension cord from your present radio to an extra loudspeaker installed in the child's room. This could be equipped with a switch at the radio set which would cut off the main loudspeaker when the extension speaker was in operation and vice versa.

Your Shortwave Station List is some rather antique affair, don't you think so? Or do you think we fellows here in Canada are just satisfied with whatever you have to dish out? . . .

—H. O.,
Vancouver, B. C.

(We try and give the very latest shortwave dope. Anyone finding mistakes or important additions is invited to write and call it to our attention. Actually we hold press for the shortwave flashes. Ed.)

Got my April copy of RADIO NEWS a couple of weeks ago and like it very much. You cover the radio situation as no other radio magazine does. . . .

—Charles Robbins.
Jackson, Tenn.

I received my copy of the so-called bigger and better R. N. and I can say that I never want to see it again. This April copy is going into the trash can as soon as I can get to it. . . . I d—n well do not care anything at all who is singing, or shouting on the NBC and CBS systems at the present time. All that I am interested in is how many DX stations are on the SW and BC bands. . . .

—William Harriman.
San Pedro, Cal.

(We are featuring as much shortwave information as before, and more technical articles than ever appeared in the old R. N., but we cannot ignore the B.C. systems. They are also a part of radio, and R. N. covers the radio field in its entirety. Ed.)

I *like* the NEW RADIO NEWS! If the future issues can measure up to the standard of the April one you will truly deserve the title of "The Leading Magazine in Radio." . . .

—L. M. Jensen.
Cowley, Wyo.

(To Mr. Jensen, who was a LPO under the old regime, and who wrote a most constructive letter outlining many features, we give our sincere thanks. Ed.)

I want to congratulate you on the new RADIO NEWS for April. . . . I have been a subscriber to your magazine for years, and must say I enjoyed the last issue more than any other. My wife never read R. N. because it was too technical, but this month she read it completely. . . .

—Harold L. Hanley,
Reading, Pa.

(RADIO NEWS is so put together that we hope that the wives of the DX'ers, experimenters, hams, servicemen and dealers will find something in it to interest them. Ed.)

I am a subscriber of R. N. It sure is a swell radio magazine. For your radio program which you are to sponsor. I suggest you devote some time to have someone explain the principles of Radio and Television. . . .

—Jack Robinson.
Krakow, Wis.

(Thank you for the suggestion, Mr. Robinson; we will certainly consider it. Ed.)

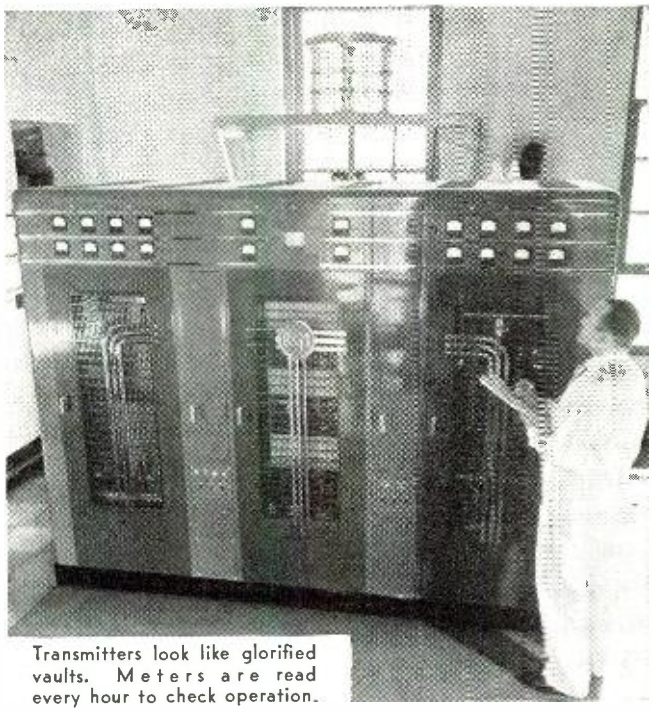
Your April issue does not come up to the standard of the last two years because there are not enough articles for the amateur and experimenter. . . .

—M. Rosen,
Brooklyn, N. Y.

(By actual count the new R. N. has more technical articles than ever before. We ask our readers to remember that we are now running 96 pages. The technical articles will be continued and there will always be more than heretofore. Ed.)

What help can be given to a public who want

(*Continued on page* 79)



Transmitters look like glorified vaults. Meters are read every hour to check operation.

Let's Start a RADIO STATION

by CONRAD E. KENNISON
Manager, WRDO, Augusta, Maine

Few realize the time, trouble and expense that go into the establishment of even a very small broadcasting station. The author shows what must be done to go on the air.

SOME evening you may have rested comfortably in your chair listening to the radio and all of a sudden this thought struck you, "I'd like to start a Radio Station!"

Let me suggest that you think twice before you start—in fact think several times twice *before you start!* Bring to mind that wise old biblical quotation, which very aptly applies in this matter, "Many are called but few are chosen!"

It's a comparatively simple matter to start a small grocery or clothing store, the first requisite being some small amount of capital, the selecting of a good location, obtaining a stock of merchandise and hanging out your sign. But the starting of a small radio station (and we are talking here of starting a 100-watt station, of which there are approximately 400 in the country) is a far from simple matter.

Let's trace a few of the preliminary steps. Today it is absolutely necessary that the would-be station owner have sufficient capital. One of the first requirements of the Federal Communications Commission (the federal licensing body of Radio Stations) is "financial responsibility." For stations of 100-watt size $25,000 should be the minimum amount of actual cash you should have available. And as we trace the steps of getting a station established you'll be surprised how fast this $25,000 is going to disappear!

Your transmitter site must be selected. This is of vital importance to your success and minute attention will be given this detail by the Commission. The location for a 100-watt station must necessarily not be too far outside of the principal city you wish to cover or the "wire" charges between studio and transmitter will be excessive. In many instances, but usually not as satisfactory, the transmitter can be located atop some building within the city. One to two miles outside the city, in the general direction to give as much coverage in adjoining towns or cities you wish to include in your primary area, would be more desirable.

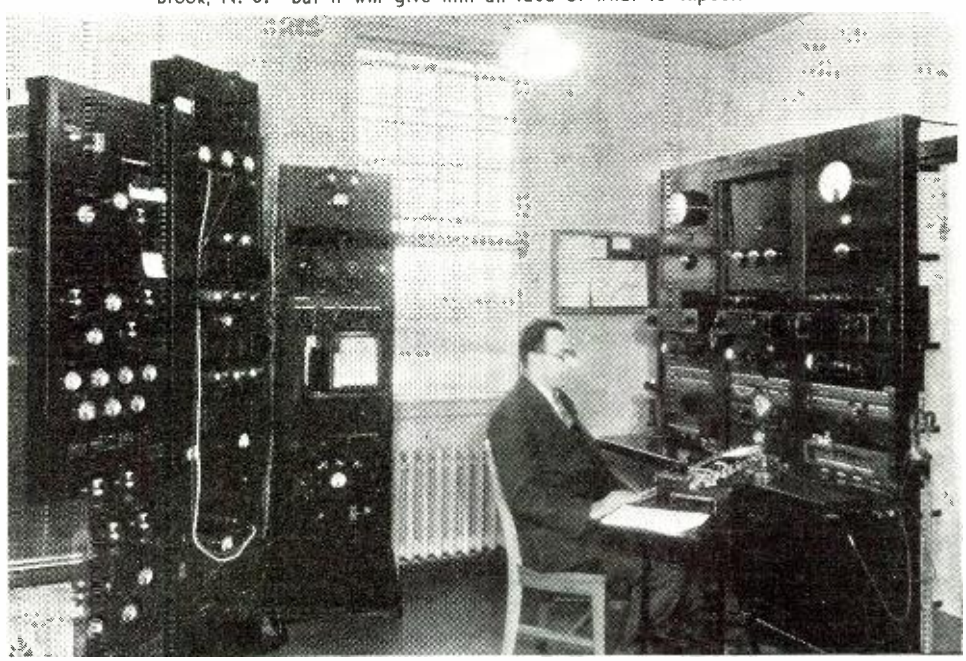
One of the best investments you can make at the start is the hiring of a competent radio engineer to make careful surveys. [RADIO NEWS, April, 1938.] Follow the recommendations made by him for transmitter location. Incidentally the fallacy still persists in the public mind that the best location for a transmitter is on top of a hill. Of far more importance is the "ground," and in your travels around note how many radio towers are situated in wet or marshy locations.

Well, it has cost you several hundred dollars for engineering service to determine your transmitter site—perhaps the sum spent is over a thousand, depending upon the engineering staff employed and the time required. Of course you have gone into the matter of the "type" of antenna, with your engineer, and found that a "directional antenna" is necessary to get the coverage you want and to prevent undue interference with other stations.

You have obtained application blanks from the Commission to apply for a station license and with all your facts and figures at hand you are ready to go to Washington to engage a lawyer specializing in radio practice before the Federal Communications Commission. Now comes the matter of a retainer fee or the sum agreed to be paid this lawyer for his services. It's specialized work and your bank

(*Continued on next page*)

A prospective station owner need not have a layout such as the emergency and shortwave control room of WJZ, Bound Brook, N. J. But it will give him an idea of what to expect.



roll has received another shock!

The months roll on. You impatiently await some word from Washington, but remember the Commission has a full docket and your application must take its turn. After study by a commissioner, and an engineer of the FCC, a date is probably assigned for a hearing on your application. In the meantime you have been hopefully arranging for studios, and if all ready engaged the rent has been accruing. It may be a matter of a few months before your application is up for hearing—It can be a year, or even several years, because of complications, before your application is finally acted upon. You have made various trips to Washington, your lawyers fees continue, and an expenditure of $1,000 to $5,000 can easily be chalked up against your $25,000 original capital.

But assuming that one bright morning you receive notice from the Commission that your application has been granted and you have been given a "Construction Permit." Note that it stipulates that your station must be completed ready for operation at a definite time not many months hence, and although an extension can usually be obtained you start frantically to build.

Now comes the buying of all that equipment you have planned on—a transmitter, generators, tubes that cost enough to send you comfortably on a trip to Europe, wire and more wire, not to mention that giant mast, your antenna, which must go skyward 100 feet or more and deplete your bankroll several thousand dollars.

Since your transmitter is very likely located in Si Pullen's pasture, you have got to construct a nice little building to house your equipment and for your radio operators to work and live in, unless you expect them to bed down at night with gentle Bessie and spend daylight hours driving away Bovine gentlemen and other livestock that may inhabit that region. All this, of course, is to the tune of more thousands.

In town, your studios and offices are being made ready, and how it does cost for insulated walls, speech input equipment, microphones, modernistic furniture, studio furnishings, a "baby grand," thick carpets, and dozens of other things that go to make up attractive and modern studio quarters!

The day comes, however, when the last item has been purchased and everything seems in readiness officially to go on the air with your own station. (That is, it's your own station except what the bank controls by now, or some kind friend—and of course Uncle Frank let you have a thousand dollars to carry you along, and to meet the payroll that has suddenly sprung up.) But impatient waiting, discouraging delays, big bills and annoying difficulties are all forgotten on the great day you first throw the switch for the opening program to be broadcast from that station you have dreamed of owning, and struggled so hard to obtain.

Everything ought to be all right now—but wait! What did you say your call letters were? W—I—M—M? I know why you chose them, and just what they stand for. The question mark should be inflected for a year or two when referring to your station—*Will It Make Money?*

The purpose of thus briefly sketching the difficulties and cost of starting a broadcasting station is to encourage careful consideration and planning before such an undertaking is embarked upon by an individual or group. The starting of a radio station is no longer a "peanut stand" proposition, but one requiring sufficient capital, an abundance of patience and accurate knowledge—at least from all information the author has been able to gather from six years connection with radio broadcasting.

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Radio's Stamps
by Ernest A. Kehr

RADIO is a far cry from letter writing as a means of communication, yet the two are interlocked by several special issues of postage stamps prepared by different countries.

Only last month Italy's Post Office initiated the sale of three commemorative stamps prepared in honor of Senator Marconi, the father of modern radio as we know it today. The adhesives are rotogravure prints in delicate colors and suitably portray the master of the ether.

Guatemala, a small Central American country, was the first to recognize the importance of radio and so honor it. As early as 1919 the thirty centavos stamp depicted the two radio antennae at Guatemala City. The lathe towers and bedspring aerial seem antiquated now, yet then were ultra-modern and evidenced the fact that our Latin American neighbors were brodacasting as pioneers.

Honduras, a neighboring Central American nation, has a similar picture on her official stamps of 1919. In addition to the antennae, the transmitting station and studio buildings are also shown.

Russia has been issuing many stamps to show her progress in diverse fields. Her radio activity is well known, so it is only natural that this industry should also be honored by postage stamps. In 1933 two different designs were made in which Soviet broadcasting transmitters are depicted. The one has the station at Nientzi, in the Arctic, while the other pictures Yakut Antennae. The following year a large thirty kopec label appeared at the Soviet post office upon which may be seen one of the tall, single tower antennae located in the far north of the Soviet. Professor A. S. Poppoff, whose experiments in wireless telegraphy paralleled the work of Marconi, was honored back in 1925 when two stamps portrayed his bewhiskered countenance. In the background may be seen the aerial wires of his laboratory. The inscription, "Inventor of Radio," claims for Russia the honor of this development.

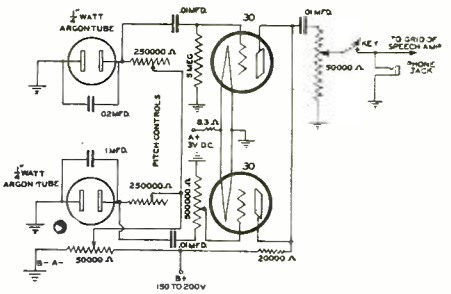
These are but a few stamps, and probably do not justify the vast progress radio has thus far made, but it does show that foreign countries are aware of radio's importance and have consequently placed it upon labels that generally honor only important heroes, patriots and kindred subjects.

All of the ones mentioned in this story can be obtained for less than a dollar, and make unique souvenirs for one interested in the advancement of this industry.

-30-

Adding Personality to Your 5 Meter Signal
by Robert S. Coe

IN the old days of "Rock Crushers" and "Squeak Boxes" (spark transmitters to you youngsters), a ham was known by his signal, as well as his call. In many cases if he should have forgotten to sign, it would have made little difference anyway as by listening to the particular note, you could identify the man behind the gun. The distinctive signal of the particular individual was just as much of a label, as his voice would be in a conversation.



Circuit diagram of the tone modulator.

No wonder "wireless" in those days had the glamour and fascination to attract a following. Those old time signals had a punch that somehow seems to be lacking today with the pure flutelike CW notes. Even though the CW note of today is better in cases of interference, it seems to become more monotonous to listen to for any length of time, as compared to the old type note that was composed of several pitches and was full of overtones.

Inasmuch as ICW is still a regular form of communication on the five meter band, why not rig up a trick oscillator that gives a combination of tones, which when blended would give an imitation of the old spark-type transmitter already discussed. Such an arrangement can easily be constructed using a pair of quarter-watt argon tubes, used with a pair of triodes as a mixing device to prevent reaction between the two argon audio oscillators.

Referring to the diagram you will note that one argon oscillator is used for low tones while the other is used for higher tones, each of these oscilllators being resistance coupled to the grids of their respective triodes (type 30's in this case for portability) for mixing, and also to get some gain. It is then only necessary to blend the two tones until the desired note is obtained. The pitch of either oscillator can be varied over quite a range by means of the series resistors so marked in the diagram, and the two tones blended by means of the volume control on the input to the low tone amplifier, marked "Blender Control." With the saw tooth waveform produced by the argon oscillator it is quite easy to adjust the rig to give quite a good imitation of an old fashioned spark transmitter, or in fact an imitation of almost any type of note ever used in "wireless" or "radio" telegraphic communication.

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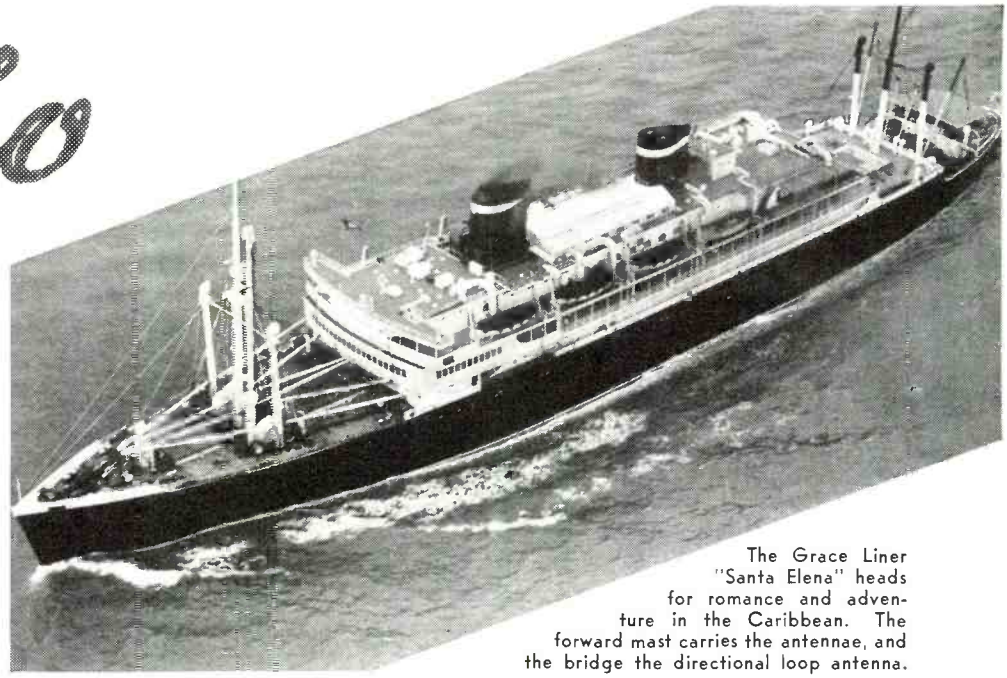
Radio on the HIGH SEAS

by
ROBERT R. FRENCH
Grace Line



The Grace Liner "Santa Elena" heads for romance and adventure in the Caribbean. The forward mast carries the antennae, and the bridge the directional loop antenna.

Generally accepted by the public, few realize what exactly goes on in the radio shack. The author describes the exciting routine of the radioman on the high seas.

IN the chill, morning hours of April 14, 1912, there came through the ether faint, raucous signals of distress from the North Atlantic to a lonely radio station on the coast of Newfoundland. Shortly afterward the world knew that the great White Star liner, "Titanic," had struck an iceberg on her maiden voyage and was slowly sinking.

