The CQ COMMERCIAL RADIO MAGAZINE

July 1933

15 Cents

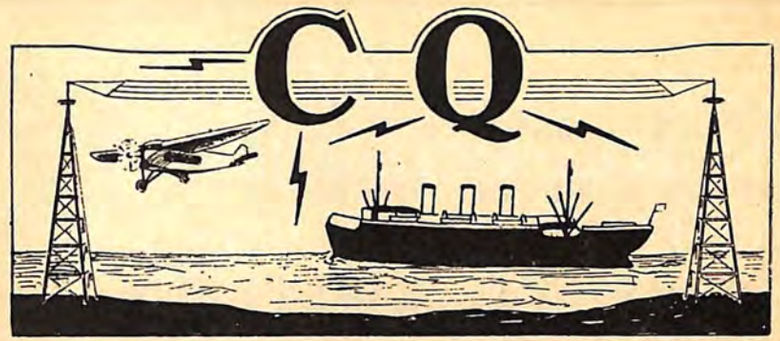
Zworykin on Television

De Forest Writes on Pioneer Radio

Volney W. Mathison Fiction Story

Aeronautic Developments

Complete Lists of Airway Radio Stations: Modern Ship Salvaging The Commercial Operator Today



THE COMMERCIAL RADIO MAGAZINE

The ONLY Magazine in America Devoted Entirely to the Commercial Radio Man.

Published Monthly by CQ Magazine Company, 112 West 13th Street, New York, N. Y. Yearly subscription rate $1.50 in U. S. and Canada; $2.00 foreign. Make all checks, drafts and money orders payable to the Company. Single Copies, 15 cents. Text and illustrations of this Magazine are copyrighted, and must not be reproduced without permission.

JAMES J. DELANEY, Editor L. D. McGEADY, Bus. Mgr.

VOL. II JULY, 1933 NO. 11

CONTENTS:

Editorial

AMATEUR OPERATORS INCREASING

There were on July 1, 1933, approximately 41,000 amateur radio licenses in the United States. This compares with the same period of 1932 when there were 30,374, and in 1931 about 22,739, according to estimates of Lieut. E. K. Jett, Assistant Chief Engineer of the Federal Radio Commission.

All luck to the amateurs of the country. They have long represented the background of radio interest. Many professional radio operators are included in this number, but it is to be hoped that not many amateurs take so great a liking to the art that they transfer to the professional class at this time. Many of the schools of the country are cautioning young student prospects that the field is already overcrowded. If this is not enough of caution, we can only hope that they get the benefit of the insight that we more closely associated with the field are able to give.

An important matter develops here in the responsibility of every licensed radio operator, to the duty that no man within his province of control shall do work of such a character as is not called for on his radio license. What is the use of the government issuing licenses for various classifications of work, if this is not to be lived up to by those who are in a position to know better? It may be a much easier task to sit back and complain that this, that, or the other rule is broken, but from experience, we know that the respective inspectors are always responsive to complaints of this nature.

THE MATE OPERATOR

The mate-operator is today receiving quite a bit of attention and criticism. This is of course to be expected, as he has affected the shipping industry in many ways.

Several years ago, he was a personage to be shunned at every press of the key. He was looked down upon by the steamship company, the radio operator, and the personnel of the ship. But today there is a different attitude taken toward him. The steamship companies are approving of him. His friends are accepting him.

This change of attitude in respect to the mate-operator is, of course, due to economic measures. Companies in some instances do feel that he is a saving to them. Mates and operators feel that it is more of a necessity to the individual that he take on double duties and receive the extra recompense.

In Europe this problem has received much study and the mate-operator is rapidly becoming a past personage. Why?

Both the steamship companies and the mate-operators themselves, have been shown the inefficiency of the double-duty man and the extravagance, rather than the saving, affected by him. At the Madrid Conference it was pointed out that the greatest number of breaches of the regulations are to be laid at the door of those stations, the service of which is a supplementary duty of the navigator. The leader of the Norwegian Masters Mates Association of Norway points out the fact that it is a mistake to assign double duties.

If other countries find a way to control and discourage the mate operator assignments, there is no reason why we should not, and it is high time that we pursued the same tactics. It is simple to understand that the mate-operator is dependent upon ships with short wave equipment and certified operators for his home Q.S.O. If the latter would be less good-natured in extending Q.S.P. services, much might be gained.

DON'T BE JUST "GOOD," GET BETTER

News arrives that new shipping is being put into service. This means new positions for radio ops.

Many ships that have been stored up for a long time, are being put back on the waves. New boats are being constructed with finer equipment, and it is to be hoped that the men who will fill the positions as wireless operators will appreciate the finer installations. Yesterday's operator may have been all right for yesterday, but tomorrow's ship wireless operator must be even better. These are times that make improvement very convenient, and the wise operator is already studying everything in his field that he is able to get hold of, and that he now has the time for.

It may occur to some that they are already well equipped. But, to the wise one, he knows that if not in his particular branch of enterprise, possibly in one not too far removed there is opportunity that may call him without a minute's notice. It is up to him to be ever ready for this call, so that he will not be in the unfortunate position of having to say, "Let George have it."

The radio man of today knows, and only too well, that he requires many things that the man of the past did not have. Just so it will be that the man of tomorrow will require the things that the man of today does not have. It is not only speed at the key or at the earphones that counts. It is the ability to put it down quickly and neatly on paper so that the next man may read. The ability to know not only the present set he is, or hopes to operate, but the operation of all and any set both in repair and out of repair, with an accurate knowledge of the function of every part of that equipment. So a word to the wise. PREPARE.

MODERN SALVAGING

By FRED A. GRITZNER

By a streak of good fortune, I received what to me will very likely prove to become an ideal assignment. Such has certainly been the case up to the present time at least. Joining the diving expedition which had for its goal, the salvaging of the four to six million dollar treasure of gold and silver bullion as well as fortunes in jewelry and other valuables which sank with the ill-fated SS MERIDA in 1911, promised plenty of excitement and interesting experiences.

The SS MERIDA was enroute from Mexico to New York when on May 11, 1911 she was rammed by the SS ADMIRAL FARRAGUT, during a dense fog and sank sixty-five miles off the Virginia Capes. No lives were lost but practically everything else took the plunge of 210 feet down to the watery grave where the MERIDA has lain on her starboard side during the past twenty-two years.

Under the command and direction of Captain H. L. Bowdoin, of Whitestone, New York, the sturdy former Western Union cable laying vessel ROBERT C. CLOWERY, now named the SALVOR, was equipped for modern salvage operations and started work on the wreck July 25, 1932.

The chief diving equipment consists of a huge three man observation tank constructed of very heavy circular steel plates and special laminated glass port holes capable of withstanding enormous external pressure. A hose of special construction for the intake and exhaust of air at normal atmospheric pressure into the bell also includes telephone lines and electric cables, which supply current for large undersea lamps and motors that allow for the turning of the bell. There is also a similar, smaller One Man bell which is usually used during the operations.

An explanation of the mechanism of the diving suit, which is also of all steel construction and was invented by Captain Bowdoin, has up to the present been kept from the public, but it is understood that a man can work with safety in depths up to 700 feet with this machinery. The length of time during which the diver can work below with this unique apparatus is practically unlimited and is determined only by ordinary physical fatigue. With no pressure whatsoever upon the body of the diver, and with air being constantly exhausted after coming either into the tank or suit at normal pressure, it is a fact that divers have actually smoked while working below. Large grappling hooks or buckeds lowered by powerful winches are properly directed by divers in the bell or suit, with the aid of strong undersea searchlights. Dynamite charges are placed in the same manner with the exception that a man must, of course, ascend when the blast is set off and the salvage vessel is also moved some distance away. The ascent can be made as fast as it takes the men above to recoil the large hose as the bell is being rapidly raised to the surface and no decompression whatever is necessary.

The preliminary survey work of last season has paved the way for considerable progress this spring. Bad weather last fall postponed actual entry into the hull of the MERIDA and the treasure is eagerly anticipated by the hard working members of the crew in the very near future.

In spite of the fact that not even a rumor was circulated to the effect that the SALVOR expedition would be abandoned, several rival expeditions threatened to "Muscle In," and in the early spring of this year an expedition, commanded by Captain John Hall, made an attempt to "substitute" for the SALVOR at the "Golden Rendezvous" a near sea battle was the result. The wireless operator was ordered to send an appeal for U. S. Coast Guard advice to the Commanding Officer of the Norfolk Naval base.

The Coast Guard Destroyer DAVIS was immediately dispatched. Excitement ran high when the destroyer was sighted on the pitch dark night of May 8th. When the huge light of the DAVIS framed the rival ship, THERESA AND DAN, against a black background, the picture was indeed a pretty one. The destroyer, after sizing up the situation upon locating the position of the rival ships, simply stood off a short distance until morning when a boarding-party investigated the claims of both factions. The presence of so powerful a supervisor prevented a physical clash between the rival expeditions and by evening the THERESA AND DAN departed for Norfolk, leaving the SALVOR to continue her long-delayed activity.

During the following few days a very large section of the promenade deck steel bulkhead was raised to the surface with the aid of huge grappling hooks and deposited upon the deck. Bad weather then forced the SALVOR to return to her Norfolk base of supplies.

Several other large sections of wreckage, which have been blocking the entrance to the Strong Room and Baggage Room, have been cleared away during the past voyage but, strong northerly winds have again caused a postponement of operations.

The SALVOR boasts of a very modern wireless installation, a Mackay Radio and Telegraph Company, intermediate and short wave transmitter and receiver which have kept very busy during the excitement.

THE ICONOSCOPE
A Modern Version of the Electric Eye

By V. K. ZWORYKIN, E.E., Ph.D.
RCA Victor Company, Inc., Camden, N. J.

The idea of being able to observe far-away events is a fascinating one. A device which will enable a person to do so has been for centuries the dream of inventors and for decades the goal of earnest scientific workers.

The goal of television is to make this dream a reality. The problem, however, is a difficult one and requires for its solution a great many component elements, most of them unknown up to quite recent years.

The meaning of seeing over a great distance can be interpreted as sending instantaneously a picture through this distance. This requires means of communication extremely rapid and free from inertia. The discovery of electricity and the development of electrical communication, therefore, laid the foundations for the future realization of television.

The first step which enabled the conversion of the picture into electrical energy was taken by May in 1873 through the discovery of the photo-resistive property of selenium. Further advance came from Hertz fifteen years later by the discovery of the photoelectric effect. The succeeding years witnessed rapid progress in this line from the study of the effect by Hallwachs, Elster and Ceitel and others.

How eagerly the experimenters were taking advantage of these new tools placed at their disposal is illustrated by the fact that the first proposal of a solution of the television problem by means of the selenium cell was made by Carey in 1875, or only 2 years after its discovery. Carey proposed to imitate the human eye by a mosaic consisting of great numbers of minute selenium cells. The second attempt to construct a mosaic of this kind with a small number of elements was made by Ayrton and Perry in 1877. Later in 1906 Rignoux and Fournier actually used a mosaic of this type to transmit simple patterns and letters. Their transmitter consisted of a checkerboard of sixty-four selenium cells. Each cell was connected by two wires to a corresponding shutter in a similar checkerboard comprising a receiver. The picture was projected on selenium cells, creating in them electric currents which, in turn, operated the shutters. The light from behind the shutters reproduced the picture.

The idea of separating the picture into small elements, converting the illumination of each element into electrical current, and sending each through a separate wire is a good one, but leads to a very elaborate system. To transmit a picture of good quality, a great many pairs of separate wires would be required, which, of course, is impractical. To simplify the problem, Nipkow in 1884 proposed that instead of sending all the elements of the picture at once to transmit the picture point by point, or to scan the picture. This proposal simplified the problem considerably, since it enabled the transmission of the picture over a single wire or over a single communication channel.

The means by which this simplification was achieved was the scanning disc. The introduction of the scanning disc alone, however, did not bring the solution of the problem, due to the lack of some more essential elements. Almost forty years later, through the development of the thermionic amplifier for radio purposes and gas discharge tubes, television became possible, and various inventors demonstrated television images transmitted by radio.

In the next few years progress was rapid and remarkable results were obtained, considering the difficulties encountered during this period of development. Practically all the work

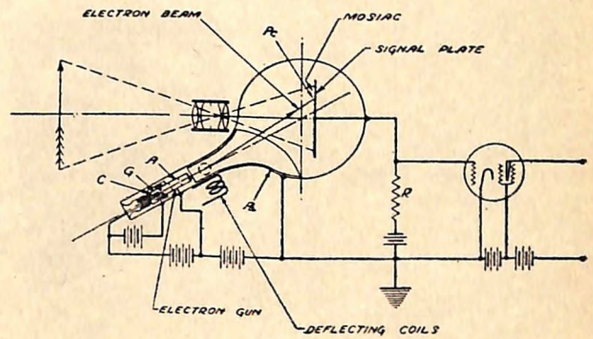


Figure 1.—Showing construction of the Iconoscope.

was done with mechanical methods of scanning, using either Nipkow discs, polygonal mirrors, mirrored screws, etc. This involved purely mechanical complications in construction of sufficiently precise scanners, difficulties in increasing the number of picture elements and particularly in obtaining sufficient light. This last limitation actually introduced a stone wall which prevented the increase of the resolution of the transmitted picture to obtain the necessary quality and practically excluded all hope of transmitting an outdoor picture—the real goal of television.

In order fully to understand the reasons for this difficulty we should remember that the picture in all conventional systems of television is scanned point by point and therefore the photosensitive element is affected by the light from a given point only for a very short interval of time corresponding to the time of illumination of one picture element. Assume for a picture of good quality, we desire 70,000 picture elements. For twenty repetitions per second, this means that the time of transmission of one picture element is 1/1,400,000 of a sec-

ond. On the other hand, the output of the photocell, which goes into the amplifier is proportional to the intensity of the light and time during which the light is acting on the photocell. A brief computation shows how microscopic will be the output of the photocell for this number of picture elements. If we take an average photographic camera with a lens F-4.5, the total light flux falling on the plate from a bright outdoor picture is of the order of 1/10th of a lumen. Substituting a scanning disc for the plate suitable for 70,000 picture elements and placing a photocell of 10 microamperes/lumen sensitivity, we will have a photo current from a single picture element

$$i_e = \frac{1 \times 10^{-5}}{10 \times 70{,}000} = 1.43 \times 10^{-11} \text{ amp.}$$

The charge resulting from this current in the time of one picture element is

$$Q = I \times t = \frac{1.43 \times 10^{-11}}{1.4 \times 10^{6}} = 1 \times 10^{-17} \text{ coulombs}$$

Comparing that with a charge of one electron, $e = 1.59 \times 10^{-19}$ coulombs, we see that only 63 electrons are collected during the scanning of one element. The amplification of such small

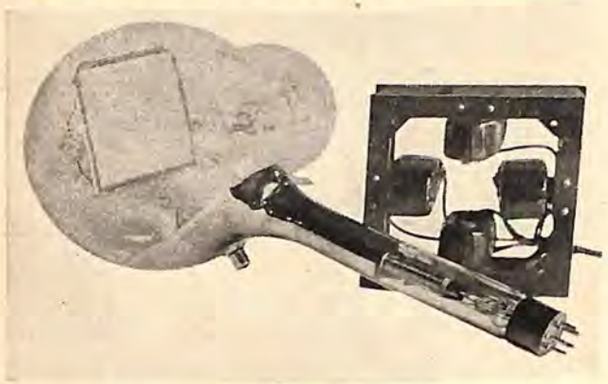


Figure 2.—Photo of The Iconoscope.

amounts of energy involves practically insurmountable difficulties. If we now compare this condition with that of a photographic plate during exposure, we will see that the latter operates under much more favorable conditions since all its points are affected by the light during the whole time of exposure. This time for studio exposure is several seconds, and of the order of one hundredth of a second for outdoor exposures, or many thousand times greater than in the case of the scanned televised picture. The human eye, which we regard as an ideal of sensitivity, operates also under the same favorable condition.

If a television system could be devised which would operate on the same principle as the eye, all the points of the picture would affect the photo-sensitive element all the time. Then in our example of a picture with 70,000 elements the photo-electric output for each point would be 70,000 times greater than in the conventional system. Since scanning is still necessary in order to use only one communication channel, we should have some means for storing of the energy of the picture between two successive scannings of each point.

