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GENERAL HEADQUARTERS
G-2
FAR EAST COMMAND

FILE NO. 412.41

LINE NO. _____ TO _____

DATE JAN 1947 TO DEC 1947

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By NARA Date 11-21-11

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G-2, GHQ, FEC
APO 500

28 March 1947

FROM:

TO:

AC of S, G-2.....(____)
Executive.....(____)
Asst Executive.....(____)
E/A, Adm.....(____)
E/A, CIS.....(____)
E/A, T.S.& S.....(____)
E/A, Radio Reports.....(____)
E/A, WDID.....(1)
E/A, Miscl.....(____)
E/A, Gen Liaison.....(____)
E/A, Jap Liaison.....(____)
Theater Intell Div.....(____)
Operations.....(____)
PDM.....(____)
Plans & Estimates.....(____)
WDI Div.....(____)
CI Div.....(____)
Historical Section.....(____)
Library.....(____)

TO:

Administrative Officer.....(____)
Chief Clerk.....(____)
Message Center.....(____)
File Clerk.....(2)

FOR:
Information.....(1)
Necessary Action.....(____)
Note & Return.....(____)
Approval.....(____)
Signature.....(____)
Initials.....(____)
Comment or Concurrence...(____)
Dispatch.....(____)
Info on which to base reply.(____)
File.....(2)

Initials_____

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SSON
GSC
Division

MEMO FOR RECORD

GB/5250 TIC/SCW/plc
27 March 1947

Reference 1 above was forwarded to 5250th TIC by CIS. Request they be furnished one copy of investigation. Investigation will be continued as stated in paragraph 5 Report of Investigation and any further information will be forwarded.

R.L.F.____82-0184

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GENERAL HEADQUARTERS
FAR EAST COMMAND
Military Intelligence Section, General Staff

APO 500
27 March 1947

GB/WDI DIV

SUBJECT: TERANISHI - Type Sodium Turbine.

TO : Director of Intelligence, War Department General Staff,
The Pentagon, Washington 25, D.C.

1. Reference file No. MID 000.73, subject: "Civil Censorship Intercept JP/OSA/34460", dated 12 Nov 1946.

2. Forwarded herewith is Report of Investigation - TERANISHI - Type Sodium Turbine by 5250th Technical Intelligence Company, dated 27 March 1947 with two (2) Inclosures.

3. 5250th Technical Intelligence Company will continue the investigation as stated in par 5 Report of Investigation, and forward all further information gained.

For the Assistant Chief of Staff, G-2:

E. H. F. SVENSSON
Colonel GSC
Director WDI Division

1 Incl: as described in par 2 above.

MEMO FOR RECORD

GB/5250 TIC/SCW/plc
27 March 1947

Reference 1 above was forwarded to 5250th TIC by CIS. Request they be furnished one copy of investigation. Investigation will be continued as stated in paragraph 5 Report of Investigation and any further information will be forwarded.

R.L.F. 82-0184

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412.5 Engineer

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By NARA Date 11-21-11

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GENERAL HEADQUARTERS
FAR EAST COMMAND
Military Intelligence Section, General Staff

GS/MDI DIV

APO 500
27 March 1947

SUBJECT: TERAHIRI - Type Sodium Turbine.

TO : Director of Intelligence, War Department General Staff,
The Pentagon, Washington 25, D.C.

1. Reference File No. MID 000.75, subject: "Civil Censorship Intercept JP/OSA/34460", dated 12 Nov 1946.

2. Forwarded herewith is Report of Investigation - TERAHIRI - Type Sodium Turbine by 5250th Technical Intelligence Company, dated 27 March 1947 with two (2) Inclosures.

3. 5250th Technical Intelligence Company will continue the investigation as stated in par 5 Report of Investigation, and forward all further information gained.

