A GUIDE TO

CODES AND SIGNALS

INTERNATIONAL FLAG CODE, SECRET CIPHERS, WEATHER SIGNALS,
MORSE CODE, SIGN LANGUAGE, ETC.

WITH FLAGS OF ALL NATIONS

VICTORY

Joyce C Bielfelt

27

A Guide to

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INTERNATIONAL FLAG CODE, SECRET CIPHERS, WEATHER SIGNALS, MORSE CODE, SIGN LANGUAGE, ETC.

WITH FLAGS OF ALL NATIONS

By GORDON A. J. PETERSEN
and MARSHALL McCLINTOCK

With over 100 illustrations

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What This Book Contains

A CODE is a system of letters, numbers, words, flags, or other devices for sending messages. Codes are used most frequently when spoken or written messages cannot be sent, as from one ship to another at sea, or over great distances which are covered almost instantaneously by radio and telegraph. A blind man cannot read the ordinary book, but he may learn a code of raised dots which will enable him to read with his fingers. Deaf people cannot hear spoken words, but they may learn a code of gestures standing for letters and words.

Codes are also used to send messages in much shorter form than would be necessary if they were fully spelled out. A single flag raised on board ship may carry a message of seven or eight words. A few lines drawn on a map will tell a military man that at a certain spot there is stationed a platoon with a .50 caliber machine gun from Company A, 3rd Infantry regiment.

Codes are used for sending secret messages containing military orders, diplomatic reports, or data from spies. The receiver must have the key or decoder to learn the true meaning of the cipher message.

Code messages may be printed, written in ink, pencil, or invisible ink. They may be spoken, sung, or whistled, or sent by the clicks of a telegraph key or the *dit-da* of radio. They may be transmitted by waving flags of different designs, flashing lights, blowing whistles, ringing bells, or gesturing with hands and fingers.

Men have always used codes. Blazes on trees signaled the trail to the man in the

forest. American Indians signaled by means of smoke, and talked with other tribes in sign language. In China, huge gongs on high hills boomed messages across the valleys, and in Africa the beating of drums sped word through the jungle faster than men could travel.

Codes are common in everyday life, even though they may not be called by that name. An automobile license number is really a code. It can tell a policeman who looks up the number in the files the make and model and year of a car, the name and address and description of the owner. Certain symbols are really codes — a red-and-white striped pole for a barber shop, three balls for a pawnshop. Abbreviations are codes, too. C.O.D., F.O.B., W.P.B. mean something to most people even when the words for which the initials stand are forgotten.

Although some codes are secret, others are more widely used than any spoken language. The International Flag Code is understood by sailors of all nationalities. The International Morse Code may be used wherever there is a radio or telegraph. A baseball umpire's upward jerk of the thumb means "out" in any language. A white flag always means surrender, truce, peace.

Flags are symbols of the nations for which they stand. And every country has numerous special flags, for government officials and branches of the armed services. In this book you will find the flags of all nations, and some special United States flags. An alphabetical index on pages 60-62 will show you where to find the flags, codes, and signals most widely used.

International Code Flags

FORTY small flags are used by ships all over the world for transmitting messages. No matter what the nationality and language of the ship's master and crew, another ship can understand at once when the code flags are hoisted on the mast. The code book, published in eight languages, contains thousands of messages which can be sent by combining the flags in different ways.

Flags are raised in hoists of one, two, three, or four at a time. Twenty-six of the flags stand for letters of the alphabet, ten are for numerals, one is an "answering" pennant, and three are substitute or "repeater" pennants. Alphabet flags are given names which can be easily understood when called out on deck. The answering flag is raised by a ship which has been called by another. The repeaters are used to avoid the necessity of carrying more than one set of flags. The first repeater pennant indicates the repetition of the first letter of one group. The word "arab" will be shown as A-R-First Substitute-B. The second substitute means repetition of the second letter. (Loom = L-O-Second Substitute-M.) The third substitute pennant means repetition of the third letter. (Full = F-U-L-Third Substitute.)

Hoists of single flags are used for messages of great urgency or frequent use. The B flag says "I am taking on or discharging explosives," and the K flag means "You should stop your vessel instantly."

Hoists of two flags together are the next most important messages used at sea. The flags AD mean "I must abandon my

(Continued on page 8)

International Flags and Pennants—Plate I

International Code Flags (*Continued*)

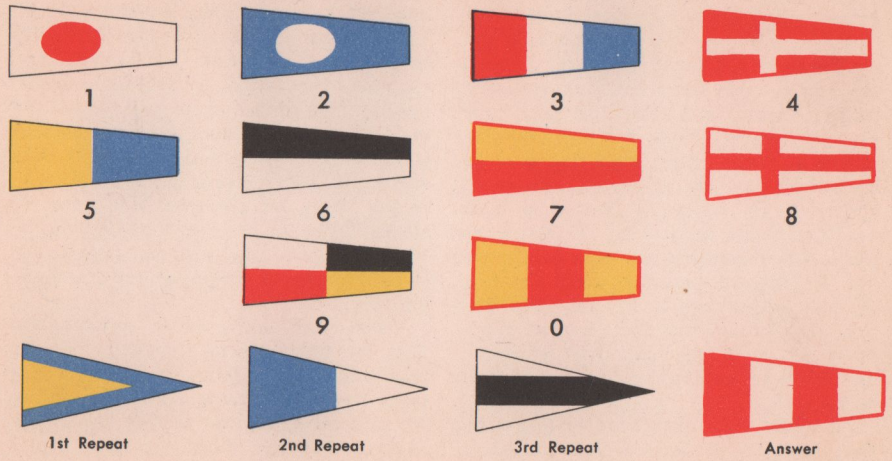
vessel." Three-flag signals are all the other words and phrases which might be used. In case of doubt about the meaning of some messages, certain flag signals clarify other messages. For example, the three hoists LMO—RIF—BKM might mean "I am proceeding to her assistance," or "Proceed to her assistance." In case the sender wishes to make certain that the other boat should proceed he begins with the signal AGV, which means "The group which follows is an order."

Another way of clarifying messages in which the verb form is not obvious is to use the model verb. The complete conjugation of a model verb has been made in all eight languages of the code book, and each verb form given a flag signal. In English the model verb is *to glean,* but in code it has no meaning except to indicate which verb form to use. The message "When do you expect to arrive," can be signaled as QML—AFZ—BIR, meaning "When—do you *glean*—expect to arrive." When the word *glean* is omitted, the desired verb form remains and the message is clear.

Four-letter signals beginning with A designate geographical points of the world, large and small. AEAZ is Chicago and ALHE is New York. Quoddy Head, Maine, is ANBF, and Tulagi in the Solomon Islands is AQOJ. Other four-letter signals are the call-letters of ships, planes, and signal stations.

In addition to the many code combinations, flags may be used for plain-language messages in which all words are spelled out.

