HOW DID THEY LEARN THE MORSE CODE

As a collector of telegraphy equipment from (mainly) the 19th century, I show in this article some of the equipment and methods that, long ago, were used to teach and/or to learn Morse code. At the end of it, I added a little bit about learning Morse code today, up to and including the use of the PC.

1. OLD SYSTEMS

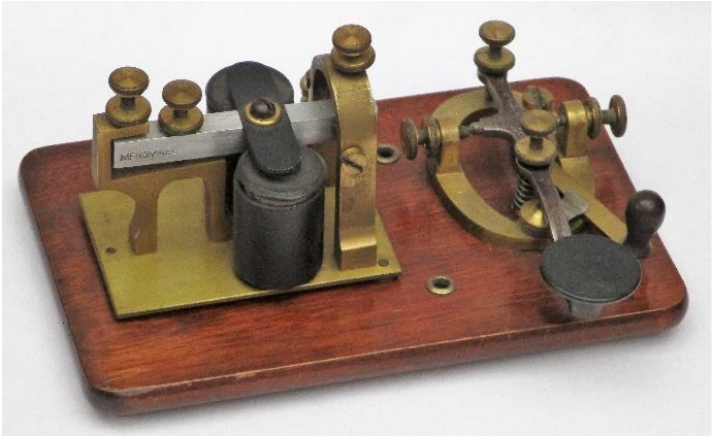
Note: The 'learning aids' that I present here were once part of my collection. (This can be a collection domain in itself…)

1.1. "Learner Sets"

The first of these sets may date from 1849 and included a complete telegraph key and a separate sounder mounted onto a single board to allow for greater portability. By the mid-1850s, small pocket sets incorporating a key and relay mechanism came into use as linemen's test sets.

Soon after the Civil War, manufacturers introduced a new class of instruments specifically targeting aspiring telegraphers. Initially termed "Learner Sets," "Learners Outfits," or "Learners Apparatus", these devices consisted of an inexpensive key and a sounder mounted on the same base. Today, many of these sets are referred to more generally as key-on-board sets, or KOBs.

Menominee



Bunnell

As Learners Sets, private line sets and other KOBs achieved greater acceptance, manufacturers varied their styles, materials, intended durability, and artistic design to meet the needs of their customers. A wide variety of KOBs were designed, not only for use at home, but also in business circuits, or in commercial telegraph offices. Hereby three of my KOB's.

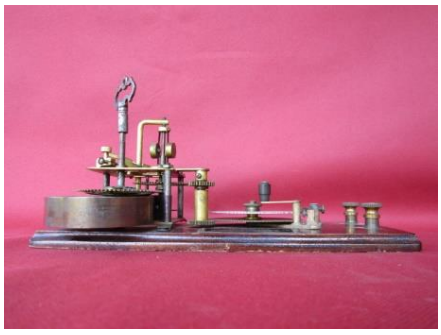
Patrick & Carter (Private Line Set)

1.2. The Omnigraph

First of all two models of the company Omnigraph (New York City).

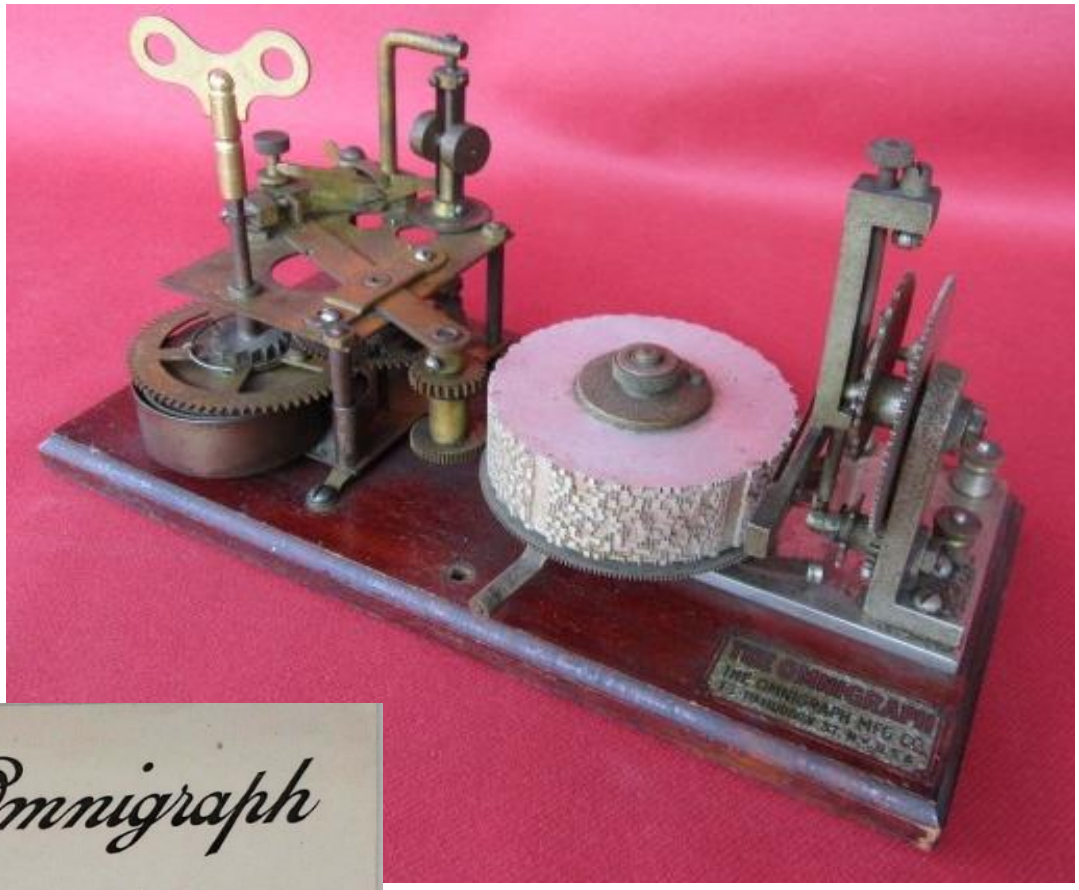
Their first model came out in 1900/1901. This single-disk model included a hand cranked single aluminum disk with a key and sounder mounted as a KOB on a mahogany base. The disk read "JOHN QUICKLY EXTEMPORIZED FIVE TOW BAGS." (*). An optional battery-powered motor and pulley system were also available to rotate the disk making the Omnigraph the first fully automatic training device. It generated code from the movement of an electrical contact that tracked along the raised edge of a flat aluminum disk. As the disk rotated, notches on the rim opened and closed the electrical contact enabling a sounder, buzzer, or headphones to operate.

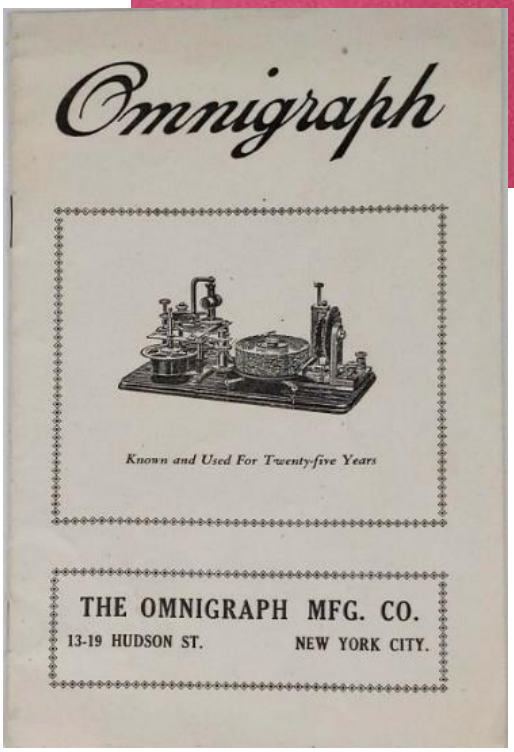
(*) This sentence contains all the letters of the alphabet. Since long it has been replaced by '"THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG"



In a later model several disks were stacked together on a spindle-carrier, which was driven by a "motor." The whole assembly of disks looked like a cylinder with little "bumps" on it. A wide range of speeds from about 5 to over 60 wpm could be set by adjusting the brake on a flyball governor, which held the speed constant after it was set. Each disk had five groups of code characters cut like gear teeth around its periphery, and each group was composed of five characters plus a separating space. A spring-loaded "follower" rode along the edges of the disks, opening and closing the keying contacts.

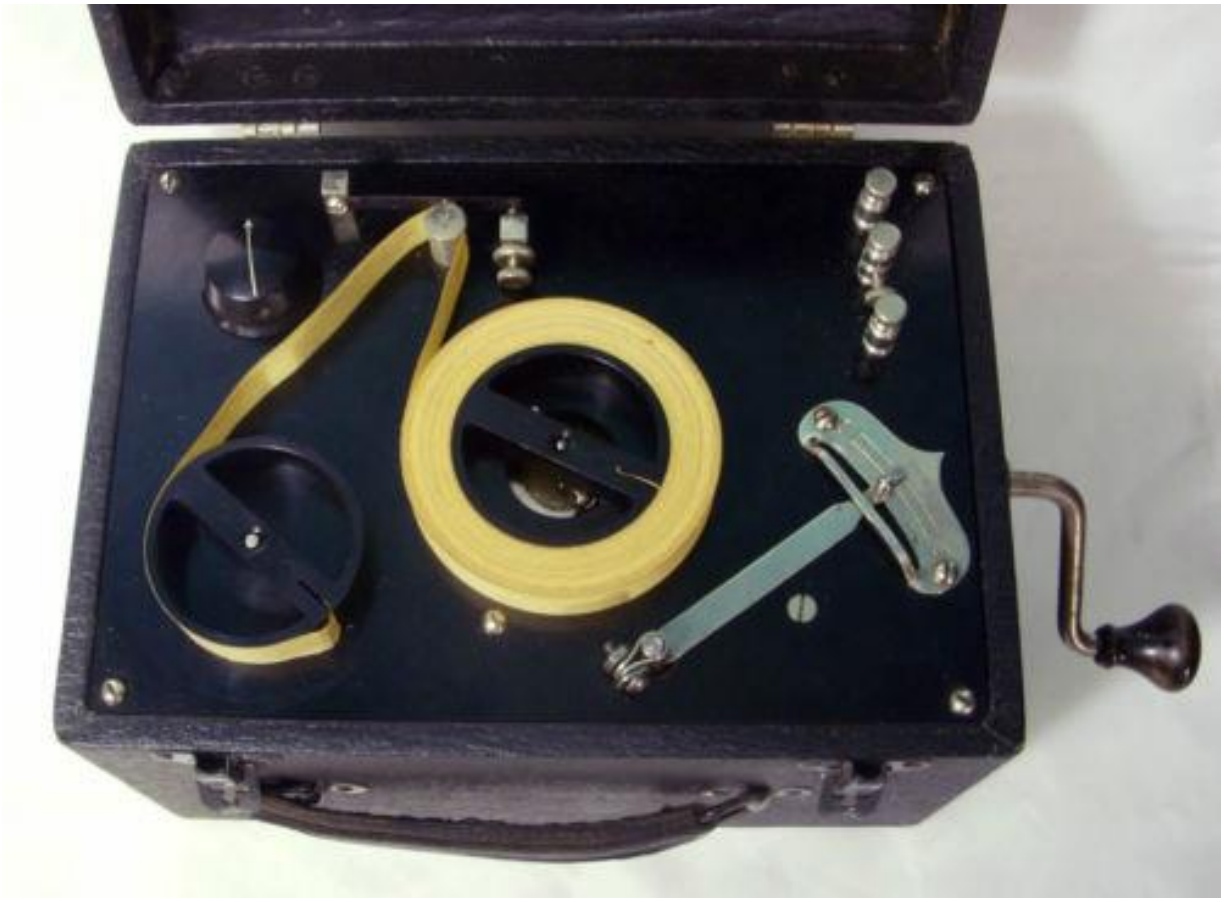
A clever adjustable sequencing mechanism actuated by the rotating disk carrier caused the follower to move up or down at user-selected points during each revolution. Various models provided from five to ten or more disks. By changing the stacking of the disks and by adjusting the sequencing mechanism, the five character groups could be set in many different sequences. There was, however, no way to alter the order of characters within a group, and all keyer-follower movements occurred between groups. These machines were intended for use with a sounder for American Morse or a buzzer or oscillator for International Morse. They seem to have had a very wide usage for basic learning and for developing speed among would-be operators, including amateurs. Advertising often claimed that a month of serious study could qualify an operator for licensing tests. The government licensing authorities also used Omnigraphs to administer the code tests required for operator's licenses at least until 1930.





