

### Challenge 3

#### Solution:

**Method of enciphering:** The image of Brower's desk indicates a type of grille was used. We see a series of grilles with a few holes punched out. If this grille is placed over the ciphertext, some plaintext can be read. However, just using the grille once would only allow for a fairly short message (15-16 characters). To achieve a longer message with the same grille, it can be rotated 90 degrees to reveal more of the message. Two more rotations would reveal the last two pieces of the plaintext. All of the grilles in the photo have holes punched in such a way that any 90 degree rotation would reveal a different set of 15 characters. In fact, the design of such a grille is hinted at by the two grilles with the numbers still showing: the numbers 1-16 appear in the NW quadrant and their positions after subsequent 90 degree rotations appear in the other four quadrants. Thus, to make a Turning Grille, one must punch out one of the four "1"s, one of the four "2"s, etc. One can then just start writing the plaintext message in the "holes" and rotate the grille by 90 degrees when more space is needed. It looks like the places occupied by the number 16 were not used (the center four cells of the ciphertext block are blank). Maybe the grille used is in the picture [it isn't]. However, given a crib, one can begin to re-create the grille used as a key.

**Recreating the key:** The drop location is supposed to be in Central Park, so we try using this for a crib. Since "K" is not a very common letter, we look for the letters in "PARK" fairly close together. We find two possible "P"s and two possible "K"s with one choice for an "A" and "R" between them:

```
P F A U S L E L
W I B C G E R R
N H A T R T R L
Y G P1     E R O
F I E     P2 L C
O L A D E S R I
K1 L E K2 N F D T
R S X T R O O X
```

Label the current four possibilities at this point:  $P_{11}$ ,  $P_{12}$ ,  $P_{21}$ ,  $P_{22}$  depending on the choices for "P" and "K". So,  $P_{12}$  means take the first choice for "P" and the second choice for "K".

We don't see the word "CENTRAL" coming before "PARK". However, there is a "TRL" (actually three ways to form this using different nearby "T" and "R" combinations), so perhaps we should look for an abbreviation. Before the "TRL"s we do find a "C" & "N" close by. We're pretty sure we want a grille with holes where the red letters are:

```

P F A U S L E L
W I B C G E R R
N H A T R T R L
Y G P1 E R O
F I E P2 L C
O L A D E S R I
K1 L E K2 N F D T
R S X T R O O X

```

At this point, create four grilles with holes punched out in all the red positions and each grille having holes punched out according to one of  $P_{11}$ ,  $P_{12}$ ,  $P_{21}$ ,  $P_{22}$ . Also, punch out the four holes for the two "TR" positions, but put small colored dots in the squares so you can keep the blue "TR" separate from the green "TR". Of course, we could also use the blue "T" with the green "R".

If we assume that the grille is used by writing plaintext in the punched holes, rotating 90 degrees, and repeating, place each of the four grilles over the ciphertext rotated 180 degrees. The holes that originally corresponded to "CNTRLPARK" should now spell out some more of the plaintext message. (You could just rotate 90 degrees, but this will likely just reveal some plaintext letters far apart in actual message, making it difficult to guess at missing letters. Rotating by 180 degrees gives us plaintext letters close by.) We have four grilles and three possibilities for "T" and "R" for each grille.

Using  $P_{11}$ : the three possible pieces of plaintext are:

- rhtpodein (corresponding to the blue "TR")
- rhtpolain (corresponding to the green "TR")
- rhtpolein (corresponding to a mix)

The third option looks most promising (blue "T" and green "R"). Using this option with the other three grilles rotated 180 degrees yields:

$P_{12}$ : ghtpolein

$P_{21}$ : rhtpolein

$P_{22}$ : ghtpolein

A reasonable guess of the plaintext would be "light pole in". If so, there is one good choice for "I" and two for "L". If we rotated back 180 degrees to the original position, these would correspond to the blue positions:

P F A U S L E L  
 W I B C G E R R  
 N H A T R T R L  
 Y G P<sub>1</sub> E R O  
 F I E P<sub>2</sub> L C  
 O L A D E S R I  
 K L E K N F D T  
 R S X T R O O X

If the first “L” is chosen the plaintext reads “cntrl park dx”. If the second “L” is chosen the plaintext reads “cntrl park dr” which seems more promising. We know that the message is describing a dead drop, so maybe “dr” is the start of “drop”. If we rotate the grille 90 degrees clockwise, an “O” shows up in the bottom row and a “P” shows up in the upper left, confirming some of our earlier choices.

We now have about half of the plaintext message:

Piece 1 (which may not be the beginning of the message):

- “[maybe something here]cntrl park drop”

Piece 2 (rotate 90 degrees clockwise): (which will have some additional letters added throughout, so it is hard to read):

- ... drop “l a r g e r d l e f o” [the word LARGE is promising]

Piece 3: [rotate again]:

- Light pole in [maybe a few missing letters at the end]

Piece 4: [as with piece 2 there could be some missing letters to fill in, so it’s hard to read]

- a b e r r i e l d s x x

The two “x”s might be nulls indicating that piece 4 is indeed the last piece of the message which might mean that piece 1 is the first. Since the “p” in “drop” starts off piece two, the most likely order is piece 1, piece 2, piece 3, and piece 4.

At this point, it’s a matter of making a few guesses as to the missing words, punching out the appropriate grille cells and rotating the grille through the other positions to see if the guess yields good results.

Hints:

- Piece 2 may be describing a LARGE object that begins with an “R”. Try coming up with some possible words by taking letters that follow the “R” in the ciphertext: rope, rice, rock, etc.

- The end of Piece 3 appears to indicate where a light pole is located in Central Park. So, the end of Piece 3 and Piece 4 could be a location in Central Park. The “berr” and “ields” may bring to mind Strawberry Fields.

If you punch out the cells in a grille corresponding to the following red letters you will have the key:

```

P F A U S L E L
W I B C G E R R
N H A T R T R L
Y G P     E R O
F I E     P L C
O L A D E S R I
K L E K N F D T
R S X T R O O X

```

Yielding the following plaintext [spaced added]:

use cntrl park drop large rock left of light pole in strawberry fields

This should be enough detail to stake out the drop and catch Worsteadt.

**Alternate crib:** Several teams noticed pieces of “Strawberry Fields” in the ciphertext and using maps of Central Park, identified this large crib.