For the Assistant Chief of Staff, G-2:

F. H. F. AYMESCH
Colonel GSC
Director MDI Division

1 Incl: as described in par 2 above.

MEMO FOR RECORD

GS/5250 TIC/SGW/plc
27 March 1947

Reference 1 above was forwarded to 5250th TIC by CIS. Request they be furnished one copy of investigation. Investigation will be continued as stated in paragraph 5 Report of Investigation and any further information will be forwarded.

R.L.F. 82-0181

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5250th TECHNICAL INTELLIGENCE COMPANY
WDI DIV, G-2 GHQ FEC

APO 500
27 March 1947.

SUBJECT: Report of Investigation of TERANISHI - type Sodium Turbine.

TO : Director, WDI DIV.

1. REFERENCES:

a. Memorandum, Civil Intelligence Section, GHQ, AFPAC, to 5250th Technical Intelligence Co., subject: "Civil Censorship Intercept JP/OSA/34460", dated 18 December 1946.

b. Letter, file MID 000.73 Intelligence Division, War Department General Staff, Washington 25, D.C., subject: "Civil Censorship Intercept JP/OSA/34460", dated 12 November 1946.

c. Civil Censorship Intercept JP/OSA/34460, dated 20 October 1946, subject: INVENTIONS AND PATENTS: "Production of Teranishi-type Turbine Engine".

2. PURPOSE:

To determine extent of development and application of sodium turbine engine described in reference CCD Intercept, and to obtain data on patents granted; engine specifications, and fuel sources.

3. DETAILS OF INVESTIGATION:

Interrogation of TERANISHI, Hiryoshi, inventor of the turbine at Osaka, Japan, revealed that the turbine is registered with the Imperial Japanese Government Patent Office in Tokyo Japan and is covered by patent number 354800. On 18 August 1946, TERANISHI received a permit (Osaka MG 109-213) for experimentation, production, and sale of constant pressure combustion turbine set in motion by catabolism of metallic natrium. No detail drawings of the turbine have yet been made by TERANISHI. An assembly drawing, (Incl 1) shows the four main sections: (1) hydrogen generator; (2) high pressure combustion chamber; (3) air compressor; and, (4) conventional type turbine. Not shown is equipment for extruding metallic sodium into the reaction chamber.

The sodium turbine has never been built and tested as a complete unit. Tests were made on the hydrogen generator; the generator was then dismantled and refashioned into a combustion chamber unit. In testing the latter unit, gasoline ignited by spark was substituted for the hydrogen gas, which would ignite spontaneously at the operating

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temperature of the chamber (180° C). TERANISHI stated that he has conducted all experiments at his own expense without outside financial help but that he does not have sufficient capital to build a complete working model of the turbine. Research notes of TERANISHI indicated that he proposes to manufacture metallic sodium by chemical reduction in an induction-heated smelter, using an un-named reducing agent (Incl 2).

4. CONCLUSIONS:

a. The sodium turbine envisaged by Mr. Teranishi is presently only in a rudimentary stage. The main points of interest, the extrusion apparatus which will charge the hydrogen generator, and the economic production of the base fuel, metallic sodium, by means of a reducing agent, are not yet clearly developed by the inventor.

b. The efficiency of the turbine (65-84%) is based solely on calculated rather than observed performance.

5. RECOMMENDATION:

Recommend that this report be forwarded to Intelligence Division, War Department General Staff, Washington, D.C., and that further investigation of method whereby metallic sodium is to be produced by a chemical reduction be made by this unit.

RALPH L FOSTER
Lt Col Cav
Commanding

Incl 1: Assembly Drawing.
Incl 2: Research notes of Mr. Teranishi.

