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SUBJECT: OTTICO MECCANICA ITALIANA CRIPTOGRAF-WIRING

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OTTICO MECCANICA ITALIANA "CRIPTOGRAPH"

1. The "Criptograph" is an Enigma-type machine with a cipher maze consisting of end plate, 5 rotors, 1 stator and a reflector.

2. Although the model under consideration is provided with rotors which are cammed for simple motion, (the rotor contacting the end plate moving one position for each keyed letter; all other rotors one position for each complete revolution of the preceding rotor), it is understood that the manufacturer may construct rotors with multiple cams ("notches").

3. A feature of the "Criptograph," both physically and cryptographically, is that each of the 5 rotors is made up of 2 cores, - each core being a completely wired unit. The cores may be locked together at any of 26 positions with reference to each other; the resulting double core may be fixed within the rotor ring in any of 26 positions with reference to the ring.

4. The following definition and/or descriptions are applicable:

5. Rotor: A complete wheel which rotates when the machine is keyed. It includes two wired cores fixed together within an outer ring.

6. Core: Wired wheel with flat contacts on one face and plunger contacts on the opposite face. Two cores are joined in each rotor. Since the longitudinal axis of the maze (this model) runs from front to rear of machine, it will be convenient to refer to the cores of each rotor as "Front Core" and "Rear Core". Front cores are numbered with odd figures. Rear cores are numbered with even figures. Front cores cannot be interchanged with the rear cores.

This model has been provided with 8 front cores and 8 rear cores. Specific cores will be referred to as:

F1, F3, F5, F7, F9, F11, F13, F15
R2, R4, R6, R8, R10, R12, R14, R16

Any front core may be combined with any rear core to make a rotor.

7. The following partially mixed alphabetic sequence is used on the core faces to mark wiring terminal points.

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

This sequence runs clockwise around each face of a core; that is, a straight through wire, moved successively through the 26 positions would generate reverse mixed alphabets at its opposite points:-

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

The relationship is, of course, reciprocal. A white dot is marked on outer circumference of each core at letter "A" as reference point for setting it within ring of rotor.

8. Ring: The housing of the cores, constructed so as to permit each core to be set at any of 26 positions which are indicated by digits from 01 to 26 around outer circumference of ring. When the rotor is in operating position the number sequence runs clockwise around circumference from operator's viewpoint. Since the rotor rotates counterclockwise the numeral sequence is brought to the window benchmark in normal order.

9. Cam: Device on ring of each rotor equivalent in function to the "notch" of an Enigma rotor. It is affixed to the ring at reference point 01, but effects a turnover on junior rotor when 26 on senior rotor appears at window benchmark.

10. Stator: The stator consists of a ring containing one core. Though non-rotating when the machine is keyed, the stator is settable to any of the 26 positions on the ring.

In the model under consideration, the stator is constructed so that the core can be screwed into the ring in but two positions: "A" core to "06" ring and "A" core to "19" ring. The latter relative position was found in this model as delivered.

11. Since the lettering on the front face of the core of the stator cannot be observed without removing core from ring, it will be convenient to note that with "A" core to "19" ring the following front face of core to ring relationship holds:

Ring	19	20	21	22	23	24	25	26	01	02	03	04	05
Front Face	A	T	M	I	W	J	K	X	Y	Z	U	V	S
	06	07	08	09	10	11	12	13	14	15	16	17	18
	R	Q	P	O	N	L	H	G	F	E	D	C	B

12. Reflector: The reflector, which is non-rotating but settable, is single faced making contact with rear face of stator.

Terminal points of wires are pairs of points on its face. The specific reflector at hand is wired in accordance with the following table which is to be read vertically in pairs and refers to reference points on ring of reflector:

Input	ø1	ø2	ø3	ø4	ø5	ø6	ø7	ø8	ø9	1ø	11
Output	18	19	12	22	15	11	24	16	13	17	ø6

12	13	14	15	16	17	18	19	2ø	21
ø3	ø9	26	ø5	ø8	1ø	ø1	ø2	21	2ø

22	23	24	25	26
ø4	25	ø7	23	14

13. End Plate: The end plate is single faced and fixed, making contact with the front face of the first rotor. Its contact points are marked with the same partially-mixed alphabet sequence, clockwise, with "C" fixed at the 12 O'clock position:

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

14. The print wheel is also constructed in this sequence. End plate keyboard/print wheel wiring is straight, with each letter going to its counterpart at the terminal points.