The writer began to work on the realization of this idea years ago, and devised various solutions of the problem. One of the solutions of this problem involved the use of a special cathode ray tube with a photosensitive mosaic structure applied on an insulated metallic plate. This represents a picture from one of the patents already issued upon one form of the development. Each element of the mosaic is a miniature photo-electric cell. The picture is projected on this mosaic, resulting in continuous emission of photoelectrons according to the distribution of light of the picture. The charge acquired by each element of the mosaic is released by the cathode ray beam once in each repetition of the picture. The resulting impulses were amplified and used to modulate the intensity of the cathode ray beam in the receiving tube, in which the picture was reproduced on a fluorescent screen.

Transmitting tubes of this type were actually built quite a few years ago and proved the soundness of the basic idea. During the succeeding years this development was carried on in the Research Laboratories of the Westinghouse Electric and Manufacturing Company in East Pittsburgh.

One of the first receptions of a picture with a cathode ray tube was achieved in 1929, using a mechanical galvanometer for transmitter. This was reported at the Rochester meeting of the I. R. E. in November, 1929. The next year the work was moved to the laboratories of the RCA Victor Co., in Camden, where development of the cathode ray receiving system was continued, the pick-up being obtained with a scanning disc. This has been described in a series of papers in the Proceedings of the I. R. E.

In the meantime, the development of the pickup tube was pushed on and the results obtained from it soon surpassed the results of mechanical scanning and eventually completely replaced it. The tube itself is called the "Iconoscope" from the Greek word "Icon" meaning an image and "scope" signifying observation.

To understand fully the operation of the Iconoscope, it is best to consider the circuit of a single photo-electric element in the mosaic. Here P represents such an element and C its capacity to a plate common to all elements, which hereafter will be called the "Signal plate." The complete electrical circuit can be traced starting from the cathode P_c to C, then to resistance R, source of e.m.f. B and back to the anode P_a. When light from the projected picture falls on the mosaic each element P_c omits electrons, and thus the condenser element C is positively charged by the light. The magnitude of this charge is a function of the light intensity. When the electron beam which scans the mosaic strikes this particular element P_cC that element receives electrons from the beam and may be said to have become discharged.

This discharge current from each element will be proportional to the positive charge upon the element and, hence, the discharge current will be proportional to the light intensity at the particular element under question. The electri-

(Continued on Page 17)

DO YOU REMEMBER WHEN;---

The Author: **VOLNEY G. MATHISON**

MADE THE CONQUEST OF OUGLAMUCK?

I hear there's some rumors goin' around in th' United States that I've abandoned my old peaceful profession of brass-poundin' an' degenerated into one of them highbrow conglomerations of hydrophobiac algebra, discomposed electrons, an' dumfoundin' decrements otherwise known as radio engineers. But I want to make it plain that all them reports about my havin' adopted a new system of defraudin' my employers out of three squares a day an' a place to sleep are nothin' but low-down misrepresentations.

Radio engineerin' an' myself have separated company. Constructin' wireless stations is all right in books an' amateurs' wood-sheds—but not in Alaska. Buildin' power-houses an' raisin' hundred-an'-fifty-foot wireless-masts up among th' Siwashes an' snow-blizzards of th' Aleutian Islands is interestin' work; but hereafter I am selectin' some kind of a more soothin' occupation—such as mixin' up nitroglycerin' in a bomb factory, or piloting a flyin'-machine with a busted rudder in a cyclone.

Long about last Christmas, I quits poundin' brass at KVI over on Unga Island, on account of th' insufficient feministic environments; an' after makin' preparations to disunite myself from Alaska on th' eastbound mail-boat, I decides to breeze over to Popoff Island to say farewell to Hell-Fire, my desperate brother-in-radio at KOXN.

"Leavin' me an' my wireless-pole to start swingin' down through space with th' graceful, breath-catchin' swoop of a shootin' star."

Ramblin' in my fishin'-dory around to Pirate Cove, th' hard-bo'led hangout where finds Hell-Fire sittin' lop-sided wharf, in th' freezin' north wind, his heavy red mackinaw peaked up around his ears, an' lookin' about as joyful as a tom-cat spendin' the evenin' on a back-alley ash-can.

He reciprocates my cheerful greetin's by kickin' his shins against th' side of th' old salmon-barrel he's roostin' on, like a sourdough tryin' to bust th' ice out a' th' family wash-basin after a cold night, an' remains about as conversible as a Point Barrow iceberg until I remarks that I'm permanently removin' myself off of Shumagin Island **terra firma** in th' mornin'.

"You're quittin' KVI?" he scrunches, twistin' his neck about a sixteenth of a inch.

"Quit already," I repeats.

"Then yo're just in time to take a fine job!" exclaims th' infamous builder of KVI and KOXN, his physiognomy crackin' loose into a bunch of refrigerated smiles, like a river breakin' up after a hard winter. "Come up to th' shack, an'——"

"I come over here to say good-bye—not to get another darned hunk of brass to pound," I objects; but Hell-Fire refuses to listen.

"Th' schooner **'Pirate King'** is comin' in from Frisco with a load of gear to build a wireless station at th' company's fishin' dump out on Ouglamuck Island," he explains, draggin' me up to his shack. "I'm s'posed to build it, but th' relief operator for KOXN won't be here till th' May mail-boat; so I can't leave. You can go an' put up th' station; an' if you wan'a operate it afterward, ya can.

"It's gonna be a swell job, because th' company are plannin' on a combination operator-superintendent to boss th' whole works at Ouglamuck—in fact all th' instructions about it are lyin' up there in th' company office right now. Th' sourdough who is runnin' th' joint at present is showin' too much favor to th' fishermen, an' th' company is disratin' him to straw-boss—so between handlin' th' wireless station an' rulin' over th' codfish snailers, yo'll be th' big pebble on th' Ouglamuck beach."

"An' how does th' present Ouglamuck fish-boss feel about gettin' deflated of his authority?" I inquires, prudent-like.

"Oh, he's nothin' but a little calf-livered shrimp," Hell-Fire assures me, careless-like. "Only his squaw is a kinda fractious old hag. Th' company have already sent four different superintendents up to Ouglamuck, an' I've been couple, an' poisoned one, an' th' last one she made drunk an' burned him up sleepin' in his told that she bothered 'em a little—knifed a shack. Ya see, she figures that if her old man loses his job she loses her meal ticket——"

"Say, I think you better go yourself," I breaks in, somehow feelin' a shortage of exuberance over KOXN is dislocated. I solitary-like up on th'

this proposition. "I might consider relievin' you here at KOXN———"

"Yes, but I can't leave now anyway," intersperses Hell-Fire, decided-like. "I've paid in a hundred an' fifty dollars fer a season's seat in th' spring studpoker tournament which begins next month up in Five-Ace Sharpneck's shack —an' ya don't expect me to pass up a whole spring of stud-poker tournament just to go an' build a darned wireless station some place, do ya?"

"No," I replies, weakenin', "I s'pose not."

"And now," resumes Hell-Fire, relieved-like, "since it's all settled that yo're takin' th' job, just sit down here an' I'll give you th' dope on buildin' th' station. Th' transmitter is a five-kilowatt Hellkum Special———"

"Then I quit right here!" I announces, startin' to get up again. "Th' set at KVI is also a Hellkum Special—an' I been fixin' an' fightin' aroun' with it from th' day I arrived to the day I left. Th' only way to operate them Hellkums is with a sledge-hammer."

"But this is a latest improved Hellkum Special," explains Hell-Fire, soothin'-like. "It's got twice as much junk on it as th' old type, an' ya see that makes it twice as easy to run."

"Well," I replies, a little mollified, "seein' it's that way———"

"It's a real easy rig to install, too," says Hell-Fire, producin' a blue-print th' size of a windjammer's mainsail, which has a lot of geometry problems an' Egyptian hydroglyphics drawed all over it. "Here's a simple little plan of th' power-house and transmitter-room. You see, after ya put up th' power-house accordin' to th' buildin'-plans, all ya hafta do is to put in this concrete foundation for your main alternator, an' another for your direct-current excitin'-generator; then over here a couple more concrete beds for th' spare alternator an' exciter, an' down here in th' center is th' fifth an' heaviest foundation to set your diesel engine on Ya don't hafta worry if all these different bed-bolts in th' concrete should happen to get a thousandth of a inch or so out'a place, because most of your belts will stay on, even if th' machines are out that much.

"There is a synchronous-gap mounted out on th' end of th' alternator-shaft, and th' transmitter-panel goes up alongside th' alternators; then you are all through, except for buildin' th' separate receivin'-shack, which stands over here fifty feet away from th' power-house; an' there are fourteen lines of conduit to put in between th' two shacks, carryin' wires for th' generator rheostats an' meters on th' control-panel alongside your operatin' desk, an' six pushrod switches to change wave-lengths without leavin' th' receivin'-shack, an' a water-coolin' system for th' diesel engine, an' a fuel-oil heater to set up an' a distant-control automatic break-in key, an' th' receivin apparatus, an' a few other similar little trifles.

"Then you are all ready for business, only of course you hafta put up th' two hundred-an'-fifty-foot wireless masts, an' guy 'em to stand th' hundred-mile gales that blow all th' time on Ouglamuck, an' hang up a couple aerials, one fer short an' one fer long waves. Ya see, there ain't nothin' to it, because everything is already done on these drawin's—all ya hafta do is follow them."

By this time Hell-Fire has me swamped in a flood of plans an' blueprints enough to build a couple of Panama Canals, an' more comin' to view every minute.

"Yes, it's real kind of you to build th' station on this cloudburst of scratchpaper," I agrees, dazed-like. "It don't leave me hardly nothin' to do a'tall. What kind of a joint is Ouglamuck —where is it anyway?"

"Why, don't ya know where Ouglamuck is!" exclaims Hell-Fire, surprised-like. "It's up in th' uninhabited island in western Alaska. It's s'posed to be a swell place—lots'a snow an' Berin' Sea, four-hundred miles beyond th' last rocks, an' everything. You'll like it fine."

An' this is how it was that after pitchin' an' divin' for fourteen days in a blindin' snowstorm, with foamin' white mountains of seawater breakin' over us an' freezin' on the spars an' riggin' till the **"Pirate King"** turns into a solid chunk of white, snow-caked ice, I finally hears th' anchors go rumblin' down one stormy night, an' gets out in the gray, gusty morning to find th' schooner lyin' in the middle of a little bowl-shaped harbor surrounded by high rolling snow-covered hills, which swept back a few miles to the bases of three stupendous white-coned volcanoes all straight in a row, the middle one twice as high as the other two and with steely frozen clouds hangin' around its crater. On th' inner side of the harbor squatted a bunch of white-painted buildin's an' a small wharf—th' codfish company's diggin's—an' about a mile back up on th' hill ground straggles a few old tumble-down shanties an' round, domeshaped dugouts of a Siwash village, all half-buried under the frozen white snow-drifts.

As I stands out on th' poop-deck of th' **"Pirate King,"** watchin' th' schooner come alongside th' ice-crusted ramshackle wharf, which snuggles out along th' foot of a high snow-streaked black cliff, a jagged hundred-pound rock comes tumblin' down th' face of th' bluff, whishes along past my ear, clearin' me by about a quarter of a inch, an' lands with a heavy scrunch square on top of my suit-case, squashin' it out flat as a pancake.

Gatherin' up th' remains of my toothpaste an' safety-razor, I climbs up onto th' wharf, where a considerable convocation of hard-lookin' codfish snailers an' clam-faced Siwashes silently sizes me up with a bunch of unwelcome stares.

"Don't notice th' rocks," chirrups one insignificant-lookin' hyena-faced little gink, who I later learns goes by th' confidence-inspirin' cognomen of Double-Cross Picketts, as another descendin' slab of granite brushes th' snow off of my mackinaw an' busts a plank in th' wharf. "Some of 'em is kinda detached up there."

"Yeh—easy to push over, huh!" I retorts, returnin' generously th' friendly butcher-knife glares of my supercordial reception committee.

"Here comes Big-Gun Beardsley," whispers one of th' gang, in a awed tone, like it was th' emperor of Japan. "He's comin' to clean him up."

Followin' th' fearful-like glances of th' assembled assassinators, I observe comin' down th' hill toward th' wharf what seems to be a steam-hammer-fisted cross between a grizzly-

(Continued on Page 28)

PIONEER RADIO OPERATORS

By DR. LEE DE FOREST

By July 20th the wireless case had been argued, a Federal injunction secured, and that Noah's Ark of strange animals was again launched. Declaring that a telegraph company has the right, under Federal law, to send telegrams even for gambling purposes, Judge Bethea issued an order restraining the Mayor, Chief of Police, et al, from interfering with the Wireless Company.

Assured that there would now be no more cessation of the race news, the doughty "City of Traverse sailed the Lake again, crowded with sports, bookmakers, and touts, with bands playing and crowds shouting in the ecstasy of victory."

But, alas, what the authorities failed to accomplish was thoroughly effected next day by atmospheric conditions, brought about perhaps by the fervent prayers of church-goers ashore. Only the first race at Saratoga registered. After that static won each race by ten lengths, followed by "Bock Beer," "Pretzel," and "Hot Dog" in the order named.

That night Ocker rushed two operators and a picked-up transmitter to Michigan City, to be nearer his floating goal next day. But now the City Hall began also to wax scientific in this battle of brains. The plan was to erect a mast and station on the roof of the City Hall so that when Commodore Bud White and "Social" Smith awaited returns on the first race his amazed guests would read on the bulletin board, "The eyes of the Lord are in every place, beholding the evil and the good!" And when odds were posted on the second race, "Woe to him that gaineth an evil gain." For unfortunately for the majesty of the law static was too frequently asleep on the beat. And could not be relied on as "Public Defender."

Then the wireless war became indeed merry. Instead of upon the City Hall the police of Chicago decided to erect their station secretly on the Lake shore at Buffington, Ind. No sooner were its activities noted by our wireless staff than Ocker sent out a third station "to intercept the intercepter," as the reporters phrased it. "Nikola Tesla, Fessenden, and other wizards of the wireless telegraph," reads the Interocean of October 1st, "have been appealed to by Chief Collins, who hopes to have a fourth instrument that will intercept the messages of the Company's intercepter that is interfering with his intercepter. Should the Company retaliate and put in still another intercepter, the whole matter will solve itself into a 'war of intercepters'." What a theme for a movie scenario of today! Race tips and reports became entirely secondary or tertiary.

And now the row became inter-State, and threatened to bedome international. State's Attorney Boone of Indiana proceeded to raid the City of Chicago's wireless station erected on the sovereign soil of that state to prey upon the City of Traverse. And Detectives Helwig and Vanatta, arrested for carrying concealed weapons, were locked up over night in the Buffington hoosegow while their new wireless set totally disappeared.

On their return from East Chicago, Indiana, Detectives Vanatta and Helwig of Chief Collins' newly organized wireless police squad (the first such in radio history!) announced that the entente cordiale between Indiana and Illinois had been messed up badly.

"—pinched by a bunch of vealy constables all broken out with tin stars," said Van incoherently. "And they kept you in the lock-up all last night?" the chief asked. "All night is right," assented Helwig solemnly. "And when we asked for something to eat the constable with the boots and the biggest star of all says, says he, 'We'll send you a sandwich by wireless, and a cup of coffee by heliograph!' What's heliograph, Chief?" "I think he ran last at Coney Island," said the Chief. And then as if to add to the cost of their education in Wireless the Morse detectives found they were out on $100 bail to return to Indiana to stand trial.

Some mighty interesting points of law, common carrier, common nuisance, municipal ordinance, and inter-state commerce were involved and thrashed out during that thrilling wireless summer on the shores of Lake Michigan. Legal precedents which may even now be cited for or against the Radio Commission and censorship may be found in those time-yellowed columns from which I quote. But at the last the cold lake winds won the battle for the police. "Bet Boat's Jig Is Up," read the Record Herald of October 9th. "After bouts with gamblers' wiles Chief Collins face is wreathed in smiles."

That reporter's sonnet was so descriptive I'm tempted to quote it intact.

"No more the good ship Traverse will steam far down the main. Her colors struck, she silent lies, her glory on the wane. For yester night the commodore gave up the losing fight, and said he would not sail again, not e'en to show his right.

" 'There is no money in the game at this late time of year,' the lawyer Hynan said last night, 'but lest you think it queer that we should quit the legal strife with victory so nigh, I'll say we would have stopped ere this, but had to fight or die.'

"The skipper will no longer skip, the mate will cease to mate. The jig is up for winter and forever, they relate. The sports who in the offing saw a 'good thing' come to view and found it only a mirage can now their fortune rue.

"A long, low, rakish craft she's been, defiant of the state, and led her foes on many a chase, but now this is her fate: She'll join the Spanish caravels, a 'has been' of the sea, and over her the gales will sweep and shout full merrily.