Since that day over twenty-five years ago radio on the high seas has grown up to manhood. Television is peeking around the corner. The simple, crude spark sets have now become the compact, complex ship transmitters of 1938. Radio stations circle the globe. Ships at sea are in constant contact with one another or with master land stations. Equipment is, as far as is humanly possible, foolproof. Transmission is an exact profession, methodical and thorough.

If you should go aboard the Grace Lines' "Santa Lucia" at her North River pier, in New York City, and looked for the radio room, you'd be directed to the bridge. Just aft of the bridge, off the officers' quarters, you would notice a metal plate lettered, "Radio Room." Behind this door is the work-room of Chief Operator Fred Lambert and his two assistants.

The wheel rotates the loop on the roof, and by charting the signal, Chief Officer Abbott plots the ship's position.

During this visit aboard the "Santa Lucia," government inspectors were making their annual inspection, so we caught Lambert in a free period. Like seamen and engineers, Lambert and his assistants work the traditional ship watches, four hours on and four hours off. But Lambert doesn't haul in hawsers, paint superstructures, grease cups, or chart navigation. His hands nimbly twist numerous and perplexing dials, his ears strain at earphones.

Radio equipment aboard ship though complex to the layman, is much simpler than it was even a few years ago. Transmitters are more versatile. About ninety per cent of all radio traffic is handled by short wave; in fact, short wave rules the radio, for it gives greater range and more reliability on less power. On a short wave receiver the radio operator is receiving from "around the world."

Though small, Lambert's work-room is airy, light and roomy with the efficient layout of all ship departments. Though it may seem odd to the layman radio equipment aboard all Line ships is not owned by Grace Line but rented from the Radio Corporation of America. To the apartment house "listener in," this is RCA.

Just to the right of the Radio Room door, on the other side of the railing, is a swivel chair, typewriter, desk and transmitter; this short-wave transmitter ranges in the 12-80 meter band and is used for communication with any part of the world. Next to this radio "jack-of-all-trades" is an intermediate 500-watt transmitter for work in the 600-800 meter band; at this "work-horse" operators sit continuous watch twenty-four hours a day, since the 600-meter wave-length is the "distress band." Placed on top of this 500-watt

Chief Operator Fred Lambert, responsible to the carefree voyagers depending on him for help in emergencies as well as their "Daily Radio Press" reports.

transmitter is a small, 50-watt 600-800 meter transmitter for emergency use; its current is supplied by 12-volt batteries, which will furnish sufficient current for three to four hours continuous service.

The main transmitter is served by the ship's current. The radio equipment has its own generator to step up the ship current to the higher voltage necessary for operation of the transmitter.

Lambert's day, composed of his two watches, is no cinch. Spread out over thousands of square miles of ocean are ships, large and small, carrying freight or passengers, which must have contact with the numerous government or commercial radio stations along the coast of South and North America. And many of these ships haven't the powerful radio transmitter of the "Santa Lucia," so Lambert must act as a "go-between" and pick up their messages and relay them to land stations. Also he has passengers who wish to send messages ranging from requests to purchase orders; from the New York Stock Exchange to how Aunt Jane, ill at her home in Louisville, Kentucky, is getting along.

But Lambert's work schedule is more systematic than the above would indicate. Let us assume he is on the 4 o'clock watch. Above his desk is a schedule which tells when RCA land stations are sending or relaying messages to ships at sea, so Lambert will set his dials to listen in for messages for his ship. Should the code symbol "QTC" ("I have traffic for —") be followed by "WKER," the call letters of the "Santa Lucia," among other call letters of other ships—then there are messages for him. Lambert then pushes the button under his operating table, starting up the converter in the transmitter panel, reaches for his keys and tells RCA to go ahead.

He may take messages for as long as five minutes. When the "Santa Lucia" traffic is finished, Lambert types the messages to be given to the addressed passengers aboard ship or, if they have to be relayed, he then portions out the messages so that each message will be taken by the land station nearest the final destination of the message. He rarely relays all messages to one station.

By his clock Lambert now notices that the half-hour period has been reached, and he immediately switches to the 600 meter wave-length, the international calling band. For three minutes, at each half-hour interval, he will listen in on this band; at these periods only the traditional "SOS" can be sent. "SOS" means "come and get us" and is used because of the simplicity of the code, and its ease of recognition—three dots, three dashes, three dots. [*The SOS does not mean, "Save our Ship" or "Save our Souls" as is popularly believed.* —Ed.] Perhaps Lambert will get a call from a freighter needing assistance, so, after the three-minute period, he will shift to the 700 meter band to relay the freighter's call to a ship nearer the distressed vessel.

Now Lambert and his assistant turn their attention to passenger radiograms. These are portioned out according to the time of day. Ships have various high-frequency bands and for long-range work Lambert selects that band which is most efficient. For example, eighteen meters is best during the morning hours; twenty-four meters during the afternoon; but either thirty-six, forty-eight, or fifty-four meters are used at night.

After he has sent a message to a station, or relayed another message, Lambert always asks if that station has any message for him. It might be that the station is in, say, France, then he tunes in directly and takes the message. At seven o'clock in the evening, however, he tunes in the time ticks from NAA, in Washington, and plugs in the bridge so that the officer on watch can check the chronometer.

[*A chronometer is a ship's clock. So delicate are these instruments that they are only set on land and by experienced specialists. Only special messengers with a certain type of walking gait are used to carry the chronometer from and to the ship. Chronometers need not tell the exact time of day, and rarely do. A chart computed from time signals is used to "correct" the time as it shows on the face of the instrument. Naturally each day this time changes as the ship goes towards or away from Greenwich, England. In spite of all this complication, the ship's chronometer is the most accurate of all time pieces in the hands of the general professions.*—Ed.]

Next NAA sends out the weather reports; it's eight o'clock and he's off duty.

However, aside from this Lambert has many other messages which have passed through his transmitter. A freighter bound for Rio has had trouble with her propeller, and Lambert has relayed this message to another freighter approaching the distressed ship. An oiler wants the latest weather reports, and Lambert puts this through from NAA, in Washington, by short-wave. He picks up for his ship's information the local weather reports of a passenger vessel about 125 miles north of him. If this isn't sufficient listening and sending for four hours, he has also picked up and relayed messages to the numerous stations of RCA, Mackay Radio, Tropical Radio, and various American land stations.

Other messages have the ominous significance of "SOS." Lambert regularly stands by to pick up "CQ" messages, which range from icebergs floating southward into the North Atlantic ship lanes to calls for the doctor. Handled without charge, "CQ MEDICO" calls have precedent over all messages except "SOS." Usually such calls come from freighters, or small fishing schooners, which do not have doctors aboard because no passengers are carried. To Lambert will be sent the symptoms of the injured seaman or fisherman; by some legerdemain his ship's Doctor will diagnose the ailment; and Lambert will radio treatment. In extreme cases the ship alters her course and picks up the stricken seaman. In his three and a half years as captain of the Grace Line's "Santa Elena," Captain Walter Prengel has about twenty such errands of mercy in the ship's log.

During his watch Lambert is something of a newspaper publisher, that is, he gets out the ship's newspaper. From the New Jersey station of "WSC" he takes down the radioed news items on stencil, and these stencils are used directly for publishing the "Spanish American" which is the ship newspaper, their only source of news.

The 600-meter "international band" is also the wave length for the emergency weather reports. Throughout the world there are not located sufficient forecasting facilities for ships at sea. Also in some areas, such as the Caribbean, hurricanes burst unexpectedly, lasting a few hours leaving wreckage behind. These sudden uprisings of nature are sometimes so unexpected that advance weather reports are not possible to send out. So emergency weather reports are radioed that ships heading for the storm area may alter their courses.

[*When a hurricane is noticed in the forming, the Government sends out hourly bulletins of the progress it is making across the seas. Sometimes there are quarter-hourly bulletins. The captain of the ship then plots the course of this destructive force on his charts and may even alter his course so as to avoid being hit by it. Hurricanes generally travel over the same general area during the same times of the year. It is this habit that has enabled shipping to skirt these spots and keep its schedules.* —Ed.]

When the red light signal flashes in the radio room, Lambert is warned that the officer standing watch on the bridge wishes to take a bearing on radio equipped lighthouses by means of the radio direction-finder. By throwing an overhead switch Lambert cuts off the transmitter and closes the radio direction-finder's circuit. In the chart room the officer, donning earphones, turns the wheel of the rotating radio loop, tuning in the call of the lighthouse at its maximum intensity and then diminishing the signal to its minimum. From the readings of the maximum and minimum intensities registered on the radio direction-finder's compass, the officer is able to calculate the position of the lighthouse in relation to the ship.

When Captain Jens Nilsen, of the "Santa Lucia," wants to know the ship's position during thick weather, Lambert requests assistance on 800 meters and then sends out long series of dashes with his key for about thirty seconds. Compass stations along the Atlantic coast pick up his call in groups, get his bearing by means of their "loops" and transmit their bearings to the master compass station, which in turn tells the "Santa Lucia" its position. This is known as a radio "fix."

Every precaution is taken to make the ship's radio equipment foolproof. Should the ship current fail, there are storage batteries which can furnish current for about four hours continuous service. Emergency transmitters are standard equipment. Spare parts for every item in the radio complement are at hand. Perfection in operation is assured by constant testing and examination by the ship's operators once a week and by port inspection of government officials and Grace Line's safety engineer.

Between communication, inspection, testing, and publishing a newspaper Lambert and his two assistants are kept busy. But then many of us land-locked toilers probably wouldn't mind exchanging eight hours a day for "four hours on and four hours off" aboard a ship heading for the Caribbean and South America.

—30—

CQ-SATURN

CAME a pause in the day's occupation which was known as the Pinochle Hour. The three of us—Final Authority, Technical Knockout, and I—had just locked the door of our radio repair shop for the night. The chassis I had just finished was left on the bench, tuned to a foreign short wave code station for test.

"Fine signal," said Knockout.

"Fine repair job," I said.

"Fine thing," said Authority. "C'mon, play cards!"

We all could read code, and during the silence of the deal, translated what the station was sending. It called, not another station, but Saturn! The call letters and a message to Saturn followed. The preamble, in proper worldly order, gave the filing time, number of words, and office of origin—a city in Europe. The address was simply "Saturne", [*French spelling for "Saturn."—Ed.*] and the text was 31 five-letter code groups, in figure. When the message was finished, their regular transmission was resumed.

"Since when have we been working other planets?" I asked.

"We are supposed to be playing cards," muttered Authority. "Saturn is about nine hundred million miles from here. That means they won't copy it for over an hour—"

"Eighty-one minutes," Technical Knockout put in, "And, if they answer us immediately, the answer will be here within three hours. But the message isn't to a planet—it's that country's method of directing fleet maneuvers."

"Never heard of that country having any battleships," argued Final. He turned to me. "If you think you're going to delay this pinochle game for three hours, trying to tune in an answer, you're nuts. Pick up your cards!"

I tried to question Technical Knockout, but the Authority interrupted.

"Listen, my cosmic-minded companions: if I give you the inside dope about that Saturn call, will you promise to start the game?"

We nodded.

"Every so often, someone reports a funny noise on his radio, and, instead of recognizing it as static caused by a local barber shop neon sign, announces he heard Mars. Then, when twenty signals from Mars are reported, the newspapers use these reports to relieve the monotony of animal pictures between war crises.

"During the last wave of inter-planetary speculation, a man was found in Europe who had been sending messages through radio offices, addressed to various planets. He admitted he had friends on several of them, and confessed there was one in particular—a girl friend on Saturn—who was going to send him an answer that night. The reporters were welcome to come out to his house and help wait for the message; it came by telepathy, prepaid, and could

(*Continued on next page*)

Electric Calibrator

(*Continued from page 35*)

not touch the plates or crystal with the hands. Use a clean soft handkerchief to prevent grease from the skin from filming the cleaned parts.

The crystal is then replaced and the plates evenly tightened until the crystal will not oscillate. Letting up equally on the three nuts thus loosening the plates until the 100 kc. harmonic on a high frequency coincides with the 1000 kc. harmonic.

Occasionally the oscillator should be checked against a reliable broadcasting station, or better yet, WWV's standard frequency transmissions. These occur daily at 5000 kc., the 5th harmonic of the "high" top or 50th harmonic of the "low." Beat the oscillator against the signal. If a zero beat results the instrument is OK, if not, determine by heterodyne beat method the amount it is off and mark this up for reference.

A chart should then be made for all frequencies to maintain accuracy.

Calibrators seriously off their frequency should be returned to the factory for repair where suitable calibration facilities exist.

—30—

Short Wave Flashes

(*Continued from page 54*)

Havana, now variable near 10.01; COCQ, Havana, now variable near 9.725. . . DOMINICAN REPUBLIC—HI1S, "La Voz de Hispanola," Santiago City, back on air, on 6.43; HI7P, Trujillo, to 6.736. . . ECUADOR—HC2CW, Guayaquil, now variable near 9.235. . . HAITI—HH2S, Port-au-Prince, to 5.916. . . MARTINIQUE — "Radio Martinique," now variable near 9.71. . . NICARAGUA—YN1GG. Managua, back to 6.537. . . PORTUGAL—CS2WA, Lisbon, to 9.65; CSW3 Lisbon, to 9.74. . . U.S.S.R.—RKI, Moscow, to its summer frequency of 15.8. . . VENEZUELA —YV2RA, San Cristobal, to 5.745

Data

COLOMBIA — Correct schedule for HJ1APB (9.618), Cartagena, is weekdays 9 a.m. to 1:30 p.m. and 4:30 to 10 p.m. (to 2:30 a.m. Sundays), and Sundays 4:30 to 9 p.m. . . CUBA —COCA (9.1), owned by Testar and Gonzalez of Galiano 102, Havana, power 100 watts, operates from 8 a.m. to midnight. . . ECUADOR —HC1GQ (9.175), connected with the Guayaquil-Ecuador Railway Co., Quito, announces schedules as Mon., Wed. and Sat., 9 to 11 p.m. but usually heard 8 to 10:30 p.m., signs-off with the "Blue Danube Waltz." . . GUATEMALA— TG5 (7.1), owned by Juan Quillen and Julio Caballeros, Guatemala City, verifies with a beautiful card picturing the native quetzal bird.

INDIA—VUD2 (9.59), New Delhi, power 10 kw. operates as follows: trans. I, 9:30 to midnight (English news at 10:40 p.m.), and trans. II, 2 to 4 a.m. Send reports to VUD2, Chief Engineer C. W. Goyder, Office of the Controller of Broadcasting, All-India Radio, New Delhi; VUB2 (9.55), Bombay, power 10 kw. operates daily as follows: trans. I, 9 to 10:30 p.m. and trans. II, 1 to 3:30 a.m. . . JAVA—Latest schedule for the NIROM network (YDA 3.04—YDB 9.55—YDC 15.15—PLP 11—PMN 10.26) follows: Daily except Sat. 10:30 p.m. to 2 a.m.; daily 4:30 to 10:30 a.m. (Sat. to 11:30 a.m.); daily ex. Sat. 6 to 7:30 p.m. and Sat. 7:30 p.m. to Sun. 2 a.m.

PERU—OAX4J (9.34), "Sintonice Radio Internacional," Casilla No. 1166, Lima, Peru, relaying OAX41 (1100 kc), daily from noon to midnight, is now verifying reports with large red and orange QSL cards. . . VENEZUELA— YV3RD (6.465), owned by Rafael Angel Segura, Barquisimeto, operates daily 11:30 a.m. to 1:30 p.m. and from 5:30 to 9:30 p.m.

Amateur Notes

Those wishing to log the Isle of Man, and the Channel Islands, should be on the lookout for G6IA and G8MF, respectively, both operating near 14.1. . . The most popular DX catches of late are the Roumanian stations, the following having been heard: YR5AA (14.01—14.07—14.285); YR5KW (14.12), YR5VV (14.135) and YR5CX (14.06).

The official amateur call prefix for the Union of South Africa is now ZS. Following is a list of the more important phone hams with both their new and old calls furnished by Norman Kriebel of Ambler, Penna.:

ZS1BL—ZT1AD; ZS1BV—ZT1M; ZS1BX—ZT1P; ZS1BZ—ZT1R; ZS1CN—ZU1T; ZS6DF—ZU6AM; ZS2AF — ZT2G; ZS5BB — ZT5P; ZT5BZ — ZU5L; ZS5CJ — ZU5X; ZS6CJ — ZT6N; ZS6DV — ZU6N; ZS2AH — ZT2L; ZS5BE — ZT5S; ZS5CA — ZU5M; ZS5CL — ZU5Z; ZS6CT — ZT6Y; ZS6DW — ZU6P; ZS6EF — ZT6AL; ZS2AL — ZT2Q; ZS5BX — ZU5G; ZS5CB—ZU5N; ZS6BW—ZT6AU; ZS6CZ—ZU6AF; ZS6ED—ZT6AK; ZS6EG—ZT6J.

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.

MAY

Day	Hour	Call	State	Kc.	Kw.
10	5:35-5:50	KGMB	T.H.	1320	1.
10	6:10-6:25	KOOS	Ore.	1200	.1
12	4:30-4:45	WFOR	Miss.	1370	.1
14	4:05-4:20	WJBO	La.	1120	.5
22	3:00-4:00	KWYO	Wyo.	1370	.1

JUNE

8	3:30-3:50	WRAK	Pa.	1370	.1
9	4:30-4:45	WFOR	Miss.	1370	.1
11	4:05-4:20	WJBO	La.	1120	.5
14	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. 1930 kc, KOY, Phoenix, Ariz., 1 kw. (tips).

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

Saturdays—

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

2:45-4:00 a.m., 780 kc., CHWK, Chillinack, 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, Texas, .1 kw. (FC).

Notes from Readers and DX Clubs

William T. Golson, Chief Engineer of station WJBO, Baton Rouge, La., 1120 kc. sends in the following interesting and most welcome letter:—We plan to end our regular schedule of DX Night Owl Broadcasts this month due to lack of interest during the summer months and will start planning a new series of RADIO NEWS DX programs for next DX season. I will, however, continue to dedicate our monthly frequency checks to your magazine.—[*see sked*—Ed.]

The International Dx'ers Alliance reports the following revised sked for Bahamas, 540 kc. 400 w. daily 1:30-1:45; 8-9 and 10:30-11 p.m., EST. New permanent studios will be completed soon. A few of the new stations in Mexico: XEAI, 1250 kc., 500 w., Mexico, D. F.; XEBP, 1150 kc., 250 w., Durango; XEBU, 1200 kc., 50 w., Chihuahua; XEDH, 1340 kc., 200 w., Villa Acuna; XEFM, 1160 kc., 20 w., Leon; XEME, 1240 kc., 50 w., Merida.