International Flags and Pennants—Plate II



Morse, Semaphore, and Other Signals

FLAGS cannot always be used for sending messages from one ship to another. When the distances are great, the radio is used, the Morse Code being the universal language of radio and telegraph. The code used on telegraph lines in North America differs in eleven letters from that used on transatlantic cables, at sea, and in foreign countries. In American Morse, a dash equals in length three dots. The space between dots and dashes in a letter equals one dot. The interval between spaced elements of some letters such as R (dot-space-dot-dot) equals three dots and the interval between letters is five dots. Both American and International Morse Codes are given on page 15.

At night, ships may send messages by flashing lights, a short flash for a dot, a long flash for a dash, in International Morse. Most of the letter signals of the International Flag code can be used. For example, the letter K (dash-dot-dash) means "You should stop your vessel instantly," just as it does when the K flag is hoisted. There are other simple code signals in Morse flashing. The letter C means "You are correct." The letter R means "Message received," and W means "I am unable to read your message owing to light not being properly trained or light burning badly."

When heavy fog prevents signaling by flags or light, sound signaling may be tried. Whistles, sirens, or foghorns can carry messages between ships that cannot see each other, so long as they are within hearing distance. However, since sound

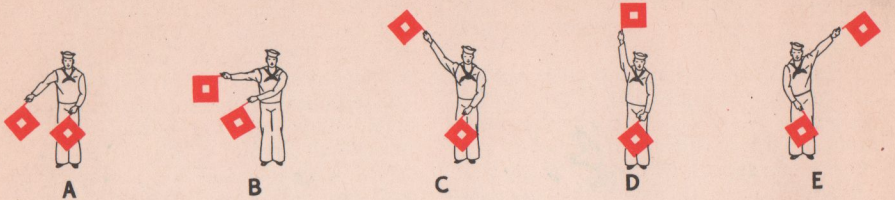
signaling is slow and tends to create confusion, it is used only in serious emergencies.

Ships in distress have still other methods of attracting attention and asking for aid. A gun or rocket fired at one-minute intervals, or the continuous sounding of foghorns, are signals universally recognized. A large square flag flown from the mast with a ball or anything resembling a ball above or below it means "In distress! Help!" Steady flames from a burning tar- or oil-barrel serve as distress signals at night.

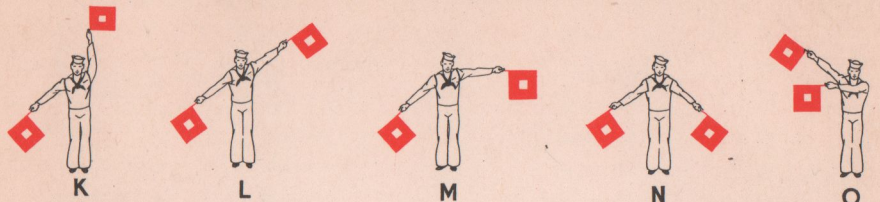
Semaphore messages are sent by two small flags held in the hands. All messages in semaphore are plain-language, fully spelled out. They are often used on land as well as at sea, and mechanical semaphores with movable arms are sometimes used by the U. S. Army Signal Corps. Lights may be attached to the arms for night signaling. The semaphore alphabet is shown on pages 12-14. There are flag positions for the twenty-six letters of the alphabet, for calling attention, and for indicating the break between words. There are no numeral signals, so all numbers must be spelled out. At the end of each word the receiver is supposed to signal the letter C. If he does not, the word is repeated. All messages are ended with the letters AR.

A single "wig-wag" flag is also used for signaling in the Morse Code. A sweep of the flag to the right is a dot, a sweep to the left a dash.

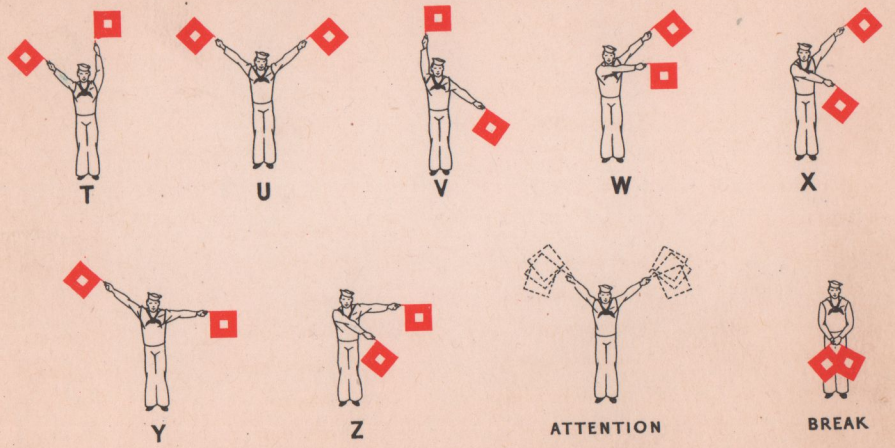
Semaphore Alphabet—Plate I



Semaphore Alphabet—Plate II



Semaphore Alphabet—Plate III



Morse Codes

International Morse

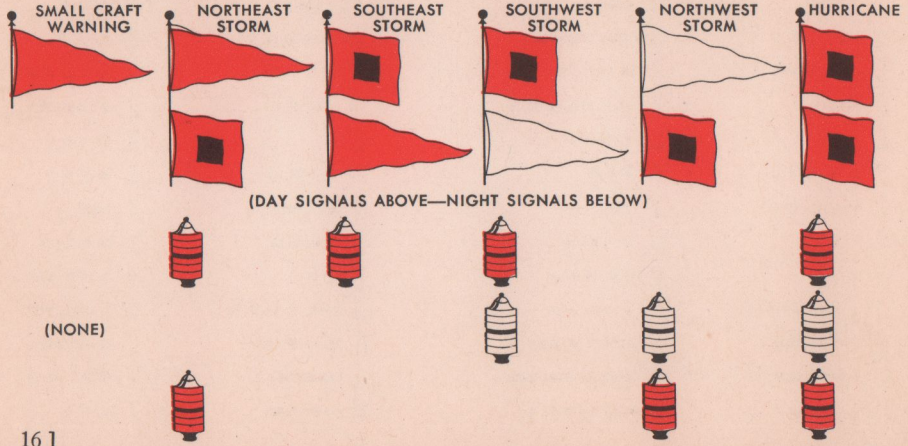
A	•—	N	—•
B	—•••	O	———
C	—•—•	P	•——•
D	—••	Q	——•—
E	•	R	•—•
F	••—•	S	•••
G	——•	T	—
H	••••	U	••—
I	••	V	•••—
J	•———	W	•——
K	—•—	X	—••—
L	•—••	Y	—•——
M	——	Z	——••

American Morse

A	•—	N	—•
B	—•••	O	• •
C	•• •	P	••••••
D	—••	Q	••—•
E	•	R	• ••
F	•—•	S	•••
G	——•	T	—
H	••••	U	••—
I	••	V	•••—
J	—•—•	W	•——
K	—•—	X	—•—••
L	———	Y	•• ••
M	——	Z	••• •

Storm and Hurricane Warnings

Flags and lanterns displayed by U. S. Weather Bureau and Coast Guard.