"So dark and gloomy on the waves in South Chicago now the pool ship sticks at anchor there, deserted as a scow. And one of Collins' cares has gone—a smile is on his face, for air waves off the cold south shore no more will tip a race."

GENERAL AERONAUTIC DEVELOPMENTS

AERONAUTIC RADIO RESEARCH

A Radio Range Beacon Providing Both Aural and Visual Service Simultaneously

In September 1932 a series of tests was made jointly by the airways division and the research division on the radio range beacon at Harrisburg, Pa., to determine the feasibility of operating such beacons both aurally and visually at the same time. (This is one of the new type range beacons designed for either aural or visual operation.) These tests served to demonstrate the possibilities of simultaneous aural and visual operation but showed that further development was necessary. Consequently arrangements were made for a study of the problem, including flight tests, at the experimental station at College Park, Md. As a result of these experiments a means has been developed for providing simultaneous aural and visual indication with very little change in existing equipment. There has not yet been opportunity to subject this development to service tests on a standard radio range beacon installation on the airways, hence the results reported herein are those of a strictly research project.

The radio range beacon transmitter employed for this work is the standard visual type with the addition of auxiliary equipment to superimpose the aural signals. The modulated amplifiers are supplied with a combination of low-frequency voltage for the visual indicator and a high-frequency voltage for the visual indicator and a high-frequency tone which is keyed to produce the characteristic N-A signals. The mixing circuit arrangement is illustrated in figure 2. Equal amounts of both frequencies are applied, resulting in modulation of the carrier to a maximum of 90 percent, half of this being caused by one of the visual beacon frequencies, the 65 cycles for example, and half by the tone frequency.

The power amplifiers have been modified to act as linear amplifiers, which lowered their total output but prevented the generation of troublesome extra frequencies tending to destroy the otherwise clear tone of the aural signal. To compensate for this loss of power, the plate voltage has been increased and the circuit impedances altered in order to load the tubes to a higher degree. The latter change has increased the power sufficiently to insure satisfactory distance range of the signal in spite of the fact that only half of the power is available for any one type of service. These changes required no additional apparatus but merely readjustment of existing circuits.

The signals from this range beacon are received with the regular radio receiver on the airplane. For the aural signals no change is necessary; visual indication may be obtained by the ordinary reed indicator or reed converter operating from the same receiving set. Either visual or aural signals or both types of signal may be utilized at will.

Flight tests on the College Park range beacon indicate that the service rendered would be identical with that at present provided by each system independently. The system appears to offer several advantages over either the visual or aural beacon used alone. Pilots flying along routes so equipped could choose the service they desired, changing from one to the other if they wished and as conditions of flight might warrant.

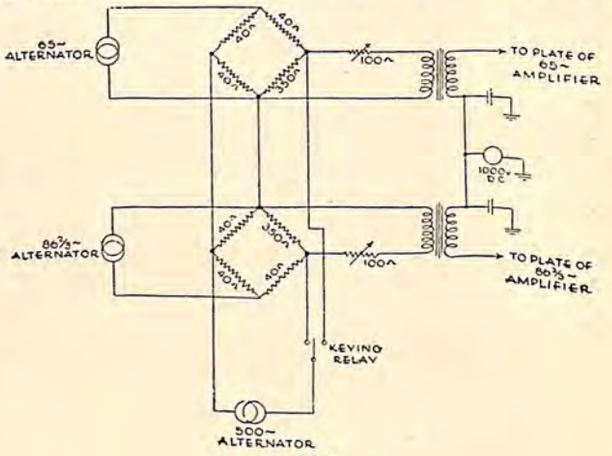


FIGURE 2

NEW DEPT. OF COMMERCE BOOK

The Department of Commerce issued on June 1, 1933, Airway Bulletin No. 2, a booklet of 182 pages, with "Descriptions of Airports and Landing Fields in the United States."

Arranged State by State is a complete list of landing ports of record of every field in the country. Size of field, type of ground for landing, facilities, ownership, flashing signal, and whether or not radio beacon and other weather facilities are available are all described in neat complete detail.

It is the most concise, complete list of the kind we have yet found anywhere. Those interested may write to either the Aeronautic Branch, Dept. of Commerce, Washington, D. C., or to the Government Printing Office at Washington, D. C.

RADIO MARKER BEACONS

Pilots flying along the Federal airways system frequently find it necessary to establish contact with the ground, or to verify their positions during flights above clouds. These needs are met by the intermediate airways radio facilities, or marker beacons, which are located between the more powerful radio communication and radio range beacon stations. They supplement the weather broadcasting and radio directional services of the larger stations, giving pilots additional information and guidance.

Originally marker beacons were designed to mark strategic points along routes—either mountains or other obstructions, or junction points of adjacent radio range beacon courses. These original purposes, and particularly the latter, are still fulfilled, but the stations now carry out other equally important functions. All of them are equipped for 2-way communication with passing aircraft. Several newly established markers have a new feature—they operate as miniature radio range beacons serving as homing devices for important intermediate landing fields. From the nature of the task originally assigned, these stations derive the name "marker beacon," which is still used in referring to them, although the scope of their activities now is considerably broader.

There are 74 intermediate airway radio facilities in operation on the Federal airways system, and 34 under construction. Those now operating in class B markers, which are miniature low power combined code markers and radiotelephones. The other 6 are class 3 markers, which are miniature radio range beacons in combination with radiotelephone service. Those under construction include 14 class A and 20 class B.

Class A Markers

Class A markers operate on 7½-watt output They are located at Department of Commerce intermediate landing fields, which have teletypewriter drops, and are manned by the airways keepers in charge of the fields.

A station of the class A type operates as a marker beacon whenever the service is requested in advance, and continuously when the ceiling is other than unlimited and/or visibility less than 2 miles. For this purpose, which consists of indicating geographical position to the airmen in flight, the station emits an assigned signal characteristic consisting of a combination of dots, or dots and dashes by which the station may be identified. The signals may be heard when the pilot approaches within 5 to 7 miles of the transmitter, as they are transmitted on the same frequency as the radio range beacon. Thus, the pilot knows his approximate position as soon as he hears the signal. Furthermore, the signal strength as heard by the pilot increases as he approaches the transmitter and decreases as he leaves it behind, enabling him to estimate his position with respect to the field with a fair degree of accuracy.

An airman in a craft flying 150 miles an hour, after first hearing the marker signal, would proceed on his course for about 2¼ minutes before he would pass over or near the transmitter. Another 2¼ minutes, approximately, would elapse during his flight away from the station to the point where the signal would fade out. This offers a limited period of time for 2-way conversation with the ground.

The signal is so transmitted that there is no possibility of mistaking it for anything else. The group of dots and dashes is transmitted twice in rapid succession. The station then is silent for about 12 seconds, and the signal is transmitted again. This comparatively long silent period is introduced to avoid interference with the reception of radio range beacon signals. The dots and dashes are transmitted automatically, being actuated by a revolving cam which makes and breaks the electrical circuit at the appropriate intervals. (See Fig. 1.)

Junction of Radio Ranges

In a great many cases the marker beacon is located at the junction of two radio ranges, which is the midway point where an important intermediate landing field is usually established. Marker beacons so located mark the field and offer 2-way communication for safety. As such an installation the first of the two groups of dots and dashes is transmitted on the frequency of one range, and the second group on the frequency of the other. The pilot, therefore, hears the marker beacon as he approaches within its range if he has his receiver tuned to either of the terminal radio range beacons, but of course hears a single signal instead of a double identification.

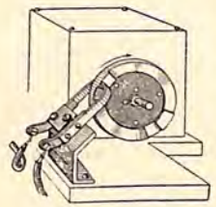


FIGURE 1. Cam which actuates characteristic signals of a radio marker beacon. The cam shown sends dot, dash, dot (. — .). Other arrangements of the raised portions of the wheel are used for other combinations of dots and dashes. Similar cams serve for actuating the A and N signals of the class B marker miniature radio range beacons.

Upon hearing the marker signal, telling him that he is near the intermediate airway radio facility, the pilot may wish to talk to the caretaker by radiotelephone to ask him about weather conditions, to inform him that a landing at the intermediate field is contemplated or for any of a number of reasons. Even if the pilot has no particular reason for talking with the keeper, he probably will call him in any event, partly to find out whether any messages have been forwarded to him and partly to afford practice in communication which will speed up contacts when emergencies do arise.

To make these contacts possible the keeper maintains a watch on a high-frequency receiver. The receiver is tuned to the frequency in use for this purpose on the airway, so that the

(Continued on Page 32)

SUPERFLUOUS SIGNALS

By VERNON W. MINZEY

It has been the experience of quite a few of our professional brothers lately to approach or sit in the "Static Room" of some radio company awaiting assignment. In fact, practically all of us have been there regularly! But it has been another thing to be assigned to the "ship of our desire" and the assignments we are lucky to receive have generally been the last thing we would have thought of taking in "The Good Old Days When."

World depression, economic crises, and other elements all have contrived to bring the standards of what we considered constituted a good job down to a lower level than existed five or more years ago. Also, a contributing factor to this loss in monetary remuneration and prestige has been the operators themselves.

A previous article hit at "Tourist Wireless Operators" in this magazine. Tourist wireless operators are not the only kind who are a detriment to the brotherhood. As professional handlers of the key it has been the privilege of men serving one or more companies for as long as twenty-five years to brag of their operating; and in most cases with good cause. You will find, though, that these men do not brag openly, but serve with a quiet satisfaction on whatever ship they are assigned and let their sigs on the air speak for them.

As a ship operator of several years' experience, it has been my privilege to either serve under, as a junior operator, or work with on the air some of these men. During these contacts I have had occasion time and again to admire the perfect fist of some op and the expeditious way he has cleared his file and given an SK and then shut down. No superfluous signals, no extra calling, no back talk because of QRM or QRN; but just straight operating. You've all had that experience, so enough said.

As a direct contradiction of these men I ask you if you've ever heard one of those operators who CQ a dozen times or more daily while right near a coastal station or directly after the coastal station's traffic list? Who, while out in mid-ocean, thinks it necessary to CQ his way across without even listening in to see who had been or was on the air? Who, while arriving in port and giving his QTP, will use full power thinking the coastal stations can't hear his signals? Yes, we all of us, during some time aboard ship, have encountered that type of operator and have either cussed or laughed at him for his thoughtlessness.

All of this thoughtless brass pounding keeps the op's fist up to a standard, but much to the annoyance of those who have traffic to handle. IT WOULD BE TOO MUCH TROUBLE TO RIG UP A BUZZER, OR TO USE YOUR RECEIVER AS AN OSCILLATOR! but the harm goes further than just annoying a fellow operator. Delaying another ship's traffic may cause that ship's master to think less of his operator because he couldn't get his traffic thru in time because of QRM; which in turn causes the aforesaid master to report to the steamship owners that Sparks was inefficient and causes the steamship company to think less of all radio operators and possibly discharge an innocent man.

That is the effect thoughtless operating has on some really good operators' names and lives. There is a further effect which is more closely related to the offending men though and one which all operators have had to combat for years, the excessive use of apparatus. Too often on a one man job it has been the claim of engineers and port superintendents that Sparks' carelessness has caused unnecessary service or repair bills, as they cannot understand why $25.00 worth of repairs are necessary when only 8 or 10 messages have been handled on a two or three month trip.

These bills have more often than not been caused by both careless and excessive use of equipment beyond the ordinary requirements of a voyage. QSP traffic must be handled, but well kept equipment should not suffer from this extra usage.

There are also other things which are painful to the bona fide operator but as space is limited and causes numerous I will not mention them. Reverting to the beginning of this article, I am hoping that my words will have effect in correcting one of the many losses our profession has suffered. If we, as Commercial Radio Operators, will conduct ourselves on the air in a manner befitting our professional status it will make more of an impression than the careless ways in which some ship stations have been handled. Traffic handling is our business, upkeep of the ship's station is in line of duty, and conducting ourselves on the air with a minimum of time wasted should be our goal. We may not be able to handle a world depression, the economic crisis may have us down for a while, (I'M BUSTED, TOO!) other elements may take a poke at our reputations (OR OUR JAW), but we can at least conduct ourselves as men, can break down a growing reputation as TOURISTS, can elevate our status, by our conduct, to that equalling the other ships officers, and prove that just because a few of us POUND BRASS unnecessarily that we are not all of us what one skipper called his operator, "A GABBY OLD WOMAN!"

THE COMMERCIAL RADIO OPERATOR

Yesterday,–Today,–or Tomorrow

Probably no field of endeavor has so raged within itself as has the field of the commercial radio operator.

His pay; his working conditions; what he is expected to do; and what he is expected to know. All have had their part in this general discussion.

As early as 1906 this started, when it was claimed that there were only 50 radio operators in the entire country. The early days of Dr. Lee de Forest's efforts, which have been so ably described by the Doctor himself, and the working conditions that he goes into detail of describing. And the Marconi Company of America was about in the same position at the time.

Of course at that early date the Germans were pretty far advanced in the art of wireless, and the standardization of working conditions, as well as operations. It was a pretty hard and fast race those days between the Telefunken Company and the British Marconi Company to furnish the world at large with wireless. As early as 1901 the Germans had built and installed radio equipment for the Mexican government, and of course we know it was in the same year that the Marconi Company sent Signor Marconi to America.

But, of course, the Government radio license in America dates back only to 1912, when following the London Convention, the Government first stepped in and passed an act which remained in force until 1927.

By the latter part of 1914 more than 3,000 commercial radio operators' licenses had been issued, either first or second class. By 1922 there were about 7,000 commercial radio licenses in force, and 125 extra first grade licenses had been issued. The extra first grade license required a thirty word Continental and a twenty-five word land-wire code test. Rather fast for equipment available at the time.

On June 30, 1931, there were 10,761 persons licensed to operate commercial radio transmitting apparatus. This included 38 extra first class commercial; 3,481 first class commercial, and 5,379 second class commercial. The balance being divided between third class commercial, broadcast class, and radiotelephone class.

The early shipboard radio men of 1906 received from $80 to $100 a month. An equivalent pay today considering value of the dollar even in these times would be close to $300 a month with accommodations and maintenance of a ship's officer.

In 1912, due to the interest developed around 1910 in amateur work in radio and the larger number of men turned out at the time by the very young industry known as the wireless school, the pay for beginners was down to $45 a month. Assignments were plentiful as few stayed with a ship long, it was a transient field where many just took the trip and dropped off. Among these, of course, were college students just playing with wireless, as well as high school students who had mastered the code after a fashion.

The year 1913 brought the test; a strike was attempted and lost. Many old timers claim to this day that if it were not for the school students who signed up for the chance of "seeing the world" it would have been successful, but come they did, and for $40 a month.

The aftermath was bad; the scale of wages dropped down to $30 a month in 1914, although it has been claimed on good authority that even in this bad period the leasing firm received $125 a month for a man and equipment. True it was some of the better class men received as high as $45 or $55 a month, but they were the exception. Shore station operators received from $80 to $90 a month, but of course had to furnish their own maintenance.

In 1915, the development of the Poulsen arc broke things open a little. Ship owners disliked the leasing policies, and decided to buy their own equipment from those willing and able to sell complete outfits outright. In 1915 the pay on the ships using arc equipment was $45 a month for freighters and tankers, and $60 for first operators on passenger ships. Operators sailing on ships with privately owned equipment at this time received about $5 a month better, running from $55 to $65 a month.

When war conditions made land positions attractive to ship operators, and the increased number of American merchant ships created a scarcity of help, the operators' wages went

up rapidly to $80 in 1918, then $110 in 1919, and finally to $125 in 1920. Even $150 or $200 a month jobs were to be had for a little extra duty.

Then again came the slashing and in 1921 a cut to $107 a month was resisted, but unsuccessfully. In 1922 the cut to $90 a month on government operated boats drove many ship operators into the newer and fast developing field of broadcast stations. And a greater cut to $75 accentuated this movement in the latter part of the same year, but then the duties were strictly in the shack, with no outside work of any kind. Shore stations at this time paid about $145 a month, with living quarters often furnished but no maintenance.

From 1922 to 1929 the pay like many other fields of work gradually increased, until with a little extra work it again became possible for a ship radio operator to get between $150 and $200 a month.

But from 1929 to the present day the pay slash has continued. $125 a month on the very best and largest passenger ships for a first operator is the pay. And, shameful as it may appear on many smaller ships $65 a month has again been reached, with few opportunities for transferring one's affections to the broadcast field, which already has its own problems.

It would seem folly to predict at this time where ship radio operators' pay will go, either up or down. To a man engaged in making his living it is disheartening to see the continuous flow of students from schools, when he knows there is nowhere near enough jobs to go around for men already actively engaged in the field, or for the thousands who have either "left the sea" or are looking for engagement.