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CQ—Saturn

(*Continued from page 72*)

only be received during certain syzygy between the two planets.

"They came, and after sitting quietly in his reception room for over an hour, were told the message had been received. Now, let's get back to Earth and accomplish some pinochle. What do you bid?"

"Three hundred," I said, with only forty jack to meld. "What was in the message?"

"He never told. Explained to the reporters it was of such personal nature he was afraid his wife would leave him if she heard. Pass."

Preoccupied with the code from the set on the workbench, I lost the hand by over one hundred points. Who received the message: sweetheart, battleship, or planet?

Did the sender have a real sweetheart and was this his way of reaching her? Was he in communication with Saturn? It seemed fantastic; but in radio I had learned many things could be true. Or was this a message of international importance, carefully coded, which would send spies, ships or even an army to some far port. I wonder!

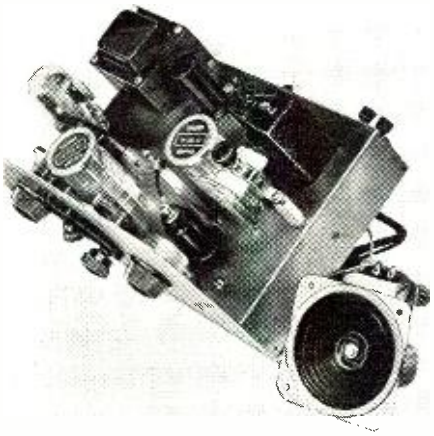
[Note: Every word of this story is true. The author has double checked the transmissions by investigating certain sources where permanent records are kept. For obvious reasons the names and places are fictitious and any similarity to any persons mentioned and those living, is wholly coincidental.—Ed.]

—30—

Universal Receiver

(*Continued from page 63*)

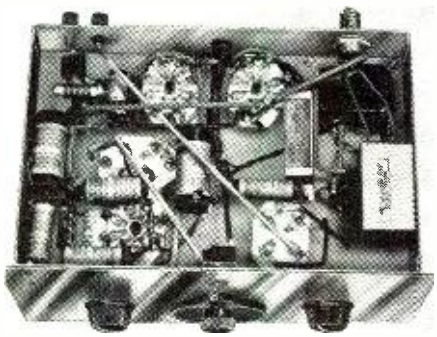
further attention, and it will now be possible to tune band spread by merely using the condenser on the main dial (C_2). When changing bands, of course, it will be necessary to readjust condenser C_1.



A neat arrangement of receiver parts.

There is very little adjustment to be made on the intermediate frequency transformer; while adjusting the condenser on top of this transformer, rock the main tuning condenser back and forth for maximum volume.

The regeneration control regulates the screen voltage of the 6K7 second detector, and thus is also a volume control. For normal operation to provide maximum gain, it should be adjusted to a point just below regeneration. However, for C.W. reception, the control should be advanced



Underside the receiver chassis.

somewhat further to produce regeneration, thus acting like a beat frequency oscillator.

This receiver will work with a conventional antenna or a doublet. The doublet is recommended for the best performance and may be loosely coupled to the set by looping two turns of push back wire loosely around L_1, the primary of the antenna tuning coil.

-30-

OOPS! SORRY.

In the diagram published last month on the beat frequency oscillator on page 39, a blocking condenser of 0.1 mfd. was left out of the circuit between resistors R_{20} and R_{21}. The line between these two resistors should be broken and the condenser inserted. The value of the resistor in the grid-ground circuit of the 76 tube is 2 megohms. The 10 watt resistors can be 1 to 5 watts each. To Mr. Zadig, our sincere apologies.

Airplane Transceiver

(*Continued from page 59*)

operation, it is advisable to check the Transceiver on reception. The D.P.D.T. switch should be set on the "receive" side and the rheostat turned up. The variable resistor should then be set at the point where the characteristic rushing noise of a super-regenerative receiver is loudest. The dial should be turned slowly until a point is reached where the hissing ceases or diminishes. This point indicates that a station has been tuned in. The variable resistor is then adjusted to a point of maximum response.

In closing it should be remembered that a log must be kept of the transmissions in order to comply with the FCC rules. No notification need be given by the license holder. [*Only a licensed amateur may operate this set under the law.* Ed.]

With the complete equipment costing so very little, it will be well worth while for the flying or boating ham to consider this transceiver as a necessary adjunct to his summer vacation.

-30-

Transmitter Construction

(*Continued from page 56*)

cuit, driver tube, and output stage. For instance, the oscillator could just as well have been a tri-tet, the driver an 809 (which was unborn at the time this transmitter was built), and almost any one of a long list of final amplifier tubes.

As the simplicity of this transmitter necessitates but few coil changes from band to band, the convenience of coil switching seemed a rather dubious one, considering the extra expense, probable losses, and complications it would involve. To shift back and forth from 14 to 28 mcs. requires the changing of the final amplifier coil and the driver unity-coupled coil. However, when shifting from either 14 or 28 mcs. to 7 mcs., it is necessary to change an additional coil, the shielded plug-in unit.

It is also possible to change operating channels adjacently related, without retuning any of the circuits, by a turn of the crystal selector switch. Naturally, shifting from one end of a band to the other, such as from 14,000 kc. to 14.400 kc., necessitates slight readjustments. But switching frequency within either end of the 14 mc. band, for example, without retuning may be accomplished by first tuning all the transmitter's circuits to the center of the frequency range to be used, such as 14325 kc., and then using any frequency between 14250 and 14400 kcs. by retouching no controls but the crystal switch. Similarly, the entire 14 mc. phone band may be used, or the low frequency c. w. end.

Rack mounting was not wanted for this arrangement as the space available was a shelf above the operating position. Anything paneled in front would, under these conditions, be inaccessible from the rear. The open construction used is very convenient to band changes and adjustments from the operator's chair. To those having an appreciation for good layout design

and neat construction, an open transmitter of this type presents a very pleasing appearance. Only too often does an array of beautifully finished rack panels with their attendant dressy dials and meters serve to hide a multitude of sins behind them.

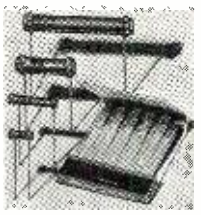
In concluding an article, it is customary to mention the results accomplished with a given collection of apparatus, so, in keeping with convention, it may be recorded here that this transmitter worked all continents, within the first few hours after it was first turned on, using a simple single wire feed Hertz antenna located in a maize of BCL antennas in a congested area of Chicago. What is more important, it has proven to be consistent in its ability to "get out" and, because of its simplicity and straight forward performance, allows a maximum amount of communications per hours operated.

—30—

What's New in Radio

(*Continued from page* 58)

Standard Transformer Corp., Chicago, have released their new service guide No. 125. This manual is invaluable to every serviceman because it contains over 2,800 accurate receiver listings with the necessary transformers and chokes to service them. Lou Gamache, development engineer, is the author.



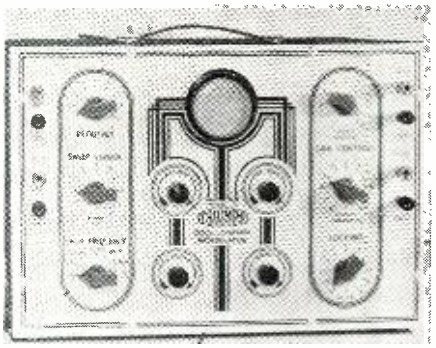
Centralab of Milwaukee, Wis., announces a new line of ceramic fixed condensers in ranges from 10 mmfd. to 1000 mmfd. They are rated at 1000 v. breakdown.

RCA announces that it has ready for distribution to amateurs and television experimenters, the necessary yokes, condensers, etc., that a television receiving circuit requires.

Emerson Radio & Phonograph Co. of New York City, announce the first of a differently stylized radio series. The unit is known as the BD-197, also the same company has service notes on the following chassis ready for distribution: AZ, AM, BF, BE, AY and BD. All are in their 1938 line.

A new type burglar alarm available for the first time to the public directly from their radio and electrical stores is the Teletouch Electric Eye Burglar Alarm manufactured by the Teletouch Industries, Inc., of New York City.

A picture amplifier tube of extremely high grid-to-plate transconductance has been released by RCA of Camden, N. J. It is the 1851 tube. It is metal with the usual octal base.



Triumph Mfg. Co. of Chicago announce a new Oscillograph Wobbulator Model 77-2. It employs a built-in 840 kc. freq. modulator automatically synchronized to the linear sweep circuit.

Bud Radio of Cleveland, Ohio, announces a new Ultra high freq. Transmitting Condenser. Ceramic insulation is used.

Thordarson Electric Mfg. Co. of Chicago announce their new replacement catalog covering all the sets in the Rider's Manual Vol. VIII. This volume covers all 1937-1938 home model receivers. The catalog, therefore, covers all the latest sets.

Sound Systems, Inc., of Cleveland, Ohio, have brought out a new speaker mounting with a high frequency deflector unit. Speakers from 3" to 18" are put out in this form of cabinet.

Thordarson Electric Mfg. Co., Chicago, have gone into the amplifier field with a new line of amplifiers featuring illuminated dials, protected controls, window visibility dials, dual tone control, low distortion inverse feedback, multiple inputs with individual controls, etc. Power ranges from 8 to 60 watts

Gordon Specialties have moved to larger quarters at 1104 S. Wabash Ave., Chicago, Ill.

Operadio Mfg. Co., St. Charles, Ill., have a new 35-52 watt amplifier with latest beam power tubes, 3 input channels, electronic mixing, capable of use with velocity, velotron, diaphragm or cell types of mikes; also with crystal, and high impedance dynamic mikes. Features a new non-resonant equalizer used as a tone balancer.

WJR, Detroit, has installed 2 new type 23 input speech units, with arrangements for handling 3 studios, etc. Talk-back is accomplished without use of switches or keys. The units were designed by the Bell Laboratories of the Western Electric Co.

National Union Radio Corp. announce the new "Monotron" tube suitable for generating a single image for television test experiments.

Allied Radio Corp. of Chicago has brought out a new radio-phonograph set featuring automatic tuning, with a self starting synchronous motor, 12" turntable and magnetic pick-up. The unit includes a specially matched 8" speaker. The radio portion has a 2 band set covering 16-54 and 175-550 meters. It is the latest Knight model of its kind.

Same company announces a new automatic auto radio featuring push-button tuning. Output of 2 watts and a coverage of 535-1530 kc. is included in the 5 tube superhet.

The Knight line of the same firm has added a phonograph with a built-in amplifier with 3 watts undistorted output. Also a 5 tube superhet in plastic with 4 station tuning.

General Electric of Schenectady, N. Y., releases a frequency monitor for police stations. It is operated from 110 v. AC source and crystal controlled. Range 1.5-3 and 30-42 mc.

Mallory-Yaxley of Indianapolis, Ind., announce a new line of Midget Volume Controls—plain, single tap, double tap, and duals in values from 5,000 ohms to 3 megohms. Plug-in shafts (pat. app. for) are featured.

Antenna Mast

(*Continued from page* 64)

The approximate length of each guy wire can be calculated in advance, by considering it as the hypothenuse of a right triangle, with the mast as one other side and the distance from the foot of the mast to the stake as the third side. Then (height)^2 plus (distance to stake)^2 equals (hypothenuse).^{2} In the case of a 38-foot mast, with the stakes 20 feet from the base, this would give

$$\sqrt{(38)^2 + (20)^2} = \sqrt{1444 + 400} =$$

$$\sqrt{1844} = 43'$$

as the length of each of the two top guy wires. Add about five feet to this, for easy handling and fastening, and cut it off later. The approximate lengths of the lower guy wires, to the same stakes, would figure out about 28-29 feet each.

For maximum efficiency, particularly if the antenna is to be used for transmitting, strain insulators should be inserted in each guy wire at ten-foot intervals. Such insulators will break up these wires into short, electrically isolated sections of a length that will not absorb energy from the antenna if it is used for transmitting, or cause any "shielding" effects if it is used for receiving.

A metal mast such as this does not need any annual painting or, in fact, any attention at all, once it has been erected in a workmanlike manner. If a good grade of galvanized wire is used, to prevent rust, a mast of this type will give many years of faithful service, with no other attention than an annual inspection to detect cracked insulators or guy wire stakes which may be loosening. And it will be far more satisfactory and pleasing in appearance than any of the usual haywire antennae hung on tree limbs, bent and rotting 2x4 beams or crumbling chimneys, such as are seen so plentifully on every hand.

For those amateurs, desiring a vertical radiator, the mast will more than fill the bill. It may be used insulated from the

ground, or not, depending on the type of feed. 33′ is the usual amateur length. This can be made of two pieces 16′ in length securely *threaded* together by means of a reducing joint. A bolted antenna should not be used for transmission because of loss at the bolted stage.

-30-

Letters to the Editor

(*Continued from page 70*)

their shortwave broacasts rescued from code and noises of all kinds?

—Thomas Ryan,
Reynolds, N. D.

(The Cairo Conference has this proposition up before it. Of course there will always be some sort of interference in some locations from electric apparatus, but the code will be eliminated for those who have good sharp receivers. That is one of the purposes of the conference of the nations. Ed.)

Even an old technical stiff like me enjoys seeing a swell looking gal like Lucille on the cover instead of a condenser or a tube or an amplifier or something else. Let's have more glamour girls to add color and sparkle to the old grind. I have R. N. from the first issue, but never such a magazine as this. Keep it up and more power to you. . . .

—Lloyd Moore,
Chariton, Iowa.

(We wonder if Mr. Moore's sentiments are not those of many servicemen such as he. It is nice to have an occasional pretty girl liven up the day. R. N. will feature technical covers more than those of girls, but we will run a girl cover now and then. Ed.)

Congratulations on the April issue of R. N. It is now a good radio magazine. May I ask you to keep it radio—do not let moving picture stars who make rare appearances before the mike dominate your gossip columns and magazine cover. . . . For your radio program, I want to hear the stories of O'Henry, Kipling, DeMaupassant and other masters simply retold with no dramatization whatsoever!

—Mrs. Guy B. Rose,
Montclair, N. J.

(We aim to touch on all parts of radio, and we cannot slight the performers. That they are moving picture stars, we deem secondary. We will consider your suggestion on the program. Ed.)

Just got my second copy of the NEW "RADIO NEWS," and let me say just one thing at the beginning—YOU'VE GOT SOMETHING THERE! . . . For the first time in my life I've read R. N. from COVER to COVER, ads and all. . . . The best of luck to the new R. N., and keep it going just AS IS!

—Claude R. Crever,
North Star Radio Service.
St. Joseph, Minn.

(Thank you, Mr. Crever. We think that we have a nice balance, and will try and maintain it. Ed.)

I don't believe any comment on the change of format in R. N. could be as strong as was your newsstand circulation gain for the month. That speaks louder than words!

—D. J. Finn,
Advertising Dept., R. C. A. Manufacturing Co.
Camden, N. J.

I just saw the new copy of RADIO NEWS. I am very much impressed with the new make-up, art work, and practicability of the radio subject. You now have a RADIO NEWS which is true to its name, RADIO NEWS and not a magazine solely designed for the radio experimenter.

Tobe C. Deutschmann, President,
Tobe Deutschmann Corp.,
Canton, Mass.

(To both of these gentlemen who are primarily interested in radio as a business, may we express our sincere thanks for their nice letters. Ed.)

Radio Gadgets

(*Continued from page 62*)

for r.f. measurements, an adapter is used. It consists of a six prong male and female plug wired together with a 5 wire cable, all connections being made straight through except the grid circuit which is left vacant. One plug of the adapter is inserted in the tube socket, the other receives the 6E5 tube.

A short length of stiff wire is wrapped around the grid prong of the tube and extended outward at the junction of the tube and plug as pictured in the drawing. A 5 or 10 megohm resistor should be connected from grid to ground if the circuit to be measured does not provide a d.c. path.

As no means are provided to insure permanent calibration, indication of absolute values of voltage may have a low accuracy due to changes in tube characteristics or live voltage, but for measurements made on a comparative basis, results should be as accurate as if an expensive v.t. voltmeter were used.

Forest Fire Patrol

(*Continued from page 39*)

of communicating with this island, radio is used for every purpose to which a telephone would ordinarily be put. This system includes four stations, one in the park office, one on each of two boats that ply back and forth between the island and the mainland, and the other at Houghton, the nearest point of communication.

Three hundred and sixty messages were sent from this park during the month of August alone; and in September two hundred and seventy more were transmitted. The greater than usual number sent during August was due to a bad fire, which destroyed thirty-five thousand acres of forest land and would have been even more destructive if radio calls had not brought the fire-fighters into prompt action.

In the Mount Rainier National Park radio is regularly used for control of ski races, particularly on the long, hazardous runs. Sets at the begining and end of the course insure the skiers of a clear track and thus prevent accidents.

The arid expanses of the Grand Canyon and Death Valley Monuments are particularly well adapted to the use of high frequencies, 2496 kilocycles being used within the park boundaries of the Grand Canyon. There sets are used entirely for communication over the vast desert and mountain territories, where the lives of the rangers and of the tourists in their charge often depend on that single connection with their base of supplies and information.

Last summer an expedition, led by Dr. Anthony and backed by the Museum of Natural History, explored the Temple of Shiva, a part of the Grand Canyon Park, which, prior to that time, had never been investigated. Such an expedition—over treacherous, torturous, uncharted paths—naturally necessitated carrying as light a load as possible. This expedition carried the portable radio, designed by Mr. Hilgedick (2496 kilocycles), having secured special authority to use the Park system. It was, therefore, able to keep in constant communication with the base station at Grand Canyon. No doubt, the service furnished by this small set played a substantial part in keeping up the morale of the intrepid little band of scientists and in the success of the expedition.

Another place where radio has proved its usefulness in Park administration is in the patrol cars, all of which are now equipped with fire-fighters' outfits, first-aid kits, tow chains, and radios.

One of the most recently established stations is that at the Fort Jefferson National Monument, on an island off the coast of Florida. It was at this Fort that Dr. Mudd, the physician who treated John Wilkes Booth, President Lincoln's assassin, was imprisoned. W.P.A. labor is now working to make a show place of the Fort. When the National Park and Monument Division first took over the job, considerable difficulty was experienced in the establishment of radio communication. An old set was sent down there, which operated on a frequency of 2994 kilocycles, and the Coast Guard was given the job of setting it up and putting it in working order.

