

ter  
 for that matter, more important and thousands in every dy of the problem in proper form and efficiency. The results of these devices that the noticeable feature of their complication toward making the every possible combination particularly in the dust naturally conse who use motors who will make a ter, even in a single tion the constantly plied, the quest for under all circum- opeless; and added cecivity of "exper- ine operators, and its adjustments of ust horrify their ion a serious ques- nstrusting delicately

found to contain 232,075,324 particles to the pound and had 60,503 square feet of surface, while a pound of dust was found to consist of 192,715,378,500 particles, representing 527.821 square feet.—*The Engineer.*

**A New Cipher Code\***

WEBSTER defines a cipher as "a private alphabet, system of characters or other mode of writing, contrived for the safe transmission of secrets, also a writing in such characters." A cipher key is defined as "a key to assist in reading writings in cipher."

Some months ago, startling accounts were published in the newspapers concerning the alleged theft of one of the United States Government's secret code books by supposed emissaries of a foreign government, and, according to the newspaper stories, the possession of the missing code by possible enemies made necessary the adoption of an entirely new system for transmitting messages in cipher to and from our foreign representa- tives and agents.

Cipher codes are a necessary adjunct to the conduct of governmental affairs, especially in time of war, but

1	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
2	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	A
3	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B
4	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C
5	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D
6	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E
7	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F
8	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G
9	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H
10	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I
11	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J
12	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K
13	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L
14	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M
15	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N
16	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
17	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
18	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
19	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
20	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
21	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
22	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
23	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
24	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
25	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
26	Z	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
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	

Code table to be used in connection with a key word.

aside from their use by recognized government officials, the cipher message is usually thought of as the particular instrument of spies and secret agents, especially in the minds of the general public, and the very air of mystery with which cipher messages are tinged adds a fascination to any story which treats on this subject.

We have secured possession of a copy of the cipher code which we are told is now in almost general use not only by the army and navy officials of the countries at war, but also by practically all of the spies operating in Europe to-day. It consists of a simple diagram and a key word. The diagram, which is nothing more than the alphabet arranged in a simple non-secret manner, is required in the preparation and translation of messages, but is absolutely valueless unless accompanied by the key word.

A study of the following will show that the key word can be any word, sentence or combination of letters imaginable, and that the methods for reading

IY YQXB CZIHRUSMNR

In order to translate the message, the same method is followed. The key word is written in succession over the message:

EC LUBE CLUBECLUBE  
 IY YQXB CZIHRUSMNR

Again using the diagram, look for "E" in the "I" row, and the top letter in the row with this "E" is "W." "E" is found to be the top letter over the "C" in the "Y" row; continuing this method, the entire message is easily translated.

The method of translating code messages, as described in the books of Poe, Conan Doyle, and others, is to count the different characters appearing in a long message and to assume that the one appearing most frequently was "E," which is the letter most used in our language. As can be readily seen, this would not be of assistance in translating messages written in this new code, as described above, because the same symbol in the cipher may represent entirely different letters in the message itself. For example, "E" in the message is represented by "Y," "Q" and "X," and "M," which occurs twice in succession in the original message, is represented by "Z" and "I" in the cipher.

The publication of this cipher code will no doubt bring to the mind of the reader other codes, but it is doubted if any heretofore invented is as effective in every way as is this one.

The method used for the preparation and reading of code messages is simple in the extreme and at the same time impossible of translation unless the key word is known. The ease with which the key may be changed is another point in favor of the adoption of this code by those desiring to transmit important messages without the slightest danger of their messages being read by political or business rivals, etc.

**Casehardening Bronze for Dies**

THE bronzes which possess the greatest hardness lack the requisite properties for chasing and sinking fine intricate designs. It is, however, possible to obtain a hard face on a bronze by a process analogous to the casehardening of steel, and this is practiced with some bronze dies. The method is that of coating the surface of the die with pure tin, and then heating to a low red heat in order to alloy the tin with the surface of the bronze. As is well known, copper and tin unite in all proportions, and with from 20 to 30 per cent of tin the alloy becomes quite hard.

The surface of the die to be casehardened is cleansed from grease by soaking in a strong hot potash solution and then immersing in a pickle or dip of acid to remove the oxide. A suitable pickle, which works more rapidly if hot, is made with five parts of water and one part oil of vitriol, and the die is allowed to soak in it for several hours until clean. It is then taken out and brushed, and the surface coated with a strong solution of chloride of zinc to act as a flux.

The surface is then covered with pure melted tin. The tin may be melted on the surface by a soldering-iron, but by far the best method is to use a torch or a blowpipe. The tin is melted over the surface only, and as little as possible put on, as the fine detail of the die must not be filled up. The die is then washed in water to remove the excess of chloride of zinc flux, and the surface examined. If there are any portions

reter.  
 of gasoline is con- on to the jet, which ached to the needle lift the needle from with the speed the ne is supplied. The by the screw at the he needle is raised gasoline to flow over d through a series n the drawing. A ed, also a Bowden addition of a hot s are obtained from and paraffin. It is equally well in any

he unskilled mil-