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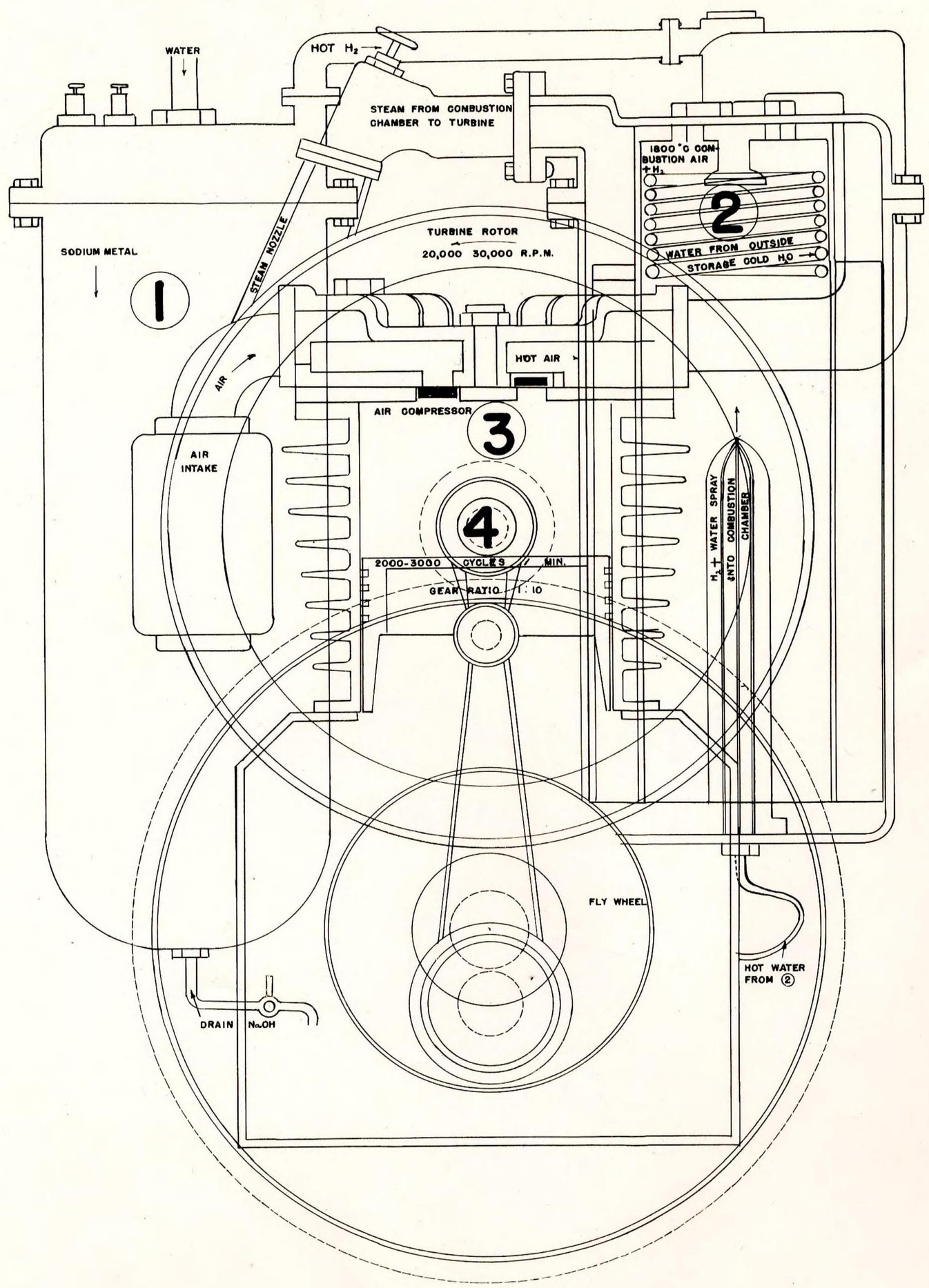
NO.	PART NAME
1	HYDROGEN GENERATOR
2	HIGH PRESSURE COMBUSTION CHAMBER
3	AIR COMPRESSOR
4	TURBINE



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NOTES ON THE SODIUM TURBINE - TERANISHI

Enterprise:

1. The Sale and Manufacture of an Internal Combustion Turbine Prime Mover which is powered by Metallic Sodium (Na^{o}) as well as Other Fuels. (i.e. Metallic Sodium and its Derivatives).