With this set-up the station at Fort Jefferson could hear messages from about fifty miles away but could send only three miles. Since the establishment of a set at that frequency in such an isolated region

would, as Mr. Cross, of the National Park Service, said, have been rather like giving a man a telephone that would talk to the house next door, when the house next door was empty, the Coast Guard set the radio up to operate on 3410 kilocycles. This enabled the Fort to communicate with the Coast Guard lighthouse station, the nearest human contact. However, the use of the higher frequency was unauthorized and the man in charge of the lighthouse refused to talk to the Fort Jefferson station. Every time he received a message from the Monument he would leave the station and go over to talk to them. A temporary permit was finally granted and now communication with the Key West base station is achieved by means of the Key West station's picking up the conversations between the lighthouse and Fort Jefferson.

It is intended that a new and more efficient radio set shall be put in within the next few months, in keeping with the program which plans to establish radio communication within the boundaries of every National Park and Monument.

—30—

High Fidelity Amplifier

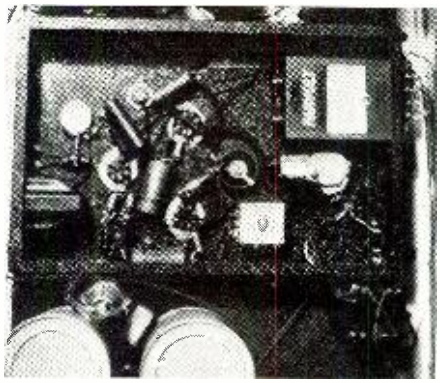
(*Continued from page* 51)

ratus under test where plate voltages must be isolated from the grid of the 6C5 tube. If desired, T_1 may be dispensed with.

Both halves of the primary winding of transformer T_2 (totaling approximately 70,000 ohms impedance) are used in the plate circuit of the 6C5. This allows working the tube at a plate current lower than is customary. The grid bias developed by R_2 is 7 volts, which is the voltage giving lowest harmonic distortion for the values of load impedance and plate voltage used. The voltage gain of this stage, measured across one secondary of T_2 is 6. Thus, with the permissible 7 volts peak input voltage, this stage is capable of delivering a maximum of approximately 42 volts peak to the input circuit of each 6L6. The electrolytic filter condensers C_1 and C_4 of this stage are shunted by paper condensers C_2 and C_5 to give better filtering at the higher audio frequencies. R_3 and C_3 across the primary of T_2, constitute the equalizing network.

6L6 tubes in push-pull were selected for the output stage primarily for their power handling ability. Class A operation was chosen in preference to Class AB operation, to take advantage of lower plate voltages and the less stringent voltage regulation requirements imposed on the power pack. The approximate output of 15 watts available from Class A operation provides sufficient reserve capacity for any normal usage.

The inverse feedback circuit of the output stage is a conventional arrangement consisting of R_5, R_6, R_7, R_8, C_8 and C_9, whereby 10% of the audio frequency voltage developed across the output of each 6L6, is placed in series with the input voltage, but 180 degrees out of phase with it. Considerable voltage amplification is sacrificed by inverse feedback, and the input voltage must be approximately doubled to load fully the 6L6 tubes. but this has been cared for in the design of the first stage. The advantages of inverse feedback include (1) reduction of any hum which may be present as the result of inadequate plate supply filtering, (2) reduction of harmonic distortion caused from non-linear operation of the tubes, (3) reduction of unequal frequency response, simplifying equalization and (4) reduction of frequency distortion, caused from the non-uniform load impedance presented by the loudspeaker at different frequencies.



Underside the amplifier chassis.

Rheostat R_{10} provides means for equalizing the no signal plate currents of the two 6L6 tubes. This is desirable to eliminate distortion otherwise resulting from the use of unmatched tubes. With the resistance of R_{10} all out, read the plate current of each tube on milliammeter M_1 by throwing SW_2 successively to both positions. If one tube is drawing more plate current than the other, add resistance in rheostat R_{10} until the plate currents of both tubes are equal. If adding resistance causes the plate currents to further depart from each other, the 6L6 tubes should be interchanged in their sockets, as it is necessary that R_{10} be in the cathode circuit of the tube drawing the higher plate current. Meter M_1 may be an inexpensive milliammeter, inasmuch as its primary function is to compare two equal currents.

The author's amplifier, shown in the photos, is mounted in a 3"x11"x17" chassis arranged for relay rack mounting. If desired, the apparatus may be built into a smaller chassis, since the arrangement of the apparatus is not critical. The builder can largely suit himself on this point. Filter condenser C_{11} can be omitted if adequate filtering is provided in the power pack. To reduce hum pick-up, wiring in the grid circuit of the 6C5 should be short and kept close to the chassis. To reduce chances of positive feedback, the 6L6 plate wiring should also be short and kept close to the chassis.

The performance of the amplifier can best be appreciated on signals received from local broadcast stations using a broad tuning one or two tube tuner. A suitable speaker is essential and the sacrifice at this point is foolhardy, since with the amplifier delivering full high fidelity, the reproduction would be bad. Builder will be amazed at the manner in which signals sound when amplified by this unit. For pleasant superior reception or recordings it cannot be beaten.

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Vest Pocket Transmitter

(*Continued from page 45*)

No trouble was experienced in mounting the power supply, tuning condensers and coils, but the tubes measured about 2¾" in height so it was necessary to drop them beneath the top of the base, in other words, spacers were used on the sockets and instead of being mounted flush they were ¾" under the top of the base. The tubes then extended only 2" above the base and to give you some idea of the close figuring, it was necessary to remove part of the guide key of the amplifier tube so that there would be clearance between the bottom of this tube and the top of the oscillator tube. The coil forms measure 1" x 1½" and the tuning condensers are the Ultra H-F type measuring approximately 1½" x 1¼".

When all parts were mounted I had the following layout; on the bottom base, the power supply using a 5W4 as a rectifier; on the base above that, the crystal oscillator using one triode of a 6N7 and the buffer-doubler using the other triode. The next base above contains the 6N7 link coupled push-pull final amplifier, the metal shell of the tube acting as a shield between the coils and a small piece of aluminum shields the tuning condensers. On the top base is mounted the antenna system, a Pi network.

Here, then, in all its glory, was my complete model transmitter, but something seemed lacking in its appearance and after a few minutes thought I discovered what it was. No relay rack transmitter would be complete without the usual grill in the panel of the power supply through which can be seen the flashing of the 866's, this also applying to the final amplifier so that the big bottles can be admired, and this little detail was immediately taken care of. The panels were then given a coat of black crackle paint, the rack frame a coat of aluminum paint.

Now came the ticklish part, the circuit hookup. Ticklish, that is, when you consider the small amount of space under these bases when all parts were mounted. Picture the base of the final, measuring 3½" x 5" x 1". Looking at the under side you will see the bottom portion of the tube, two sockets for the coils with barely enough room to mount them, two neutralizing condensers which seemed to be a foot wide while being mounted, a jack for reading the plate current, also the various by-pass condensers and resistors. When the connections to all these parts were made I was rather thankful for the fact that to date no one had decided that a few additional condensers and resistors placed here or there in the circuit would be an improvement for I am sure there would have been no room for them. Here, in my opinion, was the perfect setting for stray coupling, however, I was hoping for the best.

The hookup now completed, the next step was winding of the coils. Due to the small amount of tuning capacity in the tank circuits, and in the Collins antenna coupling system, it was thought unwise to attempt operation on wave-lengths above 40 meters, therefore, coils were wound for the 40, 20 and 10 meter bands only.

I would like to mention here an amusing incident experienced with the oscillator. The extremely small size of the coil form being new to me, the cut-and-try method of finding the band was used. More turns than considered necessary were wound with the idea of removing a few turns at a time until the point of oscillation was reached. Using a 40 meter crystal, 30 turns were wound on the oscillator coil form and these were reduced two at a time until no wire was left, but still no oscillation. After checking the circuit and finding nothing wrong I noticed that the key, which breaks the negative return, was open.

Using the coils for 20 meter operation, it was very pleasing to note that each circuit, in the proper order, tuned perfectly, that is, until the final was reached and that's where the fun began. With no amount of tinkering, tuning, or coaxing, would the final neutralize, but let me explain that having been unsuccessful in trying to learn the grid-to-plate capacity of the 6N7 I acted upon information received from hams who claimed the 6A6, which is somewhat similar to the 6N7, neutralized at about 15 mmfd. Therefore, two 10-70 mmfd. trimmers were used and with no plate voltage to the final there was no difficulty at all in burning out a flashlight bulb coupled to the tank coil with practically any setting of these condensers. A 10 mmfd. mica condenser was then connected in series with each of the trimmers and the tube neutralized perfectly at around 5 mmfd. These condensers were later replaced with 3-30 mmfd. coil trimmers which were ideal for the purpose.

It was rather surprising to note that my fears of stray coupling were unfounded for this unwanted coupling, at best, is quite a miserable thing to cure, particularly when the space is limited.

The Collins type antenna coupler, a Pi section filter, was chosen because of the ease with which practically any length antenna can be made to resonate. I am planning on doing a lot of portable work with this little rig and it is not always a simple matter to put up an antenna cut to a fundamental length. My home antenna, at present, is approximately 100 ft. long and after this was connected to the transmitter the final was loaded up to about 15 watts input. Although the power input could be increased there is only one power supply operating the three stages and after all there IS a limit to the current to be had from a small transformer.

The tuning procedure used is rather simple. With the oscillator tuning condenser set at maximum capacity, the meter plugged into J_4, and voltage applied only to the oscillator tube, rotate the tuning condenser until there is a sharp rise in current which indicates that the circuit is oscillating. For stable operation it is best to go slightly beyond this point.

(*Continued on next page*)

No provision was made to measure the plate current to the buffer-doubler as an ordinary tuning lamp was considered sufficient for tuning that circuit. With the tuning lamp loosely coupled, the buffer-doubler tank condenser is rotated until reaching the point of greatest brilliancy which indicates that this circuit is now in resonance.

The tuning lamp method is also used to tune the grid tank circuit of the push-pull final. Due to the interaction between the buffer-doubler plate tank and amplifier grid tank it is necessary to return these two circuits. With the lamp remaining in the grid circuit of the final, retune each tank until the greatest brilliancy is obtained.

Before voltage can be applied to the final the circuit must be neutralized. With the lamp coupled to the final tank coil and the final tank condenser set to the point of greatest brilliancy the two trimmers are adjusted simultaneously until the lamp ceases to glow, care being taken to keep the two capacities approximately equal. If upon retuning the plate and grid tank circuits the bulb still glows this entire procedure must be repeated. Continue until there is no sign of r.f. in the plate circuit.

We are now ready to throw on the voltage to the final. With the meter plugged into J_2 tune the plate circuit for minimum current.

The antenna circuit may now be connected to the coupling coil L_5. This coil must be exceptionally closely coupled to the final tank coil and although it may be wound inside or outside of the plate tank the best method to obtain the necessary close coupling is to interwind the turns of the coupling coil with the turns of the plate tank coil. Further information regarding this is given in the Coil Data shown elsewhere.

To those unfamiliar with the tuning of a Pi network the following procedure should be followed. Without touching the final tuning condenser at any time set condenser C_{13} about half way and tune to minimum plate current with C_{12}. If the amplifier is not loaded to the proper value reset C_{13} to another point and retune with C_{12}. Continue until the proper loading is reached. It will be necessary to juggle the tap on the antenna coil if C_{12} does not tune to resonance or if the proper loading cannot be reached.

It might be interesting to know of some of the incidents experienced that did cause a little concern at the time, first of which was the ever-ready reply at the ham stores when shown a part needed for the rig, such as: "Is that the smallest you have," or, "Sorry, can't use it, not small enough." I'll bet at least one dealer here will be glad that this rig is finished. Then, there was the trouble experienced when trying to find a socket for the a.c. input small enough to mount beneath the power supply base. After haunting various electrical and hardware stores for quite some time with little success I found that banana jacks answered the purpose very well. Also, the evening when I decided to take the rig to the home of one of my ham friends but could find nothing suitable to carry it in until noticing my wife's favorite sewing box which answered the purpose perfectly (snitched while she wasn't looking), however, since then a carrying case has been purchased, which, according to its dimensions, was really made for this transmitter. It is made of metal and measures 15" x 7" x 6".

Plans are now being made to build a model receiver to be used with this rig. I think it can be built its comparison in size with my model rig will be much the same as the comparison between the ordinary transmitter and receiver. It can be truthfully said here that having owned and operated various rigs up to a kilowatt in power, no thrill has equalled the one received when the pure crystal note generated by this midget rig was first heard.

There is one other satisfaction, and that is: unless advised to the contrary I will consider this rig the world's smallest relay rack transmitter incorporating a power supply, four tuned circuits, and an antenna coupler, complete in every detail.

COIL DATA

For 40 meter operation using an 80 meter crystal, L1-35 turns closewound No. 28 P.E., L2-18 turns closewound No. 28 P.E., L3-18 turns closewound No. 22 P.E., L4-24 turns slightly spacewound No. 22 P.E.

For 20 meter operation using a 40 meter crystal, L1-16 turns closewound No. 28 P.E., L2-8 turns closewound No. 28 P.E., L3-8 turns closewound No. 22 P.E., L4-11 turns slightly spacewound No. 22 P.E.

For 10 meter operation using a 20 meter crystal, L1-7 turns closewound No. 28 P.E., L2-4 turns closewound No. 28 P.E., L3-4 turns closewound No. 22 P.E., L4-5 turns slightly spacewound No. 22 P.E.

Antenna coupling coil L5 to be interwound on the final amplifier tank coil with approximately one-third the turns of the tank coil.

Antenna coil L6-22 turns, 2" diameter, 2⅛" long, No. 14 wire.

Link—1 turn on 10 and 20 meters, 2 turns on 40 meters.

—30—

Robot Timer

(*Continued from page* 47)

in permanent service has an even wider range, equalizing frequency extremes from 50 to 6000 cycles.

It is made up of filter sections having attenuation characteristics similar to ordinary telephone cable. The problems of equalization and repeating are similar to those encountered with cable.

Each filter section gives the greatest time delay possible while having the ratio of loss between the lowest and highest frequencies such that transmission at the two extremes may be equalized.

The program is fed to the first filter section. Then it goes to an equalizer, which of course reduces total volume, and then to an amplifier. From here it goes to the second filter section, etc., until it has been delayed the correct time interval.

Since the robot timer was put in service, new telephone cable between WBBM and KFAB has increased the time lag to thirty-six thousandths of a second. In the equipment now used it takes twenty filter sections to delay transmission this long, and the programs radiate from the two stations at exactly the same instant.

Thus, sometimes does the broadcast engineer face and solve problems which are "not in the book" and for which he must use his ingenuity. Falknor is modest, he says it is all in the day's work.

—30—

Ham Shack

(*Continued from page* 57)

30 turns of No. 24 wire, and a tickler coil of 8 turns wound ¾ inch away from the tuned coil. The tickler coil may be wound with No. 30 wire. A tuning coil for 40 meter operation should have 12 turns No. 24, and 4 turns of No. 30.; for 20 meter operation, 5 turns on the tuning coil and 3 on the tickler.

Inasmuch as most battery operated tubes vary somewhat in oscillating characteristics, it may be necessary to add or subtract a few turns from the tickler coil. The essential thing is to have it oscillate smoothly. If it does not oscillate, a few additional tickler turns may be necessary; if its oscillation is uncontrollable, a few turns may be removed. The 50,000 ohm resistor in series with the plate battery should provide adequate control.

Either separate headphones or a midget loudspeaker may be used with such a monitor. Sufficient volume will be obtained with a small reproducer to make the signal audible when sitting several feet from the unit.

If relay keying is used, an additional relay may be installed to operate a high toned buzzer that is audible in the shack.

Either of these two systems are extremely helpful to the sender. They make mistakes readily noticable and help in the checking of a "fist" for the purpose of improvement.

Once properly developed a good "fist" is something to be proud of. Remember an announcer or foreman tries to inject personality into his voice. C. W. men should do the same with their key and after a while your "fist" will be as easily recognizable as your voice.

—30—

Beginner's Receiver

(*Continued from page* 65)

250 volts of well filtered plate current and 6.3 volts for the tube heaters may be used with this receiver. Or, if alternating current is not available, the set will operate on a storage battery and 180 volts of "B" batteries. When batteries are used, it will be necessary to "ground" one side of the heater in order to supply a "B" minus return. In a.c. operation this is taken care of in the power supply by connecting the center-tap of the filament winding to the "B" minus.

When the set has been wired and completed, connect a 50,000-ohm, 1-watt resistor externally in series with the B plus lead and then hook up the filaments to their power source. The resistor above mentioned will serve to prevent the tubes from burning out should there be a mistake in wiring or a short circuit to the "ground." If everything seems in order, and the tubes light up normally, then the set is ready for test.

Place the broadcast coil in place and tune slowly through the band with the main tuning condenser. Several stations should be heard. This will show that everything is in proper order and the other coils may now be inserted and tried out. After every coil has been tried out, the 50,000-ohm resistor may be removed from the B circuit. *Do not remove it before trying all coils.* The set is now ready for operation on all bands.

For a camping trip or the extended sail or motor boat trip this little three tuber will be invaluable. Especially on the water, where occasion will arise to make use of weather reports and "radio fixes," this receiver will more than justify its existence. In use on the water, it is recommended that the receiver be built in to a water tight box after it has been completed. The batteries, if they are used, should likewise be so enclosed. This will prevent corrosion which has put many receivers out of commission just when needed most.

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KWSC

(*Continued from page* 34)

KWSC habitually, the farm programs were elaborated. Advice, weather reports, and news are given. Free of commercial advertising, the station has many steady day-long listeners. From sports fans to homemakers, every listener is considered. WSC has front rank football and basketball teams. Games with big Pacific coast colleges are broadcast and bring in scores of letters. Many of the student announcers actually get fan mail.

Evening programs lean to music, from swing to the classical *Evening Concert Hall of the Air*, featuring student musicians.

A glance at some of the graduates of KWSC is testimony of the station's reputation and popularity as a training school.

The graduate roster shows where the students went after their trainiug. Art Gilmore is a staff announcer at KNX, Hollywood. John Herber is chief of installation of 50-watt transmitters for Western Electric. Lester Hatfield is head technician for the *March of Time* program. Ed Morrow is director of European broadcasts for Columbia Broadcasting System. Hugh Allen is with RCA, New York. Emmett L. Kuntze is with the radio development division of Bell Telephone.