Many former ship radio operators have been guilty in the past of deserting their former callings for more advanced calling. Experimental laboratories everywhere show this. Only through higher and more advanced study and interest was this made possible. Many have developed a land business of their own as proved by a hundred different fields of manufacture and commerce. Natural born leaders of men and enterprises show a decidedly high percentage to the ship radio operator of the past, and there is no reason to believe the future will change this any.

When the ship radio operator is in port he is free. Yes, free, for the development of self or of folly. He can visit points in many harbors not possible to others of different callings without great expense. His time between ports leaves much time for silent thought and self constructive thinking. Experiences are his even without the asking. To the yonger man going in, as well as to the older man still in, the opportunities appear to be equal. This, then, is the unwritten opportunity of the ship radio operator of today, as it was to the ship radio operator of yesterday.

VICTORY FOR AMERICAN FEDERATION OF LABOR UNIT

Saturday, June 24th, marked a signal victory for the unit of radio men under the banner of the A. F. of L. when a certain Eastern radio broadcasting station having dickered at length and finally defied the organization, dropped off the air at 9:03 P. M. just before the main feature of the evening was to go on. The usual signing off announcement was made and the station was off until a little after 11 P. M. when operators from a large chain system arrived and tried to put the station back on the air with emergency equipment.

The modulation was rather poor, and the battle of station owner and labor officials continued in a conference room until four o'clock in the morning, when an agreement to an eight hour day, six day week, was finally won with double time for all overtime work. Previous working conditions were a flat weekly pay, with very often a twelve hour day, and sometimes a seven day week. The station was on the air the scheduled time next morning with perfect transmission.

THIS IS INTERESTING

The Department of Commerce announced a new 500,000 watt broadcast station had been authorized at Matamoros, Mexico, just across the border from Brownsville, Tex., by the Mexican Ministry of Communication. Call letters are to be WEM. XER at Villa Acuna, Mexico, across from Del Rio, Tex., now uses 80,000 watts and has been causing considerable disturbance to American stations.

There are more than 50 low-powered stations in Texas defying the Federal Radio Commission, claiming that they do no interstate communication and that they are not responsible to other than State laws. The Department of Justice is acting against the first group of these as they have banded themselves together to protect their interests against Federal interference. Such defense cases have been already tried and defeated in other States, the courts upholding the Radio Commission claims that their waves do cause interference of atmospheric conditions outside their State lines.

The Steamship City of Panama which operated cruises to "nowhere" from Los Angeles and broadcast its entertainment on 813 meters, 1000 watts, using letters RXKR, has had its registry cancelled by Panama, due to protests by the State Department as the ship was causing interference to United States broadcast stations.

Vienna plans a radio mast which will probably be "highest in the world." Eiffel Tower with its 1,000 foot mast, will then hold second place. American stations with their little less than 900 foot masts have not reached the height of either of these two for regular commercial broadcast work.

THE ICONOSCOPE

(Continued from Page 8)

cal circuit then transforms this discharge current into a voltage signal across the output resistor R.

If we plot the rise of charge of the element PeC with respect to time, the potential will continuously increase due to the light of the picture. The slope of this increase or $\frac{dv}{dt}$ will depend only on the brightness of the particular point of the picture shining on this element. This linearity will be preserved until the saturation of the capacity C, which is so chosen as never to be reached at a given frequency N of repetition of the discharge. Since the scanning is constant, the interval of time, t, which is equal to 1/N is also constant and therefore the value of charge depends only on the brightness of this particular point of the picture. With constant intensity of the scanning beam, the impulse through R and consequently the voltage drop V_1 across R is also proportional to the brightness of a given point of the picture. This potential V_1 is the output of each single photo-element of the Iconoscope, which is applied to an amplifier.

The above explanation is actually somewhat complicated by the fact that this discharging beam not only neutralizes the positive charge of the photo-element, but charges it negatively. The equilibrium potential of the element is defined by the velocity of the beam and the secondary emission from the photo-emitting substance due to bombardment by the electrons of this velocity. This equilibrium condition in the dark, for a normal Iconoscope, is of the order of 5 to 10 volts negative. The light causes the element to gain a positive charge, thus decreasing the normal negative charge, and the scanning beam brings it back again to the equilibrium potential.

Another complication is due to the existence, besides the discharge impulses, of a charging current of the entire mosaic due to light. This current is constant for the stationary picture and varies when the picture, or part of it, begins to move across the mosaic. This variation, however, is very slow and does not affect the amplifier which has a cutoff below 20 cycles.

In order to compare the magnitude of this output with that of the conventional television system, using a perforated disc, under identical conditions, we will write down the value of the output for the Iconoscope and for the usual mechanical method.

The output of the photoelectric cell measured across the resistance, R, from the disc scanner is

$$V_a = R \times \frac{L}{n} \times S$$

L = light flux corresponding to the total image.
S = sensitivity of the photo element.
n = number of picture elements.
R = input resistance.

Considering the time necessary to build up the picture signal, we have to satisfy the condition that the time constant CR of the input circuit (C being the capacity of the photo element and associated circuits to ground) should be at least equal to or less than the time of scanning of a picture element,

$\frac{1}{Nn}$ where N = number of picture frames per second

or

$$CR = \frac{1}{Nn}$$

from which

$$R = \frac{1}{NnC}$$

Introducing this in the expression of output of the photoelectric cell, we have

$$V_a = \frac{L}{n} \times S \times \frac{1}{NnC}$$

which shows that the output decreases as the square of the number of picture elements.

For the charge on the picture element of the Iconoscope, we can write approximately

$$q = \frac{L}{n} \times S \times t$$

where t is the time during which the light shines on the element and which roughly equals

$$t = \frac{1}{N}$$

the output voltage from the Iconoscope will be

$$V_1 = \frac{q}{C_1}$$

where C_1 is the total input capacity of Iconoscope and associated circuits to the ground

or

$$V_1 = \frac{L \times S}{n \times N \times C_1}$$

The ratio between outputs from the Iconoscope and disc scanner will be

$$n = \frac{\frac{L \times S}{n \times N \times C_1}}{\frac{L \times S}{n^2 \times N \times C}} = n \frac{C}{C_1}$$

or for equal output capacity

$n = n$ (the number of picture elements)

If we take the previously given number of picture elements n = 70,000, the net theoretical gain of the mosaic system against the conven-

Figure 3.—Photo of the Kinescope.

tional system of television is equal to 70,000 times. It should be noted, however, that 100% efficiency can hardly ever be attained for various reasons, but we have already achieved approximately 10% efficiency which gives us a net gain of several thousand times. These several thousand times increase of picture signal output do not serve to merely decrease the necessary amplification. In the conventional television system, we have already pushed the amplification as far as it is possible from the point of view of permissible noise to picture signal ratio. This gain, therefore, is the only factor whereby real television can be achieved, if we understand by this term not only the transmission of a picture of limited definition with respect to the signal plate is determined by the thickness and dielectric constant of the insulating layer between the elements and the signal plate. The discharge of the positive charge of the individual elements is accomplished by an electron beam originating from the electron gun located opposite the mosaic and inclined at 30° to the normal passing through the middle of the mosaic. Both mosaic and electron gun are enclosed in the same highly evacuated glass bulb. The inclined position of the gun is merely a compromise in the construction in order to allow the projection of the picture on the surface of the mosaic.

The resolution of the Iconoscope is determined by both size and number of picture elements in

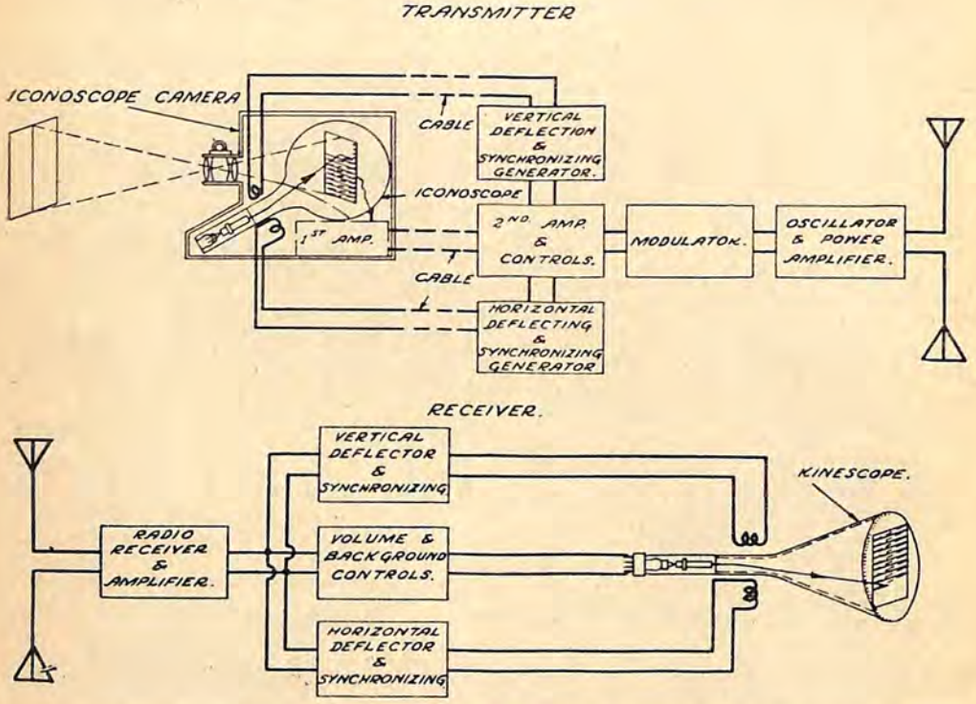


Figure 4.—Schematic drawing of the Iconoscope and Kinescope showing the use of each in circuit.

under artificial conditions but the actual transmission of a picture of high resolution under reasonable or natural conditions of illumination.

The scanning of an object with the flying spot is not considered in this computation, because it represents an entirely artificial condition and cannot be used for television pictures of distant objects.

The schematic diagram of a complete electrical circuit for the Iconoscope is shown in Fig. 1. Here the two parts of the photo element P are entirely separated. The cathodes are in the shape of a photosensitive mosaic on the surface of the signal plate and isolated from it, the anode is common and consists of a silvered portion on the inside of the glass bulb.

The capacity C of each individual element the mosaic and size of the scanning electron beam. In practice, however, the number of individual photo elements in the mosaic is many times greater than the number of picture elements, which is determined entirely by the size of the scanning spot. From the initial assumptions formulated in the analysis of the ideal circuit for individual elements, we find the qualifications which should satisfy the mosaic for the Iconoscope. These assumptions required that all the elements be of equal size and photo-sensitivity and equal capacity in respect to the signal plate. The fact that the exploring spot is much larger than the element modifies and simplifies this requirement so that the average distribution, surface sensitivity and capacity of elements over an area of the mosaic

should be uniform. This allows considerable corresponding to the size of the scanning spot tolerance in the dimensions of individual elements.

The requirement of uniformity, which at first glance is quite difficult to accomplish, is solved by the help of natural phenomena. It is known that such a common material as mica can be selected in a thin sheet of practically ideal uniform thickness and it therefore serves as a perfect insulating material for the mosaic. The signal plate is formed by a metallic coating on one side of the mica sheet. The mosaic itself can be produced by a multitude of methods, the simplest of which is a direct evaporation of the photoelectric metal onto the mica in a vacuum. When the evaporated film is very thin it is not continuous but consists of a conglomeration of minute spots or globules quite uniformly distributed and isolated each from the other. Another possible method is that of ruling the mosaic from a continuous metallic film by a ruling machine.

Although the initial method of formation of the photo-sensitive mosaic was the deposition of a thin film of alkali metal directly on an insulating plate, subsequent development in the photocell art resulted in changes in the methods of formation of the mosaic.

The mosaic which is used at present is composed of a very large number of minute silver globules, each of which is photo-sensitized by caesium through utilization of a special process.

Since the charges are very minute the insulating property and dielectric losses should be as small as possible. Mica of good quality satisfies this requirement admirably. However, other insulators can also be used and thin films made of vitreous enamels have proven to be entirely satisfactory. The insulation is made as thin as it can be made conveniently. The capacity to the signal plate of one square centimeter of mosaic is usually of the order of 250-300 uuF.

The sensitivity is of the same order as that of corresponding high vacuum caesium oxide photocells. The same is true also of the color response. The cut-off in the blue part of the spectrum is due to the absorption of the glass. The actual color sensitivity of the photo elements themselves is shown as a dotted curve.

The electron gun producing the beam is quite an important factor in the performance of the Iconoscope. Since the resolution is defined by the size of the spot, the gun should be designed to supply exactly the size of spot corresponding to the number of picture elements for which the Iconoscope is designed. For the given example of 70,000 picture elements and a mosaic plate about 4" high, the distance between two successive lines is about .016" and the diameter of the cathode ray spot approximately half of this size. This imposes quite a serious problem in gun design.

The electron gun used for this purpose is quite similar to the one used for the cathode ray tube for television reception or the kinescope, which has already been described in several papers. It consists of an indirectly heated cathode, C, with the emitting area located at the tip of the cathode sleeve. The cathode is mounted in front of the aperture O of the controlling element G. The anode A_1 consists of a long cylinder with three apertures aligned on the same axis with cathode and control element. The gun is mounted in the long narrow glass neck attached to the spherical bulb housing the mosaic screen. The inner surface of the neck as well as the part of the sphere is metallized and serves as the second anode for the gun and also as collector for photo electrons from the mosaic. The first anode usually operates at a fraction of the voltage applied to the second anode, which is approximately 1000 volts.

The focusing of the electron beam is accomplished by the electrostatic field between elements of the gun and between the gun itself and the second anode. The theory of electrostatic focusing for this type of gun has already been published by the writers. Briefly summarized, it amounts to the fact that a properly shaped electrostatic field acts on moving electrons in the manner as a lens on a beam of light. The action of the field in the Iconoscope gun is roughly equivalent to a composite lens consisting of four glasses, two positive and two negative. The optical analogy is shown on the same figure. The actual appearance of the Iconoscope is shown on Fig. 2. Its overall length on this particular model is 18" and diameter of the sphere is 8".

The deflection of the electron beam for scanning the mosaic is accomplished by a magnetic field. The deflection coils are arranged in a yoke which slips over the neck of the Iconoscope. The assembled deflecting unit is shown besides that of the tube. The scanning is linear in both vertical and horizontal directions and is caused by saw-toothed shaped electrical impulses passing through the deflecting coils and generated by special tube generators. The circuits for these generators as well as methods of synchronizing were given in a previous series of papers in these proceedings.

Since the Iconoscope is practically a self-contained pickup unit, it is possible to design a very compact camera containing the Iconoscope and a pair of amplifier stages connected with the main amplifier and deflecting units by means of a long cable. Since the camera is portable, it can be taken to any point of interest for the transmission of a television picture.

The reception of images transmitted by the Iconoscope is accomplished by means of the cathode ray receiving tube or kinescope. This (see previous citation). The picture of the tube tube was described in the writer's earlier paper is shown on Fig. 3.

The complete block diagram of the circuit associated with the transmitting and receiving ends of the whole system is shown on Fig. 4.

The main feature of this scheme, as seen from this diagram, is that in the whole system there are no mechanically moving parts and the transmission of the picture is accomplished entirely by electrical means.

From the color response curve it is clear that the Iconoscope can be used not only for transmission of pictures in visual light but also picture invisible to the eye in which the illumination is either by ultra-violet or infra-red light.

The present sensitivity of the Iconoscope is approximately equal to that of a photographic film operating at the speed of a motion picture camera, with the same optical system. The inherent resolution of the device is higher than required for 70,000 picture element transmission. Some of the actually constructed tubes are good up to 500 lines with a good margin for future improvement.

With the advent of an instrument of these capabilities, new prospects are opened for high-grade television transmission. In addition, wide possibilities appear in the application of such tubes in many fields as a substitute for the human eye, or for the observation of phenomena at present completely hidden from the eye, as in the case of the ultra-violet microscope.

(Continued from Page 20)

CORRESPONDENCE SECTION

Considerable interest has been shown by radiomen as to what the new residence course offered by the Capitol Radio Engineering Institute, of Washington, D. C., is like. As "CQ" is circulated pretty freely among commercial operators, this seems the best way to tell just what we are getting out of the school, which is what most of the fellows are interested in.

The summer course now in session at Washington is worked in conjunction with the correspondence course put out by this school. The work taken up theoretically in the correspondence lessons is worked out in the class room and the practical work in connection with them actually done by the student in the laboratory.