V for Victory

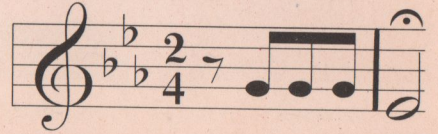
THE twenty-second letter of the alphabet has become a symbol and message of hope for millions of persons under the yoke of the Nazis. To the Dutch it represents *Vryjheid* (freedom); to the Czechs it means *Vitezstvi* (victory); to the Serbs it is *Vitestvo* and to the French *Victoire*.

In the Morse Code, V is three dots and a dash. German soldiers in occupied countries have found it chalked on walls and sidewalks, have heard it rung on doorbells, tapped on glasses, whistled, and sung as the call to victory over oppression.

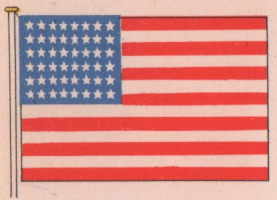
The opening bars of the Fifth Symphony of the great German composer, Ludwig van Beethoven, sound three short notes and a long note, in the rhythm of the Morse Code V signal. These ominous and beautiful tones have become the song of freedom throughout Europe.

On the following pages are the flags of the United Nations, countries joined together in a pledge to end Nazi aggression. Following are the flags of the Axis nations, and those of countries technically neutral or in ambiguous positions.

V • • • —



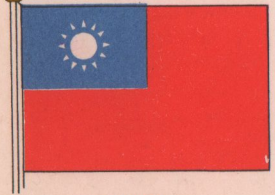
Flags of the United Nations—Plate I



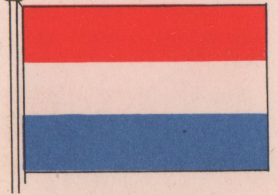
UNITED STATES OF AMERICA

GREAT BRITAIN

RUSSIA (U.S.S.R.)



CHINA

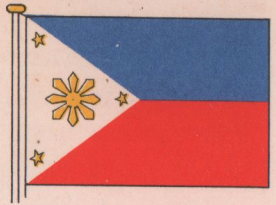


NETHERLANDS

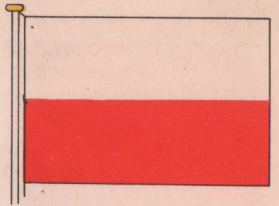
BRAZIL

Flags of the United Nations—Plate II

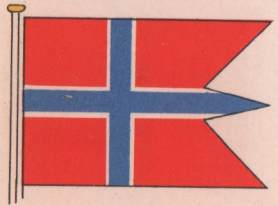
AUSTRALIA



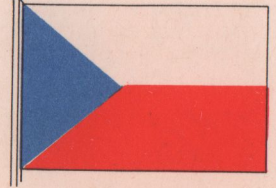
PHILIPPINES



POLAND



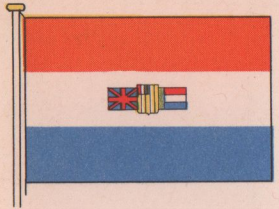
NORWAY



CZECHOSLOVAKIA

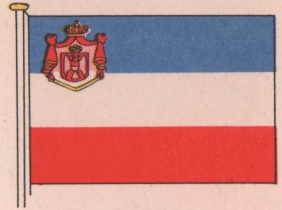
BELGIUM

Flags of the United Nations—Plate III



UNION OF SOUTH AFRICA

GREECE



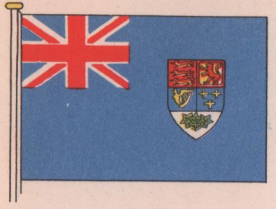
YUGOSLAVIA

LUXEMBOURG

INDIA

NEW ZEALAND

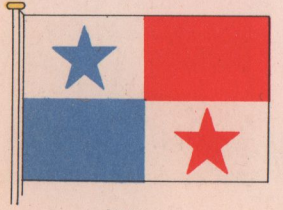
Flags of the United Nations—Plate IV



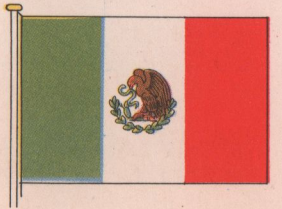
CANADA

COSTA RICA

CUBA



PANAMA



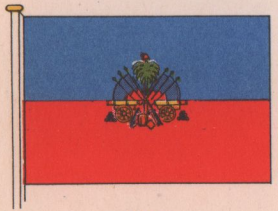
MEXICO

GUATEMALA

Flags of the United Nations—Plate V

EL SALVADOR

DOMINICAN REPUBLIC

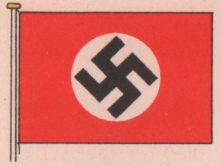


HAITI

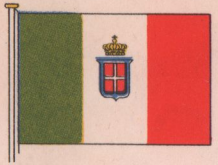
NICARAGUA

HONDURAS

Flags of the Axis Nations



GERMANY

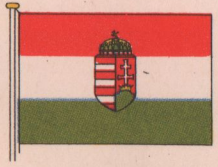


ITALY

JAPAN

MANCHUKUO

FINLAND



HUNGARY

RUMANIA

BULGARIA

Flags of Other Nations—Plate I

BOLIVIA*

COLOMBIA*

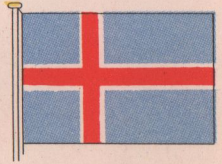
ECUADOR*

PARAGUAY*

PERU*

VENEZUELA*

URUGUAY*

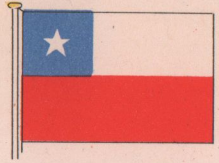


ICELAND**

*Broke relations with Axis upon U. S. entry into war.
**Neutral, but consented to occupation by British and U. S. troops.

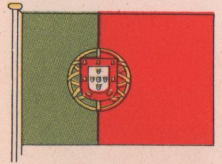
Flags of Other Nations—Plate II

ARGENTINA

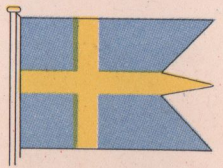


CHILE

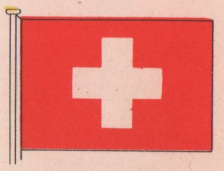
TURKEY



PORTUGAL



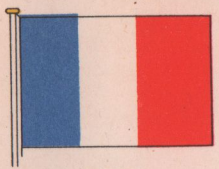
SWEDEN



SWITZERLAND

(On the third anniversary of war's outbreak, the above nations remained neutral, maintaining relations with warring nations.)

Flags of Other Nations—Plate III



FRANCE
(Defeated government at Vichy supports Axis; Fighting French under De Gaulle support United Nations.)

DENMARK
(Occupied by Germany, co-operation enforced. Considered friendly to the United Nations.)

EGYPT
(Technically neutral but supporting British fighting in North Africa.)

IRAQ
(Occupied by British to forestall fifth column and protect oil fields.)

