



another MRL Handbook...

HB-11

# RADIO OPERATING AS A CAREER



By Elmer G.  
Osterhoudt.

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INTERNATIONAL MORSE CODE			
A ● —	N ● ●		
B ● ● ● ●	O ● — —	1 ● — — — —	
C ● ● — ● ●	P ● ● ● ●	2 ● ● — — —	Period ● ● — — — —
D — ● ●	Q ● ● ● —	3 ● ● — — —	Comma — — — — —
E ●	R ● ● ●	4 ● ● ● —	Question mark ● ● — — ● ●
F ● ● ● ●	S ● ● ●	5 ● ● ● ●	Error ● ● ● ● ● ●
G — ● ● ●	T —	6 — ● ● ● ●	Double dash (BT) — — — — —
H ● ● ● ●	U ● ● —	7 — ● ● ● ●	Wait (AS) ● ● ● ● ●
I ● ●	V ● ● ● —	8 — — ● ● ● ●	End of message (AR) ● ● — — ● ●
J ● — — — —	W ● ● ● —	9 — — — — ●	Invitation to transmit — ● ● ●
K ● ● ● —	X ● ● ● —	0 — — — — —	End of work (SK) ● ● ● ● ●
L ● ● — ● ●	Y ● ● — —		
M — —	Z ● ● ● ●		

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by

Elmer G. Osterhoudt

"With Radio since 1915," including:

Radio Operator, R.C.A. Marine Service  
 Radio Mechanic, Maximum, U.S.N.  
 Technician, Electrical Products Corporation  
 Southern California Edison Company  
 Majestic Electrical Products  
 U.S. Motor Company  
 Manchester Radio Electric shop  
 Modern Radio Laboratories  
 Amateur and Radio Service  
 6NW (1919)

Litho. in U.S.A. by Modern Radio Laboratories

## FOREWORD

The Federal Communication Commission (FCC) license is the main stepping stone to a Radio operating career. With it - you can go places! By passing the various elements - you advance to better jobs and higher pay. It is wise for every Radio Fan to start working for his FCC license - from Novice on up to the Commercial grades. Even if you don't intend going to Sea - the FCC license will help you to go into dozens of Electronic fields to your liking. Just like a College man - he specializes after he has acquired the rudiments of "operating."

For the Old Timers, before 1920, when we had only Ships and land stations to work on - it is almost impossible to comprehend the extent of the present Electronic operating field. Now each license category has so many, many thousands of operators that it makes the field and jobs almost endless.

This Handbook should be instrumental in helping you to lay the groundwork for this important step in your life. It tells you how to begin the easy way. It advances you up to the Radio school and the license. And from there, we have given you some interesting sidelights on Sea life. As the ultimate, for the professionals - we have given

some interesting notes on the KPH land station.

We are especially indebted to Mr. Frank Geisel (FG), manager of KPH receiving, for his help and interesting notes on many of the details of operating the station.

We are also indebted to Mr. W. L. Galten, a former operator at United Air Lines - who has given us interesting data on Airplane equipment and operating.

Also, we wish to thank the RCA Institutes, Pacific Radio School, National Radio Institute, Grant-ham School of Electronics, National Schools, etc. for their help in adding to our notes.

One thing is in favor of most of us - is that a College degree is not necessary. While a degree is most useful, and you'll make more money with it - you can also get along right well without it in the Electronic fields.

For the man, who doesn't relish mathematics - only the higher classes of licenses get into it. The Engineer must have it to succeed we all know. When most of us need math. - we can easily refer to a text to work out our problems.

Our hope is that this Handbook will help you in some phase of your Radio work. Due to space, it is impossible to go into the thousands of details.

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## I. The World of Electronics.

In the olden days we had Electricity and Wireless. Then the Wireless operator became a Radio operator or "Sparks." (Even called "Lightning" by some of the lesser intellectuals aboard the ships.) Finally, Radio became Electronics. Today there is hardly a branch of Science that does not hook up with Electronics - even to "Electronic want ads!" "Radio" denotes transmission and reception of Radio frequency waves. "Electronics" may technically refer to electrons - especially as concerns tubes. But the single term "Electronics" can just as well cover the whole field because branches are so closely affiliated.

The field of Electronics has expanded much more rapidly and widely than predicted. All the branches are just going ahead by leaps and bounds. This fastest-growing industry has become the fifth largest in the U.S. Its annual revenue totals over 15 billion dollars - and employs more than 1,700,000 men and women thruout the industry.

Even so - it urgently needs some 100,000 additional trained Technicians and operators to meet the huge demand for high-pay jobs to keep this equipment in operation. This last statement was from a correspondence school - so it is not ours! As increasingly complex equipment comes into wider use - more additional training is necessary. And pay may run to \$10,000 per year.

Many of the previous "common labor" jobs are being taken over by automation - so to train for the good high-paying jobs it is necessary to prepare for the more technical positions. The person with the most ability, drive and know-how - will get further in the Electronic field.

There will be a shortage of good Technicians for a long time to come. Production is being stepped up all along the line -

and where technical production lags - they usually lay it onto lack of skilled operators and mechanics. Often many parts are diverted to military use - which causes a shortage - and more technicians are again needed. You can usually find several "help wanted" ads for operators and technicians by the big companies - as well as the military. This large, constantly-changing market is always looking for well-trained Electronic men. This is even to the point where companies compete for the best men in their specialized lines. The pay varies according to job, location, products, services, operations, company demand and the ability of the applicant. Naturally, most of them may soon advance above the starting wages.

## OPERATOR or SERVICEMAN?

Since Wireless began - the Operator was required to service his own equipment. This was for a good reason, that nobody else knew anything about it but him. What steam Engineer would know which condenser to replace - if he only knew which one needed it - and why? Altho he may know a lot about motors and electricity - Wireless was something else.

Even in the large BC stations of today - the operator is a lot more than a "tube puller." When he takes his FCC examination - he must also know how to fix the set when it "plops" out. In the larger stations, where the work is more specialized - the Service Engineer tends to most of the maintenance work.

In view of all this - the FCC requires that most TV, Radio and electronics equipment must be serviced by a trained technician or operator. In most cases an FCC Radio phone license is required or desired. No code is required, unless you expect to handle code. This last rule is a great improvement over the olden

days - when he was required to know it regardless.

#### THE BRANCHES OF ELECTRONICS.

Today, three branches are usually considered.

(1) Radio-TV servicing branch: This takes in Radio, TV, FM, Auto, Hi-fi, PA systems, inter-coms, etc.

(2) Principles, practices and maintenance branch of electronics: This comprises computers, servo-mechanisms, welding, automation, ultrasonics, telemetering, feedback systems, radiation detection, industrial, etc.

(3) Communication electronics: This takes in the operation of TV, AM, FM and BC stations, police, transcontinental, transoceanic, aviation, mobile, 2-way communications, marine operating, Amateur radio, Citizen's band, etc. In the 20's and 30's - some authors considered the whole subject of Radio as "communications."

From jungle drums to electronics! What change has come over our civilization. Now it has become so complicated that we are lucky to have it divided into but three large classifications. For our subject, we will consider communications and its operating and servicing as a career.

#### THE VAST FIELD OF COMMUNICATIONS

Television was supposed to "kill" Radio, but this wireless medium is far from shot. Prior to World war 2, there were some 900 BC Radio stations in the U.S. But, today there are over 3500 going full blast.

The average Radio listener, who tunes in a couple of his favorite stations all day - or he narrows to a few channels of TV, does not realize the immensity of Radio. While he is being entertained in his own little tiny World - he does not realize that thousands of stations are operating on different bands. We are sure many Operators have not taken time to consider how many

stations are in operation. Nor does the average listener realize there are about 200 million home and car Radios and 50 million TV sets operating - besides his own.

Some of these figures on communication may not be amiss here - and can give you an idea what a big field you are entering. It may help you to pick your field you would most enjoy. When I began Radio, in 1915, we had but one branch - and that was operating wireless on ships. This meant being away from home most of the time. But, now there are so many other branches of communication electronics that allow you to live normally.

Vehicles. Some one million vehicles have Radio phones. This includes mobile as Police and other services, trucks, Citizen bands, Amateur licensees, etc.

Boats. Some 80,000 boats have transmitters. This runs from row-boats up to Ocean liners. To get an idea of its range - you can write to the Sup. of Documents, Washington 25, D.C. and get a listing of "Merchant Vessels of the U.S., including Yachts" - for \$7.25. This has 1128 pages for the 1961 issue. Of course, this does not include row-boats. Hi. Ships take in everything from fishing boats, pleasure boats and up to Liners.

