"A CARRIER PIGEON FELL EXHAUSTED AT THEIR FEET." WHAT MESSAGE DOES IT BEAR, IN JULES VERNE'S IMMORTAL STORY?

G RILLE, n. A system of bars, especially of wrought iron, forming an open work barrier, large or small, as a high fence inclosing a public building or across a passageway, or the grating of a window. (Webster.)

This is the generally accepted meaning of the word grille. But to the cryptographer it takes on an added significance in that it has been found convenient, because of a certain resemblance, to use the same term in designating the apparatus used in accomplishing certain types of ciphers.

The grille of cryptography, also commonly called a lattice or grating, is made from any suitable flat material, as metallic plate, parchment, cardboard, or even paper, pierced with openings.

The process of enciphering with a grille varies with different types. But in every well known cipher of this kind the significant letters of the message are written through the openings or interstices of the grille, the letters, letter groups, or words, thus being broken up from their original arrangement.

The key to a grille cipher is the disposition or arrangement of these openings, without knowledge of which any unauthorized reading of an enciphered message is supposedly impossible, or at least materially retarded.

Thus the use of a grille, for instance, at a window, or in preparing a cryptogram, is for the purpose of preventing surreptitious access to whatever lies beyond. And in this sense Webster's definition is as nicely suited to cryptography as to the intended meaning, since the grille is an open work barrier in both cases.

Of grille ciphers there are many. The invention of the original grille is attributed to Jerome Cardan, the celebrated Italian physician and mathematician of the sixteenth century. And the simple grille described in this author's works will be treated in some detail in a later article.

An ingenious cipher derived from the grille is said to have been used by the Germans during the World War. But probably the most famous of the true grilles, and the subject of this article, is that perfected in 1881 by Eduard B. Fleissner von Wostrowitz, Austrian colonel, and author of a work on ciphers entitled, "Handbuch der Kryptographie," published at Wien in the same year.

Fictionists have had their fling at grille ciphers. Honore de Balzac used a form of the original grille in 1881 in his "Histoire des Treize"—The Thirteen. Poe mentions it. And to Jules Verne's story, "Mathais
Sandorf," first published in 1885, the world is indebted for an example of Fleissner's grille.

Verne was the author of numerous tales of extravagant voyage and adventure. This author's was the peculiar genius of interweaving scientific fact with fiction, yet with a skill that lent his narratives all the plausibility of truth.

And Verne, too, was one of the first writers to realize the value of ciphers in fiction. Solving Cipher Secrets for June 6 has already dealt with his use of the Gronsfeld cipher; and this exposition will similarly include his use of the Fleissner grille in "Mathais Sandorf."

This story differs, however, from the accustomed Verne yarn. It tells no tale of a mechanical monster of the skies or of the deep. Nor yet of a delving into the bowels of the earth, or of an interplanetary flight through space.

A more usual narrative, this, being merely the relation of a series of adventures, strung on the thread of governmental intrigue.

The story opens on the eighteenth day of May, 1867, which finds two penniless adventurers wandering aimlessly about Trieste, the capital city of Illyria.

In due course they ascend the slopes of the Karst hills, and find themselves eventually in an inclosure, formerly a cemetery. Here an exhausted carrier pigeon falls almost at their feet. Concealed under its wing they discover a cipher message, of which one of them, scenting conspiracy, makes an exact copy.

They now revive the bird, and, climbing into a high church tower overlooking the city, they release it and, watching the course of its flight, are fortunately able to observe its destination.

One of the adventurers now obtains employment at this place, obtains the key by stealth, and deciphers the cryptogram. Upon which hinges the remainder of the story.

The cipher, as it happens, is Fleissner's; and the key is one of the innumerable forms of the grille possible with this cipher. In order to make this more understandable some knowledge of the structure and use of this cipher is necessary.

To begin, then, this cipher is of the transposition class, the letters retaining their original values, being changed only in their relative order. This transposition is effected by means of the grille, which, in its most usual form, operates upon a square of letters consisting of an even number of rows and columns.

This even number may be 2, 4, 6, 8, 10, or any other even number whatsoever. Suppose for illustrative purposes a square of 6 rows and columns, having a capacity of \((6 \times 6 = 36)\) letters, be selected.

The preparation of the grille consists of determining the locations of its openings, the arrangement used being the key to the cipher. To do this it is first required to divide the square into four equal smaller squares, as indicated in the subjoined diagram by the Roman numerals I, II, III, and IV, and then to number the cells or spaces of each of these four squares in an exactly similar manner, also shown in the drawing.