1.3. The Instruct-O-Graph

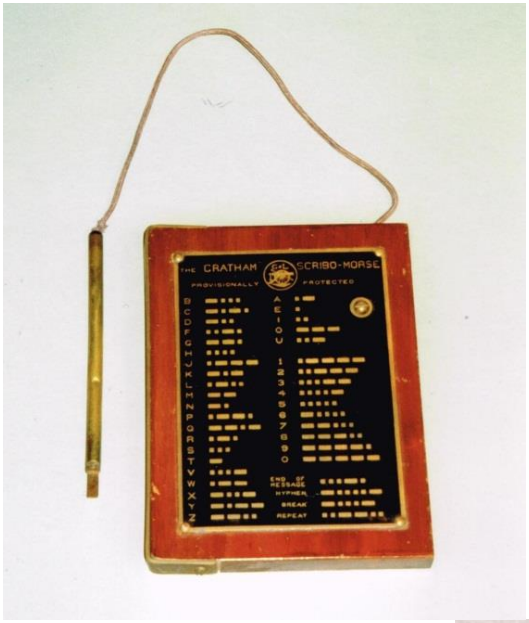
The image shows an ‘automatic’ transmitter that drives a pre-prepared paper tape containing the message in Morse code. It has the typical motor and speed regulator of a gramophone. Speeds ranged from 3-40 words per minute.



1.4. Some others

The little board below is impressed with the Morse code patterns set in metal strips. By sliding over each set of impressions using the metal sensor (as part of a circuit with a battery and receiver), the circuit would be completed, and the user could effortlessly forward the desired Morse signals for letters, numbers, and common abbreviations signalling the end of message, hyphen, break, and repeat.

Shown below is another device in a box that contains metal strips with all the characters of the alphabet in Morse code. The use simply has to slide them, one after the other, over the 'scanner' (the little box at the right-hand side). Cumbersome…



To discover more such devices and tools, I refer you to Tom Perera's great website http://w1tp.com and specifically to the related chapter http://w1tp.com/m3500.htm

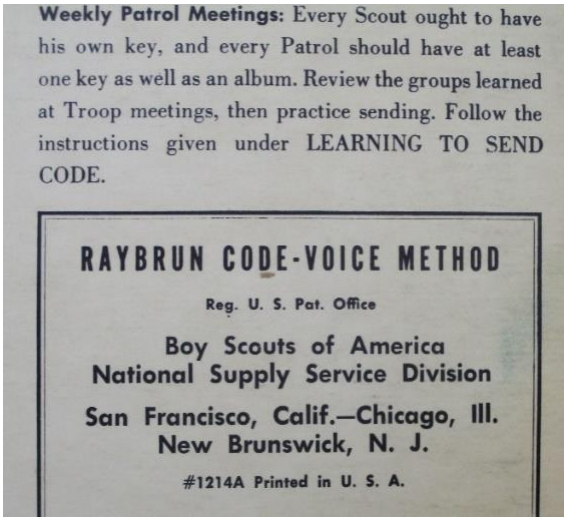
1.5. More tools that could help

There were many other systems; I thought it worthwhile to show some of them as they have a certain charm.

1.5.1. Learning with the aid of a record player

Of all the Morse code training methods, the use of phonograph and tape recordings offered the most easily accessible and least expensive approach for both professional and amateur operators. The growth of the phonograph industry in the early 1900s enabled entrepreneurs to develop training programs that did not require specialized devices like the Omnigraph. Mass production of inexpensive recordings featuring actual Morse code enabled students to learn at home using their home phonograph. The low cost of selling and shipping phonograph records made the development of mail order code training courses possible and increased the selection of training programs available to the public.

- This first one is from the RAYBRUN Company (a **33-1/3** rpm one)


Weekly Patrol Meetings: Every Scout ought to have his own key, and every Patrol should have at least one key as well as an album. Review the groups learned at Troop meetings, then practice sending. Follow the instructions given under LEARNING TO SEND CODE.

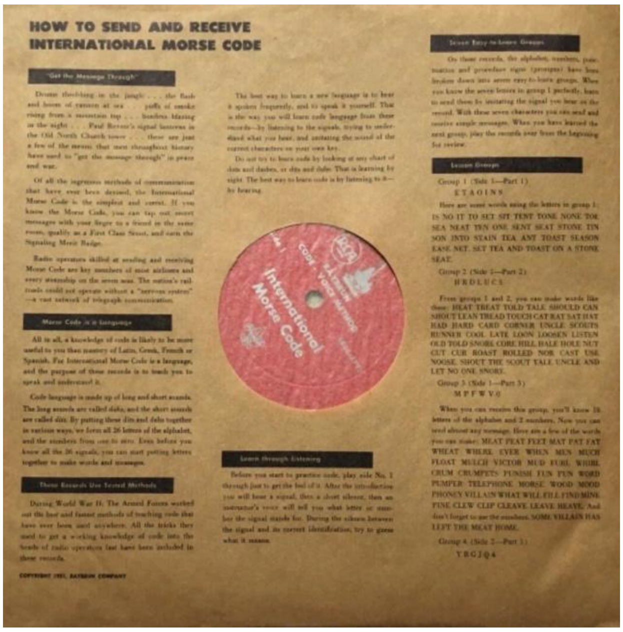
RAYBRUN CODE-VOICE METHOD

Reg. U. S. Pat. Office

Boy Scouts of America
National Supply Service Division

San Francisco, Calif.—Chicago, Ill.
New Brunswick, N. J.

#1214A Printed in U. S. A.



to the signal, then try to imitate it on your key during the following silence.

Take a position at the key that is natural and comfortable for you, modeling yourself after one of these photographs.

All the positions shown illustrate good ways to operate the key. The operator in Figure 1 prefers to send with his index finger on top of the button, using the thumb and third finger as guides at the side. Compare Figure 2, where the index finger slightly overlaps the edge of the key button. In Figure 3, the operator touches the top of the key button with the tips of the first two fingers. The thumb and fourth fingers are at the sides of the button to guide and control it.

Beginning Practice

Begin your practice by sending a series of dits to develop timing and get the feel of the key. Try hard to space the dits equally. In practice, it is important that you copy from the model furnished by the records. Send as smoothly as you can, and increase speed as you feel your muscles limbering up. The dits will be rough and tend to "stutter" if you try to send too fast. When you hit a smooth, steady swing, try a series of I, S, and H.

FIGURE 1

FIGURE 2

FIGURE 3

When you have mastered sending dits, try a string of dahs, again imitating the long sounds you hear on the records. Work on regular spacing, and remember that the space *between* dahs should be no longer than the space between dits. When you are satisfied that your dahs are properly spaced, start imitating the signals in Group 1. In the silence between signal and voice repeat the record signal on your key.

Procedure Signs and Symbols

The traffic in every radio and telegraph net is regulated by certain "traffic rules." These are the procedure signs, called "prosigns" for short, used to call other operators into the net, to identify the sending station, to ask for repeats of messages not clearly received, etc. The few procedure signs you need to know in order to work with a buddy in learning code are given below:

Prosign	Meaning
$\overline{CQ}$	"Are you listening? I want to send a message."
K	"Go ahead—I am ready to receive your message."
$\overline{AS}$	"Wait—I will be ready to finish in a moment."
$\overline{IMI}$	"Repeat."
R	"Message received completely."
$\overline{AR}$	"Signing off—no more traffic."

Notice that prosigns consisting of more than one letter are not spaced, but are run together in one sound. This is the reason for the horizontal line above the printed sign.

Note to Scoutmasters

The following hints are intended to help you use these records when planning a Boy Scout program that features signaling activities.

Troop Meeting

Scoutcraft: Open your first meeting by explaining the Code-Voice Method as described in this album. Play Record 1—Side 1, then repeat the signal part of Side 1 until everyone knows the characters. The Scouts should follow instructions given under HOW TO BEGIN. When everyone knows the characters E T A O I N S, send words made up from these letters.

Proceed group by group in this way. Review the previous groups learned before going on to the next.

Patrol Corner: Review the characters you have learned by practicing with a key, or whistle.

Games: Make a game of learning. Using code in your games will make everyone want to learn. There are a lot of games built around Code. You'll find them in the Handbook for Scoutmasters, Handbook for Boys, Boys' Life, and Scouting.

Weekly Patrol Meetings: Every Scout ought to have his own key, and every Patrol should have at least one key as well as an album. Review the groups learned at Troop meetings, then practice sending. Follow the instructions given under LEARNING TO SEND CODE.