SPAIN
(Technically neutral but supports Axis.)

Special Flags of the United States

In addition to the national ensign, every country has many flags of special significance. Some nations have merchant flags different from the national ensigns, but the Stars and Stripes serve both purposes for the United States. The Union Jack of the U.S.A. is the blue field of the national flag, with its forty-eight stars. Vessels at anchor fly the union jack from the staff at the bow during the day, and it is hoisted from the foremast as a signal for a pilot. Flown from the mizzen mast or at a yard arm, it means that a general court martial is in session.

The President, members of his cabinet and their assistants, the Chief of Staff, Generals, Admirals, and other government officials have their own flags which are flown from ships when they are aboard. The Infantry, Cavalry, Signal Corps and all branches of the armed services possess their own standards, and individual regiments and other units fly distinctive guidons, small flags with a "swallow-tail" cut (see p. 31).

The Marine Corps, the Coast Guard, Coast and Geodetic Survey, U. S. Customs, the Bureau of Fisheries, U. S. Public Health Service, and many other bureaus of the federal government have their own flags, as have the forty-eight states of the Union. Long pennants are flown from boats in active commission in the Navy, the Coast Guard, and the Coast and Geodetic Survey.

On the following four pages, examples of special United States flags, guidons, and pennants are shown.

Special Flags of the United States—Plate I

PRESIDENT'S FLAG

SECRETARY OF WAR

SECRETARY OF THE NAVY

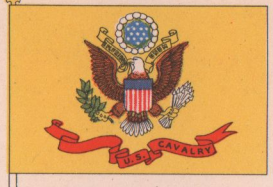
SECRETARY OF THE TREASURY

SECRETARY OF COMMERCE

GENERAL OF THE ARMY

Special Flags of the United States—Plate II

INFANTRY COLORS



CAVALRY COLORS

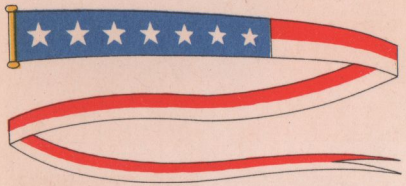
FIELD ARTILLERY COLORS

COAST ARTILLERY COLORS

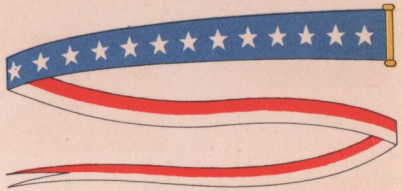
ENGINEERS COLORS

SIGNAL CORPS COLORS

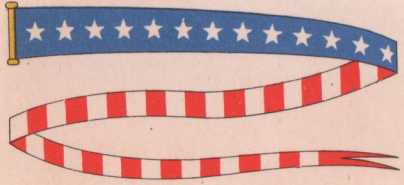
Special Flags of the United States—Plate III



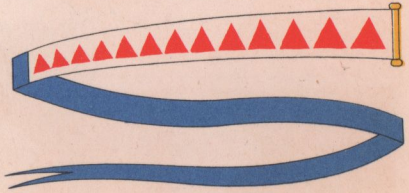
CRUISER AND LESSER CRAFT PENNANT, U. S. NAVY



FIRST CLASS BATTLESHIP PENNANT, U. S. NAVY



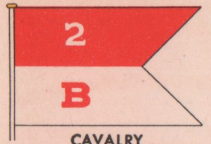
U. S. COAST GUARD PENNANT



U. S. COAST AND GEODETIC SURVEY PENNANT

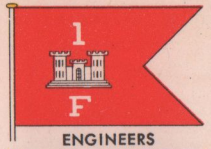
Special Flags of the United States—Plate IV

GUIDONS



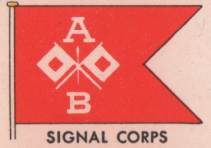
CAVALRY

FIELD ARTILLERY



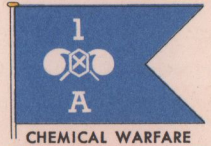
ENGINEERS

INFANTRY



SIGNAL CORPS

AIR FORCES



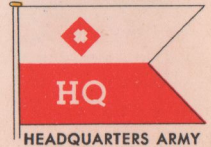
CHEMICAL WARFARE

MEDICAL CORPS

QUARTERMASTER

COAST ARTILLERY

ORDNANCE



HEADQUARTERS ARMY

U.S. Naval Aircraft Code Markings

THE first letter or letters refer to the type of aircraft, and the last to the manufacturer. If numerals are added, they refer to the model number. Example: PBY-2 = Patrol Bomber made by Consolidated, Model 2.

Types of Aircraft

Z—Lighter-than-air	P—Patrol
X—Experimental	PB—Patrol Bomber
V—Heavier-than-air	PT—Patrol Torpedo
B—Bomber	T—Torpedo
BF—Bomber-Fighter	TB—Torpedo-Bomber
F—Fighter	J—Utility
O—Observation	JR—Utility-Transport
OS—Observation-Scouting	G—Transport (single-engine)
S—Scouting	R—Transport (multi-engine)
SB—Scouting-Bomber	N—Training
SO—Scouting-Observation	M—Obsolete aircraft

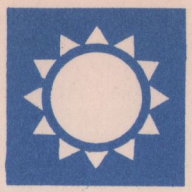
Manufacturers

A—Brewster	M—Martin
B—Boeing	N—Naval Aircraft Factory
C—Curtiss	O—Lockheed
D—Douglas	P—Pitcairn Autogyro
E—Bellanca	Q—Stinson
F—Grumman	R—Stout
G—Bell	S—Stearman
H—Hall	U—Vought-Sikorsky
J—North American	W—Waco
K—Keystone and Kinner	Y—Consolidated
L—Loening	

Aircraft Insignia of Chief Nations at War

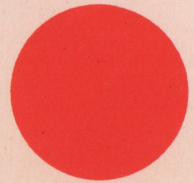
UNITED STATES

RUSSIA

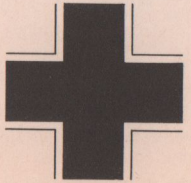


CHINA

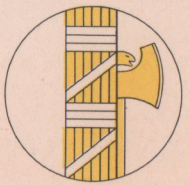
GREAT BRITAIN



JAPAN



GERMANY



ITALY

Time on Shipboard

HUNDREDS of years ago, time was kept on shipboard by a sandglass which was turned every half hour. A bell was rung at the turning of the glass, eight bells (the highest number used) at the beginning of each watch. The day was divided into six equal periods beginning at midnight. Midnight is eight bells, twelve-thirty one bell, one o'clock two bells, one-thirty three bells, etc. Four o'clock is eight bells again, the beginning of a new watch, and the same is true of eight o'clock.

At sea, the time system is now based on the 24-hour clock, eliminating the use of A.M. and P.M. The time of day is always written in four figures, the first two for the hours, the last two for the minutes. One-fifteen A.M. is 0115. Three-fifteen P.M. is 1515. Midnight is 0000.