The equipment here consists of a crystal controlled 200 watt broadcast transmitter, using two 849 tubes in push-pull in the output circuit, 100 percent modulation being employed. We also have a complete studio, feeding speech equipment capable of handling six incoming lines, so that the student can get practical experience in broadcast work, both in operating the transmitter itself, and in handling the studio and speech equipment.

Various types of receivers are on hand for the student to become acquainted with. These include what is about the latest thing in short wave receivers, the Hammarlund Comet-Pro. Various types of modern broadcast receivers are also included.

An installation of storage batteries for the broadcast transmitter, and the necessary charging equipment is also included, permitting the student to get some experience in this direction.

Laboratory equipment includes a very sensitive Wheatstone Bridge for making resistance measurements, and equipment is provided for making measurements from which can be calculated the inductance and distributed capacity of various types of coils.

Oscillators and power packs are built in the laboratory by the students and after these are in operation various types of amplifiers are constructed, these to be fed from the oscillator. With the proper meters included in all circuits where a meter is needed, one is able to see clearly how and why Class A, B and C amplifiers function. This is quite different from just reading about it in a book or magazine article. Means are also provided for making all kinds of R. F. measurements.

In connection with audio work, attenuation pads and volume controls, calibrated in decibels, are designed and constructed by the various students and then tested on output meters for accuracy. Design work for transformers and reactors is also taken up.

Classes are from 9 A. M. to 12 noon and from 1 to 4 P. M., Monday to Friday, and from 9 A. M. to 12 noon on Saturday. The day is divided between classroom and laboratory. 9 to 10:15 A. M. takes in the morning lecture period and from 10:15 A. M. to noon the student works in the laboratory. We have another lecture period in the afternoon from 1 to 2:15, the remainder of the school day being spent in the laboratory. Saturday is examination day, the week's work being covered by this examination.

Up to the present time lectures and instruction have been given by Mr. Rietzke, President of the school, Mr. Mark Biser and Mr. Clayton Williams. Arrangements have been made for men prominent in radio to give lectures to the class. Arrangements have also been made for the class to visit stations and laboratories well known to radiomen in general. The Naval Radio Station (NAA) at Arlington, Va., was visited a short time ago and similar trips to other stations are scheduled.

In the present class we have marine operators, airways operators, servicemen, a geophysical operator and a U. S. Army operator, this attesting to the popularity of the school.

Capitol also runs a resident course entirely independent of the correspondence course (although based on the material in this course) during the regular school year from September through to June. This course is quite complete and, I believe, the only one of its kind in the country. In concluding I may say, that for any man interested in radio, who cannot afford to take a regular course of instruction at one of the technical colleges, this course in Practical Radio Engineering offered by the Capitol Radio Engineering Institute cannot be beat.

H. M. KAIZEN

THE ICONOSCOPE

(Continued from Page 19)

The writer wishes gratefully to acknowledge the untiring and conscientious assistance of Messrs. G. N. Ogloblinsky, S. F. Essig, H. Iams and L. E. Flory, who carried on much of the theoretical and experimental work connected with the development which has been described in the foregoing, and whose ability was the major factor in the successful solution of the many problems arising in the course of this work.

THE CONCENTRATION OF WEALTH

By GERALD MATHISON

The concentration of wealth in the hands of the few in these United States during the last two decades is astonishing and, according to Mr. Arthur Brisbane, we have 40,000 millionaires in the United States and on the other hand there are approximately 14,000,000 idle wage earners today.

According to the best information available, there are 3 men in the United States whose wealth has been estimated at $5,000,000,000. Twenty-five years ago the largest fortune in our country was rated at one quarter of a billion. Today we have 2 fortunes totaling 8 times that amount, 2 more than 4 times that amount, and hundreds at and around the quarter of a billion mark. Forty thousand millionaires controlling wealth estimated at $160,000,000,000 provided the average wealth of every millionaire totals $4,000,000! Here we have one-thirty-third of one per cent of our total population controlling over fifty per cent of the wealth of the nation.

We all know that it is necessary for us to have capital, but we have no need for a few selfish men to control, dictate and dominate all phases of our economic life. These few men control all industry and dictate legislation in both Federal and State governments. Is it any wonder today that 40 states have no minimum wage laws resulting in starvation wages, long hours, and child labor?

In the great year of prosperity, 1929, so called for profits and dividends, according to the New York Times of October 1, 1930, these dividends for the first nine months of 1930 amounted to $3,621,000,000 as compared with $2,395,000,000 during the same nine months of 1929.

Industries upon which forty per cent of our wage earners depend for a living actually employed 900,000 fewer wage earners than they did in the meager year of 1919, although the business handled was far greater. In manufacturing our factories fabricated forty-two per cent more products with 546,000 fewer wage earners; our railroads and shipping companies increased their business by seven per cent with 253,000 fewer employees; our coal mines surrendered twenty-three per cent more coal with approximately 100,000 fewer miners. These astounding figures are compiled by the American Federation of Labor from official government reports.

Some of the dictators, in the shipping business especially, for years have had radio operators working for starvation wages at long hours, and the latest move of these intellectual and moneyed giants was to dispense with the radio operators on ninety per cent of the Great Lakes' freighters.

It takes no Solomon to arrive at the conclusion that the conditions under which we are operating and the industrial laws under which we are governed have been formulated to favor the few and disregard the many.

One of the greatest men of modern times, the one who rules over the destiny of over 300,000,000 followers, has said:

"Every effort, therefore, must be made that at least in the future a just share only of the fruits of production be permitted to accumulate in the hands of the wealthy, and that an ample sufficiency be supplied to the working man."

SILENT KEY

The sudden death from heart trouble of Ralph Wendall Rice on the morning of June 4th as the trawler "Quincy" on which he was employed was bound from Boston to the fishing banks, took from the ranks of Boston radio operators one of its best known members and a veteran of many years' standing.

"Bugs" Rice was for a number of years an operator in the Savannah Line and until forced to quit the southern climate because of his illness was chief operator on the City of Savannah. He was born in Somerville, Mass., attended Somerville High School, and soon after graduation entered upon his radio career. He was 39 and unmarried. He is survived by his mother, with whom he lived at Somerville.

The pall bearers, all veteran operators, were Walter Swett, Boston RMCA inspector; Robert Philbrook, formerly of the RCA Institute and lately on the trawler "Billow"; Harry Chetham, chief radio operator of the Somerville Police Radio Station; and Clayton White, Edward Drozek, and Richard Blake, all active operators.

Operators and officials of the Boston Radiomarine office sent a beautiful floral tribute in the shape of a ship's anchor. The burial took place at Woodlawn Cemetery in Malden, Mass.

Joseph L. Bergman, member of the A. R. T. A., formerly with the 102d Engineers, 27th Division, from which he was honorably discharged passed away at the Veterans' Hospital, Johnson City, Tenn., May 18, 1933. He was 49 years old at the time of his death.

NEW PRODUCTS

The transformer division of the Universal Microphone Co., Inglewood, Cal., has gone into production for the Wallace transmitting transformers for short wave work.

The new line includes two power transformers: one 1000 volts and one 1500 volts, both 200 M. A. There are two power units: one 500 volts at 70 M. A. and one 900 volts at 100 M. A. Three filament transformers: 11 volts, 5000 volts insulation; 10 volts, 2500 volts insulation and number "T7," two 7½ volts, 2500 volt insulation.

The new line will also include a power filament unit and three chokes . . . heavy duty, medium duty and small filter. All of the products have been built to exact specifications by Don C. Wallace, and eight small blueprints are available in loose leaf folder style.

American Radio Telegraphists Association News

All communications for The American Radio Telegraphists Association should be addressed to Hoyt S. Haddock, President of the Association, 20 Irving Place, New York City.

Authorized delegates:
Los Angeles, M. L. Shaefer, 514 West 55th Street.
Ashtabula Harbor, Ohio, Arthur Freitag, Box 1056
Coral Gables, Florida, D. W. Scott, 222 Sidonia Avenue.
Beaumont, Texas, Clyde B. Trevey, Radio Station, Magnolia Petroleum Co.
Boston, Charles W. Marsh, 28 Westland Avenue.
Boston, Richard J. Golden, 36 Conwell Avenue, West Somerville, Mass.
Seattle, Wash., W. C. Connell, Pier 1.
Norfolk, Va., Jesse Copeland, 322 Bute Street.
Chicago, Ill., Sumner S. Loomis, 1126 Ainslie Street.

This office has had numerous requests from operators concerning the whereabouts of their friends. We maintain a complete list of American vessels with operators attached where known. Since many operators transfer without notifying us of their new address we are unable to maintain this information up to date.

Anyone knowing the correct address and assignments of the following operators, kindly communicate with this office, that we may advise their friends of their whereabouts:

Gail Benson, F. Budenbender, William J. Carey, Ralph E. Carpenter, C. F. Cegavske, M. J. Cestone, A. B. Chappelle, David Cintron, Lee W. Clifford, Wm. Louis Comyns, Joseph Constantini, Charles A. Cooper, Theron Copeland, V. J. Cornelius, Edward S. Costigan, Milton Courchene, Carlos C. Cox, Lawrence E. Day, Albert Dean, George Dill, Daniel Downing, Reginald Ray Downing, John Dudor, James Dunn, Virgil C. Ellis, Omar D. Evans, Edward T. Fager, G. W. Farmer, Roy C. Fell, Irvine E. Finver, F. Flickner, Vernon Flatten, George W. Foley, Joseph Gandia, Irving Gerstle, Alva R. Gibbs, Wm. Gilmartin, E. E. Gilmore, M. L. Girard, Gordon Gleen, Frank O. Goodwin, Enrique Gorbea, Walter Gordon, Lloyd W. Graham, John H. Green, Earl Lee Grove, J. J. Haber, Charles Hamilton, Jr., Wm. Hamilton, E. R. Haney, A. E. Harding, John Harfield, O. T. Harrison, John D. Harton, Lawrence Hastings, V. F. Hawley, J. L. Hecht, C. W. Hemingway, T. R. Hemmes, Robert Herbert, J. J. Hickson, Jr., Fred C. Hirsch, James W. Hodges, C. L. Hooper, Harding E. Hull, John Hultquist, James Jansen, Oney G. Johnson, David Jolls, Carl L. Jones, Fordyce L. Jones, Ralph Melville Jones, A. W. Jorgenson, Orin R. Jorgenson, P. N. James, Roy Kaplan, Arthur E. Kellogg, James P. Kelley, Louis Kleinklaus, Walter W. Koch, George H. Kolbe, Albert Kudzma, Darrell E. Laird, Harry Leatherman, Max Lerner, Cyrus J. Lingo, W. J. Littlefield, F. B. Long, M. E. Loop, Kenneth Lucey, Carl W. Lundquist, Henry McCrillis, Michael McDonough, Carl McDow, Harold Mc Elray, C. S. McFadden, Howard McGraeth, Wm. McIntee, Herbert H. MacCalmon, Lloyd W. Mackey, Geo. A. Magary, Joseph Magen, Matthew Maushart, Paul Means, Joseph R. Meloan, Truman F. Murray, John E. Morse, Lawrence Leo Monett, John O'Reilly, J. H. Payne, A. H. Phelps, E. C. Roeger, Lynn F. Rogers, Ivor Sacrison, Herbert Stiles.

Boston Notes

Richard J. Golden, vice president of the American Radio Telegraphists Association, has been chosen by the Boston members as secretary of their local, the first local unit of the American Radio Telegraphists' Association. Boston members of the association have been granted a charter as Local Number One, and it is hoped and expected that the formation of a local will stimulate enrollment greatly in this area. Communications should be addressed to "Secretary, Local No. 1, American Radio Telegraphists Association, Inc., P. O. Box 1426 Boston, Mass."

* * *

Charlie Marsh, popular Boston operator and delegate of the A. R. T. A., has been ill at his home at 28 Westland Ave., Boston, for the past few weeks. His job on the SS Saint John of the Eastern Steamship Co. is being temporarily held down by Arthur Iodice. We hear that Charlie's absence from the environs of Saint John, New Brunswick, has been noted with regret by the young ladies of that quaint little town. His recovery may be greatly accelerated by the information, which we have from a local Walter Winchell, that Arthur Iodice is the very devil with the ladies.

* * *

This is vacation time for operators in the fishing fleet. Many of the trawlers have hauled out for the summer. There are, however, more boats running than there were this time last year. Reports from New London indicate that the Portland Trawling Company's fleet will resume operations at an early date this fall, which ought to be good news for New York ops.

* * *

Richard Gibbons recently took out the freighter Santa Veronica, instituting a new freight service from Boston to Chicago. The wages on this ship mark a new low for this port but there is some satisfaction to be derived from the fact that formerly the ship carried a combination third mate-operator.

ASSIGNMENTS

Vessel	Operator
T. J. Williams,	Lester Jordan
T. J. Williams,	B. F. Beaumont (vacation)
Geo. M. Cox,	Wm. E. Miles, H. E Mitch
Theodore Roosevelt,	Hatty Lorce
Sinola,	Stanley Pachner
Lightburne,	H. V. Herrington
Lightburne,	H. G. French, Jr. (vacation)
Virginia WKCY,	L. P. Maigret
Washington KDCB,	Robert Ubaldo
Virginia WKCB,	Roberto Ubaldo (Detached)
Washington KDCB,	L. P. Maigret (Detached)
South Chicago WGO,	Ed. Glause (Mgr.)
Northland,	Rollie B. Weiss
Bytond D. Benson,	Roy H. Roberson (Relief)
Edward L. Shea,	Hank Staggers
J. N. Pew,	R. C. Harper (Relief)
J. N. Pew,	Lee R. McMahon (Hospital)
Senator Bailey,	Lewis H. Pierce
Gulf of Mexico,	Joseph Senyk (Relief)
Gulf of Mexico,	W. W. Wells (vacation)
Gulftrade,	McKinley Rhodes (Detached)
Gulftrade,	Harry Bell
San Francisco KGGC,	R. A. Irvine (Detached)
President Hayes,	R. A. Irvine, Walter Little
Gulflight,	W. J. Bryan (Detached)
Gulflight,	C. F. Barclay
R. W. McIlvain,	R. C. Harper (Relief)
Bafshe,	C. G. Price
Bafshe,	E. A. Bourgeois (vacation, to return to R. W. McIlvain)
Betty,	W. Werner
Georgeanna,	Oscar Bennett
Helen,	H. R. Wright
Scanmail,	J. P. Hall, T. McCarthy
Scanstates,	Fred Hirsch
West Isleta,	H. Schlesinger
Padnsay,	C. A. Draper
Cathlamet,	A. Kowalsky
Atlantic WBCO,	L. E. Trubey
Yacht Alamo,	Richard Cufbert
Henry S. Grove,	D. P. Newman
Santa Cecelia,	J. Lafferty
J. W. Van Dyke,	Gerald Hiltz
Bohemian Club,	Wm. Bahls
Steelworker,	V. B. Reed (Detached)
Black Point,	E. S. Pittman
Middlesex,	Randolph E. Smith
Hampden,	R. Chislet
Watertown,	R. C. Foege (In dock)
Lexington,	T. Lupien
President Grant,	C. W. Bulger
President Lincoln,	Van Weigand
President Monroe,	B. Mickelson
President Pierce,	J. F. Taylor, A. B. Wauchope
President Taft,	Wm. Beach
President Van Buren,	P. Letsinger
Mojave,	Paul Q. Griffin
Gulfbird,	A. Heise
Steel Scientist,	A. Cosmas
Steel Exporter,	C. M. Wonneberger
Commissioner,	Ted Craise
Del Mundo,	Paul F. Brown, H. Callen
Munargo,	Edward Akar
Munsomo,	A. D. Rosser
Richard Peck,	Paul Newman
Steel Motor,	M. Ruttgen
Steel Electrician,	L. Duel
Steel Vendor,	W. Uhl
Nebraskan,	W. R. Amark (Detached)
Ohioan,	W. R. Amark
Chalena,	Karl Baarslag
Barbara,	C. Sakellerios
Isabel,	O Theiss (Detached)
Geo. H. Jones,	Kenneth Peterson
Sayville WSL,	Joseph Finzimer (Detached)
Santa Maria,	Donald Shaw, T. C. Ault
Santa Maria,	Stanley Young (Detached)
Malton,	Otto Schmidt
William G. Warden,	M. Riley (Detached)
William G. Warden,	A. B. Anderson
Saint John,	Charles W Marsh (Hospital)
Saint John,	Arthur Iodice (Relief)
Harvard,	R. J. Golden
Santa Veronica,	Richard Gibbons
Munbeaver,	S. Carrabba (Detached)
Munbeaver,	J. P. Worden
Exochorda,	A. B. Swarts (Detached)
Exochorda,	Edward Rocks
Manhattan,	Edward Rocks (Detached)
Manhattan,	A. B. Swarts

S.S. GEORGE M. COX WRECKED

The Rock of Ages and a heavy fog seemed to have conspired to conquer the S. S. George M. Cox on her maiden voyage.