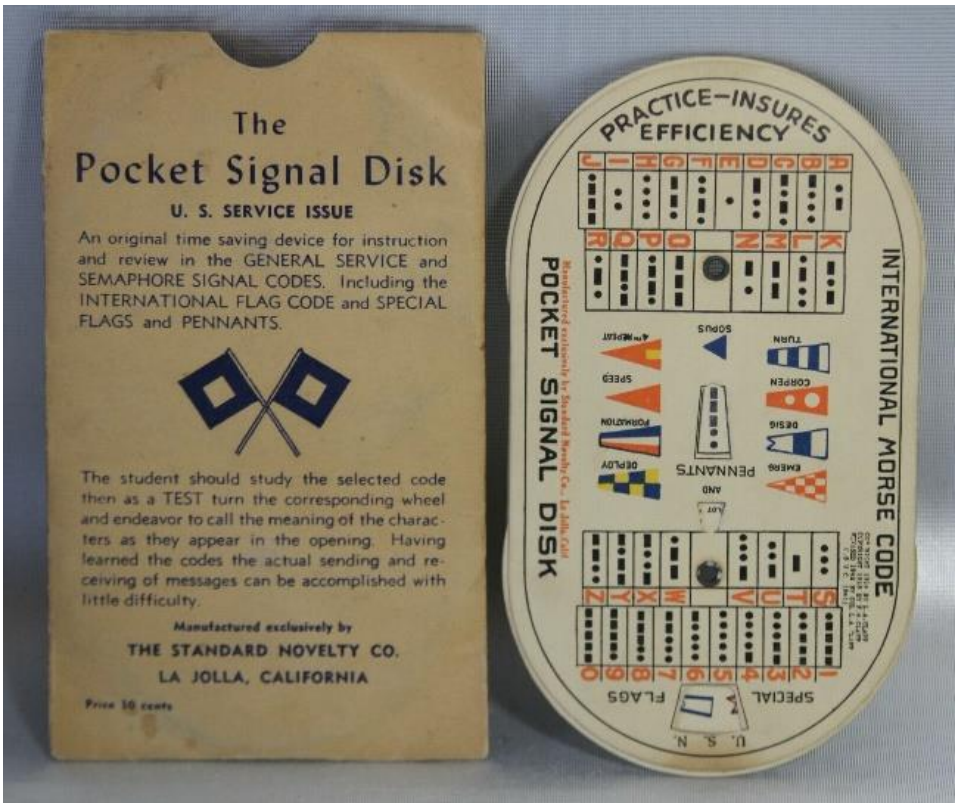
RAYBRUN CODE-VOICE METHOD
Reg. U. S. Pat. Office
National Supply Service Division
Boy Scouts of America
2 Park Avenue
New York 16, N. Y.

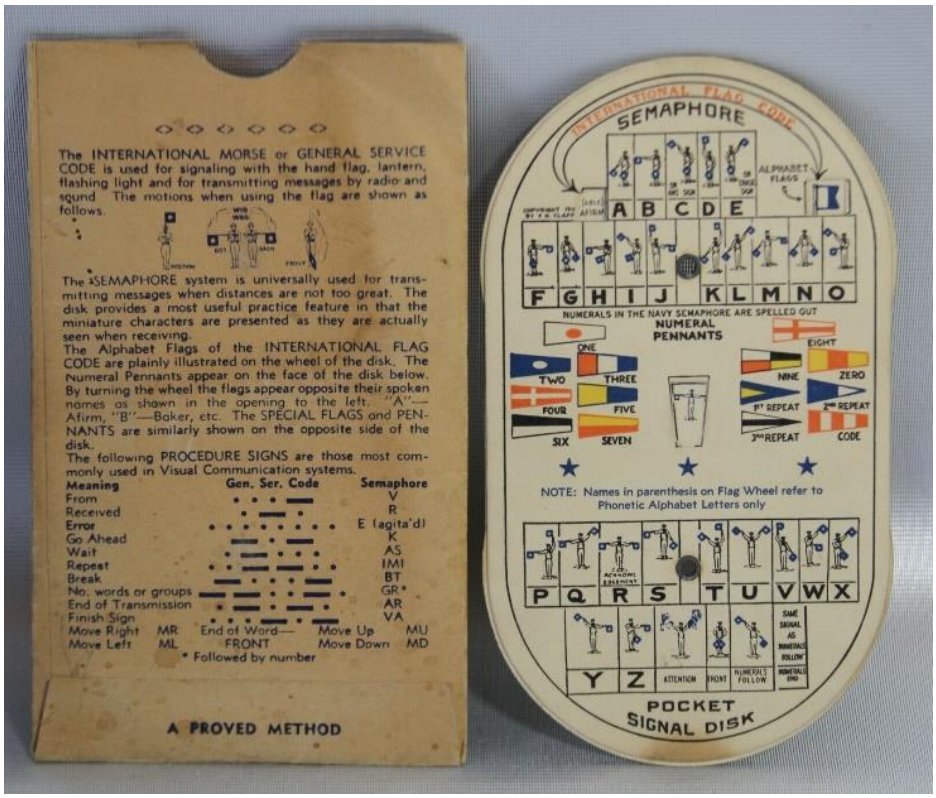
- Here a **78** rpm French record to learn Morse code.

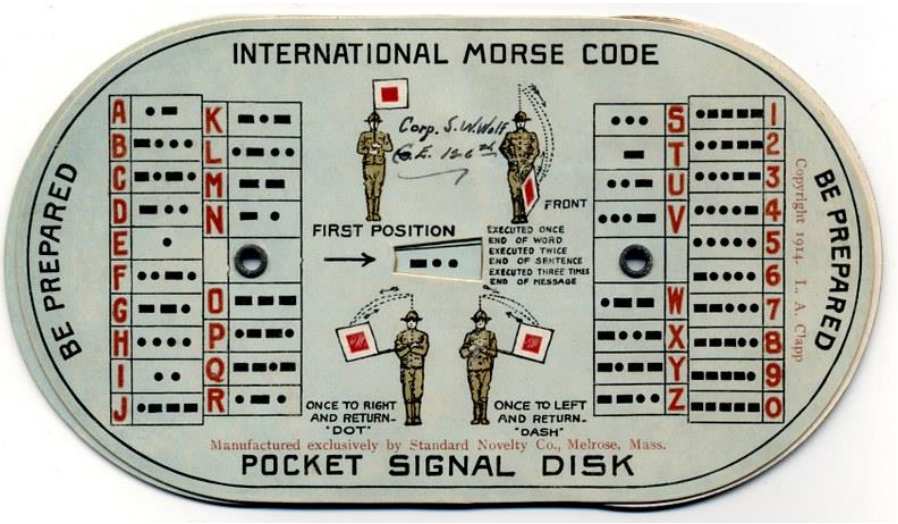
They came in sets of 10, each record with an increased level of difficulty. This one is from the ‘ECOLE CENTRALR-TSF’‘The name is well chosen: “The tireless Professor”.

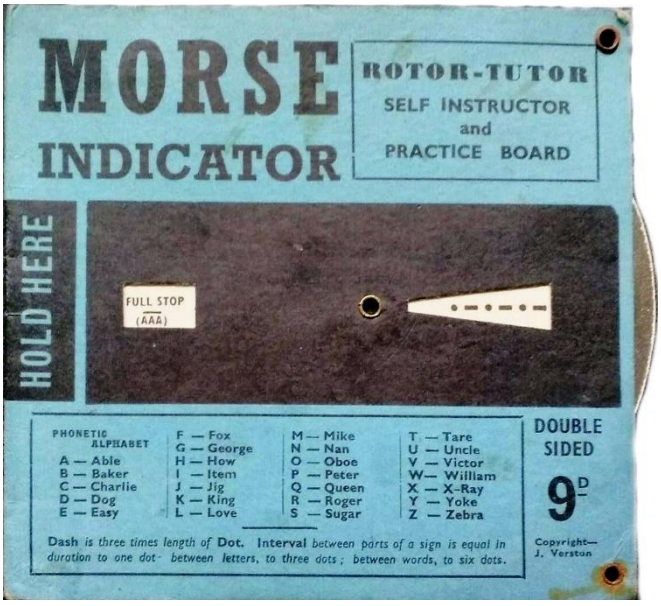
- And the next one (**33-1/3** rpm) came together with the written training course by ‘Dr. BLAN’; a well-known Dutch author in the 1950s.

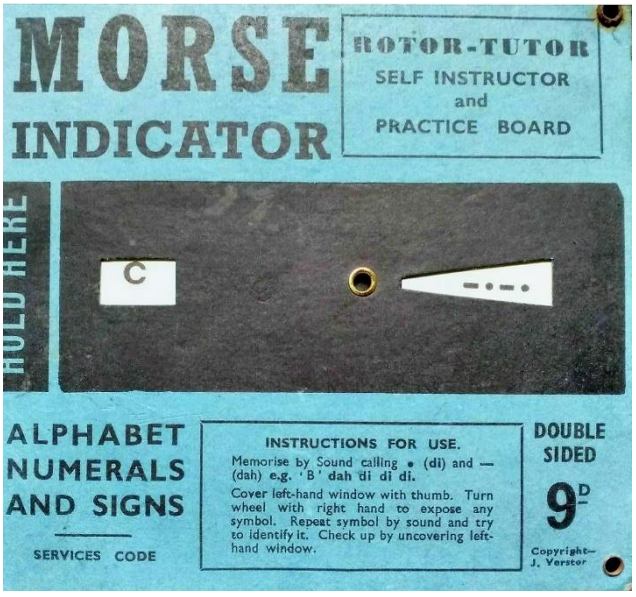
1.5.2. “ Signal Disks”





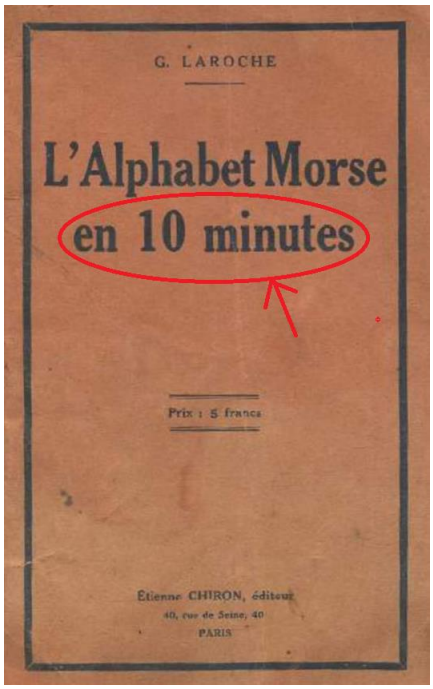

INTERNATIONAL MORSE CODE
BE PREPARED
BE PREPARED
A ·—
B —···
C —·—·
D —··
E ·
F ··—·
G ——·
H ····
I ··
J ·———
K —·—
L ·—··
M ——
N —·
O ———
P ·——·
Q ——·—
R ·—·
S ···
T —
U ··—
V ···—
W ·——
X —··—
Y —·——
Z ——··
1 ·————
2 ··———
3 ···——
4 ····—
5 ·····
6 —····
7 ——···
8 ———··
9 ————·
0 —————
Corp. S. W. Wolf
Co. E. 126th
FRONT
FIRST POSITION
EXECUTED ONCE END OF WORD
EXECUTED TWICE END OF SENTENCE
EXECUTED THREE TIMES END OF MESSAGE
ONCE TO RIGHT AND RETURN- "DOT"
ONCE TO LEFT AND RETURN- "DASH"
Copyright 1944. L. A. Clapp
Manufactured exclusively by Standard Novelty Co., Melrose, Mass.
POCKET SIGNAL DISK