In a grille of this size there are nine numbers in each of these four smaller squares.

In grilles constructed on squares of 8, 10, or 12, there would be 16, 25, or 36 numbers, respectively; and so on.

Now, for reasons that will soon be obvious, the number of apertures or windows in any grille of the type being described is always the same as the number of cells in each of the four subdivisions of the larger.
square. In other words the number of
openings is equal to one-fourth of the num­
ber of cells in the entire square.
In the present instance, then, there must
be 9 openings. And having determined
their number, it is now required to decide
on their locations.
This may be done by selecting any de­
sired numbers in any of the squares, with
the single restriction that each number be
used once, but once only.
Suppose that it is decided to use cells
2, and 9 in square I; cells 1, 5, and 7 in
square II; 3, 4, and 8 in square III; and 6
in square IV; all of the numbers thus being
used, but each one only once. This key,
more conveniently expressed, could be
written:

I: 2-9.
II: 1-5-7.
III: 3-4-8.
IV: 6.

If openings be now cut or punched in
any desired flat material in accordance with
this key, indicating the front and top of the
apparatus by some distinguishing mark, as
an X, or the word TOP, the completed grille
will appear as shown in the accompanying
illustration.

Incidentally, you may be interested to
know that the grille just constructed is iden­
tical with that used by Verne in his story.
The grille prepared, next let us proceed
to the manner of using it. And to demon­
strate this phase of the cipher since we have
used Verne’s grille, nothing could be more
fitting than also to use that author’s mes­
 sage.
The original of this is, of course, in
French. Besides, Verne took the additional
but unavailing precaution, which we will
not, of writing his message backward before
enciphering it. Here is Verne’s message in
English:

**ALL IS READY. AT THE FIRST SIG­
NAL THAT YOU SEND TO US FROM
TRIESTE, EVERY ONE WILL RISE TO­
GETHER FOR THE INDEPENDENCE OF
HUNGARY.**

To encipher this message, place the grille
upon a piece of paper, with the marked edge
on the upper side, and at the top. It is con­
venient to use paper ruled in squares of the
same size as the subdivisions of the grille.
But this is not absolutely necessary, as the
space occupied by the grille may be out­
lined on the paper with a pencil mark.
Now, taking the letters of the message
in their regular order, write the first letters
through the openings of the grille, placing
but one letter in each opening, and using
each opening once. In doing this the lines
of the grille must be taken in their order
from top to bottom, and any openings in
the same line must be used in their order
from left to right.
In the present case the first nine letters
of the message, **A-L-L-I-S-R-E-A-D,** will,
upon removal of the grille, be found written
on the paper in the following order:

```
A
L
I
S
R
E
A
D
```

Now give the grille one-quarter of a com­
plete turn in a clockwise direction, so that
the marked edge will be at the right. Then,
placing it upon the same space of the paper,
write the second group of nine letters,
**F-A-T-T-H-E-F-I-R,** through the openings,
observing the same rule as before.
Whereupon the first nine letters previ-
ously written, together with the second nine—just written—printed below in *italics* so that you may readily observe their order—will stand as follows:

```
+----------------+------------------+
|     A           |                   |
|     L           |                   |
|     Y           |                   |
|     I           |                   |
|     A           |                   |
|     S           |                   |
|     T           |                   |
|     R           |                   |
|     E           |                   |
|     H           |                   |
|     F           |                   |
|     D           |                   |
+----------------+------------------+
```

Next, having given the grille another quarter turn, so that the marked edge will be at the bottom, place it upon the same space, and similarly write the third group of nine letters, *S-T-S-I-G-N-A-L-T*, through the openings.

The eighteen letters previously written, with the nine just written—again in *italics*—will, upon removal of the grille, be found thus:

```
+----------------+------------------+
|     H           |                   |
|     A           |                   |
|     S           |                   |
|     L           |                   |
|     L           |                   |
|     T           |                   |
|     Y           |                   |
|     V           |                   |
|     I           |                   |
|     A           |                   |
|     O           |                   |
|     S           |                   |
|     S           |                   |
|     T           |                   |
|     I           |                   |
|     U           |                   |
|     T           |                   |
|     R           |                   |
|     S           |                   |
|     G           |                   |
|     E           |                   |
|     H           |                   |
+----------------+------------------+
```

Thus the first 36 letters of the message have been enciphered. Each additional 36 letters are now treated in an exactly similar manner, until the entire message has been enciphered.

In the event that any message, or remainder of a message, is less than the capacity of the grille, it is necessary that all unoccupied spaces be filled in with nonsignificant letters.