Aircraft. Here we have about 80,000 aircraft transmitters. Needless to say - they are of all sizes and shapes.

B.C. stations. There are over 10,000 AM, FM and TV broadcasting stations in the U.S. alone - all trying to "broad-scatter" their signals. There are also lots of TV translator stations, which relay to out-of-the-range localities - usually called "community Antennas," to which they sell subscriptions. You may also write to the Sup. of Documents, Wash. 25, D.C. for "BC Stations of the World" - part 2 - listed according to frequencies - for \$2. (1960 edition.) This lists All BC stations, long, medium



1-1. Police Radio Operator.

(NRI)

and short wave - except the U.S. medium wave BC stations. This is a book of 438 pages - so again you see the enormous number of BC stations in the World.

Repeaters. Hundreds of microwave repeater stations exist. There are 1,400,000 Xmters. for private use and for the telephone companies. There are over 600 miscellaneous common carriers that provide phones to the public for a fee. These all require operators, or a maintenance crew to keep them going.

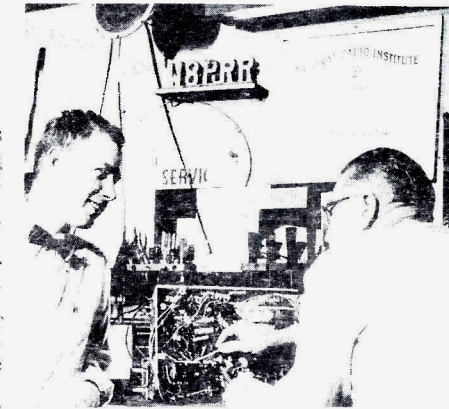
Citizen band. In Aug., 1961, there were 200,000 CB permits in service. These require a certain amount of servicing from the technician.

Amateurs. In June, 1960, there were 204,500 Amateur licensees in the U.S. It is estimated there are over 300,000 over the World. During that year - Amateurs forked over 30 million dollars for equipment. Thousands have Novice licenses - which are good only for a year. As you know - Ham stations require licensed operators and a station license.

Technicians. In 1958, over 300,000 Electronic technicians and servicemen were employed in the U.S. As color TV, etc. advance - more will be required. Many of these have telegraph operator, or Radio phone licenses on their own - and may own their own Ham station as a hobby.

In 1958, most Radio and TV servicemen earned about \$130 per week. Most dealers also offer bonuses for TV sales, tubes, etc. made on the job. In 1958, technicians working with manufacturing companies were paid up to \$3

per hour - plus overtime. Many repair sets, etc. on their own time, with good "side money." In manufacturing plants, it is considered about right for an Engineer to have 7 technicians to make up the things he thinks up.



1-2. Radio Technician. (NRI)

Military. As the armed forces demand more of electronics, more operators are required. You do not need an FCC license to work in the armed forces. Many in the armed forces go in for operating and servicing when they return to civilian life, altho their equipment is entirely different than found outside.

Mighty oaks are grown from small acorns. Many examples of how different ones started in small shops - and emerged to become giants of the industry - are being read every day. One instance is Eimac - starting in 1934 with \$5000, ran up to an annual business of \$16 million in the manufacture of tubes. We could cite many more. They had connections with operating companies in the beginning.

Yes - few realize the number of stations - but albeit it gives the FCC a real headache!

Scientific careers are started before reaching High school in most cases. One-half have developed interest B4 the 6th grade.

## 2. Radio Experimenting.

### START AT THE BEGINNING.

Readers of this Handbook will be found at all stages of the game. Many are rank beginners - while others are about ready for their Operator's license.

For the beginner, we wish to give a little advice. You may start in the operating game by enrolling at once in a Radio school. But, all thru our literature we have preached "start at the beginning." You wouldn't overhaul a carburetor if all you knew about a car was to drive it around. If you go up slowly - what you learn in Radio will be with you forever.

Begin with Crystal sets. Your friends may tell you they no longer build them. Don't kid yourself! We have thousands on our lists that continually build up hundreds of circuits using these "uncanny minerals." Aren't giant Corporations, like GE, Philco, CBS, Hughes, etc. working all the time with Diodes and Transistors? These are nothing but crystal sets. With these circuits you may study tuning, capacity, selectivity, DX-getting and a multitude of other properties of Radio. And you can do your experimenting without the purchase of costly tube parts, etc. In fact, our business is built on the specialization in small sets - and there is a lifetime of experimentation along this line.

From crystal sets - you go to simple one-tube sets. After you build a few of these - you can advance to multi-tubers.

A lot of Experimenters then get into Amateur transmitting - and build them a station. Most of them build their initial Ham equipment - but later may get into the more expensive kits or manufactured sets. When you get your Amateur station going - you are well on to the career of Radio operating.

### HOME STUDY COURSE.

It is now a good idea to start a good home study course in Ra-

dio fundamentals. When you go to Radio school - you will find it easy sailing. Don't think you can't now learn anything in a Radio school. Being an old timer - I was amazed at discussions of simple subjects in a Radio class that I thought I knew all about. Every teacher also has a different slant on most subjects. As you progress in Radio - you can better understand principles.

### RADIO SERVICE WORK.

Many service shops are looking for a young fellow interested in Radio, to help around the shop. This is just like taking Laboratory in a chemistry course. It's amazing how quickly you can pick it up. If you are going to school you may find a lot of work after school and during weekends in a Radio-TV shop. You may be required to work at low pay - but your learning is worth a lot, too.

A Fan, who has worked with small sets, construction, repair, design, etc. - mostly during high school ages - can qualify as an "Electronic technician," or apprentice and possibly make \$50 per week. After 1½ years - he may reach \$100 per week in some shops. I used to hire young fellows, who were interested in Radio and did a lot of dabbling. I found they worked out very good. Being single is an advantage - as you can work for less money, which is a good deal for the Boss! Hi. A Technician's work is fairly steady - especially if he is trained in several fields.

### FACTORY WORK.

Some young Radio men may be fortunate in being close to an Electronic assembling plant - and be able to get in some summer work. Most of the manual skills in a factory are being filled by women - altho supervisory duties are mostly men as Technicians or Engineers. Higher-paid leading men usually get from \$6-

8000 per year. Factory work also adds to your knowledge.

### SPARE TIME REPAIRING.

Some young fellows earn up to \$75 per week repairing sets on their own. If you are in a small town - the word soon gets around. Another step in your Radio career. Some Fans earn money by assembling kits for others.

### SALES WORK.

One may be able to do a little selling in a Radio-TV shop nites or on weekends. While mostly on a commission basis - you are still learning Electronics. We used to pay 10% - which can add up on big set sales.

### TELEPHONE COMPANY.

Car phones is another source of employment. Around S.F. Bay - the telephone company says there are over 400 cars and trucks equipped with telephones. They may talk between other cars 30 miles away - or ring in to the phone company to be put on the wire. The phone company has a mobile marine office in Oakland. An FCC license is good to have around installations like these. No doubt they require lots of service and adjustments.

For young fellows, wanting to get into the phone companies as apprentices - they are assured of a swell job that will last. You might look into it. A Fan, who is handy with Radio tools, etc. is most welcome.

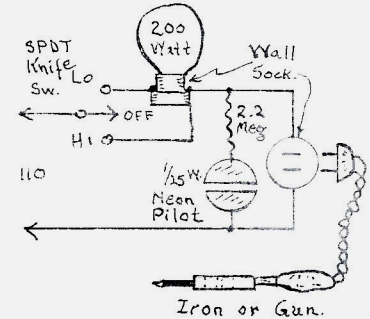
### START THAT RADIO SHACK.

You will have to find some dry comfortable room, basement, attic or part of the garage to start a Radio bench, or shack. The average person has a number of tools - but take it from an Old Timer - you'll buy tools all your life, so don't worry about a lot of them at first.

A good soldering iron, or gun, is essential, as well as various screwdrivers, side-cutters, hacksaw, wrenches, files, hammer, solder, wire, hardware, etc. You

will gradually accumulate parts, hardware, etc. from purchases or dismantled old sets.

Put up a good Aerial and install a good ground. Also some easy-access 110 v. plugs, etc. For a 100 watt soldering iron,



2-1. Soldering Iron Control with Neon Pilot.

we use a 200 watt lamp in series for "coasting" - with a SPDT sw. to short it out if you want it on hot, according to diagram.

You should have some combination volt-ohmmeter of some sort. Also a simple tube tester as you can't be running to the drug store all the time to have your tubes tested! You will eventually get a good bunch of equipment - and after a number of years, you'll be like "Pack Rat Osterhoudt" and not be able to get out of the shack!