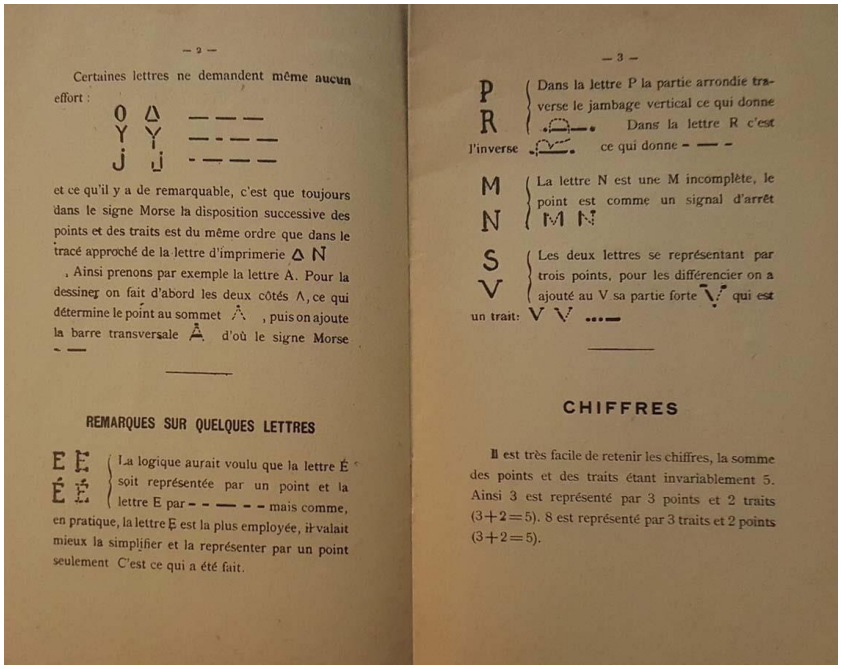

MORSE
INDICATOR
ROTOR-TUTOR
SELF INSTRUCTOR
and
PRACTICE BOARD
HOLD HERE
FULL STOP
(AAA)
PHONETIC ALPHABET
A — Able
B — Baker
C — Charlie
D — Dog
E — Easy
F — Fox
G — George
H — How
I — Item
J — Jig
K — King
L — Love
M — Mike
N — Nan
O — Oboe
P — Peter
Q — Queen
R — Roger
S — Sugar
T — Tare
U — Uncle
V — Victor
W — William
X — X-Ray
Y — Yoke
Z — Zebra
Dash is three times length of Dot. Interval between parts of a sign is equal in duration to one dot · between letters, to three dots ; between words, to six dots.
DOUBLE SIDED
9D
Copyright— J. Verston

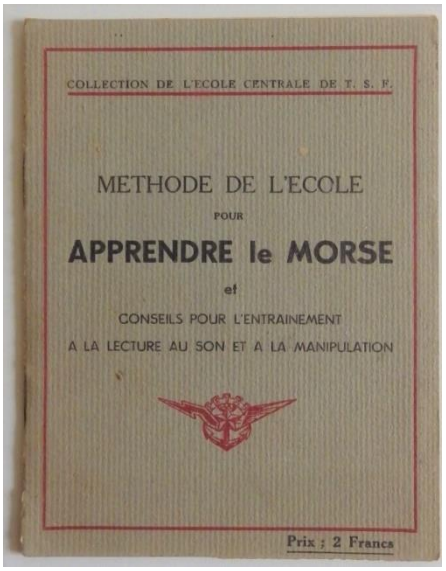

MORSE
INDICATOR
ROTOR-TUTOR
SELF INSTRUCTOR
and
PRACTICE BOARD
HOLD HERE
C
ALPHABET
NUMERALS
AND SIGNS
SERVICES CODE
INSTRUCTIONS FOR USE.
Memorise by Sound calling • (di) and — (dah) e.g. 'B' dah di di di.
Cover left-hand window with thumb. Turn wheel with right hand to expose any symbol. Repeat symbol by sound and try to identify it. Check up by uncovering left-hand window.
DOUBLE SIDED
9D
Copyright— J. Verstor

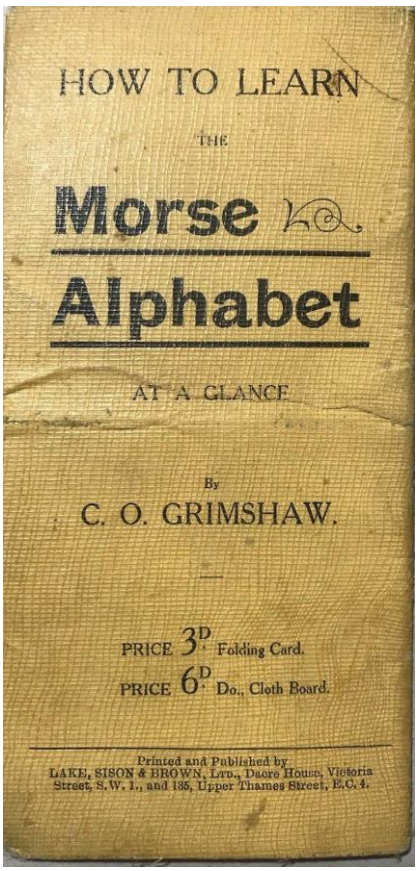
1.5.3. Old booklets

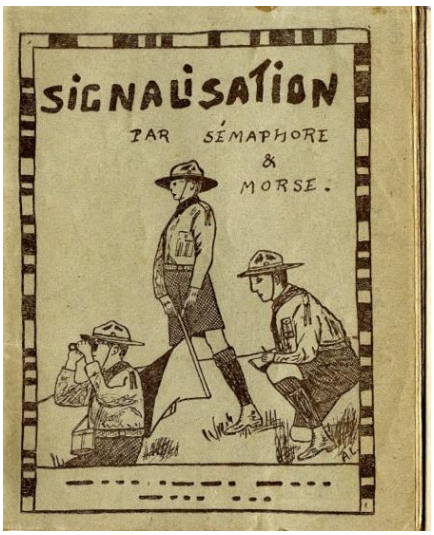
And in how many minutes did you learn the Morse code??