15. It is known that an end plate wired in normal alphabetic sequence is in existence.

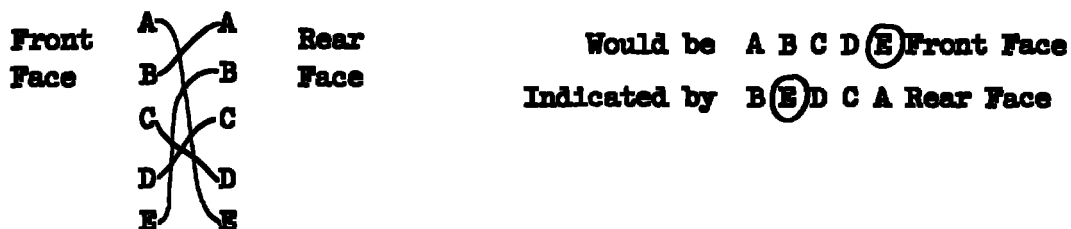
16. Wiring: To avoid confusion, (though, the opposite end may be served), wiring diagrams will replace the alphabetic sequence marked as contact points on the cores by the normal alphabet which will be considered to run clockwise around front face of core and counterclockwise around rear face of core. In this case, a straight through wire, moved successively clockwise through the 26 positions on the front face, would generate the normal alphabet at its opposite ends.

17. The conversion table which follows might be helpful. The marked alphabets are in lower case type while the normal alphabets, arbitrarily used for wiring diagrams, are in capital letters:

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Front Face	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				
	a	t	m	i	v	j	k	x	y	z	u	v	s	r	q	p	o	n	l	h	g	f	e	d	c	b				
Rear Face	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	v	u	z	y	x	k	j	v	i	m	t
	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				

18. Wiring diagrams will use the system of presentation wherein terminal points of wires and wire length may be determined from the position of like letters:



19. The E's have been circled for illustration. The diagram indicates that E on front face goes to B on rear face (which appears in diagram over the other E).

It in turn indicates that E on rear face goes to A on front face (which appears in diagram under the other E).

Wire length is measured linearly. The wire length from E front to B rear is 2.

Front Cores - Wiring

F1 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
Q U O E V G Y X L N I K Z R J S F M H P T B A W C D

F3 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
S F J N I T O D C A E K U L R V H G B X W Y M P Q Z

F5 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
E H I L S K Y Z M J C R X W Q U P N F D A G O B V T

F7 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
Q P J R N O Y L U D T M A B C S W Z G I H X V E F K

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Front Core - Wiring (Cont'd)

F9 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
L K E H P N G B D M F O C W U Y R A J Z F Q V S I X

F11 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
L E P K H Q I O C D T W X A Z U V N B G M R F J S Y

F13 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
B I K W X Y A Z V Q C F G S L N P E H J U T M D R O

F15 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
H E L I Q K J C D R N M P B T W V A Z Y F G X S O U

Rear Cores - Wiring

R2 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
K D V Z E H Y T R P I G N Q B A S X J L O F C W U M

R4 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
L J C O X P T S E Q V G R Y H I U F K A Z B M W D N

R6 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
M J W V N Q O C U H B D F K G Z Y X L E I R A P T S

R8 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
H V E Y S G R A B P X M W I N K J L F D Z C T Q U O

R10 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
B N P R S F T V Y U D G C Q O E M I L H A Z K X W J

R12 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
E U R A H I T D Y F M B X J G W N C L K Z P V Q O S

R14 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
M B G F S R C Q Y L X W V E H D U N P O Z A I J K T

R16 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
I M B A Z Y N H V L E T D F G C S O P Q W X R K U J

20. It may be useful to include a wiring diagram showing terminal points as marked on core faces. "A diagram of Front Core #1, using the partially mixed alphabetic sequence, is presented for reference.

F1 A T M I W J K X Y Z U V S R Q P O N L H G F E D C B
O I M E A T H P X S J L Z N B U Y R V D C K F W Q G

21. Since, in this case, the alphabets on the two faces are reverse and reciprocal, wire length cannot be measured linearly on this diagram. The following table may be used to obtain wire lengths, from input terminal to output terminal, measured clockwise with input face toward observer:

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

Wire Length = Output Terminal Minus Input Terminal

21. Stator - Wiring: It should be restated that on this stator "A" of the front face of the core is at "19" of the ring.

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

22. A sample of the tape and print of the the O. M. I. is attached for reference:

ABCDEF GHI JKLMNCPQR S TUVXYZ

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