U. S. Navy Ship Names

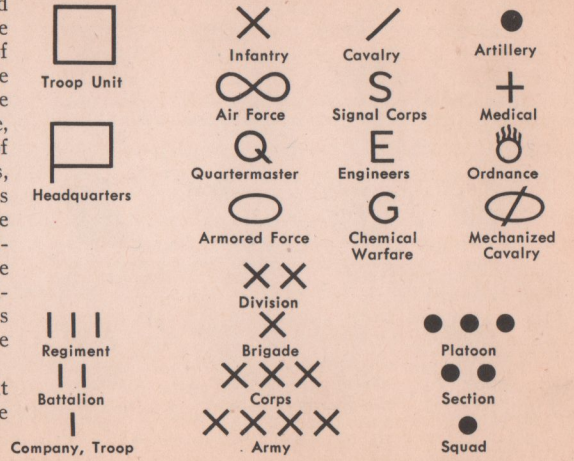
THE United States Navy comprises so many vessels of different types that a code for identifying each type and class of craft has been devised. Battleships (serial marking BB) are named after states. Cruisers (heavy CA, light CL) are named after cities. Aircraft carriers (CV) are named for historic battles, ships, etc. Destroyers (DD) are named for officers or men of the Navy or Marine Corps, for inventors, members of Congress, and former Secretaries of the Navy. Submarines (S) derive their names from fish or creatures of the sea. Minesweepers (AM) are named for birds, gunboats (PG) for smaller cities, river gunboats (PR) for islands, ammunition ships (AE) for explosives, submarine tenders (AS) for pioneers in the development of the submarine, etc.

Funnel Markings of Important Steamship Lines

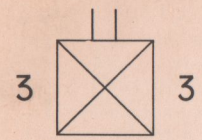
U. S. Army Map Symbols

On Army maps, symbols are used to indicate characteristics of the terrain and also the disposition of troops. All troop symbols are squares with devices added inside to show the branch of the service, others on top to show the size of the group. Numbers of divisions, regiments, and separate battalions or companies are placed on the right. Numbers designating battalions within a regiment are shown on the left. Letters indicating companies, troops, or batteries are placed on the left. Marks at the bottom indicate special units.

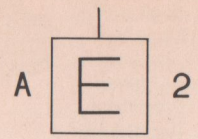
Symbols are shown in the next column, and examples of their use on the following page.



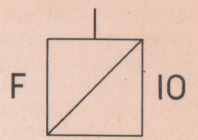
Army Map Symbols



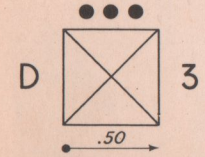
3rd Battalion, 3rd Infantry



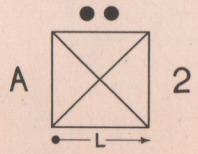
Company A, 2nd Engineers



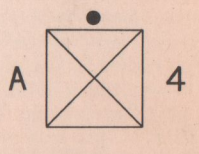
Troop F, 10th Cavalry



Machine Gun Platoon Caliber .50, Company D, 3rd Infantry



Light Machine Gun Section, Company A, 2nd Infantry

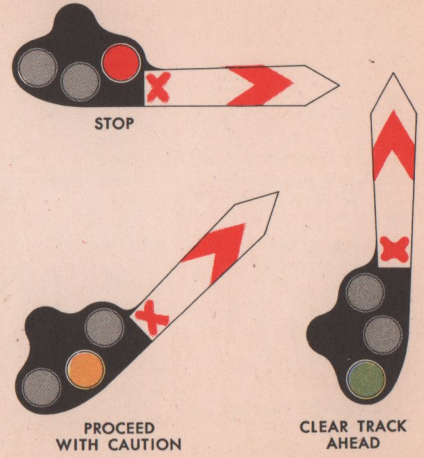


Rifle Squad Company A, 4th Infantry

Railroad Signals

In the early days of railroading, men were stationed at dangerous spots with flags and lamps. As the network of steel tracks spread over the country and trains ran more frequently, signaling became efficient and complicated. The most common signal is the semaphore arm, usually combined with a light, like those in the next column.

Signals are worked by hand or by electric power, sometimes controlled from a tower. In the *block signal* system, a railroad line is divided into "blocks" of certain lengths. When a train is in one block, the signal at the head of that block indicates "Stop." When it is one block ahead, the signal shows amber, caution. When it is two blocks ahead the signal is vertical, or green. Many railroad lines have automatic block signals controlled by the trains themselves as they pass over the track.

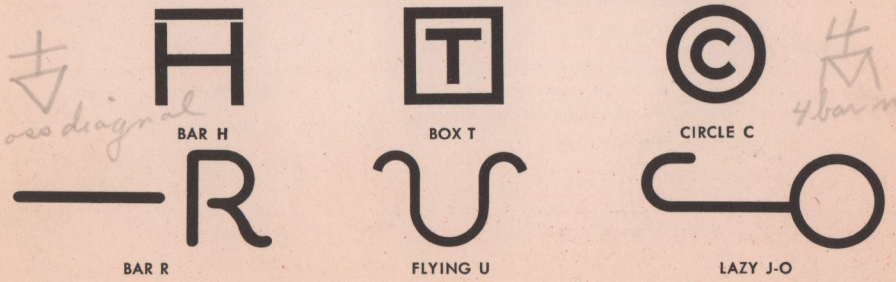


Cattle Brands

In the cattle country thousands of animals grazed on unfenced government range, so ranchers branded their cattle for identification. Brands had to be easily recognized and difficult for thieves to alter.

Branding irons are heated to a red glow and applied for a short time only. Cattle are usually branded as calves, when they are weaned from their mothers.

Many brands have picturesque names. When the letters of the alphabet are used, they may be placed in different positions. Partly inclined, they are called "tumbling." Lying sideways, they are called "lazy."



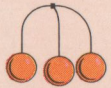
Common Scientific and Commercial Symbols

℞ Doctors' prescriptions begin with this abbreviation of the Latin *Recipe* (take).

The caduceus, official insigne of the U. S. Army Medical Corps, was once the symbol of the Greek God, Hermes.

The Red Cross is the universal symbol of mercy and neutrality among civilized nations.

The red-and-white-striped pole is the only sign needed to identify a barber-shop, just as the wooden Indian, years ago, designated the tobacco store.



The three balls of the pawnshop are said to be derived from the arms of the famous Renaissance Italian family, the Medici.

Large globes of glass filled with colored water identify drug stores. They were first used by apothecary shops in London's Great Plague of 1665.

Signs of the Zodiac

THE zodiac is thought to have originated with the Babylonians 2500 years before Christ. They believed that the sun, moon, earth, planets, and stars all moved across the sky within a band only 16 degrees wide. This band they divided into twelve equal spaces containing important constellations. Lines drawn between the stars of some of the constellations suggested the outlines of animals, so the belt of planets was called the zodiac, from the Greek word for animals, *zodion*. The signs used to represent the different constellations are called the signs of the zodiac.