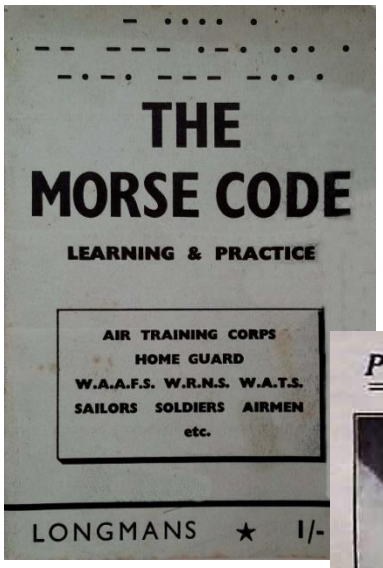


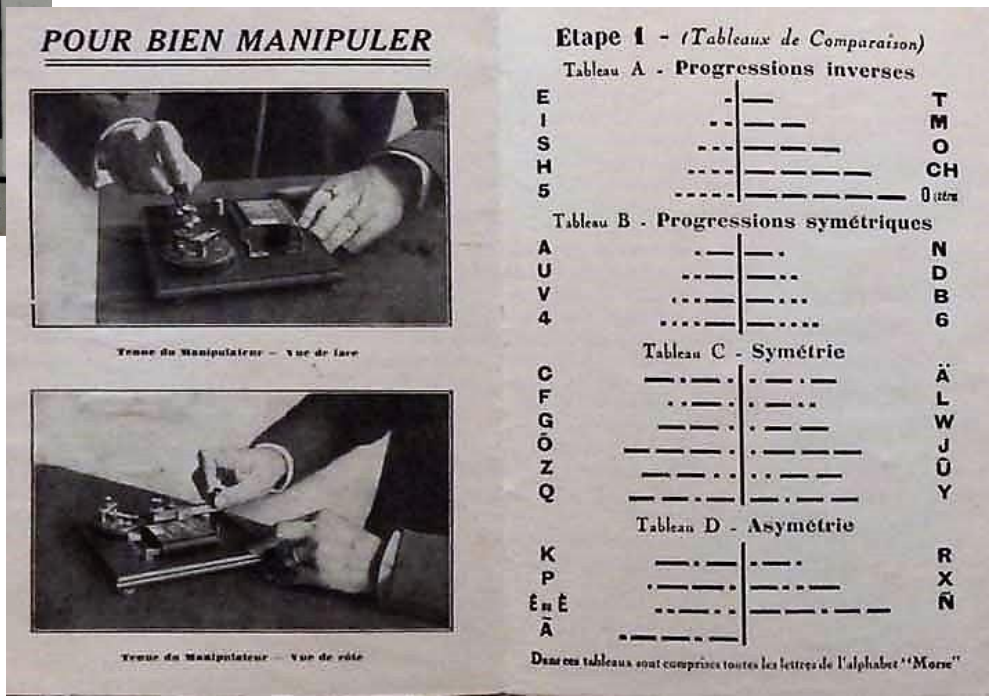


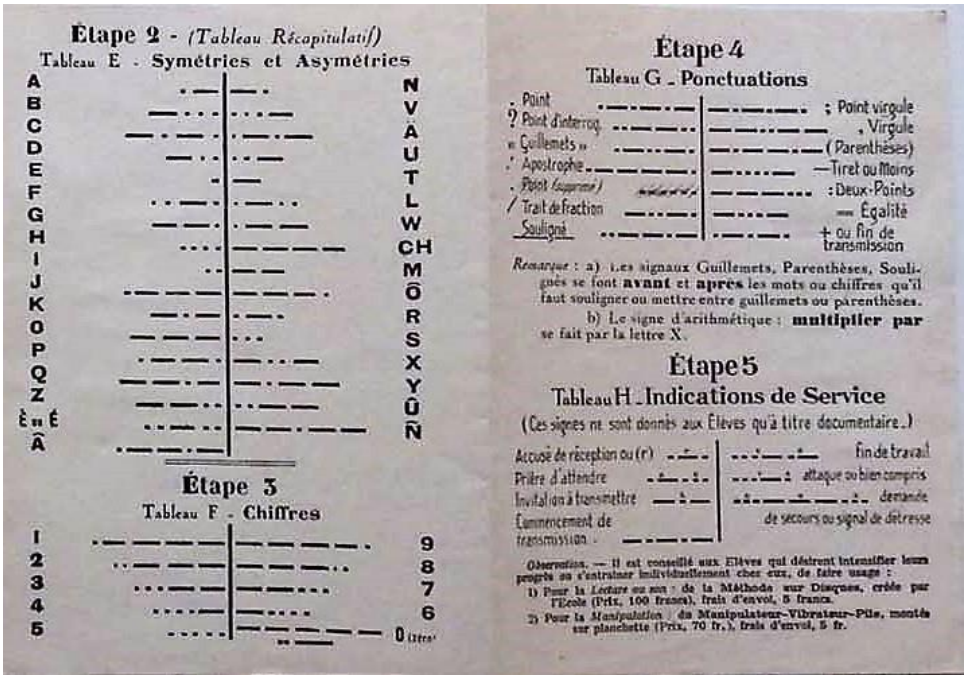


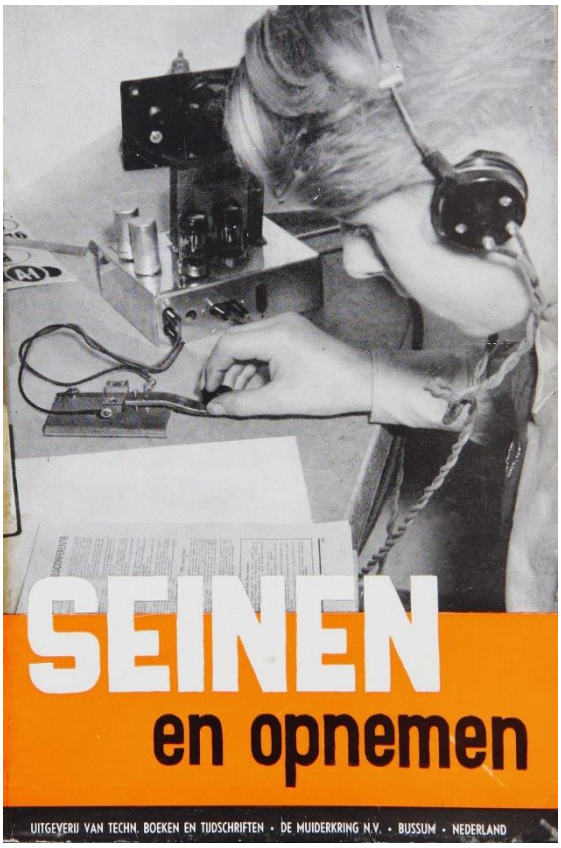


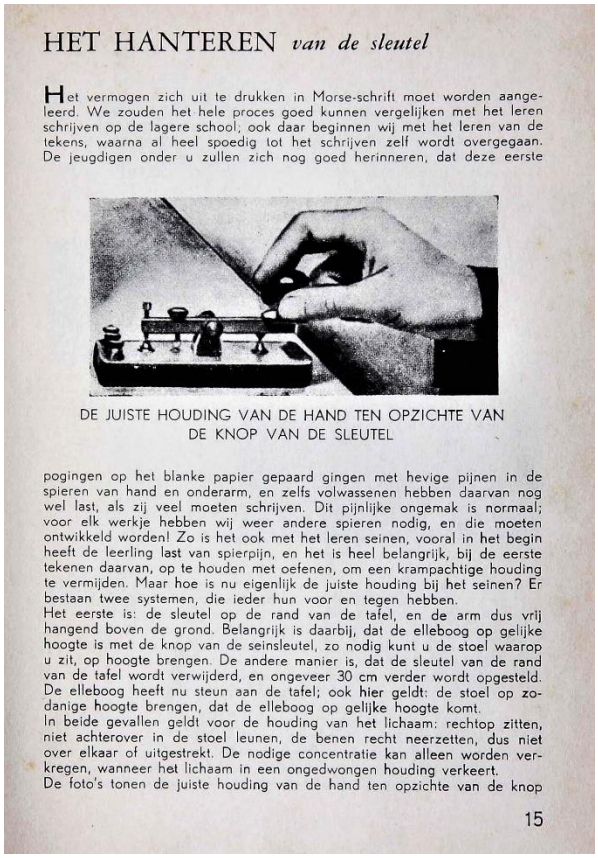



THE
MORSE CODE
LEARNING & PRACTICE
AIR TRAINING CORPS
HOME GUARD
W.A.A.F.S. W.R.N.S. W.A.T.S.
SAILORS SOLDIERS AIRMEN
etc.
LONGMANS ★ 1/-


POUR BIEN MANIPULER
Tenue du Manipulateur — Vue de face
Tenue du Manipulateur — Vue de côté
Etape 1 - (Tableaux de Comparaison)
Tableau A - Progressions inverses
E I S H 5 T M O CH 0 (zéro)
Tableau B - Progressions symétriques
A U V 4 N D B 6
Tableau C - Symétrie
C F G Ô Z Q Ä L W J Û Y
Tableau D - Asymétrie
K P È ou É Â R X Ñ
Dans ces tableaux sont comprises toutes les lettres de l'alphabet "Morse"


Etape 2 - (Tableau Récapitulatif)
Tableau E - Symétries et Asymétries
A B C D E F G H I J K O P Q Z È ou É Â
N V Â U T L W CH M Ô R S X Y Û Ñ
Etape 3
Tableau F - Chiffres
1 2 3 4 5
9 8 7 6 0 (zéro)
Etape 4
Tableau G - Ponctuations
. Point
? Point d'interrog.
« Guillemets »
' Apostrophe
- Point (soupirez)
/ Trait de fraction
Souligné
; Point virgule
, Virgule
(Parenthèses)
— Tiret ou Moins
: Deux-Points
= Egalité
+ ou fin de transmission
Remarque : a) Les signaux Guillemets, Parenthèses, Soulignés se font avant et après les mots ou chiffres qu'il faut souligner ou mettre entre guillemets ou parenthèses.
b) Le signe d'arithmétique : multiplier par se fait par la lettre X.
Etape 5
Tableau H - Indications de Service
(Ces signes ne sont donnés aux Elèves qu'à titre documentaire.)
Accusé de réception ou (r)
Prière d'attendre
Invitation à transmettre
Commencement de transmission
fin de travail
attaque ou bien compris
demande de secours ou signal de détresse
Observation. — Il est conseillé aux Elèves qui désirent intensifier leurs progrès de s'entraîner individuellement chez eux, de faire usage :
1) Pour la Lecture au son : de la Méthode sur Disques, créée par l'Ecole (Prix, 100 francs), frais d'envoi, 5 francs.
2) Pour la Manipulation : du Manipulateur-Vibreur-Pile, monté sur planchette (Prix, 70 fr.), frais d'envoi, 5 fr.





HET HANTEREN *van de sleutel*

Het vermogen zich uit te drukken in Morse-schrift moet worden aangeleerd. We zouden het hele proces goed kunnen vergelijken met het leren schrijven op de lagere school; ook daar beginnen wij met het leren van de tekens, waarna al heel spoedig tot het schrijven zelf wordt overgegaan. De jeugdigen onder u zullen zich nog goed herinneren, dat deze eerste

DE JUISTE HOUDING VAN DE HAND TEN OPZICHTE VAN DE KNOP VAN DE SLEUTEL

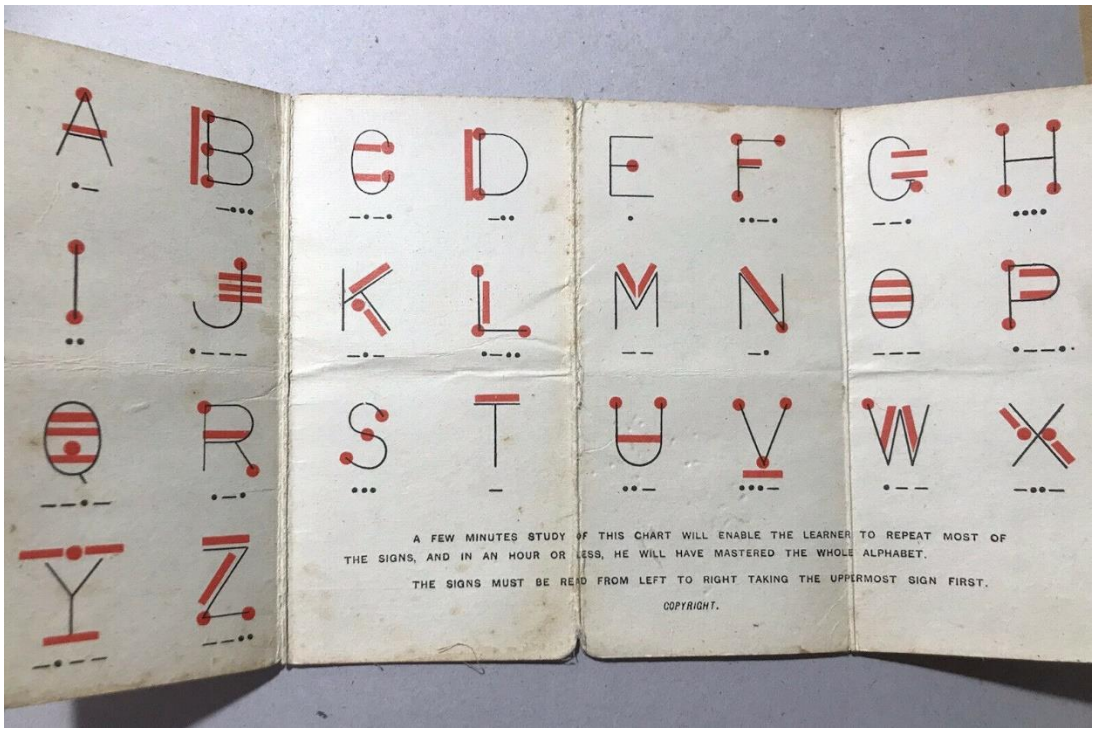
pogingen op het blanke papier gepaard gingen met hevige pijnen in de spieren van hand en onderarm, en zelfs volwassenen hebben daarvan nog wel last, als zij veel moeten schrijven. Dit pijnlijke ongemak is normaal; voor elk werkje hebben wij weer andere spieren nodig, en die moeten ontwikkeld worden! Zo is het ook met het leren seinen, vooral in het begin heeft de leerling last van spierpijn, en het is heel belangrijk, bij de eerste tekenen daarvan, op te houden met oefenen, om een krampachtige houding te vermijden. Maar hoe is nu eigenlijk de juiste houding bij het seinen? Er bestaan twee systemen, die ieder hun voor en tegen hebben.
Het eerste is: de sleutel op de rand van de tafel, en de arm dus vrij hangend boven de grond. Belangrijk is daarbij, dat de elleboog op gelijke hoogte is met de knop van de seinsleutel, zo nodig kunt u de stoel waarop u zit, op hoogte brengen. De andere manier is, dat de sleutel van de rand van de tafel wordt verwijderd, en ongeveer 30 cm verder wordt opgesteld. De elleboog heeft nu steun aan de tafel; ook hier geldt: de stoel op zodanige hoogte brengen, dat de elleboog op gelijke hoogte komt.
In beide gevallen geldt voor de houding van het lichaam: rechtop zitten, niet achterover in de stoel leunen, de benen recht neerzetten, dus niet over elkaar of uitgestrekt. De nodige concentratie kan alleen worden verkregen, wanneer het lichaam in een ongedwongen houding verkeert.
De foto's tonen de juiste houding van de hand ten opzichte van de knop

15

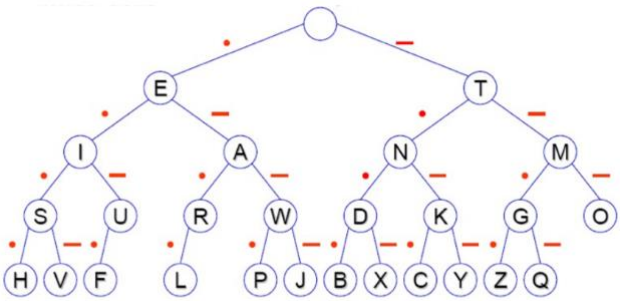
This booklet was published by the Dutch company 'DE MUIDERKRING'. Their publications and other initiatives, and also their employee/author 'Dr. VLAN (see is training record at page 8)', were very popular in the Netherlands and Belgium (Flanders) in the 1950s. I myself bought my first mail order training radio course as well as my first radio construction kit from De Muiderkring.