Wilson Edwards is chief announcer for KOL, Seattle. Kenneth King plans ship-to-shore installations for Western Electric. Mahlon Merrick is musical director for NBC, San Francisco. William Mock is announcer and sports commentator for KGW, Portland, Ore. James Hatfield is chief announcer for KIRO, Seattle. In Spokane, Herbert Wixon is program manager of KHQ and KGA; Harvey Wixon is commercial manager for the same stations. Ralph Rogers is production manager of KFPY. Curtis Roberts and Rhoda LeCoq write continuity for KHQ and KGA. Warren Green is KHQ technician, and Carl Brewster is an announcer for that station.

And there are many others on the way. Radio has become a fixed curriculum activity which brings results in later life; something for other colleges to consider and shoot at.

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NTG

(*Continued from page* 25)

that heeded the welcome mat. Such shows as *The Happy Cabbies* and *The Passaic Five*—all amateurs—became regular features.

There was no such thing as a commercial sponsor. At least no one paid for time, even though some firms managed to get across the equivalent of commercial announcements.

Because Granny had so many actor friends, he was never short of big name material when the need for stars developed. Al Jolson—who commands a pretty fancy figure for radio appearances today—went on WHN gratis with a program called *The Ritz Revue,* on which he was master-of-ceremonies.

George Jessel, Eddie Cantor and Harry Richman, among many other present headliners, appeared on Granny's informal shows, particularly his *Bohemian Hour*—the amateur program on which anything could happen and often did! There was no end to the growing list of celebrities anxious to participate and the old WHN mike carried the talents of Willie Howard, Ruby Keeler and many others equally well known.

"Pressure was brought to bear," Granny said, "when other New York stations complained against the informality of our shows. But since we were getting the listeners, as newspaper popularity polls conclusively proved, we survived all efforts to close us down."

As radio grew, so did WHN. It moved up to the roof of the Loew's State Theatre Building where it shared a penthouse with a private projection room used for film previews by the Loew executives. The wall was so thin that the sound of the early talkies linked through into the studio mike and, likewise, the efforts of *The Passaic Five* would mingle with the voices of Wallace Berry, Norma Shearer, et al, on the sound tracks next door.

Granny became famed far and wide as an announcer. Even far from the range of the small WHN, radio enthusiasts heard of the man who really operated a station on the principle that "anything goes" and succeeded doing it.

The writer knew NTG in those days. Doing a radio column for a New York newspaper, I found that NTG was always good copy.

To give you an idea of what could happen on an NTG-conducted broadcast, here's a typical incident I recall.

The broadcast was coming from some huge benefit performance outside the studio. And Granny was doing the remote announcing. A Ziegfeld entertainer—I think it was Ruth Etting—was announced by Granny as the next feature. But he immediately followed with an explanation that she was not permitted, under the terms of her stage contract, to go on the air. To fill in the gap, Granny gave a description of the hall, the surroundings, the notables present, etc., but his words were slow and so spaced that, if attentive, the listener could hear the entire song in the background!

Another thing NTG did a "first" on (no one has done a "second" to date!) was a "blow-by-blow" description of a feature moving picutre. In the manner of prize-fight announcers, Granny set up his mike in the Embassy Theatre when the old silent film *Love,* with John Gilbert and Greta Garbo was playing there some ten years back, and gave a running account of the film as it was shown on the screen. I sat right alongside Granny that night and was amazed at the manner in which he kept up his mike narrative right along with the celluloid one.

When broadcasting became Big Business, Granny disliked the formal rules it was adopting and switched to the night club and vaudeville fields with his girl shows, which have been tremendous hits continuously. A few of the big entertainment names he is accredited with either "discovering" or "abetting" are Martha Raye, Ella Logan, Irene Delroy, Barbara Stanwyck, Joan Crawford, Ruby Keeler, and Claire Luce.

Granny was born in Lapland and came to the U. S. A. with his parents when very young. They settled in Providence, Rhode Island, where young Nils attended the public schools and Classical High.

Working on the school paper gave him a yen for a journalistic career. After a short period at Brown University, he became yachting editor of *The Providence Tribune,* and eventually became sports editor. He dabbled in prize-fighting from boxing to managing fighters. These functions brought about a meeting with the late Marcus Loew, head of Loew's Theatres and he started press agent work for the Loew firm.

Now, he's planning a return to the air. Just when, he doesn't know. But he says it will be soon. And if he revives even a tiny fraction of his old WHN routine, listeners are in for a treat, indeed. He made one mike comeback in an NBC series three years ago, but he says his forthcoming engagement will be more like "the good old days" than that was. His routine would be refreshing and a joy after all the stuff with which the listener has had to contend. One thing Granny always insisted on: his mike show was sincere and full of homely philosophy. He debunked the big star and made a human of him, and he showered unstinting praise on the youngster who did well. Radio can well use Granny to bring back something he took with him when he left; he has no equal!

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SOS In Reverse

(*Continued from page* 15)

ing a partially-flooded engine, connected keying apparatus, and took storage batteries from wrecked cars for the receiver they had carried from Miami.

Then, as they prepared to go on the air with a call for help, one part more was needed. Chief of staff Bourne, exceeding tradition, *went to Miami and returned with the missing part!*

Milton Kitchen and I—operators of the *Siboney*—heard the first call when we were abeam. WAX called WRN slowly, with an unfamiliar weak note that sounded like eggs frying in the distance. There followed the first pitiful stories of the hurricane; reports of damage; requests for "food, medical supplies, and troops"; directions for rescuers. Routine calm no longer prevailed.

Captain Miller was unable to put into Miami harbor because of a too-shallow channel. We had to relay. New York was a thousand miles north, and had to be worked on 600 meter spark. The WRN arc transmitter was useless because spray was striking the antenna insulators. We called New York hopefully.

Near Hatteras, operator Al Kahn of the S.S. *Orizaba,* listening with an experienced ear, sensed something unusual in our call. Hand sending, to an old-timer, carries more with it than the coded words, for the same reason voiced words carry connotation by inflection. When Kahn copied our first startling traffic, he cleared the 600-meter channel for us by shutting other stations down, SOS fashion.

The news broke in New York at 11 p.m. Saturday night, through station WSC, Tuckerton, N. J. Rescue operations began immediately. We handled all the traffic we could until sunrise, when both WSC and WAX faded out. Then Kitchen and I put our feet back on the operating table and remarked how fortunate we were to be safely at sea.

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Earshot of the Editor

(*Continued from page 4*)

Of these 135,000 own ten shares or less, and 15%, or about 35,000 own one share only. Only 10% of the stockholders own a hundred shares each and no one individual owns as much as ½ of 1% of their stock. There are few companies in the United States whose ownership is so widely distributed as that of RCA. They have stock holders in every State of the Union. And of their total number, 100,000 of them are women. This will belie the general opinion that the public at large does not have confidence in radio as an industry, all conditions to the contrary nothwithstanding.

* * *

THE F.C.C. announces that there are not any B.C. frequency monitors meeting their requirements commercially available. It seems a pity that with so many radio engineers out of a job that there is not one single company making a frequency monitor commercially available which meets these requirements. Certainly if one company were to make one available it might alleviate the unemployment situation a little.

* * *

WE are reliably informed that the manufacturer of five meter transcievers has fallen off to a point where it is practically non-extant. This is due to the fact that many unlicensed people were purchasing and using these sets, and that the monitoring of these bands is extremely difficult by the Government: We believe that this ban is good; and we further recommend that on the sale of completed transmitters to a customer, the customer be required to furnish and exhibit his license and sign for the transmitter. The number of the transmitter, if it is a commercial job, should be recorded with the Commission and that the transfer of each one of these finished transmitters also be recorded. In this way the amount of illegal operation within the bands would be minimized. Ultimately, of course, the onus of inspecting the customer's license will fall upon the retailer, but in the final analysis the retailers who assist the amateurs will have that much greater following. The regulations requiring a license are just and the requisites for the license itself are certainly easy enough for almost anybody to pass the test. There seems to be no reason why illegal operations should take place at all.

* * *

OF particular interest to the ham who is contemplating a long extended trip will be the transmitter described by W9LLX in this issue which will be carried with him on a trip to the California coast and to Texas. W9LLX will keep in communication with RADIO NEWS through contact with a number of amateurs in the Chicago area. We will carry a running story of this venture of 9LLX, his wife and three children, as they trek across the country and into Texas.

* * *

FOR the amateur who uses a plane a five meter portable transmitter is described elsewhere in this issue. It is now a number of years ago since we used a similar transmitter in New York City and were able to get a range of in excess of 50 miles with less than 0.3 watt input.

* * *

NEXT month a five meter and ten meter transmitter for use upon a boat will be described. For those amateurs who have not much space we recommend the Vest Pocket Transmitter described in this issue. This rig is without a doubt the most compact that we have ever seen.

* * *

NEXT month a story on some of the troubles of a serviceman and how to overcome them will make an article worth reading. The A.R.R.L. situation as it develops further will be followed carefully and reported. In the popular departments, the comeback of Francis X. Bushman will be written. The "Blind landing" radio system, presently developed in the United States, will be discussed and described in full.

* * *

WHAT PRICE GLORY? One Frederick Fradkin, formerly the highest paid violinist at NBC is opening his own restaurant.

* * *

LAST month we asked what had happened to certain programs, notably "The Voice of Experience." Today we were politely but firmly informed that "The Voice" was still on the air. As much as one can apologize to a voice, we do . . . and let that be a lesson to us! One thing makes us very happy, though,—some of the old-timers who made radio what it is, are still with us.

* * *

FROM the many letters from our readers we believe that we are getting closer and closer to what the reader wants. We intend to maintain our leadership and coverage of the entire radio field. No one particular part will be slighted, and we ask our readers who are not interested in some of the sections of the book to skip them and read those parts which appeal to them. Something of interest to everybody in every phase of radio will always appear in RADIO NEWS and we will inevitably be the ones who will scoop every other publication.

We know that many hams will be taking their vacations during the months of June and July; we trust they will take their radios with them and send word to us via amateur radio as to just what they are doing and where they are. We certainly will enjoy hearing from them. And so until next month—with best of DX, we wish you 73

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Broadcasting the Next War

(*Continued from page 11*)

angle is frequently more complicated than the physical.

"We decided at four o'clock Saturday afternoon, March 12th, to broadcast the following day," Mr. White went on. "In order to get our setup complete we talked frequently on the transatlantic telephone with Paris, London, Berlin, Prague, Warsaw, Rome, and Geneva.

"We keep one man in London and one in Central Europe on a full time basis: Edward R. Murrow and William Shirer, respectively. Then we have on call what we term *string men,* part time commentators who can be summoned when needed. Many of them are American newspaper men stationed on the Continent.

"Our men in Europe made representations to the proper officials and permission was granted."

I was told by an outsider who has no connection with CBS that the Hitler regime had confiscated all radio equipment in Vienna and the job of wangling permission to broadcast from that city was no sinecure.

"To get a broadcast from Europe across the Atlantic to the United States, you have your choice of two different communications companies," Paul White informed me. "One is the American Telephone and Telegraph Co., and the other, the Radio Corporation of America. Actually they are the same, so far as the type of facilities they furnish. It is a short wave hook-up in both cases.

"Some people think such programs are brought to the United States by cable. But you cannot put words through a line very many miles without having what is known as repeater points. And repeater stations on cable lines are impossible. You cannot place them at the bottom of the ocean. In our coast-to-coast line, for instance, we may have as many as 40 repeater points between New York and Hollywood.

"When the details of the over-seas program were straightened out by telephone

and cable, only part of our job was completed. Our traffic department here had to line up the United States network and control it so they could cut the local programs at any time.

"Fifteen minutes before the transatlantic broadcast on March 13th, the Berlin station called RCA at New York. RCA went back to Berlin on another short wave band —to test the wave length. The quality was fuzzy. Berlin switched to another wave length. This second one proved satisfactory. At this point RCA trained several receivers on the short wave channel to select the best reception and re-transmitted it from the RCA receiver station at Riverhead, L. I., over telephone land line to our master control room. Here it was *mixed* and fed out to our WABC transmitter at Wayne, New Jersey, by land line; also down to the telephone headquarters on Walker Street, New York. From there it went over the land line network. After it reached each city in the chain it was put through to the local transmitter."

We are all familiar with the results of this exceptional international broadcast, perhaps the most exciting of the year. Mr. Shirer introduced Ellen C. Wilkinson, member of the British Parliament, who spoke from London; Edgar Mowrer, foreign correspondent for the *Chicago Daily News*, took up at Paris; Pierre J. Huss, International News Service man, came on at Berlin; and Mr. Murrow carried on from Vienna.

So much for a time of political emergency. But what would actually happen if war starts stirring up the kilocycles?

"The problems involved in the next war —if there is one—will prove very exacting," Mr. White said. "People will have their sets turned on almost constantly for news while it is in the making."

Right here we may as well face the question of propaganda. In the 1914-1918 conflict, we were infiltrated with propaganda through newspapers—via cold print and photograph. In the next war, we'll get it through the air. Our emotions will be stirred by words, human contacts, cheers, martial music. Also we may get broadcasts of actual battles. Machine-gun fire, and even groans of the dying, may be brought to our ears.

"In the recent Shanghai hostilities," Mr. White declared, "a unique situation developed. The transmitter was in the International Settlement and was available for use without any hindrance. Many broadcasts were sent from that point and speech was free and uncensored. I don't know any other place on the globe, outside of the United States, where a similar circumstance would prevail.

"What we will strive for in the next war—if any," Mr. White continued, "will be to present a balance of public opinion. We would use American newspaper men, foreign statesmen, publicists. Then, naturally, we would have qualified personalities speak from this country. In war time obviously nearly everybody's horizon becomes limited. If a man is on one side, he can't see the opposing viewpoint. We will attempt to present every angle of the question."

Asked whether radio would be able to broadcast actual battles, Mr. White replied: "That would be a matter of sheer chance. We once put real combat on the air. It was in September, 1936. Our foreign commentator, H. V. Kaltenborn, was broadcasting from Hendaye, on the French-Spanish border. Mr. Kaltenborn went across that little international bridge there with a microphone, amplifying equipment, and cable. We had ordered communication facilities from Hendaye to Paris and kept listening to the Paris channel. Suddenly we were switched through to Kaltenborn. He was in a hay field, hiding behind a brick building. You could hear machine gun bullets whining over his head and shells bursting around him, as the insurgents took Irun.

"Such a case could conceivably happen in the next war. But it is exceedingly doubtful if American broadcasting chains could bring their equipment to any country where conflict was going on. Perhaps you had better go and talk to Mr. Petersen, our assistant traffic manager, about that."

Mr. Petersen's comments were pithy and to the point. "If war comes," he stated, "the set-up physically would be about what we have now plus the diplomatic involvements which would arise. If we should want something from RCA or AT&T and get word back: 'Sorry. No channel available,' we would just have to handle the situation in some round-about way which would have to be worked out on the spot.

"If war comes, you can't say now what you would be up against because you don't even know the alignment of the countries—who will be fighting whom. For instance, even at this time you can get nothing out of Lithuania on a decent circuit unless you route through Austria or Germany. You can get material from Russia but the lines are poor. And here's something which may or may not prove significant: the only method of getting broadcast from Czechoslovakia is by land line through Germany or Italy.

"In war time, if permission cannot be procured to broadcast from a combatant country, we will have to route the material around the belligerents and it will require considerable ingenuity. To get a line from where the action is taking place to the nearest RCA or AT&T pick-up point would be the problem. There are pick-up points wherever there are land lines. The American Telephone and Telegraph Company have telephone communications at present with practically all countries in Europe except Spain.

"In addition to finding suitable pick-up locations, there would also be the difficulty of getting equipment to that point and finding transmission facilities from there to your short wave channel. Equipment would include amplifiers, mikes, power supply, and so on. All this may sound easy but it won't be simple in war time. Even if an operator were able to bring his own equipment into a warring country for broadcast purposes, it would unquestionably be confiscated.

"In the next war, one aim of this broadcasting chain would be to present, where possible, eye witness accounts of what is transpiring. But as to going on the air from battle fronts—that will be largely a matter of chance and human ingenuity.

"In addition to the European hazards, both political and physical, once we get the information we want from the other side, we will have to co-ordinate our whole network here in the United States, for if one minor detail is forgotten, all efforts expended will be in vain."

To round out the potential broadcasting picture during a potential European war, I dropped by to see Abe Schecter, Director of the Special Events Department, at the National Broadcasting Company, in Radio City, New York.

"What part will our broadcasting chain play in the next European war?" Mr. Schecter repeated. "Good Heavens, your guess is as good as mine. Offhand I'd say that the fellow with the strongest pair of tonsils will be the winner."

When the flags start waving and they strike up the bands; when fanatics begin to bellow with all the force of their leather-lined lungs, I hope the broadcasting chains will not overlook one small matter. When they line up the generals and the admirals and the chancellors to speak; when they broadcast battles and dramatize air raids; when the last prime minister has had his way and his say, will they allow the little people to talk? The doughboy who spends his days in the muck; the mother who is fighting a losing battle to feed her children; the girl whose father will never come home?

They bear the brunt of war.

Theirs are the voices we should like to hear.

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Sound Effects

(*Continued from page 23*)

feet—these exercises being deemed not only inexpedient but probably downright sinful. But radio engineers are resourceful and Messrs. Hanson and D'Agostino, goaded to desperation by the time-sword hanging over their heads, proved they are resourceful as they come.

D'Agostino suddenly developed a noise in his throat resembling a cough which had the remarkable property of expressing itself in any and all the notes of the musical scale. Hanson, less accomplished musically, had to content himself with snapping his fingers at various pitches under his coat as he tried to move unobtrusively about the auditorium. For a half-hour they circulated among the worshippers in this manner, acquiring a fund of information on echoes and such—and solved their puzzle in acoustics. Right in the nick of time, too, for the sound-proofers had barely finished their work before the Radio City studios began sending programs to the four corners of the earth.

Since radio is sound business (broadcasting in its last analysis is the science of creating and capturing sound and projecting it through space) it naturally follows that its practitioners are sound men—in more than one sense of the word. And possibly the most picturesque as well as profound of these are the technicians in the sound-effects department of the studios. They are real geniuses, these experts in effects, who make and manipulate contrivances, some simple and some complex, that reproduce any sound ever heard by mortal man.

How efficiently they function was demonstrated when a minor-league comedian heard on a coast-to-coast program complained that the studio audience didn't laugh and applaud enough. He was afraid the invisible audience would get the impression from the apathy of the studio spectators that he wasn't so hot.

So the sound-effects men promptly remedied things. They got a record of audience-noises (which had been made at a major-league comedian's broadcast) and dubbed it into subsequent performances whenever studio outbursts seemed appropriate. Thereby making the jester happy and the radio audience sore for the synthetic sounds of hilarity never failed to drown out what the funny fellow said just when he was supposed to be funniest.