One can always use test equipment. Most firms now offer it on easy terms - so it pays for itself as you go along. Much of it is also furnished in kit form so you get the good experience of building it up. Write to Cornell Dubilier Elec. Corp., Hamilton Blvd., South Plainfield, N.J. to get on their mailing list for the "C-D Capacitor." Lists all kinds of ads selling used equipment of all kinds.

Anyway, you have started - and with good books, circuits, contacts and a will to learn - you will soon be in the Radio business for sure. (Don't forget MFL Handbooks to help you along.)

### 3. Learning the Code.

The quickest way to learn the code is to attend a Radio school and copy tape. You'll learn it - and fast. But you'll eventually find out that tape is a lot different than hand sending - even with a "bug" key. But, isn't it swell to copy?

We'll give you a few alternatives for learning the code - if you aren't ready for that code class.

#### AN AMATEUR STATION.

Many have a desire to build an Amateur station - and work around the World. We do not have anything against a Ham station - it is a very interesting hobby. It can be used for experiments and learning about transmitters. You can also get good code practice if you like c.w. - which I prefer. But sitting at the set and calling "CQ" far into the night can be a big waste of time - that could be put to other uses. Big commercial interests encourage this as the Ham is always reaching out for larger and more expensive equipment. Ever since I started a Radio shop, in 1924, the Hams have tried to get me to put in a station - as I can pass a Commercial license examination. I have always been against it - because the shop would always be full of loiterers - and no work would be done. Running a Radio shop took all your time if you wanted to stay in business. It is a good idea to have a Ham station - but don't spend too much time "chewing the rag." A Ham station is limited to 1 K.W. input power, altho the average Ham uses but 200 watts to work around the World. This 200 watts would light an ordinary lamp.

#### LEARNING BY PHONOGRAPH RECORDS.

Get all the code you can - and whenever you can. One company, for instance, offers two courses. They are 78 rpm. with code on both sides. One set of 5 records

goes to 7½ wpm. The other of 11 records goes to 18 wpm. Also includes some written lessons. We know of others, but this is an example. No doubt they could be slowed up. The only thing against records is that you eventually memorize and know what's coming.

#### COPYING FROM A TAPE RECORDER.

as most messages come too fast - they can be recorded on tape and slowed down. If you have a tape recorder - you are in business for learning the code. Tape a commercial station and then slow it down and copy. As you can erase it - there is no end to the practice you can get.

#### VOLUNTEER CODE STATIONS.

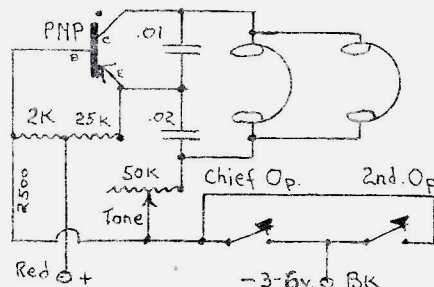
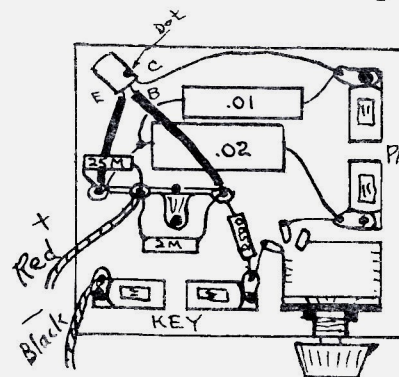
Contact American Radio Relay League, West Hartford, Conn., and they will advise you what stations are sending code and schedules. Some are slow while others are 20 wpm. Usually can be received on a 1-tube regen.

#### WORKING WITH A FRIEND.

Find another Radio Fan and send back and forth to each other. At the YMCA Radio School, in Los Angeles, (1919) we had three tables - each at different speed rates. We'd take turns sending at each table - and that was the way we had to learn it. Your code is no good if the other fellow can't copy it. We used to get a laugh going back and listening to the slower tables. How could anyone receive so slowly?

#### LONG WAVE STATIONS.

You may fish for beacons near 300 kc. long waves. Most are A-2 signals (modulated cw.) and can be heard on crystal sets if you are near enough and can tune up that high. But a 1 or 2-tube is much better. You will also find many ship stations between 400 and 500 kc. Listen to their speed and see how fast they go at 20-25 wpm. One fellow tuned 470 long wave stations on a National re-



#### Parts List.

- 1 PNP Transistor, any type.
  - 1 50M volume control; no switch.
  - 1 Small pointer knob.
  - 1 1" x ½" x 1½" bracket.
  - 1 3-lug tie point.
  - 4 3/4" Fahnestock clips.
  - 1 .02 x 600 bypass cond.
  - 1 .01 do
  - 6 6-32 x 3/8" FH Mach. Screws/nuts
  - 4 Soldering lugs.
  - 6 #6 lock washers.
  - 3 ½ w. res. (2M, 2500, 25M).
  - 1 Compo. base 3" x 3½".
  - 2 6" flex. leads (red & black).
  - 1 pc. 3" sleeving or spaghetti.
- 3-1. 2-station Code Oscillator Practice set.

ceiver between 200 and 414 kc. Beacons keep repeating their signals - so it is easy for beginners. If you find you can make them out - you are copying code.

#### SCHOOLS and CLUBS.

Many night schools as YMCA, Boy Scout clubs, branches of the

Armed forces, etc. have tape machines and Radio courses - which in some cases, are free, or almost free. No matter how elementary - you can always learn.

#### NOVICE LICENSE.

A Novice is a "Ham in training." License given for 1 year only - but if you want a new license - you have to take the regular Ham license. FCC figures that you should be able to handle it after a year. A Novice license requires 5 wpm. code. See FCC for more data on requirements. About 2500 Novice Hams qualified the first 5 weeks after it was put into force.

#### GET SOME GOOD OPERATOR'S BOOKS.

Any Radio books, or manuals U can get - will help you along the way. If going in for your FCC license later on - be sure to get familiar with a good License manual. You will always find something good in any book. The Sup. of Documents, Wash. 25, DC. always can send a good list of Electronic books - that are made up at cost. Don't forget MRL HB, and other literature.

#### SOME CODE LEARNING HINTS.

Learning anything good - takes a lot of hard work. Code is easy for some - but was hard for me.

Never write dots and dashes - get the sound instead. When you read - you don't spell out each word. Don't try to memorize the code. Try whistling it. Learn by rhythm only.

Take the 7 most used letters as E-T-A-O-I-N-S. Make a list of words with these letters, i.e., eat, noise, tan, sat, not, ton, sea, etc. Have someone send to you - and you to them. When you have mastered these 7 letters - add others one by one.

You may figure you send good from the start - but albeif you are 90% wrong. Watch spacing of letters and words - most beginners run them together. However, all operators send differently - and develop their own swing, or

"drag." When operating - I could pick dozens of Ops. out by just listening to their first few words of sending. It is different - just like our writing. Inspectors are inclined to criticize your sending as received on a tape in the exams. In my last exam, the Inspector said that my sending was "lousy," altho for years I never found anyone on ships who couldn't copy me OK. He said that I should see how his sending looked on tape!. But possibly the inspectors get used to perfect tape sending.

Practice for 20 minute intervals and then take a rest. It can then soak in. It pays. In 1920, I took a first code test and failed as I didn't have enough practice. I got away from code for about 3 months. Then I went back and took the first and passed it OK. It had soaked in.

As you learn the code - start using a typewriter (mill). The Armed forces teach touch-typing and code at the same time. This is the only way - as an Op. is now required to copy directly on his message blanks, and not with a pencil (stick) as previously.

Possibly with your pre-school code practice you can dodge the first table like I did. I could copy 7 wpm. when I started YMCA Radio School in Los Angeles, but it had taken me years to do it in those days, on my own. All we had was copying ships and Hams so code was far between. I'd say you can get 7 wpm. in one month of tape receiving. After I began - it took me a year night school to reach the 20 wpm. test - so you see it isn't easy. No wonder we never forget it. Hi. You remember Edison saying he had been away from code for 30 years and could still copy. I can copy at about the same speed as ever. A salesman told me he copied 90 wpm. in the Navy but he forgot it. He is mistaken on two points. First, seldom can anyone copy over 35 wpm, and second, if he knew the code he'd never forget it. So, don't let anyone kid you,

#### 4. Radio Schools.

There is no get-rich-quick plan for big money in Electronics - it takes a lot of work, and there is so much to learn - that no school would dare say it can be learned overnight.