The 45 passengers and 86 members of the crew were rescued by the coast guard cutter Andrew. Four persons were injured when the steamer struck, and the remainder spent a chilly, uncomfortable night on the reef.

The steamer was reported to be a total loss.

William E. Miles, Chief Radio Operator, and his Junior, H. E. Mitchell, were on duty aboard the George M. Cox at the time of the disaster.

HEARD HERE AND THERE

Ten per cen pay cuts on all Shipping Board vessels operated by the Roosevelt SS Line went into effect May the first. Radio operator's salary was reduced a little more than the rest, from 105 to 94, almost 11 per cent.

Radio jobs on the Shipping Board ships have always been known as "pure radio jobs" and no clerical work attached to it, but the Roosevelt Line officials made a rule of their own, (way back in 1928) announcing that the "radio operators are required to assist Masters in the preparations of reports, payrolls, and other clerical work." The circular letter further stated that "This is not to be construed to mean that the Radio Operator is also the ship's clerk. Heads of departments, unless the ship has a purser, are required to do their own clerical work."

Enough said—soon after the issuance of said circular letter, the pursers were dismissed, the clerical work was automatically piled up on the "good-natured Sparks," who did, and still does the ship's clerical work without a cent of extra pay.

AIRWAY RADIO COMMUNICATION STATIONS

A comp'e'e list of airways radio communication stations, revised as of May 1, 1933, is given in the following:

Stations	Call sign	Broadcast frequency (kilocycles)
Albany, N. Y.	WWAH	320
Albuquerque, N. Mex.	KCAF	230
Amarillo, Tex.	KCAG	248
Atlanta, Ga.	WHZ	266
Bellefonte, Pa.	WWQ	284
Big Spring, Tex.	KCAP	326
Birmingham, Ala.	WWAT	224
Boise, Idaho	KCR	308
Boston, Mass.	WSX	266
Buffalo, N. Y.	WWAB	266
Butte, Mont.	KCAC	284
Charleston, S. C.	WWAW	332
Cheyenne, Wyo.	KSG	326
Chicago, Ill.	KDA	350
Cincinnati, Ohio	WWAS	332
Cleveland, Ohio	WWO	344
Elko, Nev.	KOJ	314
El Paso, Tex.	KCAO	314
Fargo, N. Dak.	KCAN	365
Fort Worth, Tex.	KKJ	365
Fresno, Calif.	KCU	344
Greensboro, N. C.	WRW	320
Houston, Tex.	KCAU	332
Idaho Falls, Idaho	KCAD	359
Iowa City, Iowa	KIS	272
Jackson, Mich.	WWAR	320
Jackson, Miss.	WWAQ	260
Jacksonville, Fla.	WWAV	344
Kansas City, Mo.	KRC	3'9
Key West, Fla.	WBP	314
Kingman, Ariz.	KCAH	350
La Crosse, Wis.	WSG	224
Little Rock, Ark.	KCAJ	272
Los Angeles, Calif.	KCT	284
Medford, Oreg.	KCX	266
Memphis, Tenn.	WWAU	326
Miami, Fla.	WWAF	365
Milford, Utah[1]	KCAT	320
Minneapolis, Minn.	KCAQ	266
Mobile, A'a.[1]	WWBF	248
Nashville, Tenn.	WWAC	314
New Orleans, La.	WWAG	338
New York (Hadley Field, N. J.)	WWU	338
North Platte, Nebr.	KVM	284
Oakland, Calif.	KCV	332
Omaha, Nebr.	KJF	320
Pasco, Wash.	KCS	260
Pittsburgh, Pa.	WWAP	254
Portland, Oreg.	KCY	284
Pueblo, Colo.	KCAR	302
Raleigh, N. C.[2]	WWBI	350
Reno, Nev.	KLK	254
Richmond, Va.	WNR	260
Rock Springs, Wyo.	KDN	290
Salt Lake City, Utah	KGD	338
San Antonio, Tex.[1]	KCAW	254
Seattle, Wash.	KCZ	365
Shreveport, La.	KCAK	230
Spartanburg, S. C.	WFT	248
Spokane, Wash.	KCAS	344
Springfield, Mo.	KCAV	254
St. Louis, Mo.	KCQ	290
Titusville, Fla.	WWBC	254
Tucson, Ariz.	KCAM	338
Tulsa, Okla.	KCAA	296
Washington, D. C.	WWX	272
Wichita, Kans.	WEK	332
Winslow, Ariz.	KCAE	308
Yuma, Ariz.	KCAL	266

[1] Under construction.

[2] Proposed.

RADIO RANGE BEACONS

OF THE

U. S. DEPARTMENT OF COMMERCE

The following list of Radio range beacons, in operation or under construction on the Federal airways system, is revised as of May 1, 1933.

Stations	Frequency (kilocycles)	Identifying signal
Albany, N. Y.	320	..
Albuquerque, . Mex.	230	—...
Alma, Ga.	242	—..
Amarillo, Tex.	248	...—
Atlanta, Ga.	266	....
Big Spring, Tex.	326	—.—
Bellefonte, Pa.	284	.—.
Birmingham, Ala.[1]	224	.—.
Boise, Idaho	308	—..
Boston, Mass.	266	—..
Buffalo, N. Y.	266	—...
Burley, Idaho	272	..
Burlington, Iowa	326	—..
Butte, Mont.[1]	284	...—
Canadian, Tex.[1]	266	——.
Charleston, S. C.	332	—.—
Chattanooga, Tenn.	338	..
Cheyenne, Wyo.	326	——.
Chicago, Ill.	350	..—.
Cincinnato, Ohio	332	...
Cleveland, Ohio	344	—.—
Columbia, Mo.	242	.—..
Columbus, Ohio	242	..—
Daggett, Calif.	248	—.—
Des Moines, Iowa	308	—...
Detroit, Mich.	230	.——
Donner Summit, Calif.	272	....
Elko, Nev.	314	—.—
El Paso, Tex.[1]	314	.—.
Erie, Pa.	326	....
Evansville, Ind.	302	....
Fargo, N. Dak.[1]	365	.——
Fernley, Nev. (Synchronized with Reno. To be moved to Reno.)	254	—..
Fontana, Calif.	332	.—.
Goshen, Ind. (Synchronized with Jackson, Mich.)	320	——.
Greensboro, N. C.	320	—..
Harrisburg, Pa.	314	.—..
Houston, Tex[1]	332	——.
Idaho Falls, Idaho[1]	359	..—
Indianapolis, Ind.	266	..
Jackson, Miss.[1]	260	—..
Jacksonville, Fla.	344	.——
Kansas City, Mo.	359	..
Key West, Fla.	314	..
Kingman, Ariz.	350	..
Knight, Wyo.	260	....
La Crosse, Wis.[1]	224	..
Little Rock, Ark.[1]	272	——.
Los Angeles, Calif.[1]	284	.—..
Medicine Bow, Wyo.	344	..—
Medford, Oreg.	266	.——
Memphis, Tenn.[1]	326	—.—
Miami, Fla.[1]	365	.—..
Milford, Utah[1]	320	.——
Milwaukee, Wis.[1]	242	...—
Minneapolis, Minn.[1]	266	.—..
Mobile, Ala.[1]	248	..—.
Moran, Kans.	314	....
Mount Shasta, Calif.[1]	350	..
Nashville, Tenn.	314	..—
New Orleans, La.[1]	338	...
New York (Newark, N. J.)	338	....
New York (Elizabeth, N. J.)	248	....
Northdalles, Wash.	230	—..
North Platte, Nebr.	284	....
Oakland, Calif.	332	.—
Oklahoma City, Okla.[1]	308	.—.
Omaha, Nebr.	320	.—.
Pasco, Wash.	260	..—
Pittsburgh, Pa.	254	.——
Portland, Oreg.	284	—...
Pueblo, Colo.	302	....
Raleigh, N. C.	350	..—
Richmond, Va.	260	...—
Rockford, Ill.[1]	338	—..
Rock Springs, Wyo.	290	.—.
Rodeo, N. Mex.[1]	254	....
Salt Lake City, Utah	338	...
San Diego, Calif.[1]	230	...
San Antonio, Tex.[1]	254	.—.
Saugus, Calif.	260	—..
Syracuse, N. Y.	350	...
Shreveport, La.[1]	230	—...
Sidney, Nebr.	314	...
Smiths Grove, Ky.[1]	284	..—.
Spartanburg, S. C.	248	...
Spokane, Wash.	344	...
Sterling, Ill. (Synchronized with Iowa City)	272	...
St. Louis, Mo.	290	—..
Tacoma, Wash. (to be moved to Seattle)	332	.—.
Terre Haute, Ind.	248	.—.
Texarkana, Ark.[1]	320	.—..
Titusville, Fla.	254	.—.
Tucson, Ariz.[1]	338	..—
Tulsa, Okla.	296	..—
Washington, D. C.	272	——.
Wichita, Kans.	332	—..
Williams, Calif.	365	.—.
Wink, Tex.[1]	272	...
Winslow, Ariz.	308	..—.
York, Nebr.	260	..—
Yuma, Ariz.[1]	266	——.

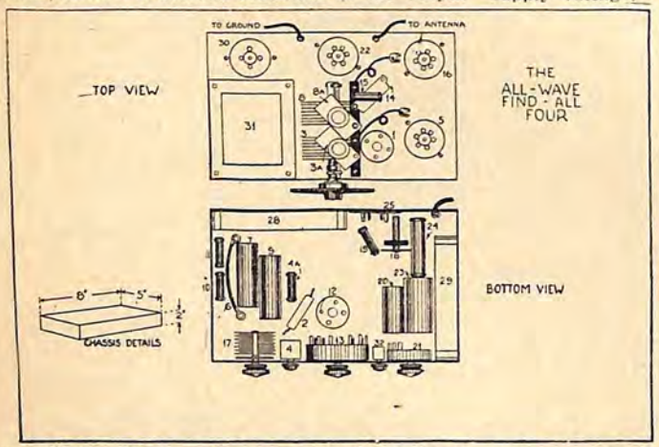
[1] Under construction.

THE ALL-WAVE FIND-ALL FOUR

By H. G. CISIN, M.E.

Recently there has been considerable demand for an inexpensive a.c. receiver, capable of bringing in short wave stations as well as the regular broadcasting. The All-Wave Find-All Four has been designed to meet this demand. No plug-in coils are necessary, due to the use of a new-type all-wave Find-All coil having enough windings to cover from 10 to 550 meters. The complete set of windings on this new coil including the tickler windings, required for regeneration, take up much less space than a single short wave coil of the ordinary type covering from 10 to 80 meters.

This new receiver is of the midget classification, being mounted on a chassis 8"x5"x2" high. It uses the latest type tubes and has lots of "pep". The circuit comprises an r.f. stage with a 57 tube, a regenerative detector also using a 57 tube and a 2A5 output power amplifier. All three of these tubes are pentodes. The 57 tube, with the special shield arrangement in the dome, allows a decided reduction in the output



capacitance. This makes it especially desirable for short wave operation. Moreover, its high transconductance and plate resistance and its sharp plate current-grid bias "cut-off," make it ideal for sensitive detection. In this circuit, grid-leak detection is employed, the 57 tube being connected to take the utmost advantage of its high sensitivity.

Resistance coupling with the output stage, permits the attainment of highest tone quality. Regeneration is controlled by means of the Cardwell "Balancet" condenser (17). A two-gang Cardwell condenser is employed for the two tuned circuits on wave lengths from 200 to 550 meters. For short wave reception, switch (4) is thrown to the upper nosition, cutting out the antenna coupler (1), and its section of the tuning condenser (3) and connecting the antenna to the control grid of the r.f. tube, through a small Aerovox mica condenser.

Switch (13) is connected to the various sections of the all-wave coil (12) permitting rapid change-over from one band to another. Volume is controlled by means of an Electrad potentiometer (21) connected in the control grid circuit of the 2A5 output tube. This latter tube is a power amplifier pentode of the heater cathode type. The indirect heating helps to minimize hum making this tube vastly preferable to the 47 type pentode. The 2A5 tube has an undistorted power output of 3 watts. With the recommended bias of 16.5 volts and a plate voltage of 250 volts, the characteristic is substantially linear, resulting in a minimum of distortion.

The rectifier may be of the conventional 80 type or a 5Z3 rectifier may be used. In the latter case, it should be kept in mind that the filament requires a current of 3 amperes necessitating the use of a power transformer designed for this heavy current drain. The field of the dynamic speaker also serves as an audio filter choke.

The automatic line voltage control amperite aids in the attainment of excellent performance regardless of variations and fluctuations of the supply voltage.

Socket holes and transformer mounting hole are drilled in the metal sheet, before the chassis is bent. After the chassis is bent, the five wafer-type sockets are mounted, four on the "deck", one for the speaker connections at the rear chassis wall. The Acratest power transformer (31) may also be mounted.

The small "Balancet" condenser (17) is mounted at the right on the front chassis wall, while the Electrad volume control (21) is mounted at the left. The three switches (4), (13) and (32) are also mounted on the front chassis wall, as indicated in the bottom view diagram.

The chassis is now turned upside down and the all-wave coil (12) is mounted as shown. The r.f. choke (18) is mounted next. The two cardboard electrolytic condensers (28) and (29) are each fastened to the sides of the chassis by two thin metal straps, but they should not be put into place until most of the wiring has been completed. Otherwise, they will make it difficult to wire up certain of the socket terminals. All other parts below the chassis are soldered in position during the wiring.

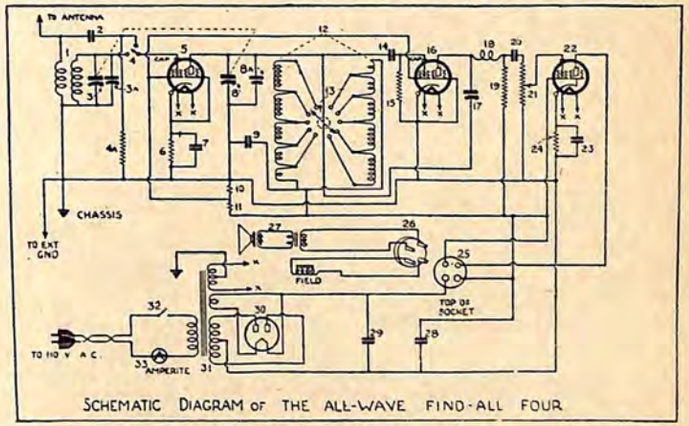
The chassis is again turned right-side up and the dual Cardwell variable condenser (3, 8) is mounted. The two trimmer condensers (3A) and (8A) are fastened to the top insulating support of the Cardwell condenser. Grid condenser (14) and grid leak (15) are also fastened to the same insulating support.

The set is now ready for wiring. Corwico push-back Braidite wire should be used for all wiring. Either solid core or stranded Braidite may be used, as both are flexible. The filament circuits may be wired in first. The filaments of (5), (16), and (22) are wired in parallel to the 2½ volt filament winding of the power transformer. The center tap of this winding is grounded to the chassis. If a pilot light is used, for the dial, this also is wired to the 2½ volt winding.

Grid circuits are wired next. Note that the control grid connections of the 57 tubes are at the caps, as indicated on the schematic diagram. The socket connections for the 57 tubes (5,16) are as follows: Looking down on the socket, the two large holes are for the filament prongs. Then starting from the left filament terminal and going around the socket in a clockwise direction, the terminals are cathode, suppressor grid, screen grid and plate respectively. Note that the suppressor grid terminal is connected externally (at the socket) to the cathode terminal.

Looking down on the socket of the 2A5 tube (22), the two large holes are for the filament prongs. Then, starting from the left filament terminal and going around the socket in a clockwise direction, the terminals are cathode, control grid, screen grid and plate respectively. In this tube, connection between the suppressor grid and the cathode is made within the tube.

After the various grid connections are completed, plate circuits are wired, then cathodes, antenna coupler primary, by-pass condensers, power supply transformer (32) to rectifier tube socket, and filter system. The dynamic and field coil connections are wired to a four-prong speaker output transformer plug (26) to conform to the connections at socket (25). Instead of using binding posts, antenna and ground connections are brought up from below the chassis, using flexible Braidite. After the wiring is completed, the tubes are inserted, aerial and ground are connected and the speaker is plugged in. When current is turned on, the trimmer condensers are adjusted for maximum response on broadcast signals. The set is then tested out on the various short wave bands.