2. The Internal Combustion Turbine Prime Mover.

a. Refer to Drawing.

b. Characteristics.

(1) With the increased R.P.M., the weight of the engine can be reduced and the cost will also be less.

(2) Ease of operation because of simplified mechanism.

(3) Since the working gas is expanded at atmospheric pressure, there is a large increase in the power output and high thermal efficiency during the complete cycle.

(4) Since metallic sodium is utilized for fuel, the chemical reactions and the performance of the engine are entirely different from cases where other fuels are being used. Compression under constant pressure can be carried out and at the same time power loss is extremely small since the air compressor is the only auxiliary mechanism.

(5) The temperature of the gas and steam mixture at the inlet of the turbine nozzle is between 400° to 500° C.

c. Fuel Consumption.

Metallic Sodium and its Derivatives.

Thermal efficiency of net H.P. = 100%
Fuel consumption = 160 gms/one B.H.P. hour.

Remarks.

Effective efficiency of the Metallic Sodium Decomposer Unit (97%).

Effective efficiency of the High Pressure Combustion Chamber (95%)

Effective efficiency of the Turbine (65-84%).

Mechanical losses. (chiefly by air compressor) (6-9%).

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d. Material.

Cast Iron for:

The outer part of the Sodium Decomposer.
" " " " " Pressure Combustion Chamber
" " " " " Turbine.
" " " " " Air Compressor.

Gun metal for the bearings.

Special glass for:

Turbine vanes.
Internal mechanism of the High Pressure Combustion Chamber

Miscellaneous for the gears, axles, etc.

3. Fuel (made from inexhaustible supply of natural resource).

Metallic Sodium and its derivatives.

4. Manufacture of the Fuel.

Salt Refining.

A Vacuum Salt Refining Equipment will be arranged at the electric salt refining plant. This plant will use an Electric Evaporator Unit so as to produce salt at maximum efficiency.

Production of the Metallic Sodium.

The diverted electricity is transformed into a special high frequency electric power and used in the production of the metallic sodium by means of a reducing melting smelter.

Reducing agents which are obtainable at a very low price cannot be disclosed.

Production Conditions.

The electricity required to produce 350 kgs. of metallic sodium from 1,000 kgs. of sodium chloride is 200 kilowatt hours.

Characteristics of the High Electrical Frequency Reducing-Melting Smelter Method.

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a. The temperature of the salt is raised electrically by dielectric heating to accelerate and excite chemical reaction.

b. Small quantity of electricity is required.

c. Mechanisms are simple and as follows.

(1) Transformer.

(2) Discharge Oscillator (own design).

(3) Condenser (accessory for the oscillator).

(4) A reducing-melting smelter.

This Prime Mover can be operated under the following conditions.

a. Addition of hydro-carbons (crude oil and gasoline).

This can be done by a partial modification of the High Pressure combustion chamber in order to increase chemical energy and to minimize fuel consumption.

b. Addition of Atomic Power to Metallic Sodium.

This can be done by a partial modification of the Metallic Sodium Decomposer in order to decrease the consumption of fuel by the working condition of the atomic energy.

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a. The temperature of the melt is raised electrically by dielectric heating to accelerate and excite chemical reaction.

b. Small quantity of electricity is required.

c. Mechanisms are simple and as follows.

(1) Transformer.

(2) Discharge Oscillator (own design).

(3) Condenser (accessory for the oscillator).

(4) A reducing-melting smelter.

This Prime Mover can be operated under the following conditions.

a. Addition of hydro-carbons (crude oil and gasoline).

This can be done by a partial modification of the High Pressure combustion chamber in order to increase chemical energy and to minimize fuel consumption.

b. Addition of Atomic Power to Metallic Sodium.

This can be done by a partial modification of the Metallic Sodium Decomposer in order to decrease the consumption of fuel by the working condition of the atomic energy.

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