Math., Science and Radio should be studied in high school as much as possible. Many schools do not require H.S., but it is a good idea to have it. Ordinarily 2 yrs. of experience is equal to a year of education, as to future pay. Going to the lesser schools or H.S., and following the many suggestions we have given - will give you a broader perspective of Electronics - if you enter a college. It is not then necessary to fiddle away on fundamentals.

##### SHOULD YOU GO TO COLLEGE?

A college diploma is much over rated by many employment offices and others. Going to college is only one form of education. A college degree isn't always necessary to get somewhere in the World - millions get there without it. The fellow, who doesn't figure on going to college usually shies away from the "book learning" and "courses" that require pen and paper. So, if you are one of these - don't worry - you can still study all your life! It seems that what we "dig" for ourselves - we tend to remember better. The first things to leave our mind are facts and figures furnished by others.

But, if you can adapt yourself to college, and enjoy it - by all means - go! Hundreds of firms will be waiting for you and that diploma. In the armed forces, if you have a degree - everything else is overlooked, and we know this from experience.

Radio is one branch of mechanics where we have Radio engineering but no Radio engineers! As far as I know - there is no degree given for Radio engineering. Instead, you get an Electrical engineering (E.E.). Usually the first two years of

college are given to Electrical engineering - and the last two a choice of Electrical power or Radio communications. It is hard to figure why there is no degree for Radio engineering - unless they may feel it is too diversified and changes too often. Years ago we never heard of Electronics. In Canada, and the British Empire, there is a degree for Radio Engineers A.M. Brit. I.R.E. Also, there is a Certificate in Radio-Physics (London).

In college, you will finally have to narrow your studies down to one branch of Electronics. They tell me that in these Radio Shows - the fellow in the next booth doesn't know what you are talking about - things are so specialized now. However, this

college specialization in math., physics, design and engineering in any specific field brings in higher pay - up to \$6-8000 per year. So, if you decide to attend 4 yrs. of college for an E. E. degree - it is well worth your time and money. After you finish - you can write your own ticket.

What soured me on Electrical engineering was when I worked for the So. Calif. Edison Co. at Big Creek, Calif., in 1920. We had two good Elec. engineers who were compelled to take ordinary Electrician's jobs as E.E.'s were walking the streets. I also had a friend, who attended Calif. Tech. at the time, and obtained a degree as Chemical engineer. He went all over the West coast trying to get a job - and finally landed one back East. No doubt - the Engineers of today are very much more fortunate that we have such a complicated mess in Chemistry, Electronics, etc. that there is no shortage of jobs.

The Institute of Radio Engineers is an association - and the members are termed Radio Engineers. It used to be kosher for operators of small Radio repair shops to call themselves "Radio Engineers." We can agree that it takes an Engineer to fix all the modern Radio-TV contraptions.

#### TECHNICAL SCHOOLS.

Schools claim you can learn Radio anywhere - but they have made it systematical. This saves money and time - and gets you to the job quicker. You may proceed as fast as your ability. Most employers prefer technical Radio school graduates, next to college degrees. Most training authorities recommend a 2-year course at a good technical school in Electronics.

Most of them provide resident day and night courses, in lectures and workshop, and many may have correspondence courses. It is natural the resident are more desired as they are more thoro, and closer to the student. They also finish the course sooner.

Various courses may be offered - all at different fees, as Prep. math., physics, English; Radio-TV servicing; TV and general Electronics; Electronic drafting; advanced Electronics technology; and Radio Telegraph courses, and many other subdivisions.

One near-college level is by PCA, called Advanced Elec. Tech. course, and 2 1/4 years, or 2565 hours of residence and costs over \$2000. From the looks of the subjects - it is worth it.

Some have Lab. fees. Others may have enrollment fees that R not refundable. Most allow you to pay by the week or month. Try to pick a school that will allow you to stop payment when you desire to stop.

Broadcast Technician courses take in operation of studio and transmitting equipment. etc. at Radio and TV stations.

#### NIGHT SCHOOLS.

It has been proven that a few hours at night school are much more productive than the same time spent in day school. There are 3 reasons for this. Altho a worker is tired - he pushes himself to learn all he can in 2 or 3 hrs. The second reason is that he goes because he wants to - and not because he has to, as so often happens with college. We may

add that night school may be a drastic change from our regular work. Eight hrs. in college may allow us to drift along - and we may go to sleep in class! Night school attendance is increasing every year- if you don't believe it - find a place to park!

#### COMPANY TRAINING.

While many large companies may prefer to help pay for a Technician's schooling in Electronics- some run their own schools, mostly at night. Some examples are IBM, RCA, airlines, etc.

#### MILITARY.

More than 250,000 members of the armed forces were engaged in maintaining of Electrical equipment in 1958. More than 100,000 of these worked with Radar, missiles, Radio and fire control.

Armed forces' technical school classes have helped thousands to get good well-paid civilian jobs later. However, due to specialization of military equipment - this experience must be altered when handling civilian equipment out of service. As an example, a Redwood City man recently completed an 11-week Officer's Radio course at Fort Monmouth, N. J., after graduating from Oregon State College, etc.

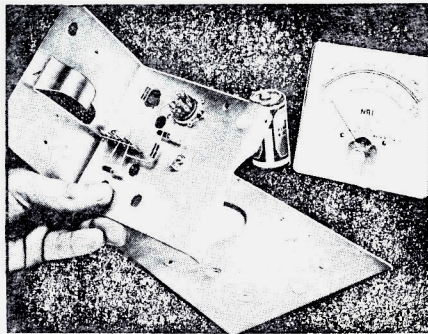
#### CORRESPONDENCE SCHOOLS.

It is estimated there are 1 1/2 million people studying correspondence courses of all kinds in the U.S. from 900 schools. There are only 96 of these schools accredited by Federal or State departments of education. It is figured that 9 out of 10 will increase their income by subscribing to this service.

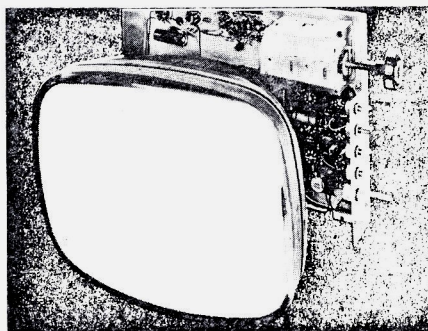
Because most courses are so systematic - most employers now encourage personnel to take the correspondence courses- while at one time it was a big joke to have a diploma from the "A-B-C school." Some employers even help with tuitions. Veterans are aided financially by the gov't.

It is a good way to learn the fundamentals. The cost is always

less than residential. It allows



TRAINING KIT 1



TRAINING KIT 8

4-1. Examples of Training Kits of National Radio Inst.

him to proceed at his own speed and earn while he learns. Kits are included with most courses.

Hearings in the Calif. legislature, this year, have attempted to control frauds along this line, and license and bond the school salesmen. Most of them R OK - but there is the occasional "gyp" salesman. Most schools have found out that this type of business does more damage than good, and are very careful. Many now advertise "no contract to sign" - which is a good idea. In years past - they'd take everything you had if you failed to pay the final balance. Be careful about signing any contract, and especially the first night.

It is much better to pay as you go along.

#### TELEGRAPH CODE SCHOOLS.

When you can receive about 5 words per minute, then enroll in a good Radio operating course in a good Radio school. Usually, after a year - and often a lot sooner - you'll be ready to see the Radio Inspector for your 2nd class Radio Telegraph license. (He is always ready to see you!) Don't worry about it - if you miss - you can take it again in a few months of brushing up. It will come a lot easier the second time.

You can't learn code by correspondence, so you'll have to arrange a residential course. Most code courses are run during evenings for 2-3 hours. Different tables run at different speeds. These brush you up for FCC licenses, Radio-Telegraph, Telephone and Amateur. Texts may run \$8-15 for the course. Night code courses run about \$2.50 per pm.

A full course, from start to finish to make you eligible for a ship job, costs about \$900 and takes about 9 mo. residential day and nite. This is about what a first-class Op. makes on the ship. Likewise, when we went to Sea, at \$125 per mo. - we paid \$100 for our course - so they know how to figure! This takes in ship and coastal station operating, AM, FM, Xmtrs, etc.

One of the best code schools on this coast is the Pacific Radio School, San Francisco, established in 1918. I have a soft spot for this institution as I took a brush-up course there in the 30's. I sure increased my code speed pronto - and passed the FCC easily.