However, dubbing-in spectator-enthusiasms isn't peculiar to American broadcasting. Radio engineers (with more or less professional pride) tell a story of its having been used most effectually in Germany on at least one occasion. It appears, according to this narrative, Herr Hitler was scheduled to pay an official visit to the opera in Berlin. Radio lines were run into the building and microphones set up that all Germany might hear the proceedings.

But when Hitler arrived a surprising lack of enthusiasm was noted. The *Heils* were few and feeble and the applause of that character described as scattering. In a panic—it would never do to let the world know *Der Fuehrer* had been practically snubbed by the opera audience—the wireless fellows, who seem equal to any emergency, snapped a record into place on a portable phonograph. And the day (to say nothing of some radio executives' heads) was saved. For the disc labelled with the German equivalent for *Thunderous Applause and Wild Cheers,* a recording on file in every American station library, ran on and on producing a demonstration which must have stirred emotions in every Nazi within range of a receiver.

Records, however, are only one article handled by the effects experts. A stranger entering one of their sound laboratories might think he had stumbled into a junkyard. Here are a few items he would see: Broken dishes and glass, mops, dust pans, screens, old motors, toy trains, plumbers' plungers, rusty iron, whistles, bells, telegraph keys, gongs, battered sheet-iron, cracked phonograph records, berry boxes, roller skates, broken crockery, pots, pans, sheets of cellophane, buckets of sand, pails of birdseed and old shoes.

Many of these properties, like the cellophane, sand and birdseed, are as essential to a cooking-recipe program as pots and pans. Wrinkling cellophane, for instance, simulates so realistically an egg sizzling in a skillet that you can almost detect the odor through your loudspeaker. The sand and birdseed make the most delicious cake you ever tasted—when batter is mixed in a broadcasting kitchen, for they are the sound-substitutes for more nourishing ingredients. The old shoes, too, have their place in the radio kitchen; the effects-men manipulate them to give the illusion of the chef walking across the linoleum-lined floor en route from table to range and vice versa.

Some of the sound-creating devices are so elaborate they take on the aspects of a Rube Goldberg "invention" to perform some simple service. And some of them serve several purposes. Ray Kelly, chief sound technician of the NBC studios, is the inventor of one of the most ingenious of these. It produces thunder claps, cannon shots and the roar of the surf, among other noises. It is a screen 2½ feet by 5 feet, mounted on a swivel and equipped with a phonograph pickup which feeds impulses to a loudspeaker on a turntable cabinet. By changing the position of the screen and rolling shot over it different sound effects are achieved.

Kelly is also the inventor of a rain-machine said to be the last word in such things. Until he emerged from the laboratory with his creation, rain didn't sound so wet coming into the parlor via a receiver. The illusion was obtained by dropping sand on a sheet of paper and it wasn't very convincing. Kelly's machine is a feed-controlled hopper which spreads grapeseed on a turntable which in turn spills it off on various surfaces like stone and tautly-stretched paper. With it Kelly creates the impression of rain falling not only on roofs and pavements, but also splashing in puddles and running in rivulets in gutters. And it can be regulated so as to reproduce the patter of a shower or

the downpour of a cloudburst, depending on what the script calls for.

Kelly, a college graduate, also has to his credit the discovery of the perfect stabbing-sound reproducer. It comes in handy in the studios when the villain in a dramatic sketch sinks a stilleto in a victim. You hear the swish of the weapon through the air and its squashy impact with a human body. But this effect is attained without elaborate apparatus—a technician merely plunges a knife into a watermelon!

The screams invariably accompanying these acts of violence may or may not be furnished by the sound-effects department. Many actresses do their own screaming but if their histrionics or lung power are inadequate the sound-man comes to the rescue with a record. His library also has recordings of mass screams useful in portraying the agony of the populace when earthquakes, fires, floods and such catastrophes overwhelm them.

Inventive as he is, Kelly once was stumped in his efforts to imitate a sound. Eddie Cantor wanted to get the effect of water being poured from a pitcher into a glass. Kelly dropped peas, sand, and seed into all sorts of contraptions but no go. He experimented with cellophane and screens and went through his whole bag of tricks without getting anywhere.

Finally a page-boy who had watched all this with wondering eyes inquired, "Why doncha try pouring water out of a pitcher into a glass and see how it sounds?"

Kelly did and had the surprise of his life. It sounded just like water being poured from a pitcher into a glass! It was perfect. And was he mortified!

But doing the real thing isn't always so satisfactory. For instance, you might think, to get the effect of a telephone ringing, there is no better way than to ring a telephone bell. But it doesn't register that way with listeners—the microphone distorts it in some manner. So the studios mount the mechanism on soft rubber, enclose it in a wooden box, and put the bells on the outside. Then when it rings it sounds like a tinkling telephone and not like a gong with the asthma.

The sound-effects department of the Columbia Broadcasting System is presided over by a woman, Mrs. Ora D. Nichols, who has discovered that berry boxes (empty) have practically limitless possibilities as sound-simulators. By crushing them and crumpling cellophane she can produce a forest fire that would cause a fire warden to order out the CCC boys from six states. They are also useful in creating the illusion of collapsing buildings, colliding trains, crashing planes and the like. A violin bow drawn over the edge of a berry container produces the squeak of bedsprings and two crushed together will make the bed fall down. Mrs. Nichols finds so many uses for them that she buys them in carload lots.

Supplementing the mechanical noise-makers are the human noise-makers. They are persons with trick vocal cords who imitate any bird, beast, or insect known to man. If the script calls for the chirp of a cricket, the squawk of an ostrich or the trumpeting of an elephant there is always some specialist to oblige. There are not many so gifted in the studios but those who are find their unique services much in demand and they make good money. For the most part they are actors who play regular roles on programs and do their imitations as a sideline.

For example, there is Elsie May Gordon. Miss Gordon is a comely maid with a voice so flexible she can impersonate any character from an ingenue to a hag. She appears in a dozen different shows a week. But whenever a parrot is needed on the air, Miss Gordon is summoned. Through the loudspeaker she actually sounds more like a parrot than a parrot does. And, of course, she is much more dependable; the most garrulous birds have a way of going stubbornly mute in the unaccustomed environment of a broadcasting studio.

The best horse-whinnier in the aerial meadows is Ray Collins, a player you may have heard as Mussolini, Sir Anthony Eden, or some other international bigwig on The March of Time broadcast. He does such characters when he isn't whinnying. "The perfect cricket" (his name so appears in the files of the Columbia Broadcasting System) is George O'Donnell. He is also swell at popping like a champagne cork.

Another voice virtuoso is an individual who answers to the name of Doctor Sunshine. He specializes on machine noises. He can be an airplane, a locomotive, a motor boat, flivver, or anything like that. Oftentimes he is the shrieking brakes you hear as well as the roar of the engine when a motor car comes to a stop. For some reason automobiles on the radio, no matter how new or expensive, never arrive anywhere without the application of brakes badly in need of adjustment. It's a wonder the motor manufacturers put up with such goings-on.

Those baby cries you hear are mostly of human origin—although they don't pinch real infants in the studios to make them wail. The babies who make the noises are grown up, the two best known being Sally Belle Cox and Madeleine Pierce. They are attracive young women who discovered some time ago that crying like a baby is nice work—and you can get plenty of it in the broadcasting chambers.

There are a number of imitators of birds, dogs and barnyard creatures, these sounds being comparatively easy to duplicate. And of the many dog impersonators, one of the more conscientious is Harry Swan. (He mimics his namesake as well and is also good as a dragon, a donkey, or any animal which may be endowed with speech in a fairy story.) Swan won't do a dog until he has consulted with the author of the script and determined just what kind of a character he is supposed to be. Is the dog a Scotty, a bloodhound, or just a pooch? And how old is the animal and just what is his mood at the moment of his appearance in the proceedings? This information, Swan insists, is vital; without it he can't do justice to the part.

There is another expert in animal noises who is a whole circus in himself. He roars like a lion, laughs like a hyena, or barks like a seal with equal facility. But it is as a dog that he excels, being rated the best barker in the business. In fact, that's his name, Barker—Bradley Barker—believe it or not, Bob Ripley.

—30—

A.C.—R.N. Skipper

(Continued from page 61)

ture will be found an asset since without it the c. w. will not be audible. In listening for broadcast, the receiver should be tuned to "dead-beat" position. By this is meant that there will be no "whistle" coming in with the signal. In tuning, move slowly through the higher frequency bands, because the signals are very sharp, and easily passed over. The "Skipper" makes an ideal stand-by receiver for the ham shack, or as a regular set for the DX hound. Careful construction will be rewarded with superlative results.

—30—

RADIO PHYSICS COURSE

ALFRED A. GHIRARDI

Power consumption test of radio receivers: If the power consumed by a device is to be ascertained by a short test during which the dials of the watt-hour meter would not move much, it may be found by accurately measuring with a watch, the time in minutes it takes for the aluminum disc in the meter (watching the black line on the disc) to make say 100 revolutions, then multiply the number of revolutions found, by the "constant" of the meter and by 60 and divide by the number of minutes during which the test was run. This will give the watt-hour consumption of the device for each hour. The *meter constant "K"* is the multiplying factor by which each revolution of the disc must be multiplied to find the corresponding average watts which have passed through the watt-hour meter during the revolution. The "constant" is usually marked on the aluminum disc of the meter or on the name plate, and varies for different types and sizes of meters.

This method is often used to check the watt-hour consumption of radio receivers installed in homes, in order to find out the cost of the electrical power consumed by the receiver for each hour of operation. As the watt-hour meter already installed in the home by the electric light company may be used, no additional meter is necessary. The same method may be used for checking the power consumption of household electrical devices.

A-C meters: The D'Arsonval ammeters and voltmeters thus far discussed have been of the magnetic type which are employed in direct current circuits. This type of meter will not function when connected in an alternating current circuit, because during one alternation the current would flow through the coil in one direction and the poles produced would tend to deflect the coil in one direction, and on the following alternation the current and poles would be reversed and would therefore tend to deflect it in the opposite direction. These alternations follow one another so rapidly that the moving element in tending to obey one impulse is almost immediately caused to move in the opposite direction by the next impulse, with the result that the indicating needle remains practically stationary, trembling slightly at the zero position. Since permanent magnet instruments cannot be used to measure alternating currents, they are generally called *direct current instruments.*

We have already seen that hot-wire and thermo-couple ammeters and milliammeters can be used to measure a-c as well as d-c but they are used mostly in circuits carrying radio-frequency currents. There are two main types of meters used in ordinary commercial low-frequency measurements.

Dry plate rectifiers, and copper-oxide rectifier type meters: In many alternating current measurements commonly made in radio work it is of utmost importance that the measuring instrument used require very little current or power for its operation. An instance of this is in the measurement of the output signal-voltages of a radio receiver. If an ordinary a-c voltmeter were connected across the output terminals of the set, it would absorb a comparatively large proportion of the power available and the reading obtained would be far from accurate. The measurement of the alternating voltages and currents in these circuits is not always readily accomplished, as the necessary instruments are too sluggish in their movement, or require too much power for their operation. Thermocouple instruments have the first two disadvantages, moving-iron instruments have the last two, and dynamometer instruments have the first and last drawbacks.

In general, a-c meters are more sluggish than d-c meters and require a great deal more power to operate them. This last drawback is a very serious one in radio measurements, for it often happens that more power is required to swing the meter's needle than is available in the circuit being studied. We are accustomed to d-c voltmeters requiring only 1 milliampere to produce a full-scale deflection (sensitivity of 1000 ohms per volt) and know that a voltmeter consuming 10 milliamperes has a limited usefulness in most radio measurements. On the other hand, a-c voltmeters of the moving-iron and dynamometer types generally require from 15 to 100 ma. in the higher ranges and from 100 to 500 ma. in the lower ranges. The power consumption is usually several watts! Even the expensive and fragile thermocouple instruments require 10 ma. to produce a full-scale deflection.

The advantages of the low current drain of sensitive d-c instruments can be retained for measuring low a-c voltages and currents by using a suitable sensitive D'Arsonval type d-c instrument in connection with a copper-oxide type rectifier.

A rectifier is a device which offers a high resistance to the flow of current through it in one direction, and a comparatively low resistance to the flow of current through it in the opposite direction. Thus if an alternating voltage is applied to the terminals of a rectifier, current can flow through it only in one direction, so the current is a pulsating direct current. Hence we say the a-c is rectified to d-c. Several forms of rectifiers have been developed, but the most suitable, simple and inexpensive one yet found for use in rectifier instruments is known as the *copper-oxide* dry-contact rectifier.

RADIO NEWS will purchase Kodachrome pictures of ham shacks or anything having to do with radiotechnicalities which in the opinion of the Editors is suitable for publication. Will pay up to $50 for each one accepted. Send to Editors, Radio News, 608 S. Dearborn St., Chicago, Ill.

Audition

(*Continued from page 29*)

shouldn't expect to land a job on a 50,000-watt station before they've served their apprenticeship. As soon as they've obtained that experience, they'll appreciate how corny they sounded to us when they took this audition."

Mr. Jackobson was referring to the half score of singers who had filed in and out of the studio for the past thirty minutes. A young fellow who sang *While Irish Eyes are Smiling* and forgot to put the smile into his voice instead of his face. A flat, midwestern voiced baritone who rendered a selection from the opera *Manon* and was blissfully unconscious of the difference between the notes, F, G, and A. A tenor came who sang only religious songs and should hide himself in the back line of a church choir. A lad who cupped his hand to the back of his ear while he sang, advertising the fact that he was unable to tell whether he was in pitch.

Were these singers to take the long road up to commercial entertainment; were they to look upon their chosen profession as a trade like carpentry and really learn it; were they to drop their dreams upon finding out that their voices are commonplace: the percentage of "discoveries" from the general audition would leap like a thermometer thrust into a blast furnace. The pig iron would be strengthened into bars of tempered steel. The premature hopefuls would stand by until they were sufficiently molded.

Just as we began to despair of hearing a potential WGN singer, a personable young lady stepped before the mike and asked Harold Turner, staff pianist, to play *Once in a While*. The girl was good. She had enough personality to give a listener a mind picture and make him think it was television. Mr. Jackobson asked her to do a number with more swing in it. She chose *Bob White*. And swing? Wow! But remember, it wasn't the numbers she sang, but the manner of delivery that put her across.

The swingstress was just a secretary at an Evanston, Ill., insurance company. She played in the Waa-Mu shows on Northwestern campus, where she was a popular Alpha Pi. Not long ago she won a contest conducted by Jimmy D'Orsey at the Congress Casino. All of which proves that her talent didn't just spring out of a vacuum when she auditioned at the radio station. It's been brewing for years. Some day she'll make a hit either on the air or on the stage. WGN plans to recall her.

By this time the reason for the "Welcome" mat and "Open House" sign at the door of the general audition doesn't have to be stated. But just in case:

The networks are forever graduating their artists into the movies or into the discards. They are always needing new clay to plug up the holes in the dyke—new singers and actors to take the place of the old. In spite of the small percentage of potential talent sifted from the general audition, the networks still find it wise to invite the public to their portals. To survive they must continue to raise their standards. Dropping the general audition would lower them. For when the dyke needs plugging, they would have to take the first excuse for an artist that came along instead of looking over their audition records and selecting the best.

Your chance of being amongst those records depends, first, upon whether you've prepared yourself sufficiently *before* you take your audition; and secondly, upon whether you've minded your "don'ts."

—30—

Not for Rebroadcast

(*Continued from page 32*)

in a test. . . . The *Chicago Daily News* and Radio Editor Charles Gilchrest have parted company—and no column has been substituted at time this is written. . . . One big publisher is eyeing the situation . . . wondering whether the public wants anything other than printed program tables.

Advertising managers are most irked of all. Having big space buyers say, "We're using radio entirely, now," is bad enough. Having the same bellwethers then come begging for free press publicity on radio-spent dollars—

That burns the ad men!

* * *

ROOM 600:

Bob Hawk is the sort of freelance m.c. who believes in being explicit. So, instead of merely saying, "write to me in care of WGN," he said, "Address your letters to me in care of Room 600, Wrigley Bldg."

Days went by and no avalanche of mail. Knowing something was wrong, Hawk called the post-office.

"You probably gave the wrong room number," the men of letters explained. "You see—your letters were all returned because. . . . Well, it's hard to explain over the telephone—but Room 600 is the sort of room where our postmen *never* deliver mail!"

* * *

SPY SCARE?

Lew Herman, a friend of mine, writes from England: "The BBC studios are not honoring letters of introduction when epistles ask bearers be allowed to tour studios. . . . They request letters be deposited with them two weeks before the tour is desired!"

* * *

SPONSORS of the Louis-Thomas fight broadcast paid $3,500 for microphone privileges.

* * *

DICTATOR AMERICAN STYLE?

What manufacturer has gotten such a hold on the radio industry catering to the amateurs, that he can dictate the policies of the A.R.R.L.? . . . that he can have his views endorsed by a body-politic of hams and presented to the FCC in Washington? . . . that he can reach out cross-country and tell Chicago amateurs what they should and should not put on their personal QSL cards? . . . that he can run a rival's advertisement off a page? . . . that he can order a national store what to run in its advertisements which do not concern themselves about his product? . . . that he can make a radio parts manufacturer change the tenor of his own "house paper" so that it does not show another rival's set? . . . that he can see to it that his drag with a certain publication is powerful enough to send its emissaries scurrying all over the country killing off any moves to oust them and him from a seat behind the governing body of an association? . . . and when will the hams wise up to him and his tactics? . . .

—30—

Man Behind the Joke

(*Continued from page* 31)

other field before becoming a radio gag writer.

John P. Medbury, responsible for many of Burns & Allen's nifties was formerly a humor columnist for King Features Syndicate authoring *Medbury Says* and the *Mutter & Mumble* columns. Don Quinn was a highly paid cartoonist before becoming a gag writer and so was Harry Lawrence, author of *Kaltenmeyer's Kindergarten.*

Al Morey, an Allen contributor, was an orchestra leader and master of ceremonies for the Balaban & Katz Theatres in Chicago, before trying his hand at putting his wise-cracks down on paper. I. J. (Wag) Wagner author of some of the Ben Bernie material and writer for Benny Rubin when he was on the air was an advertising copy writer before joining the Gagster Mob. Remember those white-on-black Wrigley cards on street cars, subways, elevated trains and buses a few years ago which had a gag theme as its copy? Well, those were Wag's handiwork. I don't know of a single gag-writer who broke into radio "cold"—in other words without some training as a humorous writer in other fields.