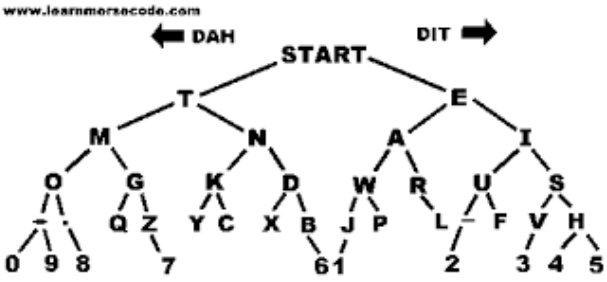
1.4.4. Tools to memorize the code and ‘decoder charts’

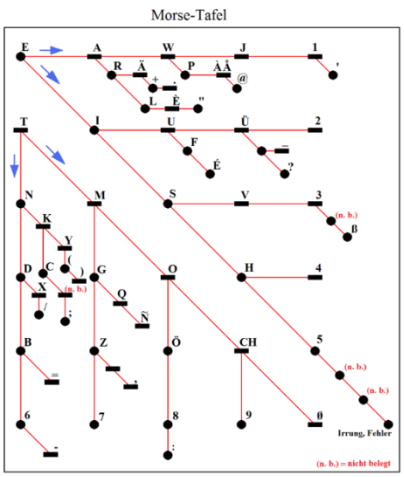
The ‘tool’ shown below, the “Lord Baden Powell’s Morse Code Mnemonic Chart”, is farfetched! It was published in the ‘Girls Guide Handbook’ in 1918.



Some ‘decoder charts

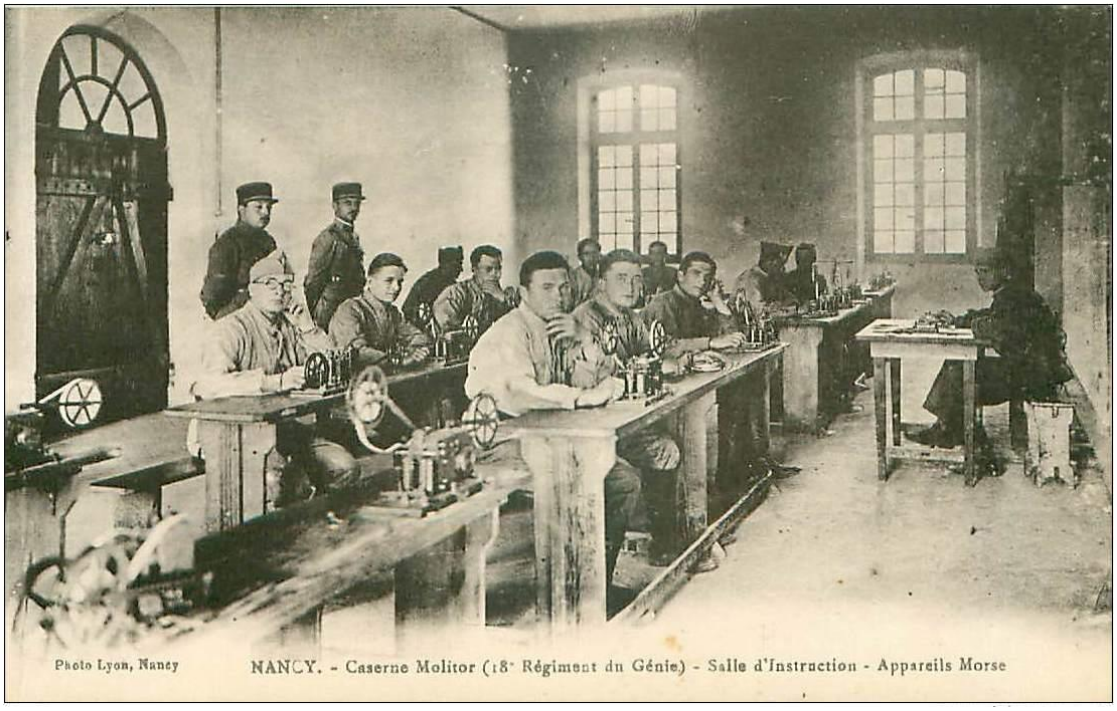






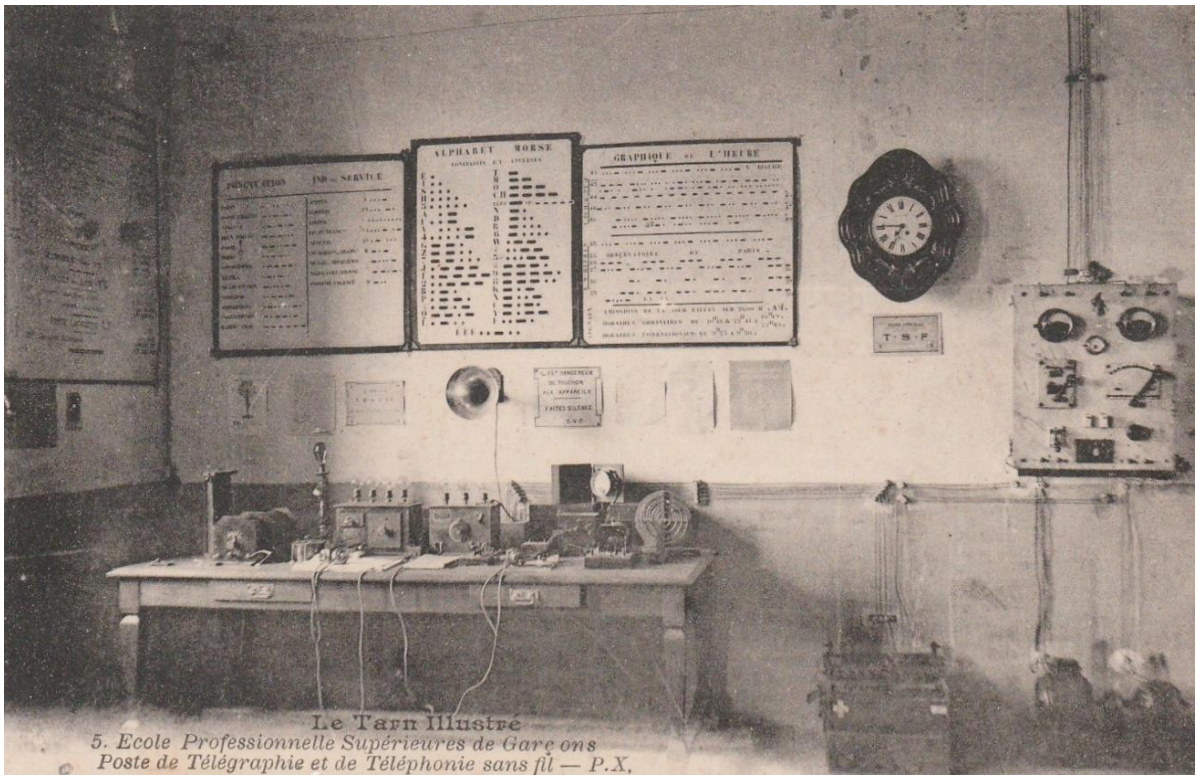
1.4.5. Learned in a classroom

Young soldiers learning Morse code, using landline registers. Left in Nancy (FR); right in Vilvoorde(B) [dates unknown]

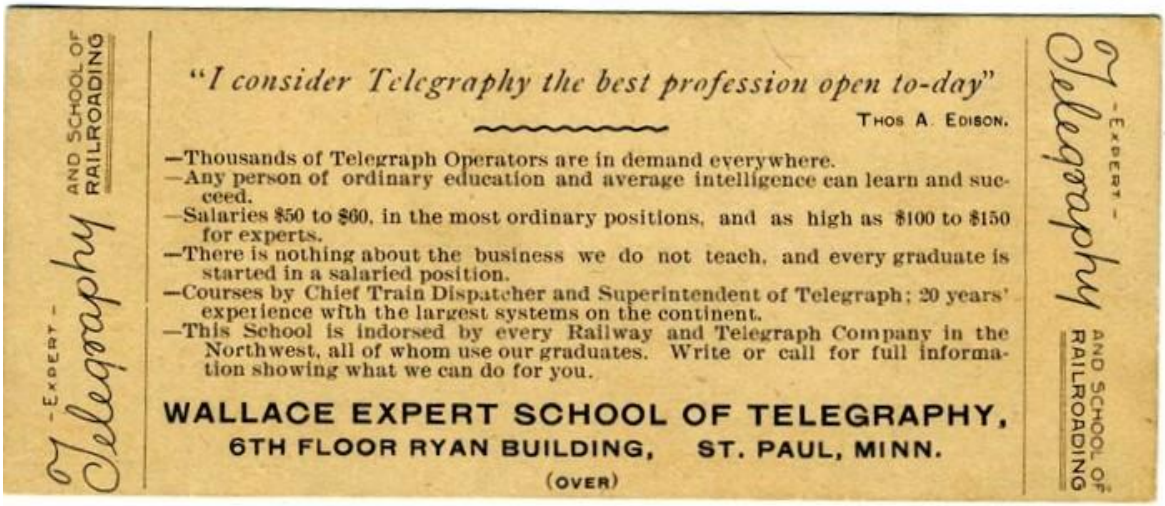


Modena Academia Militare (IT)