Their code Operator course is for 9 months. It teaches code in a fast, professional manner. It operates 6 different code-speed tables. Uses Barclay, Klein and Boehme automatic code transmitters; 2-track point-to-point service of 8 tapes and Klein-schmidt tape perforators. Also

all transmitting and receiving equipment, Loran, navigation, microwaves, direction finders, AM, FM, TV transmitters, etc. Code speed for the 2nd FCC class Telegraph is 16 wpm, with 25 as the goal. Two-way blinker lights are also available. You can operate the equipment right there.

Lessons are furnished and two books to buy. Day and night lectures. Other courses also.

This school places Operators in contact with jobs as Marine Radio officer aboard ships, fishing boats, yachts, etc. Also on airways, aircraft stations, ship-to-shore, point-to-point, private and public traffic, etc.

## 5. Radio Examinations.

As most schools give diplomas, and there are so many different courses - a standard must be introduced somewhere. This is where the FCC licences come in. A higher licence is given for the more difficult examinations. So your FCC licence is the equivalent of a Diploma in Electronics by the U.S. government. Possession of one of these licences usually opens the door to employment.

The FCC requires that only qualified operators be allowed to install, maintain and operate Electronic equipment. You must be a United States citizen.

#### EXAMINATION ELEMENTS.

In the YMCA, Los Angeles, 1919, we brushed up on 5 sets of Radio telegraph questions. We could have gotten any one of the 5 in our examination. But now the examinations are becoming so complicated that the FCC gives it to you in elements, or sections. Usually different sets of questions are given to each applicant. These elements are usually cut down so you may leave the room before starting on the next sub-section. The more elements you finish - the higher type of license you can get.

(1) Basic law. Signals, kinds of communications, etc.

(2) Basic operating practice. Mikes and handling traffic for ship, coastal stations and aircraft, etc.

(3) Basic phone is tougher. On Ohm's and Kirchoff's laws, modulation, theory, power supplies, amplifiers, oscillators, detectors, batts., motors, meters, crystals, tubes, superhets., RF, AM, FM, etc.

(4) Advanced phone. Gets real tough with math., engineering, formulas, etc. Capacity, AC, DC, transformers, amplifiers, rectifiers, Aerials, multi-vibrators, oscillators, power supplies, FM, TV and much more in detail.

(5) Radio telegraph operating practice. Non-technical. "Q" signals, telegrams, handling traffic and general operating.

(6) Advanced Radio telegraph. Similar general theory to phone, except not near as hard as no engineering used. Theory, navigation, resistance, phase, receivers, transmitters, mobile, FM, direction finders, Loran.

(7) Aircraft Radio telegraph. General theory, kinds of stations, operating, signals, Radio range, beacons, DF, Loran, patterns, navigation, etc.

(8) Ship Radar techniques. A smaller, specialized examination on Loran, scopes, wave guides, echo boxes, Klystrons, FM, cathode ray tubes, etc.

Radio-telephony is the most-sought-after license. The FCC adds questions now and then, but at present some 250 are given out of a possible 1700, so be prepared. No code is required for phone licenses.

#### TYPES OF LICENSES.

Third class phone. No previous experience. Elements 1-2. Conditional operation of coastal ph., educational FM, station to Xmtr. service, remote pickup BC, public safety stations as police, fire, forestry, highway, emergency, power, transit, pipelines, etc. Stepping stone to 2nd class.

Second class phone. After the 3rd class - you take element 3 and get your 2nd class. No on-the-job experience. This license allows operation, installation and maintenance of all phone equipment except commercial BC and Amateur. Includes 2-way Radio rigs, pickup BC stations, coastal phones, aeronautical, police, marine, fire, experimental visual BC, experimental relay BC, etc. Since there is such a small difference in effort between 1st and 2nd phone - there is no reason to be satisfied with this ticket for long. Can be used if station not open to the public.

First class phone. Called the "BC ticket." Highest ticket for phone. Good for 5 yrs. No on-the-job experience. Must have passed elements 1-2-3. You may take all 4 elements at one sitting if you desire - but not generally done in view of the weak heart condition of most of us! Hi. May operate any station except telegraph and Amateur. May act as a station engineer for any Radio, TV, FM BC station in the U.S., international BC, non-commercial educational BC over 1000 watts, etc. Employment with a first class phone ticket is assured.

Third class Radio telegraph. Telegraph licenses cover operation and maintenance of all the types of code or cw. stations. Third class requires elements 1-2-5 and code test of 16 5-letter code groups (cypher) per min. He must send for 1 min. Can be used in special and general experimental stations, geophysical stations, point-to-point, marine relay and special emergency. Is a stepping stone to a 2nd.

Second class Radio telegraph. Elements 1-2-5-6 and same code tests. This is the highest grade for telegraph without at least 1 year's experience in code. This will get you on a ship, etc.

First class Radio telegraph. Requires one year's telegraph experience at the key, and code test of 20 code groups and 25 wpm. of straight stuff. Elements

1-2-5-6. He must be 21. On this test he may use a "bug" key and a typewriter if he furnishes them.

Aircraft radio telegraph endorsement. Must hold Radio telegraph 1st or 2nd. Written test on element 7.

Ship Radar endorsement. Must hold Radio telegraph, or phone, 1st or 2nd. Written test on 8.

#### AMATEUR LICENSES.

At present there are 6 types of Ham licenses. No age limit. No cost. Information can be obtained from FCC on latest data.

Citizen band (CB). Used for necessary talk between buildings and mobile, etc. about business, but no rag chewing. No code test required. Written application.

Novice. Many boys and girls of 12 yrs. pass this. Code test of 5 wpm. straight stuff, given before a licensed operator is OK. Limited to one Ham phone channel and 3 cw. bands. Good for 1 yr.; not renewable. Written by mail.

General Amateur. Allowed 15 Ham bands. Renewable after 5 yr. as long as you want. Code is 13 wpm. straight stuff for 5 min. If you can copy any one minute continuously - you are "in." You may take the written then. If U flunk - try again in 30 days.

conditional, technician and Amateur-extra - see FCC.

Licenses given at any field FCC office. Get copy of FCC rules "Part 13" from Sup. of Documents Wash., 25, DC. before preparing for examinations. Write or call FCC office for dates. Be prepared to spend a day at it.

Tests are not hard or tricky. But, you should study up on your formulas, etc. Passing is 75%. The license holder, who applies for a higher license is required to pass only the elements he has not taken. If he fails an element he may try again in 2 months.

Most code tests are for 1 min. We used to get 5 min. like the present Hams, which gave you an advantage. In counting groups -

5 characters make one word. But punctuation and figures equal 2. No doubt the exams. will vary so consult your FCC man about it. All commercial Op. licenses run for 5 years. At present writing, no test is required for renewal.

In the 20's, we, as ship operators, were required to go up for renewal every 2 yrs. All we had to take was the code test. The RI (Radio inspector) then sent it to us with an Omnigraph, which chopped up the letters. Well, I had operated on ships 4 a year, but I flunked it in two tries at it. I became very disheartened that I had automatically been set back to a 2nd op. How was I to tell the Chief Op.; Dick Johnson, at RCA? When I told him, he said "Don't worry, I flunked it myself!" And he'd held some pretty good coastal station jobs. What a load off my mind!

About 1930, after the stock crash, I thought I'd go to Sea for awhile. I went to Pacific Radio School for a month brush-up. I passed the test with ease. So, I went down to PCA to sign on a ship. Was I fooled? The Chief Op. laughed at me! On account of the depression and some strikes, etc. he said they were putting out 3 Ops. per month on a list of 150 on the "beach." So I had wasted a month's time in brushing up. That is a lesson - so look over your field before U prepare for it. I had a Radio shop going in Oakland, Calif. so I continued in business.

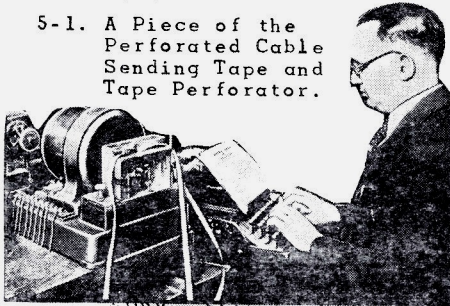
Two years later, when my license ran out, I decided to go up for a renewal, without any brushing up on code. Well, my cypher was coming along fine until an Inspector dropped a valve on my table, and I "broke." Before I could catch up again, I had missed. Nervous from that - I tried again, with worse results than before. Running downstairs to get notaried - I then took my 2nd class commercial. By golly - I missed it the first time, but finally got it on the 2nd bounce. The RI said he was



beginning to think he was going to make a Ham out of me! There's no need to be ashamed if you miss the code - we all do.