SCHEMATIC DIAGRAM OF THE ALL-WAVE FIND-ALL FOUR

This little midget covers the entire wave length band from 10 meters to 550 meters, without changing coils. Hence, in addition to receiving conventional broadcasting, it brings in police calls, trans-Atlantic phone calls, foreign stations and many other classes of interesting short wave transmissions. The circuit is regenerative for maximum sensitivity. Three pentodes are employed, including the new 2A5 power output tube. Change-over from one wave-band to another is accomplished by means of a double-pole five-point switch, connected to a new type all-wave Find-All coil, having a plurality of interconnected windings. This set is compact, inexpensive and easy to build.

COMPLETE LIST OF PARTS REQUIRED FOR THE ALL-WAVE FIND-ALL FOUR

1—Cardwell .000025 mfd. "Balancet" Variable Condenser type 607-A (17)
1—Cardwell Dual Midway "Featherweight" Variable Condenser, .0002 mfd., each section, type 406-B (3, 8)
2—Trimmer Condensers, 5 to 25 mfd., (3A, 8A)
1—Find-All Antenna Coupler (1) 1 Find-All R.F. Choke (18)
1—Find-All All-Wave R.F. Coil with Tickler (12)
1—Electrad 500,000 ohm Volume Control, type R1-203 (21)
1—Electrad Truvolt 1000 ohm Flexible Resistor, type 2GB 1000 (6)
1—Electrad Vitreous Enameled Resistor, 400 ohms, type H-S97 (24)
1—Aerovox .0005 mfd. Mica Condenser, type 1460 (2)
1—Aerovox .02 mfd. Cartridge Condenser, type 281 (20)
2—Aerovox .1 mfd. Cartridge Condensers, type 281 (7,9)
1—Aerovox .0001 mfd. Mica Condenser, type 1469 (14)
2—Aerovox 4 mfd. Dry Electrolytic Condensers, Cardboard Container, type P5-4 (28, 29)
1—Aerovox 25 mfd., 25 volt Cardboard Tube dry electrolytic Condenser, type PR25-25 (23)
1—I.R.C. (Durham) 25,000 ohm, ½ watt Metallized Resistor, type F-½ (10)
1—I.R.C. (Durham) 150,000 ohm, ½ watt Metallized Resistor, type F-1/3 (11)
2—I.R.C. (Durham) ½ megohm, ½ watt Metallized Resistors, type F-½ (4A, 19)
1—I.R.C (Durham) 1 megohm, ½ watt Metallized Resistor, type F-½ (15)
1—Amperite Self-Adjusting Line Voltage Control, type 5A-5 (33)
1—Power Supply Transformer, (31)
1—Toggle Switch, Single Pole, double-throw, (4)
1—Switch—double-pole, 5 position, (13)
1—Dynamic Speaker, 6" dia., output Transformer 7000 ohm impedance primary—2500 ohm speaker field, (27)
2—4-prong wafer sockets (25, 30)
3—6-prong wafer sockets, (5, 16, 22)
1—Toggle Switch (32)
1—Full Vision Dial and Escutcheon
2—Raytheon ER-57 type tubes (5, 16)
1—Raytheon ER-2A5 tube (22)
1—Raytheon ER-5Z3 Rectifier Tube (30) or 80 type Rectifier Tube
1—4-Prong Plug (26)
1—Roll Solid Core Corwico Braidite Hook-up Wire
1—Metal Chassis 8" x 5" x 2" high

Note: Numbers in parentheses refer to corresponding numbers marking parts on diagrams.

DO YOU REMEMBER WHEN:—

(Continued from Page 10)

bear an' a rusty shotgun, who is staggerin' around under th' crushin' weight of a cast-iron bullet-slinger with a handle like a ocean liner's crankshaft an' a barrel like a German howitzer. Comin' swaggerin' out on th' wharf, like a Russian-Fin battleship in a beam sea, when he sees me, he stops still an' begins curlin' up his lip like a mad-dog. Th' friendly Ouglamuckites immediately proceeds to form a circle around th' two of us; an' so settin' down my pancaked grip, I cheerfully waits to see what is comin' next on th' bill-of-fare of hostilities.

"An' so you're th' fishtail-faced wireless engineer who's gonna be th' superintendent 'a Ouglamuck, eh!" he snarls, in a tone like somebody tryin' to grind up iron spikes in a coffee-mill. "You're th' lightnin'-catchin' freak who's gonna tell us snailers what t' do who been pullin' codfish before you even knowed where Alaska was at, are you—you donkey-eared son of a stale bakin'-powder biscuit!" With his face bucklin' up into th' lovin' expression of a chunk of shell-shot armor-plate, he reaches down on his hip for his ninety-calibre gunpowder-burner.

Now, if I'd been a greenhorn fresh from th' States, right then my heart would'a swallowed my liver, an' I'd 'a dropped dead on th' spot; but you see, I'd already been in this country of dislawfulness an' unorder long enough to learn a thing or two about these brimstone-belchin' gunpowder artists. Stoopin' down an' grabbin' hold of th' big rock that had been pitched down th' bluff at me, I rises up an' busts this trouble-huntin' maniac on th' side of his bean with it.

"Urrumph!" croaks Mr. Beardsley; an' disconnectin' himself from his highpower Krupp, he reclines gently downward onto th' wharf with th' squashy **ka-plunk** of somebody droppin' a rotten canteloupe.

"Wow—he hit Big-Gun Beardsley!" howls one of th' codfish snailers, like he couldn't believe his eyes—an' th' whole circle of was-gonna-be attendants to my funeral instantly evaporates in all directions.

Removin' Big-Gun's belt, I buckles it on; then pickin' up th' dethoned emperor of Ouglamuck's howitzer, I advances up th' hill an' takes possession of th' office There ain't nothin' much in it to take possession of, however, because, as th' looney-lookin' fradin'-store clerk expiains, th' bookkeeper had took a notion to quit a couple days before an' burned up all th' books an' company correspondence. Alaskan codfish-station bookkeepers always burns up their books when they quit—it simplifies matters a lot for their successors.

Locatin' th' company superintendent-shack, I throws out all th' pots, dishes, an' old clothes I finds in it; an' when Big Gun comes to life, I orders him to pack his truck into one of th' fishermen's shacks—which he does with a dazed stupefied-lookin' expression, like he couldn't decide whether he was only sufferin' from a mince-pie nightmare or gone plumb cuckoo.

A little later, Double-Cross Picketts comes breezin' in like he is after somethin', but when he sees me, he seems to change his mind.

"Excuse me," he splutters, startin' to back out, "I didn't know you were goin' t' live here."

"Well, I am—an' I'm gonna stay here, too'" I barks. "Where's Big-Gun's squaw?"

"Big-Gun's squaw," he repeats, stutterin' like he was so rattled he'd forgot his own name. "Why, she—she's visitin' her Siwash relations down to Unalaska Island———"

"When Mrs. Big-Gun gets back," I says, givin' Picketts a hard, straight look in th' eye that sends him grabbin' fer th' doorknob, "you can tell her that so long as her old man acts decent, he is fisherman straw-boss—but from now on I'm th' guy who's runnin' this here camp. Get me!"

"Yezzir!" says Picketts, turnin' th' color of skimmed milk; an' he excuses himself out'a th' door.

The next day, I chooses a site up on the hill above the codfish company's building for th' new wireless station. I decides where to set the two masts, lays out the positions of the different sets of mast-guy anchors, and marks off the foundations of the power-house and receivin'-shack. But when I goes to start th' codfish snailers to work packin' lumber an' gear up onto th' hill from th' wharf, I runs against a snag.

"We ain't here to work—we only fish," th' bunch in th' bunk-house informs me, very respectful-like, but with all th' indignity of a assembly of crown princes. "Th' Siwashes up in th' village does all th' common work."

I tries to argue with 'em, but I soon sees they'd sooner be shot than work; so I hikes up to th' Aleute settlement on th' hill. I discovers th' village priest, a old chimpanzee-faced grasshopper with forty years tobacco-juice coagulated in his whiskers, out in front of his ramshackle, saggy-roofed shrine, busy shinin' up an old brass ship's bell set up on a post alongside th' one-hinge door. I ascertains there are thirty-five employable braves in th' village; an' after spendin' three hours convincin' th' old soul-merchant that **wirelessuck** is absolutely disconnected with th' devil, I finally gets him to agree to his bucks workin' on th' station.

Early next mornin' the natives report for work—an' no radio engineer ever had a classier construction-gang than my thirty-five flat-faced fish eaters with their super-intellectuality of solid granite. I sets one crew to packin' lumber an' other materials up from th' wharf, details another detachment to begin drillin' up on th' hill in preparation for blastin' out holes for the mast-guy anchors, an' puts a third division to clearin' away th' snow an' makin' ready for th' power-house an' receivin'-shack foundations.

Just when everything is gettin' nicely started, there suddenly begins a slow, imperative clangin', like a city fire-alarm, up in th' native settlement; an' lookin' toward th' village, I sees that old tobacco-whiskers is out bangin' on his bell. With th' first clang, all my Siwash construction-crew drops their drills an' shovels, or whatever they had in their hands an' strikes out for th' village—an' with th' last **dong,** they are all enveloped in th' dog-house shrine. There is no more work that afternoon. The next day th' same performance takes place again. Th' third day I am gettin' pretty infuriated—an' then Double-Cross Picketts comes along an' offers to explain it.

"It's old Two-Bits, th' priest," says Double Cross. "He's s'posed to have some kind of a mysterious spirit roostin' with him up there in th' salmon-eaters' temple; an' when this here spirit tells him to, he calls in all th' Siwashes by whangin' on th' bell an' collects a quarter apiece from 'em—then th' services is over till th' next time. But they can't work no more th' same day."

Thankin' Double-Cross for this information, I hikes up th' hill to see old Two-Bits.

"Hereafter, when that spiritualistic quarter-snatcher 'a yours starts naggin' ya, it'd be a lot more convenient fer both of us if you'd just breeze down to th' office an' take a check fer th' whole amount," I suggests, politely—and old Two-Bits agrees that it would.

Five weeks later, I runs the cement for my generator and engine foundations. The power-house is pretty well along now, but no roof on yet. Th' temperature is stickin' around thirty below zero; and as freezin' will ruin freshly-run concrete, I sets up an old cook-stove over the cement forms an' details a couple of Siwashes to carry a red-hot fire, to keep th' place warm.

Late that night somebody comes thumpin' an' hammerin' on my shack, raisin' such a infernal racket that sleepy an' tired as I am, I have to get up. Goin' shiverin' to th' door, who does I find outside but old Two-Bits.

"Check!" he chirrups, comin' directly to th' point, an' stickin' out his mitt.

"Say, look here, you pestilential old flea, ya been down to th' office twice already today fer a check!" I barks. "Ya better send that confounded graft-grabbin' spirit 'a yours off to th' country fer a rest!" With this I slams th' door shut in his face an' jumps back between my blankets. Half-an-hour after, as I doze off to sleep, I seems to hear th' distant ringin' of a bell—an' in th' mornin,' when I struggles out through th' icy wind to th' power-house to have a look at my cement foundations, I finds th' stove cold an' deserted, th' concrete forms froze an' busted, and my templets which it took me two weeks to line up all warped to th' devil.

Spoutin' a Mississippi River of cusswords, I catapults up to th' village, an' draggin' old Two-Bits like a squeakin' weasel out of his hole, I bangs his bewhiskered nut against his blasted bell until I figures I've bumped his trouble-raisin' spirit humbug out of him so complete that it'll take it five years to get admittance back into his belfry again.

The following week, I have th' five foundation moulds remade, th' templets reset; and I runs th' cement again. That night I wakes up to find another cold snap comin' on. I gets up right away an' beats it out to th' power-house to fire up th' cook-stove myself, not carin' to take any more chances on th' peanut-brained Siwashes. Besides, a couple of cases of th' high-percentage dynamite I was usin' to blast out th' holes fer th' mast-guy anchors had disappeared mysterious-like durin' th' day, an' somehow I was feelin' a uneasy presentation of impendin' devilment.

About one o'clock in th' mornin,' as I was sittin' dozin' by th' red-hot stove in th' power-house, th' whole island is suddenly shook by a terrific jarrin' **w-h-o-o-m!**—an' then rocks an' boards comes rainin' down with such a crashin' racket that I wonders if all three of th' Ouglamuck volcanoes have blowed up together. It was too dark then to see what really had happened, but in th' mornin' when I looks out, I discovers that th' superintendent-shack I have been livin' in has completely disappeared out of existence—th' place where it had stood lookin' like a shell-hole in Flanders.

Steppin' out to have a closer look, th' first citizen I runs onto is Big-Gun Beardsley.

"I never done it! I never done it!" he yelps, backin' away, his face turnin' th' color of a dirty blanket. "Honest, I never done it!"

"Who's accusin' ya?" I inquires, gently quietin' him down with a convenient chunk of lava-rock.

While waitin' for th' concretework ta set, I prepares to raise the two masts. After three days of heavin' an' pullin', gettin' up a pair of heavy fifty-foot shear-legs, a screechin' hundred-mile gale comes whoopin' over th' island an' leaves our work about as conspicuous as a couple of frankfurters five minutes after you've given 'em to a hungry kyoodle.

Th' second pair of shear-legs goes sailin' off into th' Bering Sea th' same way, but th' third time, I gets them to stay long enough to set up th' mainmasts—two sawed timbers twenty inches square and ninety feet long. This accomplished, I prepares to send up th' sixty-foot topmasts, which are also sawed timbers, a foot square, and fitted to be spliced to the mainmasts with heavy iron clamps.

We starts up th' first topmast, with a tackle rigged, of course, so that all heavin' is done on the ground; and when th' topmast begins to rise above the mainmast-head, I details four gangs of Siwashes to slack away th' four sets of stays as th' timber goes up, so as to keep it perpendicular. Siwashes get dizzy when they are elevated more'n twenty-one inches off'n th' earth; so while they heave on th' tackles an' slack off th' stays, I have to camp all alone on th' mainmast-head to keep everything workin' smooth.

At last the topmast has come up nearly into place—and then while I am roostin' up there ninety feet above th' world, with that heavy topmast-timber swayin' up into th' clouds above me, what does I hear but th' slow, dismal **dong dong dong** of Two-Bits' infernal bell—and instantly all my mud-headed Siwash riggin'-crew lets go of tackles, stays, foot-ropes, an' preventers, an' goes gallopin' off to answer th' call of th' quarter-collector, leavin' me an' my wireless-pole to start swingin' down through space with th' graceful, breathcatchin' swoop of a shootin' star.

Almost before I can realize what is happenin', th' whole world rises up an' hits me in th' back—an' th' next thing I know, I feels myself in a dim, faraway dream, bein' carried down th' hill by th' sourdoughs. After while they lays me down on th' snow; an' then I can faintly hear Big-Gun Beardsley an' Double-Cross Picketts arguin' whether to take me to my shack or bury me right away.

"Th' ground's froze too hard—we can't dig it," I hears Double-Cross sayin,' like somebody a thousand miles away. Finally they lugs me into my shack an' leaves me there.

Some time in th' night, I comes to, to find a lantern burnin' alongside me an' old Two-Bits standin' over me with a dried bear-paw in one hand an' a rusty fish-head in th' other, industriously speilin' off some kind of a Siwash incantation racket. When he sees me blinkin' at him, he leaves off his black magic an' drops down on th' floor.

"Me no ring bell!" he blubbers, over an' over. "When him ring, me sleep—me no know who ring!" He is shiverin' like a sick cat, an' I can see he's tellin' th' truth. Afterwhile he goes away with his salmon-head an' grizzly-paw medical equipment, and I falls into a good sleep.

In th' mornin' I gets up feelin' all right, except for a slight pain in th' back like I'd been kicked in th' pants by fifty thousand army mules. A little unsteady, I perambulates up to th' company cook-house an' strolls in just as th' codfish snailers are settin' down to breakfast. They all seem to be discussin' my defunction real rejoiceful like—until they sees me steppin' toward my seat at th' head of the table. For about fifteen seconds there is a dead silence in that cook-house shack that would have made th' stillness of th' tombs of Egypt sound like a scandal in a boiler-shop—then synchronously decidin' not to bother about eatin' any breakfast, they gracefully displaces themselves out of th' ham-an'-eggs hangout, takin' most of th' window-sashes with them as they go—all except Big-Gun Beardsley, who couldn't leave because he'd fell over flat on th' table, with his face stuck in a pot 'a mush.