In the last two centuries, the discoveries of astronomy showed that many heavenly bodies existed outside the zodiac, but it has remained a convenient way of referring to the general position of stars.

♈ ARIES, the *Ram*

♉ TAURUS, the *Bull*

♊ GEMINI, the *Twins*

♋ CANCER, the *Crab*

♌ LEO, the *Lion*

♍ VIRGO, the *Virgin*

♎ LIBRA, the *Balance*

♏ SCORPIO, the *Scorpion*

♐ SAGITTARIUS, the *Archer*

♑ CAPRICORNUS, the *Goat*

♒ AQUARIUS, the *Water-bearer*

♓ PISCES, the *Fishes*

Codes for the Blind and Deaf

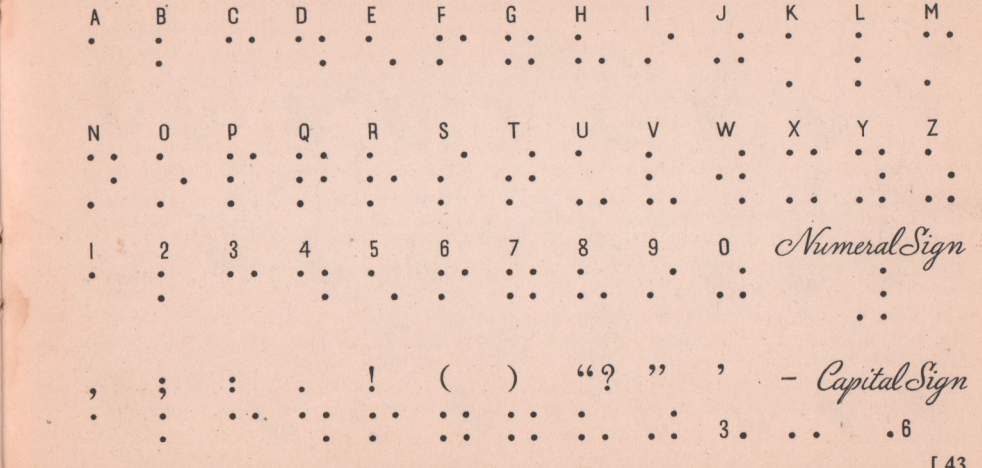
For centuries people who were blind or deaf were considered incapable of useful work or even of being taught. In the 17th century a few men began to study ways of instructing the blind and deaf.

Embossed printing, with raised letters that could be felt by the finger tips, was the first system for teaching the blind. In order to be clear to the touch, however, each letter had to be very large and printing costs proved very large, books bulky. Charles Barbier, a Frenchman, devised a system of raised points or dots, and Louis Braille, a teacher who had been blind since the age of three, perfected and simplified it in 1829.

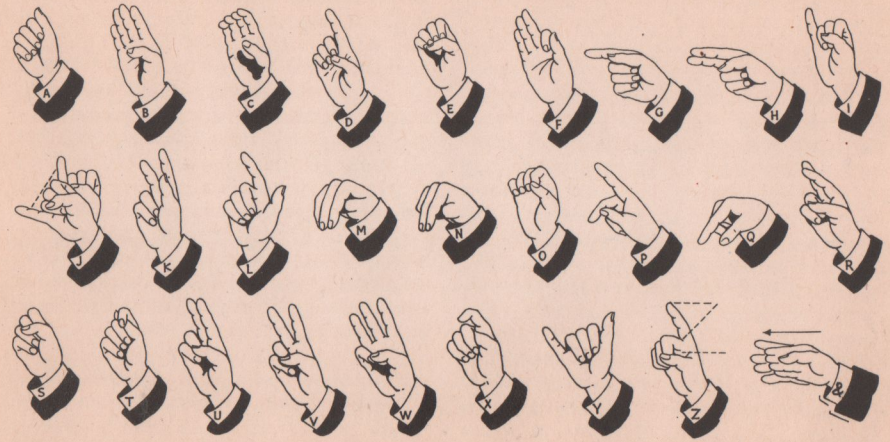
The letters of the Braille alphabet are made from a group of six dots, two vertical columns of three each. The first ten letters of the alphabet use only the top four dots. Numerals are the same as the first ten letters, but are always preceded by the numeral sign. Punctuation marks are formed from the bottom four dots, as shown on the next page, an apostrophe being the third, or bottom left, dot. The capital sign is made by the sixth dot. The signs for opening quotation marks and question mark are the same, as these two are not likely to be confused in meaning.

There are several methods of teaching communication to the deaf. If they are not mute, they can be taught to speak and to lip-read. For deaf-mutes, the hand alphabet, shown on page 44, is used, as well as certain manual signs which are code signals for complete words. A two-hand alphabet is sometimes used.

The Braille Alphabet for the Blind



The Hand Alphabet for the Deaf



Indian Sign Language

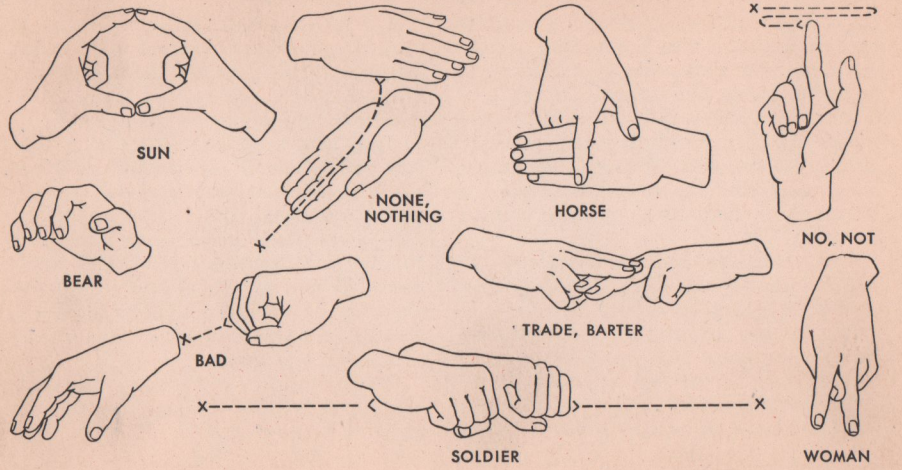
LONG before men had developed a complete spoken language, they had learned to communicate with each other by signals made with the hands and fingers. Certain gestures were obvious and universally understood—the hand to the ear meaning "hear" and to the eye meaning "see," etc. Others were suggested by actual movement, a thrust of the hand as in plunging a knife meaning "kill."

The American Indians developed the use of sign language more completely than any other group in history. Members of tribes whose languages were different could communicate with each other easily and lengthily in the sign language. Thousands of basic hand signals were understood by almost all Indians in North America.