A note on tape machines may not be amiss. You will notice 2 rows of dots. One pulls the armature over; the other back. With practice, you can learn to visu-

5-1. A Piece of the Perforated Cable Sending Tape and Tape Perforator.



ally read the tape - like they do in Western Union, etc. Some Ops. used to go down there and read tape when in port. But this is usually done by girls.

Now, Joe, for the Radio Inspector!

"Say, Joe, what are you shaking about?"

## 6. Radio Positions.

While many schools promise big pay and jobs - the Radio technician gets average pay - but look at the fun he has! Hi. There are thousands of jobs requiring, or desiring FCC licenses, it is impossible to go into detail in a small space. Will list a few we have in our notes.

### COLLEGE DEGREES.

No doubt the biggest pay goes to those finishing college with degrees. A man out of college may command \$6-7500 per year. With a Master's degree - about

\$9000. A Doctorate about \$10-11,000 a year. The latter is for specialized work. To orient him to another field may require 3 months to 2 years.

### BROADCASTING STATIONS.

It takes a lot of FCC licensed Ops. to handle over 4000 BC stations in the U.S. You must have a 1st or 2nd phone license.

First class licenses are required in TV stations as camera man, technical director, video director, projectionist, film editor, sound mixer, audio pickup man, etc. - as well as at the transmitters. Pay runs between \$7500-14,000. Many work as a combination announcer-engineer.

A transmitting engineer is a technician who operates a Radio or TV transmitter and records meter readings every half hour. The average station employs 3-4 transmitter men. A first class Operator must be on hand at all times in BC and TV stations. All non-directional AM and FM BC stations of more than 10,000 watts power, also.

Educational, non-commercial FM stations, of 10,000 watts or less are not required to have a first FCC man; 2nd is OK. Even if you have no experience in Radio - the FCC license is paramount. Look under "Broadcasting" ads for a chance at employment.

### AIRLINES.

It is a big jump from the real first paid passenger airline between Wilmington and Catalina, Calif., in 1920, owned by Sid Chaplin. One way cost \$54. I've seen these flying boats making many trips around L.A. harbor.

Now lines employ thousands of men with FCC licenses. Men are needed to operate the equipment, as well as service and install. Some airlines train their own men when they can't find licensed men. Servicing can take a 3rd class FCC, but they must be kept up by a 1st or 2nd class man.

Point-to-point in the airlines is handled mostly by CAA. It is fast becoming teletype, altho in

some remote places it is hand telegraph. Everything is now becoming so mechanical that girls, who can type, usually throw the Ops out of jobs.

As an example of the immensity of teletype operation - Pan American handles 135,000 messages a month between London and New York via teletypewriter and RCA Rocky Point transmitting station. RCA leased this service in 1948. Multiply this by all the other stations and lines - and U have a big industry. For point-to-point operation a 2nd class, or better is required.

No Op. is used on the planes - this being handled by a pilot with a 3rd class or better. Some foreign planes use a separate Radio Officer.

Equipment used to run 250 lbs. for the cockpit. Now, on the big planes it can carry 1500 lbs of Radio equipment. This helps to keep income taxes down! Hi.

The transmitter is about 75 w. output and operates on A-1, 2, 3 signals. A familiar transmitter is one using the Hartley circuit with a 210 into a 210. Power is supplied by a 600 v. dynamotor.

One of the receivers is the Army ART-13. It has 13 channels, but with the aid of 5 crystals - can do about 65 channels. It may be operated manually, or shifted automatically with the Xmtr.

Land stations may be worked for a short period of time on certain International frequencies. Most planes work on 14, 20 and 36 mc.

Mr. W.L. Galten says he has worked KFS (San Francisco) from India and New Zealand. He has also worked KHK (Hawaii) from long distances. He also used to talk to KPH, KTK and KFS (S.F.) from Trinidad.

The CAA, and the airline companies do the hiring - it doesn't go thru the Unions like the ship operators. Civil service is also required on certain airways. Pay runs from \$4600-13,500 a year. It always pays to investigate your desired field thoroughly first.

### MOBILE.

This takes in a whale of a lot of vehicles - some 500,000 in operation between fixed and mobile locations. About 5000 new ones every month being signed up. A vast field for the licensed man. A communication engineer may be a micro-wave specialist. Many mobile outfits, on short waves - cover great distances - some 2000 miles. Often police get reports across the country. However, 99% of the equipment is FM - and operates to the horizon only. There are so many opportunities that we can only generalize in this vast field.

A big branch is land transport. This takes in urban, buses, taxicabs, highway trucks, trains, etc. As an example, the trains require 2nd or better men as communication engineers, servicing, as well as servicing teleprinters, telephones and telegraph equipment, micro-waves.

Industrial may take in power, forest, petroleum pipe lines, low-power industrial, movies, agriculture, relay press, micro-waves and so on.

Safety includes police, fire, forestry, highway, emergency, state guard, citizen Radio, etc. Many of the localities also require civil service examinations in addition to the FCC license.

Paging services is also a terrific field for FCC men. Fixed office locations page their employees, who carry a tiny Transistor Radio and speaker along with them. When they are paged - they phone in for further instructions. These take technicians to service and keep up.

Many firms just service micro-wave equipment on a contract basis. Usually 25 checkups per mo. at about \$100 per month, besides sales, fees, etc. can run into a sizeable sum. Salary basis is also good - about \$100-125 per week. Installation work may also be procured on the side.

Automatic communication equipment, as Teletype, teleprinters, multiplex, telefax and various

other equipment can use FCC men. Their knowledge is appreciated.

#### HIGH FREQUENCY TECHNIQUES.

As the field of higher frequencies is so large - it would pay you to experiment and become acquainted with this range. A knowledge of this field puts you well into the mobile and other HF fields. Micro-waves take in anything higher than 300 mc. UHF can run from 300-3000 mc.

Short waves run from 1.6 BC band to 54 mc. where TV begins.

Low VHF TV bands run from 2-6 channels, or 54-88 mc.

FM broadcasting runs from 88-108 mc. They usually run 200 kc. wide and 200 kc. apart, altho narrow bands are now used. BC bands run 10 kc. apart. FM also works on other frequencies, for instance, 42-50 mc., etc. It can normally transmit twice the distance of sight.

Communication bands operate between FM 108 and 174 mc.

Next comes the High VHF bands, or TV channels 7-13, 174-216 mc.

Communications again come in between High VHF of 216 mc. and UHF TV of 470 mc.

Next is UHF TV channels 14-83, or 470-890 mc. range.

Higher than UHF TV are more communications, Radar, etc. So, you see the field is endless.

#### LAND STATIONS.

This heading is taken from the olden days, when a Radio station was either a "ship" station or a "land," or fixed station. Telegraph Ops. must be fairly professional to work in these stations, and it usually requires several years at Sea to qualify.

Even tho land stations run up into the millions in cost - the cables are more expensive to lay and service. In the Pacific, for instance, the Mariana Trench is seven miles deep.

Commercial land station power varies - but may run around 4000 to 40,000 watts, with hourly pwr. running around 100,000 watts.

Stations may have various uses as point-to-point, ship-to-shore or reporting weather and hydrographic reports, etc. Even tho land station rates are high - many operate at a loss. Pay is usually less than at Sea because the Op. is on "dry land." Hi.

Around 5 large Naval long-wave stations operate between 30-14.5 kc. on some form of narrow band c.w. They use the best Naval Ops. Orders are transmitted all over the World to Naval forces - even under the water and ice caps, as LW penetrates the water. VLF, or very low frequency stations are hard to jam, and Russia has none at present. Early in the morning is the best time for LW DX.

On Nov. 18, 1953, the Navy put Jim Creek, Wash., NLK, on the air. It works on 15.3 kc. with a million watts at \$1 per watt in cost. It has aerials a mile long and works around the World.

Recently one of twice the power was opened at Cutler, Maine, on 14.8 kc. (20,270 meters) or 12.6 mile wavelength. It is 40 times stronger than any U.S. hi-power commercial station. It uses 20 large Machlett tubes. Its call is NAA, that of the old Arlington, Va., arc station that used to give us so much press and time signals. It occupies 3000 acres with 26 towers 8-900 ft.

Another Naval long-waver is NBA, Summit, C.Z., on 18 kc. It used to be at Balboa, and one of our old steadies for arc press.

Other large Navals are NSS, Washington, D.C., on 15.5 kc. Also NPM, Honolulu, 16.6 kc. and NPG, San Francisco on 18 Kc. The last three were all old arcs put up-to-date with tube Xmtrs.