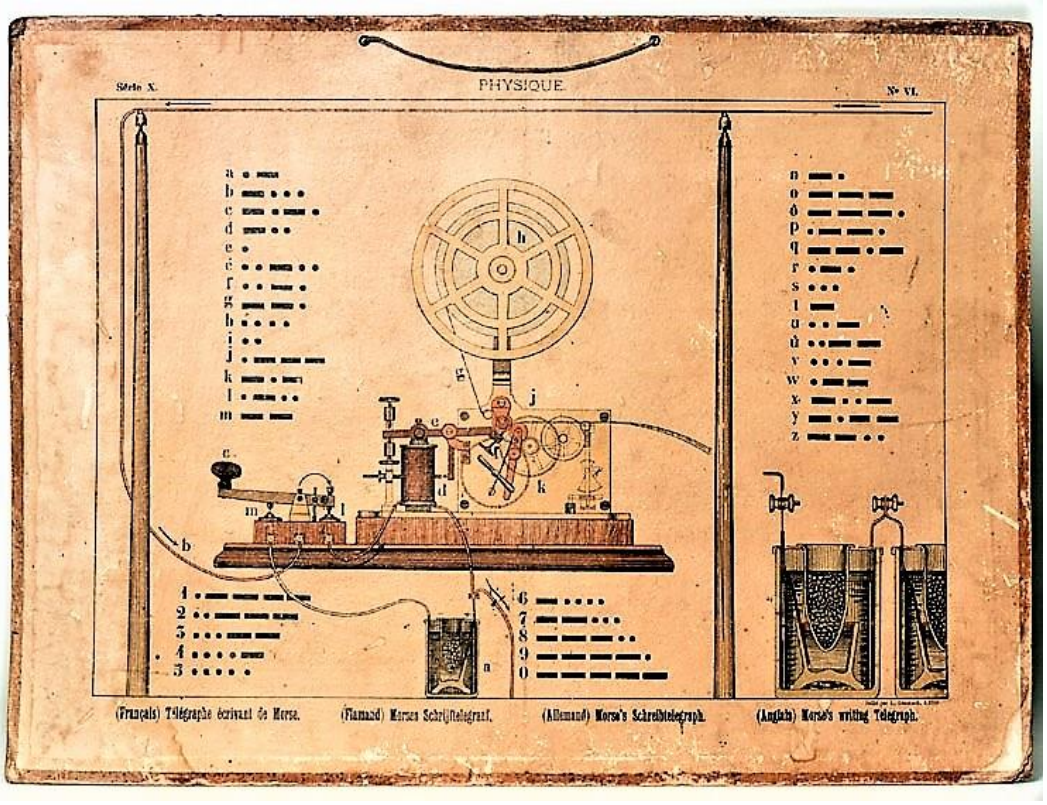
Ecole Professionnelle Supérieures de Garçons PTT (FR)

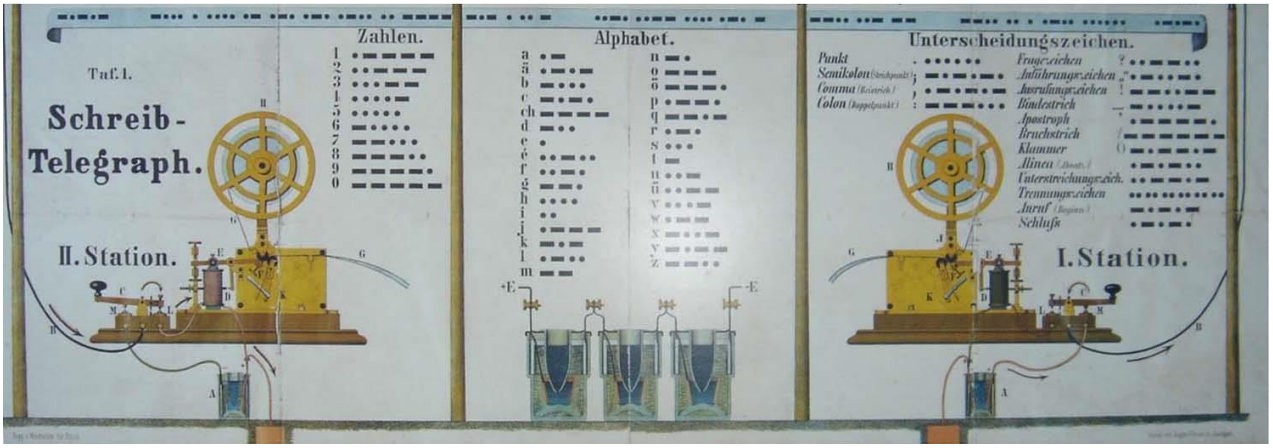


OKI Corp. - trainingsschool (JP)

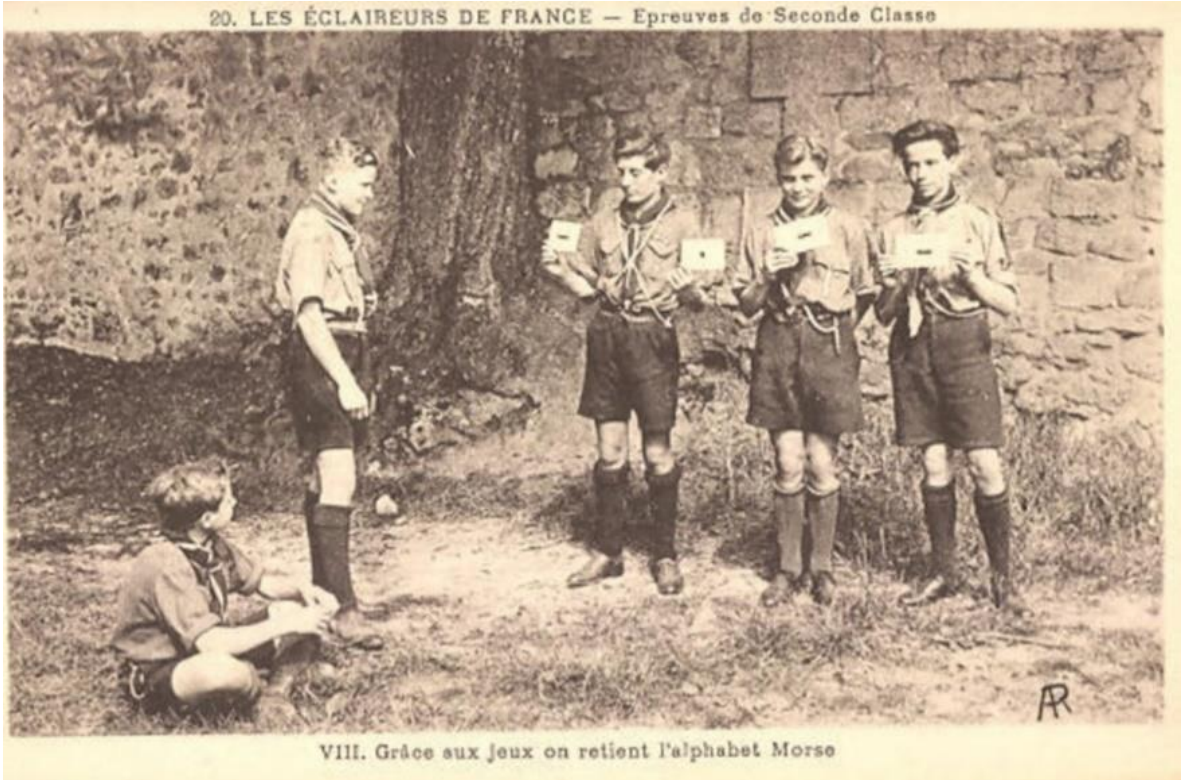


1.4.6. Two didactic school charts





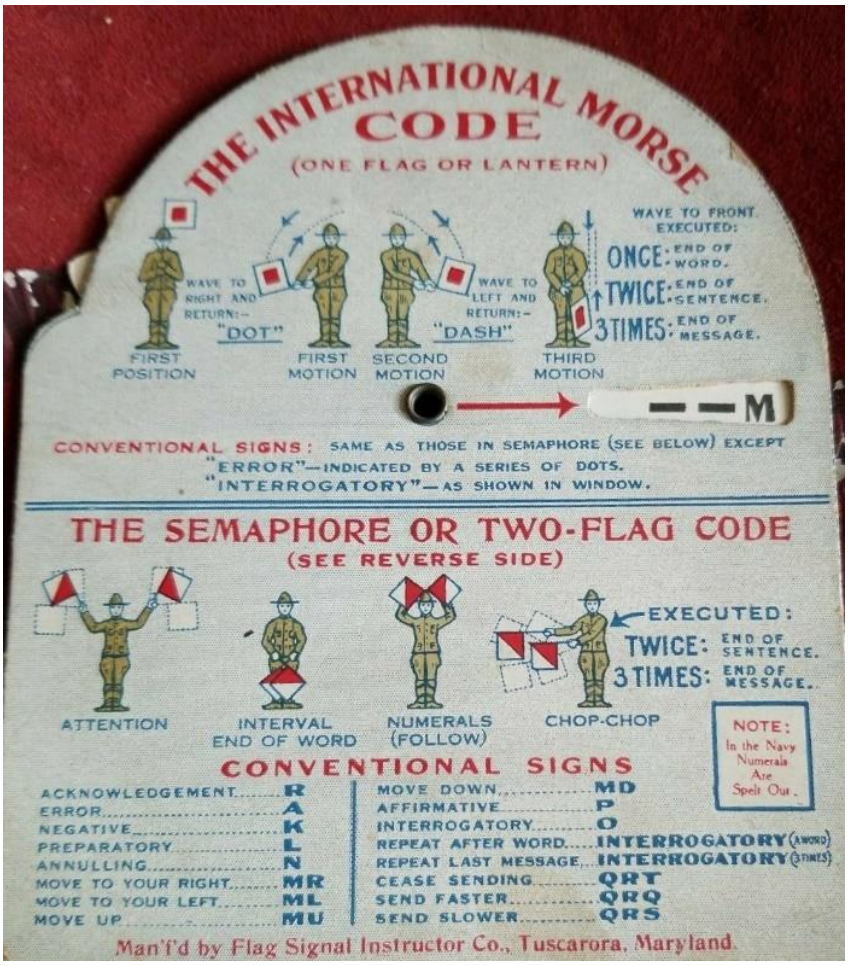
1.4.7. At the Scouts



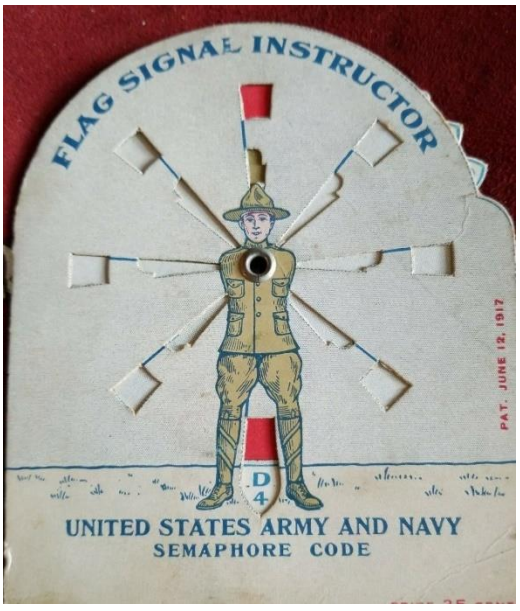
I learned the Morse code with the Belgian (Flemish) Boy Scouts (VVKS) back in 1952....

Two flags were normally used for signaling the semaphore code. But we also used them for signaling Morse code: one flag up = dot, two flags = dash.