To illustrate, take Verne's message. After having enciphered two squares of 36 letters each, only 31 letters remained for his third square. Verne therefore filled in these five remaining spaces with the nonessential letters, *X-R-Z-A-H*. And we have used these same letters here, having prepared our translation of the same length as Verne's original message, with this purpose in mind. It looks complicated, but, although it takes a little time, it is really very simple. As in dealing with all ciphers, you will find accuracy a necessity. In many ways the grille is as fascinating as any cipher ever invented.

Finally, giving the grille another quarter turn, so that the marked edge is at the left, write the fourth group of letters, *H-A-T-Y-O-U-S-E-N*, through the openings as before. The nine letters last written, italicized below, now completely fill the remaining spaces of the square.

```
+----------------+------------------+
|     H           |                   |
|     A           |                   |
|     S           |                   |
|     L           |                   |
|     A           |                   |
|     L           |                   |
|     T           |                   |
|     Y           |                   |
|     I           |                   |
|     A           |                   |
|     O           |                   |
|     S           |                   |
|     S           |                   |
|     T           |                   |
|     I           |                   |
|     U           |                   |
|     T           |                   |
|     R           |                   |
|     S           |                   |
|     G           |                   |
|     E           |                   |
|     H           |                   |
+----------------+------------------+
```

Verne allowed his cipher to remain in this arrangement by squares. This would, of course, be strongly suggestive of its type,
but it must be borne in mind that his cipher was transmitted by carrier pigeon, where interception would be unlikely.

In modern practice, however, especially if the message were intended for telegraphic transmission, it would be transcribed into groups of five letters as follows:

**HASLA**  **LTTYY**  **IAOSS**  **TIUTR**  **SGEHE**  **NENFA**  **AILDFT**  **RDLDET**  **GORIT**  **SUREY**  **SIOTE**  **FONRS**  **GETEE**  **OWEIM**  **LVGTE**  **HAENR**  **EYRIX**  **CFNER**  **DOZOR**  **EAFPH**  **ETHNU**  **HND**

The recipient of this cryptogram, if he possesses a similar grille, has only to reverse the process just described in order to read it.

He rewrites the cipher into squares of the proper size, most easily accomplished on paper especially ruled for the purpose, and then applies the grille, reading the concealed message directly through the openings, without any further manipulation.

So much for the structure and use of the Fleissner grille. In next *Solving Cipher Secrets*, besides some unusual facts about this cipher, we expect to explain a method of solving it. Appended, however, you will find two Fleissner ciphers to engage your interest in the interim.

Concerning these ciphers, as to the sizes of the grilles employed, or the arrangement of their openings, we are saying nothing. These things, along with a method of solving the cipher, are left for you to discover.

Neither have we anything to say of the messages that these ciphers convey, with the exception that, in view of Colonel Fleissner's army service, you might find that we have made them of a military nature.

If this be true, besides the shorter connectives common to almost every variety of writing, the reader may suspect the presence of certain longer words usually found in military messages. But even with this hint, those who are successful in solving these ciphers will be doubly deserving of credit.

Many, including Verne himself, have considered the Fleissner grille indecipherable without the key. And, in this connection, Verne's own words will be interesting.

"It would seem," says this writer, "that gratings offer the best and surest means of obtaining an indecipherable cipher. *Without the grating the message will remain unread*, but once this is obtained the mystery vanishes."

Now a grille has already been defined as a barrier against an intruder. And this is true whether that sought after be gold, or words, or rubies.

But there are, nevertheless, certain differences in grilles.

For instance, consider a grille as a door or window. Here if skill avails not a thief to gain entrance, he may still resort to violence, break through, and steal away the treasures that may lie within.

Not so with the grille *cryptographic*.

For with this, if one lacks skill, force can avail nothing.

Indeed, if the very elements were to rage forever in all their fury at the riddle imposed by this frail obstacle, its secret must still easily remain secure.

Here is a battle where force plays no part, and wits play all.

Skill, properly directed, can certainly prevail over this barrier.

*Can you surmount it?*

**SPECIAL EXTRA!**

"Noted bank robber traps himself with cipher message!"

"Buy a paper! *Extra!*"

That the newsboys may soon actually be crying this, and that FLYNN's cipher.
FLYNN'S

fans may be instrumental in bringing it about, are not at all extravagant flights of the fancy.

For a police official of a certain Western State has sent us a curious piece of writing, believed to be a cipher, taken from the person of a prisoner now jailed in his city, awaiting trial for supposed bank robbery.

The prisoner in question has a police record in three penal institutions. And the writing, which may give a line on the movements of this prisoner, was done with pencil upon a small piece of heavy brown paper.