After this, there follows a few days of peace. Then one afternoon a little sail-boat drops into th' harbor; an' pretty soon Double-Cross Picketts brings me some news.

"Spitzka Tillafagafanouck, th' Siwash queen 'a Attu Island, has heard about ya, Unkillable," he informs me. "She's come t' give ya th' once over, an' if she likes your looks, she's gonna marry ya."

"Looks like there's always somethin' interestin' goin' on round this unpeaceful island, don't it?" I comments.

"She's nicknamed Th' Husband-Snatcher," resumes Double-Cross, cheerful-like. "She's buried a man reg'lar every winter fer th' last twenty-eight years, besides a few old ones in between—an' now she's out scoutin' after another victim——"

"Lissen, Picketts, I ain't scared of no darned female on earth," I commences to orate—an' then I sees somethin' approachin' in our direction that freezes me cold. Comin' down th' trail is a Siwash battle-axe so ugly that—well, Shotgun Sykes over at Unga is married to a old squaw so horrific-lookin' that when Shotgun sends a photo of her to his aged parent back in Pennsylvania, th' old man keeled over dead when he saw it—an' Shotgun Sykes' old hag is pretty as a handful 'a orange blossoms alongside of this female nightmare which appears to have struck Ouglamuck Island.

"Ah-a-a-h, you **wirelessuck!**" she clicks, gazin' at me with th' sweet, amorous smile of a Rocky Mountain wild-cat fixin' to jump on a chipmunk; "u-m--m-m—fine man!" Her snappin' tarblack lamps nails me fast to th' spot, like a squab pigeon hypnotized by a rattlesnake an' I can't budge or speak till she goes away.

"You're done fer, you're done fer," doles Double-Cross Picketts, like a funeral chant. "You're absoposilutively done fer—nobody she made up her mind to marry has ever got away from her."

"Who's afraid 'a that old buzzard-faced eater of rotten salmon!" I sputters, breakin' out of my trance an' tryin' to act indifferent-like, though th' cold shivers are still playin' leap-frog up an' down my back-bone.

"Wait—just wait," jangles Picketts, like a chime of weddin' bells.

But I don't wait. Both the masts are up and well-guyed by this time; and now, pitchin' th' parts of th' diesel-engine together, I belts it up to one of th' small direct-current generators, an' hangin' up a bunch of big mazda-lamps with some rough grape-vine wirin', I makes my workin' hours from six o'clock in th' mornin' to midnight. I had been kinda thinkin' of stayin' at Ouglamuck an' holdin' down th' superintendent berth for a while, but now my ambition has got converted into a desperate intention of gettin' this confounded wireless-station to workin' long enough to locate th' nearest floatin' craft, an' then beat it off th' blasted island before that blood-curdlin' combination of a toothless rhinoceros an' a devilfish gets her deadly tentacles around me an' drags me down into th' black sea of squawtrimony. You may think it wasn't nothin' to get such frozen feet about—but if you ever have a Queen Tillafagafanouck come sailin' after you——

A few days later, as I finishes settin' up th' main alternators an' begin assemblin' th' transmitter-panel, I observes that all th' squaws an' dirty-faced kids up in th' village are embellishin' th' walls an' roof of th' soul-savin' hangout with fresh green spring-alder branches. That night, while I am tollin' by electric light, throwin' condensers, synchronous-gap, and send-in'-transformer into workin' relations, all of a sudden I feels somethin' like a cold steel blade stickin' me in th' back, an' jerkin' around quick I finds th' Queen 'a Darkness is standin' in th' door, smilin' at me as beautiful as a starvin' timber-wolf.

"Me marry you," she slithers, with th' caressin' tenderness of a female gorilla, as I stands froze to th' spot with the rotary-gap disk in one hand and a crescent wrench in th' other. "Tomorrow night!"

That evening I don't stop work at midnight. In fact, I never stop no more at all. After that it's just one wild dash, slingin' together receivin'-gear, audions, aerial-switch, sendin'-key, voltmeters, rheostats, lead-in, all flyin' around in one mad tangle of wires, tape, an' tools. As darkness comes again and I sees all th' village turnin' out dolled up in their Sunday's-best fur-hides an' beginnin' a bonfire parade beatin' on pots, kettles, an' dish-pans, I have already throwed the transmitter into some kind of tune an' got hold of th' government Bering Sea patrol, **"Seals Protector."**

"Come full speed fer Ouglamuck!" I whoops on th' key, th' minute I makes connection. "There's a fleet of fifteen Jap seal-poachers showed up ten miles off th' island—make a dash before they get away with every fur-seal in th' place!"

Of course this is a big lie, th' only Jap in sight bein' Fried-Beans Mino, th' codfishermen's cook, but I figures that anything is justified in such a emergency as this. Before I can hear th' cutter's answer, a dark icy chill slowly settles over th' shack like the cold dead breath of th' Arctic; an' glidin' in through th' door with th' slitherish stealth of a scaly poison snake comes Queen Tillafagafanouck, dressed in flowin' Siwash weddin'-robes of red-fox fur, and a wreath of green alder sprigs droopin' around her cranium

"Come!" she commands in a blood-freezin' yowl, like a bloodhound at th' throat of an escaped convict. "Me marry——"

But I never hears th' rest, because I crashes out through th' window like I was th' projectile of a German seventy-mile gun, an' makes one headlong leap down th' half-mile trail to th' beach, intendin' to grab a dory or a rowboat, or a piece 'a plank, or anything—but down at th' wharf, I finds Double-Cross waitin' in a power-boat with th' engine runnin' an' all set to go.

"You're a friend in need, Picketts!" I pants, as I swoops aboard in one flyin' dive. "Shove off!"

Early next morning, we meets th' **"Seals Protector"** twenty miles off th' island. Bidding good-bye to my one best friend, Picketts, I gets aboard; and when I feels th' good old ship's deck under me, I collapses with pure relief. Th' next day, when th' cutter is already half-way to Unalaska, I starts explainin' things to th' captain.

"I downed that fire-belchin' fish-boss, Big-Gun Beardsley, easy enough," I says, "but when that Queen Tillafascratchalot——"

"Big-Gun Beardsley!" exclaims th' grizzled old skipper of th' **"Seals Protector,"** surprised-like. "Big-Gun Beardsley is not the fish-boss at Ouglamuck,—he's only a common ornery Alaska bad man. The boss' name is Picketts—Double-Cross they call him. Queen Tillifagafanouck is his wife."

"Well, of all tha—" I begins—but it's no use puttin' down what I said after that, because I know th' editor won't print it, anyway.

N. B.—The falling of the wireless mast related above—except that the real cause of the accident is still a mystery—is a true incident, which happened to the author while constructing the radio station at Pirate Cove, Alaska, (KOXN). I actually fell over 70 feet onto frozen ground, and regained consciousness several hours later uninjured, except for a blood-blister under one finger-nail—to the vast chagrin of some of my sourdough friends. The inhabitants of the Shumagin Islands regard my escape as a miracle—which it undoubtedly was.

V. G. M.

RADIO MARKER BEACONS

(Continued from Page 13)

keeper will hear the voice of any pilot who calls. To reply, the keeper shuts down the marker code signal and operates his transmitter as a radiophone. All of the intermediate airway radio stations use the same frequency, 287 kilocycles, for voice transmission, their range being small enough that there is no interference. Voice can be transmitted a little farther than the marker signals. Communication has been established over distances as great as 30 miles, and the stations are always reliable up to about 10 miles on voice.

It may happen that the keeper has a message for a pilot, and that he hears or sees the aircraft but gets no call from it. (He knows when to expect the craft, having received previous position reports by teletypewriter.) In this event he shuts down the marker signal as an indication that he wishes the pilot to call him. In most cases, however, it is on the initiative of the pilot that a conversation is begun.

Weather Information Available

If a need for weather information has prompted the airman to get in touch with the intermediate landing field, the keeper has available a current report, as this material is received over the teletypewriter hourly. Emergency messages from a dispatcher may go to the pilot via teletypewriter and radio, and a reply made in the same way.

During the conversation the keeper may ask the pilot at what altitude he is flying, and what his judgment is as to the height of the ceiling. This information is helpful to the keeper in making his next report by teletypewriter as to the ceiling height.

The voice feature of the intermediate airways radio station takes on an added significance when weather is unsettled. Intermittent rain or snow squalls present difficulties that are augmented by the uncertainty in the pilot's mind as to when he may run into one. The caretaker, who has current information as to the progress of the storms, can advise the pilot to vary his course a few miles to avoid a squall. Thus the pilot may fly from one radio station to the next, conversing both with the radio communication and intermediate stations to find where he should fly to take advantage of the best weather.

Again, when weather closes in so that the pilot finds he will have to land at the intermediate field, the radio offers further assistance. If the ceiling has lowered to such an extent that the pilot cannot see the field until he is very close to the ground, the keeper will listen for his engine to tell the pilot, by radio, when he is in a position to proceed with his landing maneuver.

Class B Stations

The class B intermediate airway radio station has a somewhat greater range than does the class A. Its miniature radio range signals may be heard up to 50 miles and voice transmission is effective about the same distance.

The radiotelephone features of the class B station are virtually the same as that of the class A type. The foregoing account of radiotelephone communication carried on by class A stations applies also to class B, and the latter is more effective in this respect because of its greater range.

Directional guidance is furnished by the radio range, which takes the place of the simple location signal transmitted by the class A station. Except for the lower power and consequent smaller range, the miniature radio range beacon of the intermediate airways station is exactly like the larger radio range beacon utilized to mark the airway course.

It transmits the standard "off course" signals "dash, dot" (Morse N), and "dot, dash" (Morse A), at the rate of 22 signals per minute in groups of four. "On course" is indicated by the interlocking of the "off course" signals, which forms a series of long dashes, or continuous monotone signal. For this emergency requirement of the B type markers the signals are transmitted on 278 kilocycles.

The pilot, picking up the signals of the radio range, may follow them to their source at the intermediate field to make a landing, or he may fly to the field only to pass over it and determine his exact position when flying in or above clouds. He knows when he is passing over the beacon because there is a cone of silence immediately above the antenna. When the signals cease momentarily and then resume, the pilot knows that he has passed through the "cone of silence." Knowing the location of the transmitter, or finding it on his map, he is able to ascertain the position of his craft.

The miniature ranges are operated upon request, and the keepers at the intermediate fields where they are located maintain a radio watch on the calling frequency of the airway when the PX (position reporting) message of the teletypewriter indicates a flight over the airway requiring a radio watch.

The six stations now in operation with miniature radio ranges are at Archbold, Ohio, and Goshen, Ind., on the Chicago-New York airway; Donner Summit, Calif., on the San Francisco-Salt Lake City airway; Knight, Wyo., Medicine Bow, Wyo., and Sidney, Nebr., on the Salt Lake City-Omaha airway.

OPPORTUNITY KNOCKS BUT ONCE

Today is OUR **day.**

The passage of the Industry Control Bill is a BREAK for the radio operator. This bill gives the government an inconceivable degree of control over industry and compels employers to negotiate with representatives of labor, in short with labor organizations.

For the first time by statutory enactment, workers in industry are **guaranteed** the unrestricted right to join a union of their craft and to bargain collectively with their employers through representatives of their own choosing upon questions of wages, hours, and conditions of employment. This right, although heretofore conceded in theory, has in actual practice been denied the workers in many industries. Millions of wage earners are eager to enroll in their trade union organizations so that the machinery of collective bargaining can be immediately perfected.

This is OUR opportunity to gain aid and recognition of our pleas. In no other field of industry is this form of recognition of employees more needed than in our own.

Are you READY to cooperate?

Are you PREPARED to take advantage of this CHANCE?

Workers in other professions are losing no time in making ready to gain concessions. In the past three weeks, the workers in the coal mining industry, who anticipated the passage of this act, have shown that they expect to gain results; 135,000 men have enrolled in this union in that length of time.

Are we less progressive than they?

Veteran Wireless Operators Association News

"RADIO HEROES PAID TRIBUTE"

In conjunction with the observance of one minute of silence by radio communication stations throughout the world, Memorial Day services were held at the Radio Operators' Monument located at Battery Park, New York, N. Y.

Exactly at one minute to twelve Eastern Standard Time, Mr. V. H. C. Eberlin, 2d, Treasurer of the Veteran Wireless Operators Association, addressed a gathering of more than 100 persons, bringing to their attention the honor being paid to deceased members of the radio profession who died at their post of duty, after which Rev. A. W. Allen, Chaplain of the Seamen's Institute, led the congregation in prayer. A short talk by Mr. H. S. Haddock, President of the American Telegraphists' Association, followed, at which time wreaths were placed upon the monument.

Chaplain Allen summed up the services with an address eulogizing the radio operator and mariner in general.

Representatives from various communication companies and newspapers were present as well as brother members of both associations and other old time radio operators.

Mr. F. Muller, President of the Veteran Wireless Operators' Association, although being unable to attend this year's services, had previously completed the arrangements. Mr. Muller and a gathering of friends paid tribute by observation of one minute silent period at his summer estate.

BOOKS.....

EVERY RADIO MAN WANTS.

FIRST PRINCIPLES OF TELEVISION

By A. DINSDALE

Columbia Broadcasting System

Contents

Introduction. Elementary Considerations. Light-Sensitive Devices. Some Early Television Experiments. The Jenkins, Baird and Bell Systems. Methods of Synchronism. Image Structure. Transmission Channels. The Present State of the Art in Germany, in England and in America. Mechanical Systems. Cathode Ray Systems. Conclusions. Index.

241 pages 5½x8½ **$3.50**

EXPERIMENTAL RADIO ENGINEERING

By JOHN H. MORECROFT

Professor of Electrical Engineering
Columbia University

"Students of radio and those interested in reducing to practice their theoretical knowledge of radio will find this last book of Morecroft's of great value."—Journal of Western Society of Engineers.

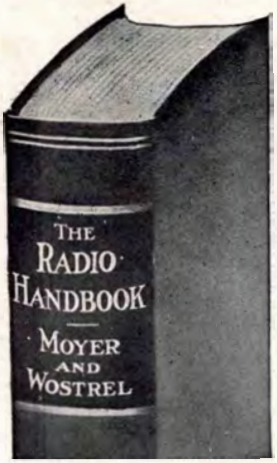
345 Pages 6x9 Price $3.50

RADIO AND ELECTRONIC DICTIONARY.

By Harold P. Manly. 300 Pages. Size 6x9 inches. 550 Illustrations. Bound in durable cloth with jacket. Price $2.50

DRAKE'S CYCLOPEDIA OF RADIO AND ELECTRONICS

(Fifth Edition of "Drake's Radio Cyclopedia.") By Harold P. Manly. Reference book covering radio transmission and reception, sound pictures, public address systems, television, photocells, and all other subjects which pertain to the electronic tube. 1048 pages. Size 6x9 inches. Price $5.00



MOYER & WOSTREL

Radio Handbook

Including Television and Sound Motion Pictures by James A. Moyer, Director of University Extension, Massachusetts Department of Education; Member of Federal Commission on Radio Education, and John F. Wostrel, Instructor in Radio Engineering and Supervisor in Charge of Industrial Subjects, Division of University Extension, Massachusetts Department of Education. 886 pages, 5½x8½ 650 illustrations, flexible

$5.00

THESE ARE BOOKS YOU NEED

Radio Traffic Manual and Operating Regulations, by Duncan & Drew..	$2.00
How to Pass U. S. Gov't Radio License Examinations, by Duncan & Drew	2.00
Principles of Radio Communication, by J. H. Morecroft	7.50
Elements of Radio Communication, by J. H. Morecroft	3.06
Radio: Beam and Broadcast, by A. H. Morse	5.00
The Radio Manual, by George E. Sterling	6.00
Photocells and Their Application, by V. K. Zworykin	2.50
Radio Telegraphy and Telephony, by Duncan & Drew	7.50
Principles of Radio, by Keith Henney	3.50
Radio Frequency Electrical Measurements, by Hugh A. Brown	4.00
Radio Engineering, by F. E. Terman	5.00
Practical Radio Telegraphy, by Nilson and Hornung	3.00

We will get any book published or any group of books and ship under one cover, if possible, within 24 hours after receipt of your order. Give complete title and author's name, and if possible publisher. Write your name and address clearly, or print it to make no doubt.

SEND CHECK OR MONEY ORDER ONLY. DO NOT SEND CASH

BOOK DEPARTMENT, CQ MAGAZINE CO.,

112 West 13th Street **New York, N. Y.**