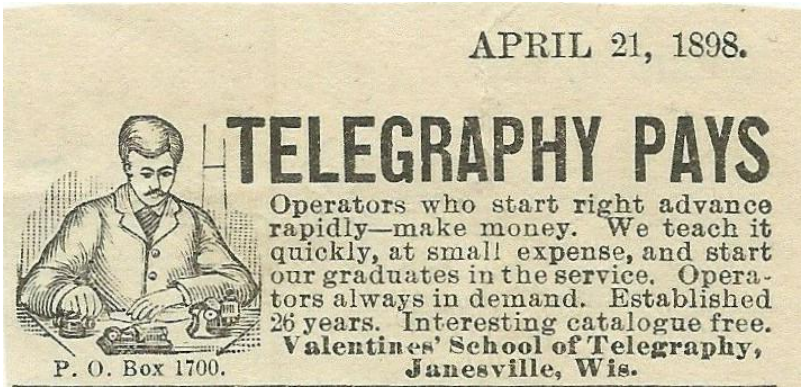
You could also use one flag: wave to the right = dot, first wave to the right and then to the left = dash

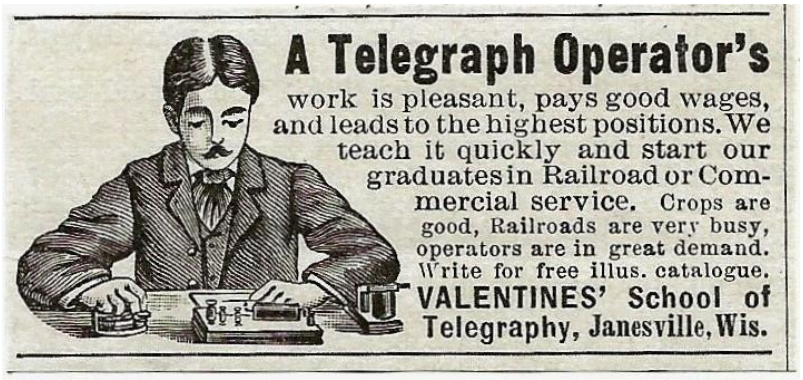


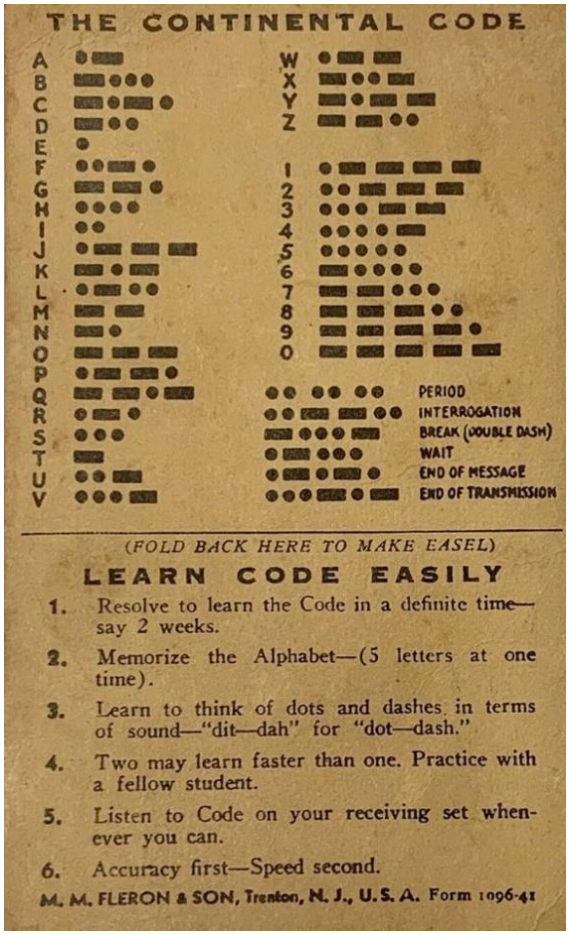
The reverse side gives the semaphore code:



1.4.8. Miscellaneous







"IT'S NEVER TOO EARLY TO START LEARNING MORSE CODE!"

2. 'MODERN' SYSTEMS

The equipment and methods described above go back to the (distant) past. Today in the first quarter of the 21st century, Morse code is almost always, and almost exclusively, communicated by radio amateurs via radio signals and thus received as an audible signal (in the headphones or loudspeaker). I am not a radio amateur and have no experience with this technology.

Today you can find information on the Internet, and of course the radio amateur (HAM) clubs have internet sites as well as radio operations and operators who can help. You can easily figure it out yourself; my good friend Google will certainly help you with that.

As said before, I myself learned the Morse code as a young member of the Boy Scouts. I was very proud when, at the age of 9, the master fixed the corresponding skill badge on the shirt of my uniform. The requirement was: meeting the standards for translating code at 5 words per minute (wpm). Unfortunately, the learning method was based on the system of memorizing the associations given by the words EISH (. , .. , ... , ...), TMOCH (- , -- , --- , ----), AUV (.- , ..- , ... -) and so on where you had to think too much when receiving and could not possibly reach higher speeds.

Here are some third-party tips, for what they are worth.

- For self-learning nothing is superior to a Personal Computer (PC) or a keyboard where the student can push a key and hear each character (and see it in print if there is a screen), as often as he wishes or needs to get the feel of its rhythm. The PC especially has become such a valuable tool that some teachers) consider it to be superior to private or classroom learning.
- It is very important to be consistent, always sending perfect code in exactly the same way and with a steady rhythm.
- It is always available and ready to be used whenever the student wants to practice.
- Most computer teaching programs provide for easy tailoring to match the exact needs of the individual student.
- A PC is impersonal, and there is never any reason for the student to feel embarrassment, something which often is an emotional deterrent to efficient learning in the presence of a teacher or classmates.
- It can provide both an excellent introduction to the code and growth in skill to any desired degree.

- I have regularly seen the following names on the Internet in connection with computer programs, so it might be useful to take a closer look at them...: Gary BOLD, Ludwig KOCH, Walter CANDLER, FARNSWORTH (timing), James FARRIOR (the MILL)…

- From Raul MERCADO (Apr 02, 2021):
  https://www.makeuseof.com/sites-to-learn-morse-code/

- The American Radio Relay League (ARRL) and other worldwide amateur radio organizations provide further links and information about different ways of learning Morse, for example the Koch method versus the Farnsworth method:
  http://www.arrl.org/learning-morse-code

- From Lode/ON6KL (2017):

  Learning Morse Signs: the internet offers many applications that can help with the individual learning of Morse Signs.

  The most suitable are those applications that use the KOCH method:

- LCWO (Learn CW Online) from DJ1YFK : www.LCWO.net (Dutch)
- G4FON Koch trainer: www.g4fon.net
- "Just Learn Morse Code" from LB3BK: www.justlearnmorsecode.com/download.html (English)
- The UBA CW course: www.uba.be/nl/actueel/uba-cw-cursus (Dutch)

Also for smartphones there are great App's:

- ANDROID App: IZ2UUF Morse Koch CW (free)
- iPhone App: KOCH trainer from Pignology

- https://www.leradioscope.fr/trafic/2016-03-30-14-42-59/cw (French)

- Here is a reaction from my good (Belgian) friend Guido Roels

It's great that you put so much emphasis on learning the Morse characters by ear. I started learning it, long ago, the wrong way and am still suffering the consequences. It takes years to unlearn this bad habit, unfortunately. The speed of the characters must be at least 12 wpm, certainly not lower. Otherwise, you're back to counting dots and dashes.

I would also like to point out that all those fancy courses, phonographs and mechanical toys are helpful for learning the alphabet the right way.

Once the alphabet is known, all the "aids" must be put aside and there is really only one correct method, namely, to record the handwriting of the various operators in practice.

My experience is that G4FON's PC program, with its many features, comes closest to reality, provided the student takes advantage of the possibilities (see chapter 2). For your information: Ray, G4FON, passed away in July 2021.

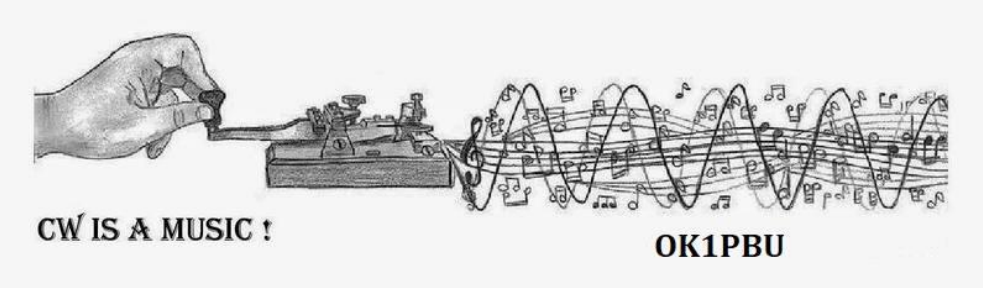
- And, sure, there are plenty of other websites**…**

- Last, but not least, I would like to mention the important reference book by William G. PIERPONT (1915-2003) 'THE ART & SKILL OF RADIO-TELEGRAPHY' (241 p.) [I have the 'Fifth Revised Edition' from 2012]. The subtitle says it all: 'A Manual For Learning, Using, Mastering And Enjoying The International Morse Code As A Means Of Communication'. It is published by the 'R. F. Heytow Memorial Radio Club (K9YA)'. In his introduction, he immediately provides golden advice:

"The first step in learning the code is to memorize the dot and dash combinations representing the letters. They must not be visualized as dots and dashes, however, but rather should be "auralized" as sounds. There is no such word as auralized, but if there were it would express the correct method of grasping the code. The sound dit-dah (meaning a dot followed by a dash) in the head telephones must impress your mind directly as being the letter A, for instance, without causing black dots and dashes to

float before your eyes for an instant. This is a point that always troubles beginners, but if you learn from the first to recognize the sounds as letters immediately without reverting to dots and dashes, you will make much better progress."

More succinctly: "Don't try to teach the Ears through the Eyes". The very first lesson is therefor: every code letter, number and symbol is a unique pattern of sound.



He then goes on to say
I was not alone in making this first false step: very many others did it that way, too, and probably some today still do. It was and is the inevitable reason why most people who start this way get stuck at some speed, around ten words per minute or less, and can't seem to get beyond it. The second mistake, even in learning by hearing, is in hearing the characters sent so slowly that the learner tends to analyze each one into dits and dahs, and even counts them mentally. (It is wise indeed for the beginner never to hear code characters sent at speeds below about 13 wpm.). These two errors largely account for getting stuck at higher speeds.

Believe me, this is an impressive didactic and educational book!

Note: CW stands for Continuous Wave. In CW communications, a continuous carrier is transmitted as long as the key contacts are closed. By making and breaking the contacts into specific patterns, characters and entire messages may be sent.

THANK YOU!!

David Bart, for some input and pointing me to his great AWA article and for having checked my 'Flemish English'. He also allowed me to copy paragraphs out of it.

Together with his wife Julia, they published in 2006 in the AWA Review (Antique Wireless Association, Vol.19), a great article (32 pages, starting page 139) about 'Morse Code Training Devices'. I highly recommended it for those with a strong interest in this subject, see: https://www.antiquewireless.org/wp-content/uploads/Vol.-19-.pdf . Their article provides a review of American teaching devices used for Morse code training after 1850. The devices discussed include training keys, disk and drum devices, paper tape machines, audio visual trainers, oscillators, and phonograph and tape recordings.

Guido Roels, for his appreciated input.