If any of you succeed in making anything out of this, communicate with us without delay, and your findings will be forwarded to the above mentioned official immediately.

Here is the supposed cipher:

MO. B.D. G. 1/4 1/2 R. D.C.
YA. 3/2 L
M. BA. 1/2 E. 1/2 R.T.C. 1/2 W.
FO. 3/2 A.B. D.C. 1/4 L.D.C.
D1. 1/2 H. E. 1/2 D.C. D.L.
V. 3/2 D.C.R. 1/2
WB. 1/2 L.D. 5 A.B.D. 2L. D.D.
WOS. WIL. R. 1/2 H. 1/2 R.D. 1 D.
H. EM. 1/2 LOW. D.C. 1/2 L.D.C.
P.B. 1/2 B.L. D.C. 1.R. 1/2 L.D.C.
H. 3/2 A.B.D.C. 6R 1/2 R U

Next you will be given another chance at a cipher written with a different manipulation of the same key as was used with the fourth challenge cipher in FLYNN's for June 27.

This cipher really offers no great difficulty of solution. And, solving it, you should be able to turn to the other cipher just mentioned, and penetrate its mystery also.

DEAR SIR:
I am peeved, shocked, and disgruntled, because your "fans" will not admit that my "cipher" is unsolvable. Until it is done I shall, vehemently or otherwise, claim that no human being can solve it.

In the event that the previous one was overlooked, here is another one, just as simple as I can make it. Go to it!

Just imagine that this message would be invaluable information to the government, and solve it, or give it up. J. C. BELL.
Cleveland, Ohio.

CIPHER No. 4.
P G S J Q W O J E F W I G D Q N
L Y I H K T W R O J I X D F H Y
W J Q N S L P M W Y.

Now for another cipher, not so serious as the above, perhaps, but still with an official history; and one which, though not indiscernible, should provide you with an interesting period of study.

DEAR SIR:
We have become interested in FLYNN's magazine and especially in the cipher department, and have resolved to send in for your approval a noted cipher which we have known in our family for a good many years.

It was originally an old-time police cipher, and we greatly doubt if there is any one living to-day who knows it except in our family.

H. J. LOTUS.
Chico, Calif.

CIPHER No. 5.
30-7-10-0-47-5-0-24-7-12-11-22-14-0-53-52-0-
42-21-40-22-50-4-37-10-15-7-0-54-33-35-34-
35-12-14-10-0-39-21-51-6-55-12-0-36-23-31-
10-48-30-28-22-27-16-0-63-14-52-72-29-0-
55-0-34-17-33-15-61-16-31-20-0-21-20-55-12-
44-33-50-12-0-55-10-58-41-56-55-90-45-0-56-
33-30-29-73-31-0-87-38-25-14-44-18-52-7-0-
68-13-24-7-53-42-0-47-26-18-17-60-46-75-71-
0-107-58-101-100-80-37-0-60-26-111-64-64-
26-0-55-10-78-40-0-111-06-61-32-45-12-39-
72-27-16-18-32-6-60-17-15-11-70-32-80-53-
50-35-80-35-61-12-22-11-47-26-32-16-70-35-
62-45-0-
33-14-40-11-103-86-53-27-0-
That the simple substitution cipher is certainly decipherable, given sufficient material in the same key, has already been demonstrated.

To make this cipher of any value among the initiated, then, it would seem necessary to modify its appearance, to camouflage it, in other words, so that it might be able to pass itself off as something other than its real self.

For example, the following cipher from Thomas F. Taylor, Brooks Field, San Antonio, Texas, might get by an unsuspecting eye as an order, bill, or memorandum for some lumber.

Could it get by yours?

CIPHER No. 6.

1. x 3 — 13 pcs. 15 ft. long; 5 pcs. 22 ft. long
2. 5 x 4 — 12 " " 6 " 20 " "
3. 7 x 9 — 19 ".. "
4. 2 x 4 — 13 ".. " do. 14 ".. "
5. 6 x 9 — 23 " 5 " 4 pcs. 14 ".. "
6. 4 x 3 — 8 " 20 .. " do. 5 ".. "
7. 3 x 2 — 15 " 20 ".. " do. 4 ".. "
8. 8 x 9 — 25 ".. " do. 4 ".. "

Ciphers are infinite in their variety. And the variations possible in any particular system are often so numerous as also to be practically unlimited.

Thus it is possible for one to know all about the construction of a cipher, but, without the special key, still be unable to solve it.