It may be interesting to note that for SW work, the large towers are coming down. Then they go up again for long-wave work. Recently the Mackay tower near here, 626 ft. high, has been taken down. Now they use a number of towers around 100 ft. for SW. Mackay have combined their operations at Palo Alto. You can hear KFS operating with ships.

## 7. Life Aboard Ship.

#### HIRING.

Current hiring is much changed from the old days we "walked the beach." The Unions now have full control of hiring. The two previous Unions are now combined into AFL-CIO. Most ship companies have little to say. In this line it used to be "RCA all-the-way" but now you can send your messages thru any land station.

Another method of hiring is the U.S. Army Transport Service, which is Civil Service. The pay is similar to Radio Op. Unions.

Many American Ops. are used on U.S. ships of foreign register, i.e., Panama, etc. A U.S. license isn't good in foreign countries, but it helps you to qualify.

Unions are strong now - and U will have to join to get on - provided their books are open to new members. Now they can tie up a ship or line. We pulled off a strike in 1921 and lost. I had a good job on the "El Segundo" oil tanker. After 3 months I had to settle for 1st Op. on the "Wil-lamette" - a lumber scow - where I had 6 meals a day - 3 down and three up!

The Unions have made it nice for the Ops. When I left the "J. A. Moffett" in 1923, I had seven jobs wished on me. I operated; made up crew lists; acted as mail man; collected correspondence courses aboard ship; got press out; did typing of all kinds, especially love letters for the OM on typewriter; typed payrolls and immigration lists, and what not. But I never scrubbed a Captain's back. Hi. Besides getting paid for extra jobs - the Ops. now get overtime Sat. and Sunday.

Standard pay, at this writing, for ship Ops. is as follows: Freighter \$665; Mariner \$692; Tanker \$700; Passenger U.S. and America \$850; Chief \$900. Overtime pay can run to \$1000 clear a month. This is a good goal for any of us. We used to get \$105 and thought it was swell.

Some of the Radio companies R

RCA Communications - All American Cables and Radio - Commercial Cable Co. - Globe-Mackay Radio Tel. - Tropical Radio Tel. - U.S. and Liberia Radio Corp. - Western Union Tel. and Cables, etc.

Usually you can't just join the Union and get a ship. You must wait your turn. Recently the wait was about 2 yrs. for a permanent berth aboard ship, and most of the Old Timers hang onto their jobs. It always depends on supply and demand. Recently a big rice shipment cleared all Ops. off the beach. Keep in contact with the Unions and you may get temporary jobs. Take anything you get - don't be choosy. The usual U.S. Marine runs about 1000 but only 25% of shipping is carried in American ships, due to high cost of labor.

After getting a good job - we always have the old saying "the squeaky wheel gets the grease." Make yourself known around the Unions so they'll get to know U. When I first went out I figured not to bother the office, but report every noon. Put, I missed 6 weeks' work because they expected me to decorate the office. If you don't ask for a transfer now and then, you may die on the old scow.

#### OPERATING ON THE BIG BRITISH LINERS.

Here are some hints from Ops. on the biggest steamers. At present writing, Britain is figuring on building several big liners - bigger than the "Queen Mary" and the "United States." They will be the last word in palaces.

While there is a lot of prestige to operating on one of the majestic liners - it is not all peaches and cream. They usually carry about 6 Ops. - which includes two apprentices.

British Ops. are required to do maintenance work on their complicated inter-com. systems and myriads of alarms, etc. - the control room could occupy a little building. The ship Electrician on U.S. ships does this.

American skippers, or mates do most DF work from the bridge. On British ships it is piped to the Radio room. This is a lot of work especially in and out of crowded fog-bound harbors. Some Radar is also included in their work.

American Ops. usually copy one line of U.S. press. British require 2 from British sources and one American. To make things lot worse - they copy direct on a Mimeo. stencil for the ship's press. The ship printer usually does it on U.S. When you consider static, QRM, etc. I don't believe they can do a good job at copying thru all this.

To top it off - this Op. said in 6 mo. of calling at lots of ports- he had never gone ashore. Who wants a job like this?

#### OPERATING ON U.S. SHIPS.

Quarters were fairly good on the tankers - but poor on lumber schooners. Few lumber scows are around now - being replaced by diesel trucks and flat cars. We hear some new ones are now being added to the West coast. One of these scows was the old "Celilo" - on which I was a passenger one time. There were two bunks for the Ops. - but one had to get up while the other went to bed. The Op. table was a shelf holding the receiver. A contortionist could reach behind and pull the change-over switch- if he didn't get mixed up with the H-F stuff. In the olden days the Pacific coast passenger and passenger-carrying steam schooners worked 12 out of 24 hours.

As these were light packets, a good part of the Op's time was spent "hanging over the rail!" Most of us get seasick until we get our Sea legs. The old roll, pitch, scend and yaw really does the trick. One Op. found he had gotten over it very soon - but he found they had been tied up to the dock for two hours! Eat light foods, get plenty of air, don't lie down, and keep your system regular with cathartics. Above all, don't think about it.

On some of the larger ships most Ops. never get sick. It's that sudden pitch and shudder that does it. Lay off seasick pills. The biggest Ocean waves ever recorded were 112 ft. high in the Pacific in 1933. Others just seem to be that high. Hi.

Quite a change has come over the old racket of "pounding the brass" aboard ship. In the early days of the 20's - when I was operating - Sparks wasn't much of a 'spud' on the old scow. On about every tin can I shipped on - the first thing I was told was about some crazy Op. who jumped overboard, or went nuts from his listening to the dots and dashes and static. In reality, if any Op. did go nuts - it was from some of their stories they told over and over. Frankly, I never heard of such a thing - as most Ops. are far better educated than most seafarers.

Sparks is usually the brunt of most jokes - possibly because he is younger and less experienced on the briny deep. "Well, I wonder what Sparks would do in a case like that - - har, har." Well, you soon get used to it and they leave you alone. The majority of the Officers are a very nice lot.

The OM (Skipper) sits at the head of the Officers' table - and Sparks down at the far end, beyond the third Mate. The only reason he doesn't eat with the crew is that he might let out some of the ship's secrets. The routine of the gossip is for the Op. to impart his Radio info. to the OM - him to the first Mate, and down the line. If you skip a rung of the ladder - you are out of line. This is very easy to get used to- altho they are more childish aboard ship than in a commercial enterprise about any "scuttle-butt."

About keeping my place- I have to laugh how a skipper, on an oil barge, tried to tell me about going ashore with a Messboy of my own age. I learned to go out with the Officers after that.

But, in the long run, the Op. has a pretty soft job. Often he can arrange his own hours. Each line may have their own skeds. We had a schedule of 8-9 am., 12-1 pm.; 4-5 pm., 6-11 pm. or if needed. "Needed" could take in anything at the OM's whim. Press at 2-3 am. - and out of a warm bunk was part of it. Some Ops. may have been "lucky" like me - to have a Skipper who couldn't sleep. At 3-4 am. he loved to get compass bearings on a clear night. I had to send --- for 3 min. and get bearings from the land station. Then run all over the ship to find the OM. He may be on the bridge- or more likely he was having coffee back aft. If we didn't need a re-check, I could go back to bed.

Tankers are one-man jobs - and the ones I preferred. Passenger ships may carry 3 Ops. and also a Chief - but the latter just oversees the job. But the OM is still the boss on the ship.

Usually the afternoons, on a Tanker or Freighter, are given over to nap time for the Op. and others off watch. The only thing to interfere with your nap is an occasional chipping hammer on your shack. Sunny afternoons are ideal for chipping decks.

Radio BC was coming into its own in the 20's. I would slip in a small honeycomb coil and pick them up all over the coast. The OM used to call on the 1st mate, going off watch at 8 pm. on the bridge. Back to coffee, a snack and a session of wild stories. The tankers believed in feeding well to keep the help, so the messroom buffets were loaded in goodies. Then - back to the Radio room to listen to these BC stations and kid the Op. I'd be routed away as the OM took over the phones. About an hour of BC and he'd turn in. I usually hit the sack after an hour or so.

Many incidents like these may keep Sea life interesting- never a dull moment! I'd advise anyone hankering to be a Ship Op. to stop right now, or forever hold

his peace. If you spend a few years at Sea - you'll never get off - it is so fascinating.

#### Ø. RCA - KPH, Bolinas.

Most of you have never seen the inside of a shore-to-ship control station. A few of the most interesting details will be given. I have had the pleasure, on several occasions, of visiting the control/receiving station of RCA Communications' major Pacific area Radiomarine station, KPH, at Point Reyes, Calif.