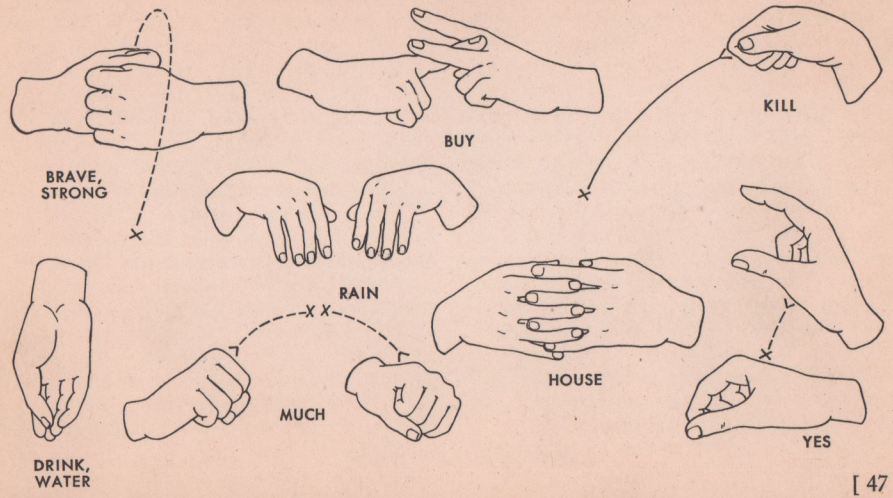
Any language based on gestures must be very simple when compared with spoken language. There is no past tense in the sign language, since one gesture means "kill" in all its tenses. However, the sign meaning "a long time ago" may be added to indicate past tense. If the speaker wishes to ask a question he may give the question signal first, then make a statement. "Question—you—house" would mean "Where do you live?" "Question — he — kill" would mean "Whom did he kill?" Persons who are adept in using the sign language can communicate with each other more rapidly than those who speak.

A few examples of the many thousands of gestures in the Indian sign language are given on pages 46 and 47.

Indian Sign Language—Plate I



Indian Sign Language—Plate II

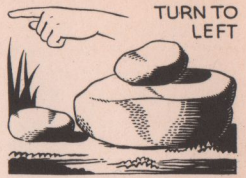


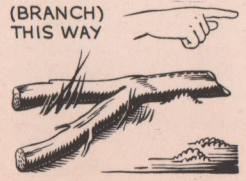
Woodcraft Signals

NOT MANY years have passed since most of North America was covered with thick forests. The men who first settled the country and the pioneers who gradually pushed the frontier westward were hunters, fighters, and explorers. They knew the ways of the Indians, of the animals of the woods. Following the animal traces over the mountains and westward through the forests, they lived by their wits and their skill with the rifle. Prints of animals were signals that told them the way to a water-hole or a salt-lick. A shift in the wind or the color of the sun told them what weather would be encountered the next day. In addition to the signals of nature, they developed a set of signals of their own, understood by all other woodsmen.

Blazes on trees marked the trail, and there were many other methods to indicate the turning of a trail that might otherwise be missed. A sapling cut to fall in the right direction, a bent bush, a limb indicating a branch in the path, rocks placed on or near each other—all these were clearly understood by frontiersmen making their way through the woods.

There were signs to warn of danger or bad drinking water or hostile Indians. In general, three of anything meant danger or a call for help. Three shots in quick succession, three stumps together, three rocks on top of each other, three tufts of grass tied together—all these meant, as they still do to woodsmen today, a warning of danger or a call for immediate help. Some examples of common woodcraft signs are shown on the next page.





Signals in Sports

SIGNALS are widely used in most sports involving team play. In baseball the manager or coach signals to batters and fielders by secret gestures such as wiping the brow, tightening the belt, taking off the cap, etc. By these frequently changed signals he can tell a pitcher to bunt, to hit, to let the next pitched ball pass, and he can tell fielders to change their positions for a new batter on the opposing team.

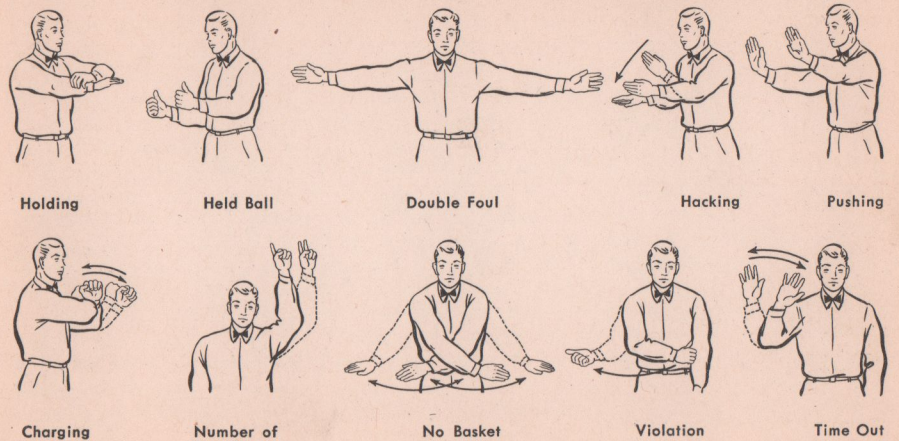
The baseball umpire lifts his right hand for a strike and the left for a ball, with fingers extended to indicate the number of each. When a runner is safe on base, the umpire extends both hands parallel with the ground. When the runner is out, the upward jerk of the right hand, thumbing the man away, gives the umpire's decision.

In wrestling the referee taps the victor on the back with the flat of his hand. In boxing a tap on the shoulder means a clinch must be broken, and lifting the arm of one boxer indicates that he is the winner. Guns are fired to start races, and in automobile racing brightly colored flags are used to order a racer from the track, to indicate lap numbers, and the finish.

In many sports, the referees use whistles to stop the play because of a rule infraction or foul. In ice hockey, basketball, and football, whistles are used, supplemented by gestures of arms and hands to indicate the type of foul or infraction which has occurred. Most of these are obvious, such as the pushing motion to indicate "pushing" and grasping the wrist to mean "holding."

Signals used in basketball and football are shown on the following pages.

Signals in Sports—Plate I (*Basketball*)



Signals in Sports—Plate II (*Football*)

Crawling, Pushing

Offside

Incomplete Pass, Missed Goal, etc.

Holding

Forward Pass Interference

Delay, Extra Time Out

Player Illegally In Motion

Illegal Forward Pass

Score

Unnecessary Roughness

Abbreviations

COMMON abbreviations are really codes in that they carry complete messages with the use of a few letters. C.O.D. and F.O.B. have definite meanings even for those who may not remember that the initials stand for *Collect on Delivery* and *Freight on Board*. Thousands of persons use A.M. and P.M. in referring to the time of day without knowing that they stand for *Ante Meridiem* and *Post Meridiem*. R.S.V.P. *(respondez s'il vous plait)* is a note placed on many invitations by party-givers who know no French. Some college graduates no doubt have forgotten that A.B. stands for *Artium Baccalaureus*. Thus abbreviations are often codes that need no translating, as the code itself bears a meaning without any reference to the original message in words.

The use of initial abbreviations has greatly increased in recent years because of the increase in the number of government agencies having a close relation to the people. Some examples are NRA *(National Recovery Administration)*, WPB *(War Production Board)*, FBI *(Federal Bureau of Investigation)*, TVA *(Tennessee Valley Authority)*, and OPA *(Office of Price Administration)*.