The next cipher, submitted by Jack Crawford, Los Angeles, California, is one of this kind. Only certain letters of certain words have any significance here. Any one in possession of the key, which is numerical, can locate these significant letters in a few minutes.

To solve it without the key, however, is a different proposition.

CIPHER No. 7.

DEAR PARTNER:

It would ruin our other wells or take quickly from the value of the bad one. It all keeps on getting worse and, back of the certain result, can, in general, be acknowledged a failure.

When you consider candidly that annually every dollar that by means of other people we coined, it immediately stops every move, almost, in fact, effectively putting us out of doing something or other.

All the investors have become impatient. When the attempt has entirely been immersed, we will buy up the most impatient at every reasonable opportunity. By all means stop worrying.

We differ on the other ways of effecting a cleanup. Cold weather prevents buying the entire normal second field. Accordingly I will learn when I can get aggregate information valuing it. Yet the lease was sold before closing yesterday.

Am using corner lot where our old office was for storehouse. Write or telegraph everything important and don’t forget once in awhile when puzzled and timid, strike hard.

Your partner,

JACK.

Mr. Crawford also inclosed his method of solving Nihilist ciphers, similar to that described in FLYNN’s for October 10. As to the above cipher, he says he will take his hat off to any one who can decipher it.

Must he doff it to you?

DE ROHAN CIPHER SOLVED

If you endeavored to solve the De Rohan cipher—No. 1 in FLYNN’s for October 31—along the lines suggested, you no doubt eventually hit upon the values the, is, he, and has, for groups 1, 3, 5, and 6, respectively.

(1) JWG DULHXCGU LH AGTA.
(2) The is is ea he has.
(3) The prisoner is dead, he has told nothing.

These four words show that T, G, W, L, H, and J, have been used as substitutes for A, E, H, I, S, and T, respectively. Substitute these values throughout the cipher, and the result is shown at (2):

Proceeding then by the method detailed in FLYNN’s for May 16, and the remainder of the cryptogram, as shown in line (3), should have been deciphered without any difficulty.

The original cryptogram in French can
now be read, even if only out of curiosity, since it contains but one character—V, in group 4—not found in the English, and it takes no great stretch of the imagination to see that this must be the substitute for M. Here is the French: LE PRISON-NIER EST MORT, IL N’A RIEN DIT.

To make this record complete, we now append the De Rohan alphabet, reconstructed in so far as is possible from this message. The two cipher characters Z and W, in italics, are not a part of the original alphabet, having been used in the English for G and H, two letters not occurring in the French.

Normal

A B C D E F G H I J K L
Cipher: T — — A G — Z W L — — M

The shorter a cipher of this type, the more difficult becomes the solution. However, many short specimens, such as the above, can often be read at sight. The No. 4 cipher in the September 12 issue was an example of this. Several fans wrote us that they solved this cipher at sight, and there can be no doubt that many also similarly succeeded in solving the De Rohan cipher.

It is conceivable, though that even a simple substitution cipher can be indecipherable. This would be when the message was of only two or three words, and written in a mixed alphabet, where the identity of no character depends upon any other.

Now for a whack at No. 2, which, as many of you probably inferred, was written in Bacon’s biliteral cipher, described in FLYNN’S for April 25.

Since in the biliteral alphabet the a characters may be expected to outnumber the b characters about two to one, a glance at this cipher should have been sufficient to show that Roman letters were used for the former, and Italic for the latter.

Transcribing the cipher in terms of a and b, dividing into groups of five, and substituting from the biliteral alphabet, cipher No. 2 lines up thus:

(1) Some doubtfully veracious writer — etc.
(2) baab aaabbbabbaa aababab — etc.
(3) baaba aabbb aabaa babababa — etc.
(4) T H E E X (E) etc.

Completely deciphered, the internal or infolded writing is: THE EXECUTIONER DECLARED AFTERWARDS ON HIS OATH THAT SUCH OCCUR-

REFERENCES WERE EXTREMELY RARE.

It is not necessary, however, to have knowledge of Bacon’s system in order to solve this cipher. Any one attempting to solve it without this information would soon note the repetition of certain arrangements of Roman and Italic letters by fives. And knowing that groups of at least five characters, each capable of two differences, would be needed to provide substitutes for all the letters of the alphabet, it would only be required to transcribe the characters in a manner similar to line (4) above, when the cryptogram could be solved as a simple substitution cipher.

From this it must not be inferred that all Bacon biliteral ciphers are easy of solution. In the two examples offered in the April 25 and October 31 issues, this cipher was presented in its simplest form.

And these must be considered as only paving the way for more complex varieties.