The transmitters are located at Bolinas, about 20 mi. north of San Francisco, on a large plateau overlooking the Ocean. Miles of Antennae are suspended on masts running in many directions. Most important is the 300 ft. vertical radiator for KPH on 500/426 kc.

The marine transmitters are located in one of the two main buildings. They comprise many panels. They are remotely controlled by KPH Ops. at Pt. Reyes - about 20 mi. to the north. The power varies from 3-20 kw. - the maximum FCC allows on 8-13-17 marine frequencies. An emergency 500-426 transmitter is also on hand if the 20 kw. rig fails. The entire station has an emergency Diesel-driven generator in case power goes off. Locally generated tones control all KPH transmitter operations. At present, KPH is the only Pacific area station using this efficient system. KPH pioneered most procedures currently in Pacific area use.

At the Pt. Reyes' station- the marine operations are worked on the lower floor of the station building. They are handled by 12 Ops. in 8-hour shifts, depending on the traffic load.

Receiving Antennae comprise a variety of horizontal dipoles, long directional Vee, highly efficient directional Rhombic and vertical curtains. Also worked into the point-to-point operations. The ground is a very heavy

cable run down to the Ocean -- with all negatives to it.

Each Op. has a good-sized Radio table with a large panel at the back, and extending around on each end - full of controls. A typewriter is placed in handy position - as all Ops. use a "mill." They use a variety of receivers, including RCA CR-88, CR-91, 8516, Collins 51-J and numerous smaller monitoring receivers. Some receivers couple to Aerial with split Antenna coils - thru a Faraday shield to secondary to knock out noise. Op. may also switch to a speaker.

The Op. continually scans the bands for calls from Ships. Manual scanning is supplemented by recent addition of a multi-frequency Electronic scanning device. A H-F Op. may guard from 1 to 4 marine bands at a time. And often 4 H-F ships are worked at the same time at the station.

"CQ marker" tapes on H-F indicate the frequencies being covered by the station. The Ship Op. calls the station and designates frequency to be worked. The KPH Op. checks pilot lights to see which frequency is not in operation and notifies the Ship. He then presses a button to start that transmitter panel at Bolinas. This is in contrast to the olden days when we had but 300, 450 and 600 m. to work on - and plenty of QRM. Now, dozens of bands are at their command - with sharper tuning thrown in.

KPH active frequencies are 426 - 500 - 2047 - 4247 - 6488 - 8618 - 8642 - 13002 - 17016.8 - 22557 kc. Underlines indicate Hi power. As these frequencies are checked daily - they make good frequency standards for your signal generator or wavemeter.

H-F transmitters may all be remotely started and stopped. 8 and 13 mc. are run continuously, but others go into operation as conditions require.

500 kc. calling and distress band is guarded continuously by any one of the 4 Op. positions. Another 2 positions to be added soon. In the past, the marine

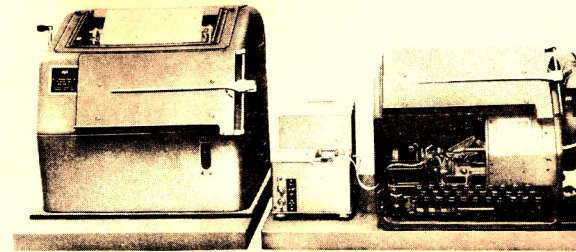
calling band was a single frequency, but now each calling band is staggered. So, calls may come in anywhere from 4 kc. on 4 mc. band to 40 kc. on 22 mc. Up to 4 outputs may be inductively fed into an Op.'s phones for standby on several wave bands.

KPH transmits traffic lists by tape, from its "Xmas tree" rack behind the Ops., every odd hour (GMT) on all KPH frequencies. After this, special broadcasts (CQ), storm warnings, etc. Regular weather sent at 0500 and at 1700 GMT. on all bands. And paid press is sent to subscribers on 4246, 6488, 8618 and 17016.8 kc. at 12:10 am. PST. This press may last for a long time - so is good for code practice. If you have a calibrated signal generator - tie in with these signals. In the near future, paid Teletype press and Telex will go directly to Ships at Sea.

No ship phones are received at KPH. Radiograms are transferred to and from KPH mostly by duplex Teletype tape, integrated into RCA International system. Domestic (USA-Canada) exchanged with Western Union. KPH also has direct TWX connection thru AT&T and direct-phone trunk to S.F.

Only one Boehme tape circuit left - mostly handled by FSK Teletype. Telex will eventually be hooked up with Ships. "Collect" messages are put on TWX, after getting an OK from the receiving office to go ahead.

Some types of messages sent from Ships thru RCA may be interesting to the future Op. Full rate telegram (P) for urgent biz in plain code language. Night Radiotelegram (NRT) is non-urgent, and filed before midnight - delivered next day. Sea Letter Telegram (SLT) sent by mail from Coast station. Gift Service (GFT) for sending flowers, candy, etc. as gifts. Hotel reservations (Hotel) sent without charge from Ships to better-grade Hotels. Observer messages (Obs) are observations on weather sent to the U.S. Weather Bureau. The free Medical Service (DI-Medico) is



8-1. RCA Teleprinter (TWX). Monitor, Transmitter, Perforator.

(RCA)

free advice to Ships at Sea from U.S. Public Health Svc. Code (Cylinder) messages may be arranged by Ship Op. and sent for passengers. Just gives you an idea what can be done by telegraphy.

The upper floor is used for International receiving communications, tape, FSK Teletype, TWX, SSB Fax (facsimile), etc.

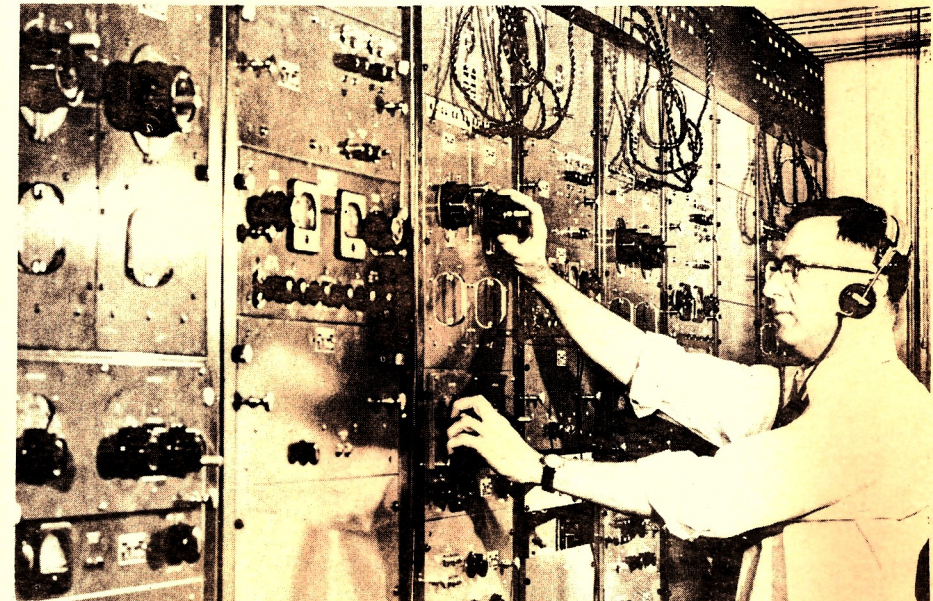
Transoceanic TWX is leased for 24 hr. service from U.S. offices to foreign offices. Started in 1950, now it has over 290,000 TWX calls a year. RCA operates telegraph, TWX and Radiophoto

from any of its big stations in S.F., Manila, N.Y., Tangier and London. It reaches over 68 foreign countries with its own RCA circuits.

With Radiophotos (FAX), the picture is wrapped around a cylinder and scanned with an Electric eye. Average picture 4x5 costs about \$20.00.

We just covered details of KPH lightly. The whole station is a Radio Fan's dream. You'll have to become a good Op. and you may get on a regular shift.

Bon voyage - good sailing!



8-2. Putting the Station on the Beam. (RCA)

another MRL Handbook...

$5\frac{1}{2} \times 8\frac{1}{2}$

HB-10. "Facts for Crystal

24 pages

32 drawings

Experimenters."

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No doubt the title of this HB is very misleading to the more advanced Fan. We feel that all types of Diodes, Transistors, Xtals and other semi-conductors come under the same category, so we treat them as such.

In this HB you will find lots of interesting material not published elsewhere, as it is the results of many experiments by our Lab. and many of our Fans. There is an immense amount of knowledge yet to be gained from the study of semi-conductors.

Be sure to add MRL HB-10 to your Radio library. It will always be a good reference for the many questions that are bound to come up.

We want to thank the thousands of MRL Handbook readers.