In first aid work, abbreviations are written on the forehead of injured persons with mercurochrome or lipstick. "U" means urgent internal injury or fracture; "TAT" means that anti-tetanus injection has been given; "M" indicates morphine has been given; "T-:15" means a tourniquet has been applied and must be loosened every 15 minutes.

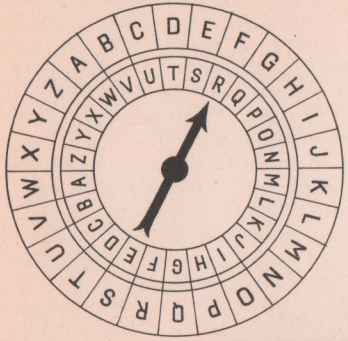
Secret Codes and Ciphers

SECRET messages are sent by military commanders when there is a chance of interception by the enemy, by diplomatic representatives, by spies transmitting data to their superiors—by anyone who wishes to make sure that his message is understood only by the one to whom it is addressed. They may be made in hundreds of different ways — invisible inks, pictures, combinations of letters, numbers, musical notes, chemistry symbols, or geometric patterns which give meaning only to the person holding the key to the cipher.

Every government employs experts who can decode any message based on a regular or mathematical code formula. Difficult codes may take so long to decipher, however, that their information is no longer of value when the meaning is finally found.

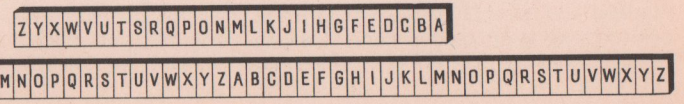
The simplest form of code is that in which letters of the alphabet are interchanged. The cipher disk and rule shown on the next page are two ways of making up this type of message. The disk consists of two round pieces of cardboard, one smaller than the other, with a pointer fixed in the center. The outer edges of the two disks are divided into 26 matching spaces. On the outer disk the alphabet is printed clockwise, on the inner disk counter-clockwise. The pointer may be salvaged from an old game or clock and fixed with a pin, thumbtack, or staple. For the rule, cut two pieces of cardboard, one twice as long as the other. The longer piece contains two alphabets, the shorter piece one in reverse order. The use of both methods is shown on the next page.

Cipher Disk and Rule



TO PUT a message in code with the cipher disk, first select a key letter. If you place A of the inner disk opposite W on the outer disk, then W is your key. To send the message, "Bridge mined," swing the pointer to the letter B on the inner circle and write down the letter on the outer circle to which it points—V. Continue thus with each letter, and your secret message will read, "Vfotqs kojst." If the receiver knows that W is the key, he sets his disk accordingly and decodes.

The slide rule works on the same principle. Select your key letter and place A of the short rule opposite the key letter on the long piece. Then write your message, interchanging letters as above.



Stencil Codes

CODE messages that follow a formula, such as those sent by the cipher disk and rule, are not difficult to decode. Various combinations can be tried until the key letter is found and the rest is easy. Code systems which do not follow any such basic plan are more difficult. One of these is the stencil code. The sender and receiver must prepare in advance two pieces of cardboard with spaces cut out at regular intervals. To send a secret message, place the cardboard over the paper for your letter and write the secret message in the open spaces. Then remove the stencil and write in other words which will make a letter that sounds innocent and natural. Be careful to make your writing look just the same throughout the letter so that the code words do not stand out in any way. When the receiver gets your letter, he places his stencil over it and the words of the secret message are shown at once. Even parts of larger words can be used, if writing and spacing of words are handled carefully.

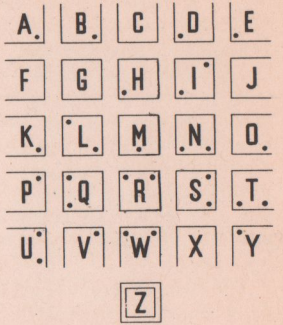
We can imagine that an enemy agent is sent to blow up a bridge in New England. He wants to notify his superiors when the job is done. He can write a postcard, with a message for anyone to read, as follows: "Dear Joe, This beautiful old covered bridge is one of the few left in Massachusetts. I am determined to take another week for this vacation trip, but wish you were here. Jim." If the stencil is cut out so that the word "bridge" is revealed, and also the last syllable of the word "deter*mined*" then the message will read "Bridge mined."

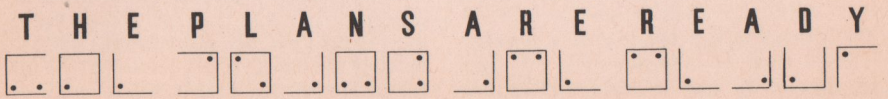
The Angle Code

DRAW four perpendicular lines and cross them with four horizontal lines. In the resulting twenty-five spaces write the first 25 letters of the alphabet. Add Z in a double box at the bottom. Since the angles and boxes of many of the letters are the same, dots are added in different corners to make them all different, as shown in the diagram on the right. To write a secret message, draw the angles and boxes, with dots, corresponding to the letters of your message.

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





Invisible Inks and Codes in Handwork

THERE are many kinds of inks which, when applied to white paper, leave no mark that is visible to the naked eye. Naturally, this method of communication has been widely used by spies. Letters or envelopes that appear quite innocent may contain important messages written between the lines in invisible ink. A newspaper or magazine has plenty of margin space for invisible writing. The white silk lining of a man's hat may contain the complete plans of a defensive position.

The simpler forms of invisible inks show up when moderate heat is applied. Other inks must be immersed in special acid baths, and some must be read at once for they disappear entirely in a few seconds. The presence of most invisible inks may be detected by experts when the paper is placed under an ultra-violet lamp.

Simple invisible inks may be made at home by mixing salt and water. When the paper is exposed to heat, writing will become visible. Other invisible inks may be made from ordinary milk, or juices from fruits and vegetables.

Spies have been known to work code messages into knitting, embroidery, hooked rugs, etc. Small knots are tied at certain intervals in the thread or yarn. When unraveled, the thread is placed alongside a decoder and the spacing of the knots reveals the letters of the secret message. In Charles Dickens' "A Tale of Two Cities," Madame LaFarge knitted industriously most of the time. She was working into her knitting the names of all those destined for the guillotine when the revolution began.

Letter Frequency Tables

IN ANY average piece of writing in English, letters are found in a standard ratio which varies only slightly from one message to another. If the message is long enough, it may be decoded by use of letter frequency tables. Since *e* is the most common letter, all other letters are given in relation to it. If *e* is used 1000 times, the other letters will be found to have the ratios given below:

e	1000	h	540	f	236	b	120				
t	770	r	528	w	190	k	88				
a	728	d	392	y	184	j	55				
i	704	l	360	p	168	q	50				
s	680	u	296	g	168	x	26				
o	672	c	280	v	152	z	22				
n	670	m	272								

(The most widely used capital letter is S, followed by C, P, A, and T.)

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