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January 13, 1943

MEMORANDUM FOR MR. M.O. HAYES. (OFFICE OF THE JAG, ROOM 2324 NAVY BLDG.)

Subject: Patent Applications for ECM Mark II.

1. The following is quoted (with slight modifications) from a memorandum prepared by myself on February 19, 1941:

"As a matter of official record (because many novel features of the ECM Mark II are too secret to patent) and to supply the 'background' of this device, the following historical sketch is given:

"(A) Mr. Ed. Hebern of Oakland, Calif.

"Original inventor of the electric cipher machine, consisting of keyboard, printer, ciphering unit and a two-way 'encipher-decipher' gang switch; all but the latter being covered by U.S. Patent No. 1,510,441 dated September 30, 1924. His ciphering unit consisted of several rotating, circuit-changing elements (patented under the name of 'code-wheels') arranged in 'series' (or 'cascade'), between fixed 'end contact plates', with insulating separator plates (carrying through contacts) between the code-wheels. The code-wheel stepping was mechanically controlled and was of modified meter action. About 30 of the second lot of Hebern Cipher Machines (now about 10 years old) are still in service. The general features of this machine were subsequently re-invented by others and patented in England, Germany, Sweden, and probably other countries. Similar machines have been constructed abroad.

"Of the essential elements which are embodied in the new ECM Mark II, Mr. Hebern invented:

- (1) The 'Code-wheels'
- (2) The 'Alphabet Maze'
- (3) The 'Electric Keyboard'."

Note: It is understood that Mr. Hebern has submitted other patent applications, including the two-way "encipher-decipher" gang switch.

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~~CONFIDENTIAL~~"(B) Mr. W. F. Friedman, War Department:

"Invented and disclosed to the Navy Department in 1935 (or early 1936) three different methods of electrical stepping control for electric cipher machines, one of which is embodied in the ECM Mark II. Elimination of mechanical stepping control (found in the HCM and ECM Mark I) is one of the essential features of the new machine. Of the essential elements of the ECM Mark II, Mr. Friedman invented:

- (4) The 'Stepping Maze'."

Note: Mr. Friedman later submitted secret patent application for the above, assigning military rights to the U.S. Government.

(Patent Application No. 70,412 dated March 23, 1936.)

"(C) Lieut. Commander D. W. Seiler, USNR, Washington Navy Yard.

"Invented or designed the following features of the ECM Mark II:

- (1) The 'Index Maze'. (Essential element.)
- (2) Circuits (and resistances) for 115-volt DC, 115-volt AC, or 24-volt battery operation - at option.
- (3) Emergency hand-drive gear.
- (4) Automatic word spacer.
- (5) The 'zeroizer' switch.
- (6) Spark suppressor circuits.

"(D) Commander L.F. Safford, Navy Department.

"Invented or designed the following features of the ECM Mark II:

- (1) The stepping circuits, with the grouping of end contacts in the 'stepping maze' and 'index maze', and the utilization of 30 out of the 32 possible stepping combinations for the 'alphabet maze'. (Essential element.)
- (2) The three-way 'plain-encipher-decipher' gang switch.
- (3) The code-wheel setting circuits.
- (4) The 'zeroizing' circuits.

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"(E) Mr. E.H. Reiber (and associates), Teletype Corp. Of Chicago, Ill.

"Invented or designed the following features of the ECM Mark II:

- (1) Printer (adaptation of stock ticker). (Essential Element.)
- (2) General layout (basically similar to 'cipher unit' of ECM Mark I).
- (3) Power unit, with cam-shaft and clutch (adaptation of similar units of ECM Mark I).
- (4) 'Triggering action' of printer magnets and stepping magnets.
- (5) Automatic group spacer.
- (6) The through contacts in the separator plates (identical with ECM Mark I). This is the only type of through contact that has proved satisfactory.
- (7) Receptacles and circuits for 'parallel operation'.
- (8) Place finder.
- (9) Clutch trip magnet contacts, and other miscellaneous auxiliary mechanical features."

2. The patent application (in secret status) for the ECM Mark II should include the following features:

(a) Invented by Lieut. Commander Donald W. Seiler, Washington Navy Yard.
(Address 1524 Ridge Place, S.E., Washington, D.C.)

- (1) "Index Maze".
- (2) Circuits (and resistances) for 115-volt DC, 115-volt AC, or 24-volt DC (battery) operation - at option.
- (3) Emergency Hand Drive Gear.
- (4) Automatic Word Spacer, wherein "Z" is substituted for space, and "X" for "Z" upon encipherment; and "space" prints as "space" and "Z" as "X" on decipherment.
- (5) "Zeroizer Switch".

(b) Invented by Captain Laurance F. Safford, Navy Department.
(Address 2821 Dumbarton Avenue, N.W., Washington, D.C.)

- (1) "Stepping Circuits" with the grouping on end contacts in the "stepping maze" and in "index maze", the utilization of 30 out of 32 possible stepping combinations in the "alphabet maze", and any variations thereof.
- (2) Three-way "Plain-Encipher-Decipher" gang switch.
- (3) Code-wheel setting circuits (involving the "zeroizer switch").
- (4) "Zeroizing circuits" (involving the "zeroizer switch").

~~CONFIDENTIAL~~(c) Invented by Teletype Corporation.

- (1) Printer
- (2) Triggering action of printer magnets and stepping magnets.
- (3) Circuits for "parallel operation".
- (4) Automatic Group Spacer.

3. The teletype Corporation made an independent invention of the "Stepping Maze", but Mr. Friedman antedated them by at least two years. Features other than those listed in paragraph 1 (E) or 2 (c) were not invented by the Teletype Corporation. The Place Finder is not worth patenting but there is no objection to including it in the Patent Application.

L.F. Safford,
Captain, USN,
Op-20-S-5.

Copy of this memo sent to;

Lt. Comdr. T.A. Smith, USN
Op-20-S-1

Lt. Comdr. D.W. Seiler, USNR
Washington Navy Yard

Mr. L.D. Whitelock, Buships.