You never know where you'll find humor in this gag writing game. Author of Joe Penner's funny songs and part of his material is a clergyman, Reverend Henry Scott Raynor who writes under the name of Hal Raynor. At one time rector of St. Michael's and All Angels Episcopal Church in Berwyn, Ill., the clergyman-humorist is now at the Grace Church in Glendora, Cal., where, because of the income he derived from his radio writings, he has helped lift a mortgage there of 20 years' standing. It took just 18 months to wipe out the debt.

Jack Cusick writes much of Ben Bernie's material. He was formerly blind but has now recovered his sight through financial aid from the Old Maestro.

Eddie Davis an Ex-New York taxi driver is responsible for much of the Jack Haley's material. The story goes that Davis, who was a taxi driver in New York's theatrical district used to amuse his fellow drivers and theatrical passengers with his witticisms. Told that he should be writing professionally he finally managed to lure Eddie Cantor into his cab. Before Cantor had seated himself he began a rapid fire barrage of gags that left the comedian in a daze. When Cantor had sufficiently recovered to listen, Davis asked him to use some of his jokes in his act and Cantor, probably to save his life, consented. The gags clicked and Davis joined Cantor's writing staff, gradually working himself up until he held the top spot among Cantor's scribes. Davis wrote for Cantor for five years, eventually leaving him to write for other comedians. Last spring he was one of the authors for Jack Haley's *Log Cabin Jamboree* which went off the air April 2nd but which will probably return soon.

Where do the gag writers get the material for their radio shows which must be churned out week in and week out? Some of them have voluminous files to which they are constantly adding. Whenever a certain gag or situation is needed they turn to their files and twist it around to fit the comedian's needs and to make it timely. David Freedman had a veritable joke factory atop a Manhatten skyscraper and had three full time assistants—Lloyd Rosenmond, Arnold Auerbach and Herman Wolk—who helped him manufacture hundreds of laughs each week. There's a fellow in New York now—a chap named Hal Horn owner of Hal Horn Inc., though not actually a gag writer himself, has about 5,000,000 jokes, all properly classified. They are believed to be the largest collection of jokes in the country. He sells these to many of the leading comedians and gag writers.

Mr. Horn decided a few years ago that furnishing gags to comedians and humor columnists would prove very profitable—and it has. Back in 1931 he set 16 girls to work buying magazines, clipping and classifying jokes. Four more copied jokes from the library files. Then they went over old periodicals from junk dealers and second-hand stores. The net result is the 5,000,000 jokes all properly classified.

The Horn firm seldom finds a joke which isn't in the files in one form or another. There are 300 variations of the one beginning with: "Who was that lady I saw you with?" Today the collection is a treasury house for many gag writers. After all, new jokes are usually old ones reworked, dressed up, and given a new slant. A standing gag among the gag-writers is the following order supposedly received by Horn from a gag-writer who probably did it for a gag:

"Rush 40 assorted wheezes in re mother-in-law, 33 bathtub-plumber, 2 dozen farmer's-daughter-traveling-salesman, 11 morning-after, 9 who-was-the-lady-I-seen-you-with and 1 fat-woman-and-peke. Please forward C. O. D."

Ed Wynn has the most extensive files of all the comedians while Al Morey has so much gag material that he's going to write a story on *The Art of Gag Writing* shortly. On the other hand, when I was up at Don Quinn's near north side apartment in Chicago, the Fibber McGee author pointed to a stack of current magazines, and newspapers and said "There's my file." He keeps his material up-to-date by forgetting entirely about files and concentrating solely on current events and timely topics. Quinn told me that he's always sat down and pounded out his stuff on a typewriter.

Gag writers are usually "lone wolves" working up their material by themselves, even though later they may get together with the comedian and the other writers in a conference about next week's script. An exception to the rule is the team of Sam Perrin & Arthur Phillips—two of the three Phil Baker writers. Perrin and Phillips have worked together as a team for the past six years. For four years of this time they have been writing for Phil Baker. Perrin was a drummer in a theatre orchestra. Working in musical shows for the Shuberts he was brought to their attention by his constant interruption of rehearsals to suggest gags and spouted forth wisecracks which convulsed the cast.

Phillips was in his third year as a medical student at the University of North Carolina where he was drafted to write the annual theatrical production of the school. From that moment medicine fought a losing battle to interest him and soon after he left college to seek his fortune in the writing field. Both are married now, live in Hollywood and would not give up gag writing for anything.

The third member of the Baker staff is Hal Block who was the campus cut-up at the University of Chicago a couple of years ago. A glum looking young fellow, he can turn out some of the most laughable material. Driving to New York in a flivver two summers ago with a batch of his college humor, he finally managed to see Baker and persuaded the accordion squeezer that he (Block) was just the man for him. He's been going great guns ever since, the only fly in the ointment being his father, a wealthy Chicago lawyer, who wants his son to quit the gag-writing business—and follow in his footsteps in the legal profession in Chicago.

Maybe the elder Mr. Block is right because gag-writing is a very nerve wracking business. David Freedman, considered by many as the top man in gag writing, died last year at the age of 40. Al Boasberg, another top-flight writer who died last year, was also about 40. The Dean

of Gag Writers and the Methuselah of Mirth is Billy K. Wells who is 53 years old.

To grind out belly laughs week-in and week-out, always fearful that your joke might "lay an egg", [*Gag-writers parlance that the joke was a flop.—Ed.*] is enough to give any writer gray hair and a weak heart.

Then there is the bugaboo of the Crossley Survey. That's a survey which shows just how popular a radio show is. If the Crossley rating of a comedian goes down the first thing he usually does is place the blame on the gag-writers and the next thing said gag-writers are out knocking at the door of some other comedian for a job.

Oh, it's nice work if you can get it; and the pay is high.

—30—

Writing for Radio

(*Continued from page 33*)

half a solidly written page. Try writing about 12 pages of dialogue for a 10-minutes skit. Then get someone to rehearse it with you, and cut accordingly. It is always easier to cut copy than it is to lengthen it.

Having finished to your own satisfaction a brief resume of the program, two or more skits, and a fairly detailed account of the development of the remaining skits, you are ready to put your material into shape for submitting.

There is no hard and fast rule for preparation of the manuscript, but the more professional it looks the better chance it will have for serious consideration. You might set up page one as the title page something like this:

A Radio Series
Tillie the Boilermaker
by
John Doe

Name
Address

On page two, if you have done any important writing, or have other qualifications which you feel should be mentioned, write a brief autobiography. Otherwise, omit this personal puff.

On page three, again place name of the series with your own name and address, and give a brief resume of the series in as colorful a manner as possible. Names of characters, and who they are.

On page four *et seq.* Proceed with the actual scripts. Don't forget name of program, name and address (pages sometimes get lost). Leave wide margins. Place name of character speaking in center of page. Indicate sound effects in margin. Double space.

On following pages, outline briefly Scripts 3, 4, 5, 6, and so on. Even though you don't follow these outlines later on, it makes a good impression to have the idea fully developed.

Make at least two carbon copies, one of them for your file. Don't fold your manuscript. A heavy cover will protect the manuscript as well as improve its appearance.

And now you have done the ground work, you are ready to try your wings. If you know someone in an advertising agency or radio studio, fine. Personal contact won't sell your program, but it may insure sympathetic reading. Your markets are the large advertising agencies which have radio departments, and the program directors of radio stations. Or if your program seems especially adapted to some certain client, you may approach the advertiser direct. But try your home station and advertising agency first. The small station is always easier to crack than the big chain.

You might also mail your program as you would any manuscript, of course, inclosing postage for its return. You may copyright it if you wish. Or do this: Register the original copy to the prospective buyer, asking the post office for a return card. At the same time, register a carbon copy to yourself. When your registered copy comes back to you, *don't open it.* Simply file it away with the return card from the prospective buyer. Then if he does steal your idea (which he probably won't), and if you sue, then your lawyer can with dramatic effect, open your registered letter in court and prove your authorship.

You may not sell your first program, or even your second. But if you are lucky you may be offered a job in agency or studio as a script writer at from $50 to $75 a week. The fabulous prices you've heard about are as rare as the proverbial hen's teeth, although now that Hollywood is taking over radio, salaries may benefit from its Midas touch.

Radio Is Begging for Material says Fred L. Prew, script writer

IF MY dog Fido could write for the Radio, the stations would keep him in steak bones for the rest of his life. They can't get enough of them. Anybody—ANYBODY—that can string ten minutes of creditable dialogue together can write for the Radio.

What you say is true. I guess, you say, but where can *I* get all the ideas I need to keep on writing for the Radio?

For three cents a day, maybe two cents, depending on the newspaper you buy, you can find enough ideas to last you as long as you can fill in the details, I tell them.

Remember the story the other day of a man who was arrested for murdering a man—a man who had done him a wrong ten years ago—and for whom he had been looking for ten years? It's a perfect story. Go back and take them through the deal that started the trouble. Relate the wanderings of the man who got the short end —then bring in the climax—where he finds his man. Easy!

Tonight a couple were announced as celebrating their 50th anniversary. They were Italian. The husband came first, opened a baker shop, then his wife followed a dozen years later. Cut it to the 25th anniversary. Have the wife die before she can get to America. Show the husband, alone, and remembering 25 years ago. A customer comes in, and sure enough, it turns out to be his daughter! Curtain!

My inquiring and ambitious friend usually begins to brighten by this time. Sometimes, if he has a paper in his hand. I can point out a story in it that could be used for the Radio.

But that's not all there is to writing for the Radio. A good idea is necessary, but there are a few things more to remember.

First, start easy. The hour programs often contain a 10-minute dramatic sketch, acted by the guest stars. That's one bit market. Start with the ten-minute sketches, then work up to the half-hour ones.

Second, have only two or three characters in the 10 minute sketch, never more than five or six.

Third, get action in your piece. Make

your characters go places and do things. The announcers do enough talking—give action in your sketches.

Fourth, work to a climax. Then stop. Don't have your climax anywhere but at the end—not in the middle, or in the first scene. Finish with a bang, or strong heart interest.

Fifth, limit your scenes to three if you can.

Sixth, put plenty of sentiment and romance in—if you don't have pure he-man action. Next to a fight, people like to cry, and "All the world loves a lover."

By that time my friend feels like he wants to rush home and dash off a script before supper.

Hold on, I have to tell him. You wouldn't go looking for a job as bookkeeper in your oldest clothes, would you? Well, when you try to sell a Radio script, you've got to dress it up too.

The big studios have a set form for all scripts. It's easy to use, and it's been found to be the most practicable for the actors to read. Show the characters' names in capital letters at the left, then the dialogue almost to the middle of the page.

I go on, and sketch out the plan for him. For the help of readers of RADIO NEWS, a sample form is with this article. It shows the first page set-up, and how to arrange the dialogue. The label for sound effects is "BIZ."—the "business." The orchestra is designated in line with the characters, also in capitals, and the music described on a line with the dialogue.

For the readers of RADIO NEWS who may already be writers—but not radio writers—I should like to give a few more ideas.

The price paid, incidentally, for the 10-minute sketches runs from $50 up. Maxwell Anderson gets $1,000 for each half-hour play he writes.

You don't have to be a NAME to write for the radio. They don't care if you've never been printed before—if you have material they can use. Just write and send your material to the Program Director of any large station, or small station, for that matter.

Another good bet, if you're near New York and know your way around, is to submit your material to the advertising agencies who handle the big programs. They, too, are at wit's end for material. And pay a little more than the studios.

Writing for the radio has many ramifications. Think of the person who started Spelling Bees, the sidewalk interview programs—or a dozen others that have cropped up over night and taken hold.

Perhaps one of the readers of RADIO NEWS has an idea that will sweep the country next.

How about a couple of ideas to start you thinking? Major Bowes has done well with his amateurs. How about starting an amateur hour for musicians — amateur swingsters—with the idea of developing Swing Bands? How about it?

Or how about developing a sketch around a family traveling over the country in a trailer? That idea has been up in the studios off and on, but nobody has been able to hit the right angle—great comic possibilities in it!

Or how about a variation of the interview program—ask people to write or appear and tell about the funniest situations they have encountered—or the most adventurous?

Or how about a letter-writing contest—limiting the letters to 50 words—offering prizes — giving subjects that will afford amusement?

Or for someone who can do the research—how about an Old Timers' program? Get people to write in about their memories of their childhood — or good times they "uster" have. Dig out old records, old songs, by-gone happenings, etc.

Those ideas are just samples of what can be done—and what can be sold—if treated properly.

In serial programs, or ideas for continuous programs—the method of presentation is simple. First, you must write at least one sample script. Then you must outline the deevlopment of your idea so the studio man can see where it is going.

Haven McQuarrie asks his listeners, "Do you want to be an actor?" If you do, you not only can sell a program, but take one of the parts you create—again, you don't need a NAME—if you have the voice, an idea, and a good script—you've sold your stuff!

So—if you want to be a writer—WRITE FOR THE RADIO.

You don't need a NAME to get into Radio script writing—but if you're good enough, you may soon have a NAME!

Go to it!

—30—

Page 1

..... (INSERT NETWORK OR STATION)

ADVERTISER..... WRITER.....

PROGRAM TITLE..... OK. .....

(..... Outlet)

( ) ( ) ( ) ( )

TIME DATE DAY

....

PRODUCTION .....

ANNOUNCER .....

ENGINEER .....

REMARKS:

List of Characters

Butch Flannagan, Gang Leader
Slag Schultz, His Lieutenant
Susie O'Grady, Butch's "moll"

(Explain scene and action)

ACT ONE

BIZ: (ALL SOUND EFFECTS IN CAPS AND PARENTHESIS) as—(SOUND OF AUTOMOBILE BEING DRIVEN)

CHARACTER: Double space, observe paragraphs and punctuation. Underline and put in parenthesis all directions, i.e., *(Softly)*. Words for Emphasis all Caps. As—

BUTCH: C'mon, you mug—GIVE. Or I'll twist y'r ears off!

SLAG: *(Whining)* Aw, gee, Boss, I ain't got nothin'.

ORCHESTRA: MUSIC, ETC. ALL CAPS.

End of act is shown by: xxxxxxxxxxxxx

End of play by: CURTAIN.

Continue with page 2, 3, etc.

North Pole

(*Continued from page 21*)

at in this article, included duties as meteorologist, mechanic, and chief of technical equipment and the power facilities.

In addition to substantial monetary rewards and an endless variety of other honors and decorations, the Russian Government recognized Krenkel's achievements by conferring on him the title of *Hero of the Soviet Union,* after he returned to the mainland with the three fellow-heroes. The return was accomplished in two rescue icebreakers which, after arriving on the scene, drew lots for the honor of taking aboard the courageous little crew of the North Pole Station.

At 4 P.M., on February 19th, the following historic radio message was despatched from the historic ice floe:

"TO ALL! TO ALL! TO ALL!

"I am finishing my work.

"KRENKEL."

-30-

A Portable Radio Station

(*Continued from page 50*)

lay-out of the various units to suit his particular taste, as the portable consists of three separate units, mainly the r.f. portion, with its associated modulator and speech amplifier, the complete receiver on its own chassis and the power supply, which may be either the a.c. power pack or the Genemotor, depending upon which is used at the time. The class "B" out-put transformer used in the modulator section has been especially designed for this portable and the secondary impedance is 4200 ohms.

mounts on the front center of a 7" x 6" x 1½" chassis with the two band-setting condensers on either side as shown. The coils mount directly in back of the condensers.

Plate and filament voltage is furnished by the genemotor or a.c. Pack, whichever is being used. Not more than 250v. should be used on the receiver and this is limited by the separate voltage divider shown.

COIL DATA

	160 Meter	80 Meter	40 Meter	20 Meter
L.1. R.F. Amp Plate Coil 1½" Dia. Form.	48 T. No. 16 wire close wound center tap.	36 T. No. 16 wire close wound center tap.	18 T. No. 16 wire 1½" long center tap.	7 T. No. 16 wire 1½" long center tap.
L.2. Antenna Coil	50 T. No. 16 wire close wound Tap every 10 T.	40 T. No. 16 wire close wound Tap every 8 T.	30 T. No. 16 wire close wound Tap every 8 T.	25 T. No. 16 wire close wound Tap every 5 T.
L.3. Rec'vr. Det. Coil	1¾" of No. 24 DSC close wound. Tap at 1¼ T.	38 T No. 22 DSC 1¾" long tap at ¾ T.	12 T. No. 22 DSC 1½" long tap at ½ T.	6 T No. 22 DSC 1" long tap at ¼ T.
L.4. Rec'vr. Osc. Coil	1¼" No. 24E, close wound. Tap at ⅓ total turns	32 T. No. 22 DSC 1¾" long tap at 10 T.	11 T. No. 22 DSC 1¼" long tap at 3½ T.	6 T. No. 22 DSC 1" long tap at 1½ T.

The Receiver

The little Super-Het receiver uses four metal type tubes, is extremely compact and makes an excellent performer when real selectivity and sensitivity are needed for reliable contacts. The use of regeneration in both first and second detectors allows either phone or c. w. reception by allowing the second detector to oscillate for the latter. A single iron-core i.f. transformer is used at 456 kc. and gives a good gain in this circuit. The design of the unit is not original and no credit is claimed for it.

A 6L7 is used as a first detector and mixer tube with a tap taken off of the coil on the ground end. This induces a slight amount of regeneration which greatly increases the sensitivity of the detector to an incoming signal.

The oscillator tube type 6C5 is of the conventional variety and needs no comment. The oscillator output is fed into the 6L7 injector grid. The secondary grid return of the i.f. transformer goes to the cathode choke which is jumble-wound with 100 turns of No. 28 or 30 wire on a ⅝" dia. wooden or bakelite rod or spool.

This coil controls the regeneration on the second detector by means of the 5000 ohm potentiometer.

A 6F5 variable *mu* tube is used and either cathode or grid-leak bias may be furnished.

A 6C5 audio stage gives good amplification to the signal and feeds into the 2000 ohm headset.

The various parts are shown on the photo. The gangband-spread condenser

Power Supplies

The two supplies are shown in the photographs and have chassis of the same sizes so that either may be used and changed in but a few moments' time. The diagrams show how these units are connected. Note that each unit contains its own filter system as the amount of ripple is entirely different in genemotor operation than that of the a.c. Pack. This genemotor is furnished with associated filter.

The a.c. Pack furnishes 6.3v. a.c. for the filament and 300v. d.c. for the transmitter or 200v. for the receiver.

Comparative tests with the transmitter receiver described above has shown that the difference between the battery operated portables with outputs ranging from 2 to 10 watts versus a transmitter of this power, makes it far more possible to break through qrm. In order that 100% contacts may be had, the selection of the receiver circuit described has certainly warranted its use in regard to selectivity and sensitivity. This constitutes half the battle, when faced with receiving conditions as they now stand.

The steel cabinet measures 12" wide, 13" high and 7½" deep wtih the shelf located 7¼" up from the base. A back cover is used to provide shielding and also to keep dust from the cabinet. A large durable leather handle completes the cabinet assembly and a handle of ample strength to carry the weight for equipment of this type should be selected.

The portable transmitter-receiver will cover many hundreds of miles when used with a simple antenna previously described.

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Studio Briefs

(*Continued from page* 10)

Benny, on a one-week visit east, used the same studio as the famous conductor.

In a bit of pre-broadcast clowning, Allen scanned the continuity and sneered at it.

"Haven't you got anything better than this?" he asked Benny.

"Look around," Benny replied. "Maybe Toscanini left something."

"I looked already," Fred said, "and all I could find was a lot of dandruff!"

* * *

THE Philadelphia Radio Center is the name of the new $600,000 building opening the week of May 16 in the Quaker City to house the facilities of Station KYW. The title is a clever one and undoubtedly was prompted by the term" Radio City" which caught on like wildfire all over the U.S.A. to describe the NBC New York headquarters in Rockefeller Center. The seven-story structure boasts the latest things in radio design. Two of the floors have been set aside for television and Leslie Joy, station manager points out proudly that "we happen to be at the terminus of the coaxial cable line which goes to New York where NBC has its television studios."

The main studio, seating 225 persons, is in the basement—an innovation, indeed! Five other studios are included in the maze of rooms in the large structure.

Completion of KYW's new home brings to an end the odd situation of an NBC station sharing quarters with a CBS unit. Since coming to Philadelphia a few years back, KYW was located in the WCAU Building. And WCAU, you know, is a CBS outlet directed by Dr. Leon Levy, a brother-in-law of William S. Paley, president of the chain. And to make things more complex, Dr. Levy managed the KYW operations as well as those of WCAU.

CBS—Chicago Briefs

PRODUCER PHIL BOWMAN and his wife vacationed by motor to the Pacific Coast during the month of April. . . . Reis Taylor of *The Romance of Helen Trent* impatiently waiting for the day he can open his summer cottage in the Indiana Dunes. . . . Actor Bill Bouchey acquired an early coat of tan in the spring sunshine by driving in an open car and playing golf.

It's happened again! Day after an auto accident in the script of *Stepmother* Peggy Wall had a real smash-up. No injuries, either real or imaginary, sustained. . . . Margarette Shanna, "Connie" of *Arnold Grimm's Daughter* adopted a recently returned Gibson Girl vogue in dress, sailor hat, puffed sleeves, and all. . . . Cornie Peeples, who plays kid roles in several CBS dramas, wrinkles his brow and says, "I'm gonna get me a crate, but I don't know whether to get a basket or a box," and then explains that he can't decide between an open and a closed car.

Having worn bow ties all his life, Edgar A. Guest never has learned how to tie a four-in-hand. . . . Frankie Masters, orchestra leader for the *It Can Be Done* series, tours the mid-west with his orchestra between his weekly broadcasts. . . . Kaye Brinker of *Manhattan Mother* celebrated her birthday on March 29. . . . Virginia Clark of *The Romance of Helen Trent* is sending tantalizing postcards from Florida to Chicago friends.

Walter Preston, producer of *Just Entertainment* gloating over a new set of golf clubs. . . . There's a dreamy look in hymn singer Joe Emerson's eye as he nostalgically muses over his inability to get away for a visit to his farm in North Carolina. . . . Actor Olan Soule and his wife are producing an amateur sound film. . . . "It's a villainous plot," says Soule, "with plenty of shootings and stabbings. Just the thing for late evenings."

NBC—Chicago Briefs

NBC Engineer M. H. Eichorst got up unusually early one morning recently, twirled the dials on his short wave transmitter, station W9RUK, and at 7:55 a.m., CST, contacted Bill Ellis at station KAIME, Manila, P. I. At Eichorst's side was Mrs. Gladys McClanahan of Chicago who became the godmother of her sister's baby being christened in Manila.

Mrs. McClanahan made proper responses at this end and the ceremony was interrupted only by the crying of the baby, plainly heard over the almost 10,000 miles of space separating the participants.

Broadcasting cost at NBC Chicago is up four dollars this year. When arrangements were being made to bring Robert Lee Bristow, the 21-year-old "Star American Farmer of 1937" to Chicago from his farm at Saluda, Va., in order that he might broadcast on the Allis Chalmers program he agreed to all stipulations except for one thing. If he came he would have to hire some one to milk his cows and that would cost four dollars. Mr. Bristow wrote that if the National Broadcasting couldn't pay the four dollars he couldn't come. So NBC dug into the sock for an extra four dollars.

Amos 'n' Andy are wondering about that "cogwheel gag." In a recent script Andy was called upon to buy cogwheel after cogwheel for an inventor the Kingfish found for him. Now the NBC comics explain:

"That cogwheel idea was pretty nutty all right. But do you know folks sent us 500 cogwheels in the mail? The last one just arrived, in an envelope. It was perfect, but as small as a dime."

Jackie Heller, pint-sized tenor of the NBC networks, is in his annual challenging mood. Each year he challenges Ted Weems, the band leader, to a tennis match. And each year Weems accepts. Then that is as far as it all goes. Jackie goes back to singing on the NBC Club Matinee and other programs and Weems goes on leading his band. The challenge match somehow never is played.

Bruce Kamman, Professor Kaltenmeyer on the NBC program, Kaltenmeyer's Kindergarten, is reminded once a year that he is a propertied individual. Bruce owns vacant building lots in Kansas City, Mo.,

St. Paul, Minn., Indianapolis, Ind., and Chicago. He is reminded of the fact each time the tax assessor sends him notice of "payment due."

INSERT CURIOUS FACTS—E, the letter occurring most frequently in the English language, is the first letter in the name of but two NBC network shows—*Easy Aces* and *Empires of the Moon*. Two start with U and many with S, but none with Q, X or Z. Ransom Sherman and Charles Lyon of the Club Matinee Science Speaks department are authorities for the statement.

Kenneth Trietsch of the *Hoosier Hot Shots* announces the filling station he opened last year is now on a paying basis. Around the NBC Chicago studios, however, the other Hot Shots insist the station will never make a profit because Ken spends too much in long distance calls trying to find out how much gas was sold.

Federal Avigation Aids

(*Continued from page 43*)

the pilot, in addition to his ordinary radio range receiver to obtain maximum results from the simultaneous method of transmission.

The pilot selects his method of reception by means of a switch. With the switch in one position he receives both voice and radio range signals, in another he gets voice only, and in the third radio range signals only.

Ordinarily he will have his headphones connected so that both voice and radio range signals will be heard. Most of the time only the directional signals will be on the air, and he will be following his course by reference to them. At the same time, he will be sure of knowing whenever any voice broadcasts go on the air, because these will be heard along with the range signals.

When he hears a voice broadcast, he may want to pay close attention to it, and if he does not need the directional signals at the moment, will move the switch to the appropriate position so that he can concentrate on the spoken broadcast. On the other hand, if he is more interested in the directional signals and does not need information about the weather, he will change the switch to that. Later, after the voice broadcast has been completed, he will change to the original position so that he can continue to follow the range signals and in addition be aware of later broadcasts.

In flight tests it has been found that under ordinary atmospheric conditions the simultaneous station can be received satisfactorily even with the ordinary receiver, without the special filters.

Navigating with a radio-compass the pilot turns on the radio-compass receiver and moves the station selector to the frequency of the station he desires to pick up. It may be a commercial broadcast station, a Department of Commerce radio-range station, or any other type of transmitting station that sends out signals either continuously or at frequent intervals, and within the receiving range of the compass.

He tunes in on this station until the maximum volume is received and from that time on he merely watches a needle on his instrument board which is pointed vertically at zero. If the plane veers off to either side, the needle will move accordingly and therefore provide a warning that the craft is deviating from its course. Hence, the airman's only duty is to fly the plane in such a direction that the needle constantly points on zero. His course will lead directly to the radio station, and from there he orients himself to the landing field.

The radio compass also may be used as a position finder. The pilot establishes the direction toward a radio station, as above, or by rotating the long antenna, gets the bearing from his magnetic compass and draws a line on his air navigation chart to indicate this. Then he takes a bearing on another station and draws the corresponding line on his map. The airplane's position is at the intersection of the two lines.

Used along the airways, in conjunction with the radio-range stations, the radio compass simplifies problems of orientation. If the pilot is off the radio-range course, and wants to get back to it, the radio compass is of assistance. It also simplifies the process of proceeding to the landing area when the pilot has reached the radio-range station.

Since it may be used in conjunction with any radio station within its receiving range, the radio compass is an aid for off-airway flying—for flights by miscellaneous commercial operators and private flyers when these follow routes which are not marked by Federal air navigation aids.

The Bureau of Air Commerce has participated in the development of the radio compass. About five years ago a radio-direction finder, which was one of the forerunners of present radio compasses, was designed by the Bureau of Air Commerce radio engineers working at the National Bureau of Standards. In 1935, the Bureau of Air Commerce conducted tests of a radio compass in a transport airplane flying several hundred miles out over the Pacific Ocean from a base at Oakland, California. These flights demonstrated that the radio compass was suitable for use in ocean flying. Several radio compasses now are available commercially.

On many of the airway routes there is so much flying that it has become necessary to establish air traffic control systems. Rapid advances in instrument flying have made control of airplane movements especially imperative, since several different airplanes may be moving along an airway at the same time in the clouds, where pilots cannot see other craft.

Actual take-offs and landings, at a number of the busier air terminals, are under the supervision of airport traffic control towers, from which the tower operators communicate directly by radio with airplanes on the ground preparing to depart, and with draft which are approaching for their landings. For flying along the airways, between air-

ports, the Bureau of Air Commerce has provided an airway traffic control system. An airway traffic control station does not communicate directly with pilots, but receives its reports from those who are in contact with the airplanes, including airline dispatchers, the airport control tower, and Bureau of Air Commerce radio operators. The control station coordinates the reports received from all these sources and issues any instructions necessary to bring about a smooth flow of traffic, relaying these instructions through the airline radio stations, Bureau of Air Commerce stations, or airport control tower.

Traffic control is most urgently needed when the aircraft along the airways are flying in or above fog and clouds and are being navigated by instruments and radio. At such times it is especially necessary that aircraft be kept adequately separated, either horizontally or vertically or both, so that there can be no possibility of a collision. Also it is necessary that the aircraft proceed in an orderly sequence and not be bunched together on arrival at the airport, and at the same time that no schedule be unreasonably delayed. However, the airway traffic control stations' activities are not confined to period of unfavorable weather. They operate continuously from early morning to midnight or later, and it is probable that they eventually will function on a 24-hour basis. Working in close cooperation with the airlines operating at the airport upon which it is based, and with the airport traffic control tower which supervises actual take-offs and landings, an airway traffic control station receives departure, arrival, and position reports on all aircraft in its area.

A pilot flying in or above the clouds and unable to see the ground reports his passage over "radio fixes," or check points; that is, when he passes over a radio marker, through the "one of silence" which indicates the location of a radio-range transmitter, or crosses a radio-range course which intersects the one he is flying.

Privately-owned aircraft and airplanes of the Army, Navy, Marine Corps, and Coast Guard, when operating along airways, also furnish their flight plans and when so equipped report by radio so that they can be accounted for in connection with traffic control.

For an out-bound airplane, an airway traffic control station receives advance information concerning the flight plan, including altitude and approximate time when the airplane will arrive over the first radio check point, cruising altitude to be maintained, estimated flying time to destination, type of airplane, and any other necessary information. If this plan will involve any conflict with other traffic already in the air, the pilot is so advised and a new flight plan worked out. This is the plane's clearance.

As soon as it has taken off, word is flashed to the control room and an operator there puts an airplane marker on a map to indicate its location. The marker is moved every 15 minutes to indicate the progress that the airplane should be making at its calculated cruising speed, allowances for wind, weather, and other factors having previously been made. As position reports are received from the pilot the position shown by the marker is checked against these reports and corrected if necessary.

In the case of an incoming airplane, reports of departure and progress along the airway are watched in the same careful manner, and in addition its movements are coordinated with other craft approaching on the same or other airways. When the first report on the incoming airplane is received, the airway traffic control station at the destination computes its probable arrival time and compares this with expected arrival times of other airplanes. As the minutes pass, the station may discover that some other airplane, which took off later, is overtaking the first one. If this occurs when visibility is limited, traffic control will assign a lower flight altitude to the first airplane.

If the possible conflict arises because two or more different airplanes are due to arrive at approximately the same time on different airways, airway traffic control assigns precedence for approaching the airport. The ship which is first given clearance comes in for a landing, and others are required to remain at higher altitudes or, if necessary, to reduce speed or circle over specified check points. When the first plane has established contact with the control tower and landed, the second is brought in, and so on until all are down on the ground.

A number of larger airports now have control towers for directing traffic to and away from the airport. Some others which do not have control towers do have radio stations, and stand watches to receive messages from pilots who are approaching the landing areas and want information about weather conditions, wind direction, and movements of other aircraft. Also, some airports have low-powered radio ranges or runway localizers similar to the low-powered ranges operated by the Bureau of Air Commerce at certain intermediate landing fields. These radio ranges are to assist pilots flying on instruments to locate the landing area. An airport radio station is defined as a low-power transmitter used only for communciation with aircraft in the immediate vicinity of an airport. Before

such an installation may be made it is necessary to file application with the Federal Communications Commission for a construction permit. When the station is ready to inaugurate regular service the Commission will then, upon receipt of formal application, grant a license to operate.

The airport radio station must at all times be under the supervision of a licensed radio operator. The minimum technical requirements for an operator's license are, however, not stringent, as a third-class radiotelephone license is acceptable.

All transmitting is conducted on the national airport frequency of 278 kilocycles. An antenna to resonate at this corresponding wavelength should be approximately 200 feet long. Although transmitting antennas are ordinarily placed as high above ground as practicable, it is necessary to sacrifice some efficiency in the radiating system where located at or adjacent to an airport. Lofty towers near a landing area are, of course, an obstruction and constitute a hazard to aircraft in flight. Most commercially available airport transmitters are designed to give satisfactory results when operated into a low single-wire antenna having an electrostatic capacity to ground of from 0.0005 to 0.001 microfarads, and almost any resistance from 4 to 40 ohms.

A transmitter capable of delivering at least 15 watts of R.F. power to the antenna is recommended. This is the maximum antenna power permissable under the regulations governing airport stations.

Good speech quality is desirable and a high percentage of voice modulation of the carrier an important consideration, as the resulting improvement in signal to noise ratio is a decided advantage.

Efficient harmonic suppression is a necessity since usually several receivers on different frequency channels are operated in the immediate vicinity, even in the same room.

The design features of one of the several commercial models of airport transmitters on the market will be described as representative. The output circuit is arranged for either feeding into a conventional quarter wave antenna and ground system, or to give the proper impedance relations for working into an R.F. transmission line. The final power amplifier utilizes two type 865 tubes excited by the output of another type 865 which acts as the oscillator. The oscillator is quartz crystal controlled since frequency stability is becoming increasingly important with the advent of pretuned 278-kilocycle aircraft receivers and the consequent demand for precise and permanent adjustment. Two type 59 tubes in parallel modulate the power amplifier 100 percent. The first audio amplifier tube is arranged so that it can be made to function as an audio oscillator by simply throwing a single switch in the "ICW" position. Thus is made available a signal source for a runway localization or other such navigational aids. Plates and bias potentials, even microphone current, where required, and direct current for operating control relays is rectified and filtred A.C. from the 110-volt supply line; no batteries are necessary.

Microphones of the carbon type should be designed for operation in any position for portable use. Probaby the moving coil magnetic type is best suited in this respect for reason that it is more rugged and less affected by moisture and weather changes. It is true it requires more preamplification as its output is lower, but it gives excellent quality capable of great amplification, with complete freedom from the noises inherent in the carbon type. It has the advantage also of not requiring a microphone battery.

Usually several radio receivers are required, two at least: An intermediate frequency receiver for airways radio range signals and weather broadcasts in the 200- to 400-kilocycles band, and a high frequency receiver for guarding the national aircraft frequency of 3105 kilocycles. The airport station guards all of the several aeronautical chains operating in the vicinity. This entails a multiplicity of receivers—at some airports as many as eight or nine—one for each transport chain frequency. H. F. aeronautical radio-transmitting stations are usually operated on the airport, frequently in the same building. For this and other reasons both low and high frequency receiving equipment should be the best obtainable. A sensitivity of 5 microvolts per meter and minimum selectivity that will permit discrimination between stations of equal strength 10 kilocycles apart in frequency in recommended as a minimum requirement. Complete shielding is important; stability of operation and freedom from frequency drift, a consideration; and, of course, adequate ventilation to prevent overheating under continuous service is essential. An efficient and quick-acting automatic gain control is a desirable feature, especially on the receivers used for guarding the frequencies used by local transmitters.

Several reputable manufacturers now offer receivers especially designed for airport use. Most of them are of multi-band design covering airway frequencies from 200 to 400 kilocycles, entertainment broadcasts, 500 to 1500 kilocycles, and that portion of the high frequency spectrum which includes all aeronautical channels.

—30—

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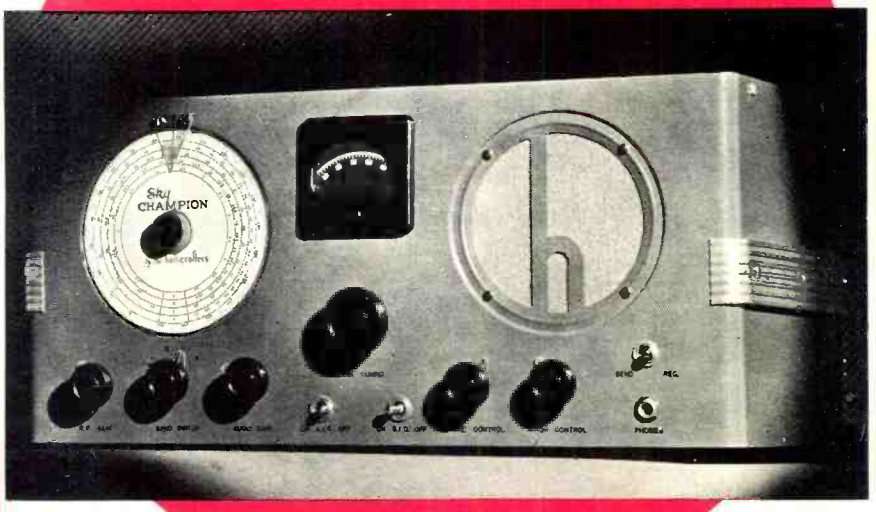

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