

ENCLOSURE (B) 34

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LOW TEMPERATURE AND LOW PRESSURE  
EXPERIMENTAL LABORATORY

by

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Plate I(B)34 General View of Experimental Laboratory for  
Low Temperature and Pressure

Plate II(B)34 Flow Sheet of Experimental Laboratory for  
Low Temperature and Pressure

Plate III(B)34 Flow Sheet of Low Pressure and Low Temperature  
Engine Testing Plant

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OBJECT

The object of constructing this building was to conduct research on fuels, lubricating oils and hydraulic oils under the condition of 10,000-20,000 meters altitude and temperature down to  $-55^{\circ}\text{C}$ .

I. INTRODUCTION

The maker and designer of this plant was Ebara Co. Ltd. at Hanedacho, Kamadaku, TOKYO and its cost of construction was ¥23,000,000 (in 1943). This plant was commenced December 1943 and was not completed (Oct. 1945). This plant consists of two parts: one part comprises the rooms of low temperature and low pressure and the refrigerator using Freon-12 and Freon-11 as cooling media, Part 2 consists of a single cylinder (aircraft engine) testing plant designed for low temperature and pressure operation. The first part is about 80% completed, while only the rooms of low pressure and temperature have not been completed; the second part has reached the design stage only except for the concrete foundation which had been built. The construction was discontinued because of the bombing and destruction of the Ebara Co. Ltd. at which time the designer was killed, and the machines, the design papers, the wooden models of the castings, and many parts of the uncompleted machines, were destroyed or burned.

II. DESCRIPTION OF APPARATUSA. The Rooms of Low Temperature and Low Pressure  
(See Plates I(B)34, II(B)34, III(B)34, and Fig. 1(B)34)1. Dimension and condition of the rooms are shown in Plate I(B)34.

The insulation of the wall of the rooms and iron structure of the low pressure rooms is shown in Plate II(B)34, and Fig. 1(B)34. These rooms were to be cooled by Freon refrigerating machine to the desired temperature within two hours from atmospheric temperature. The low pressure rooms are evacuated by means of a 20 hp rotary vacuum pump.

2. Refrigerating machine: (Plate III(B)34) The machines which use Freon-12 (F-12,  $\text{CF}_2\text{Cl}_2$ ) and Freon-11 (F-11,  $\text{CFCl}_3$ ) are constructed, with two stages, each stage comprising the turbo compressors and evaporators.

Freon-11 is used at the first stage, which cool both the Freon-12 and the Brine ( $\text{CaCl}_2$  saturated aq. solution). Freon-12 is used at the second stage, and cold liquid Freon-12 and Brine cool the low temperature rooms and observation rooms.

The operating condition, cooling media and capacities are shown in Plate III(B)34.

3. CO<sub>2</sub> Fire extinguisher system (Plate III(B)34)

Ten carbon dioxide pressure cylinders were installed outside of the low temperature rooms. Pipes filled with  $\text{CO}_2$  were led into each of the low temperature rooms and are there shut off by valves. In case of fire in any room, the workmen first open the valve, leave the room, and shut the air-tight door, thus smothering the fire.

## ENCLOSURE (B)34

B. Single Cylinder Engine Testing Plant at Low Temperature and Pressure  
(See Plate I(B)34)

This plant consisted of the single cylinder test engine (which is the same type of single cylinder test engine reported in engine test of aviation fuel), air cooling system, and vacuum system. The engine was to be installed in a steel housing and this vessel was to be evacuated (but not cooled) by means of two vacuum pumps. Intake air was to be cooled by brine and one part of the air was to be used for engine intake air and the other part further cooled by the air expansion turbine and then used for cooling air of the cylinder.

The test engine was to be attached to the electric dynamometer. Thus only the cylinder cooling air and intake air for the combustion in the cylinder was to be cooled and single cylinder test engine was to be put in vacuum state vessel but not cooled itself.

ENCLOSURE (B)34

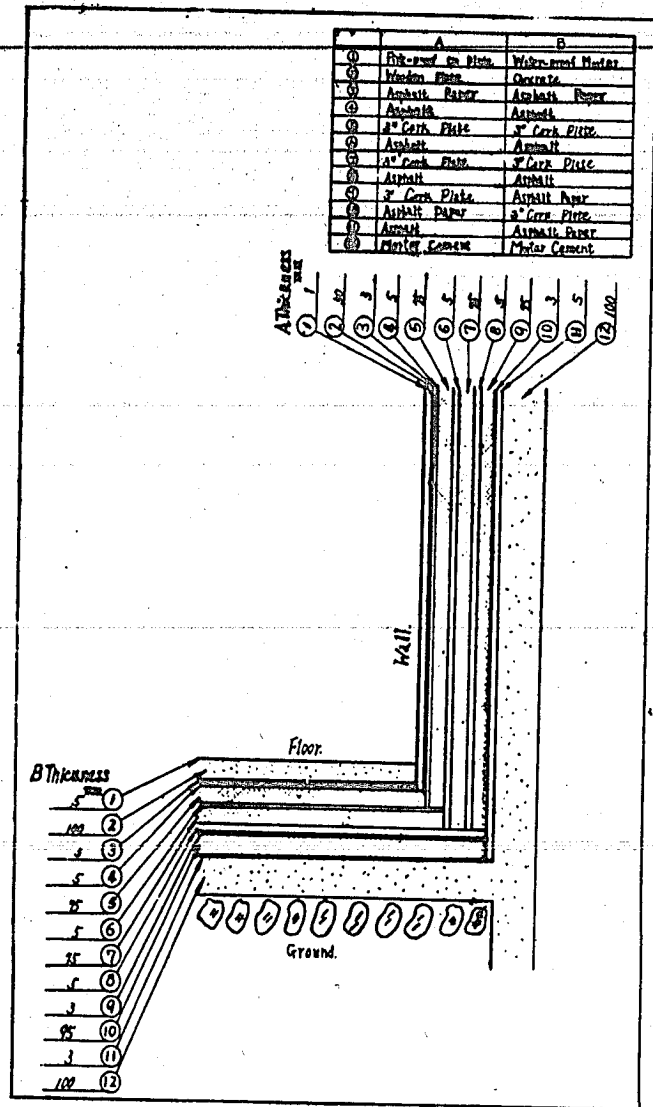


Figure 1(B)34  
INSULATION OF  
LOW TEMPERATURE ROOM

ENCLOSURE (B)34

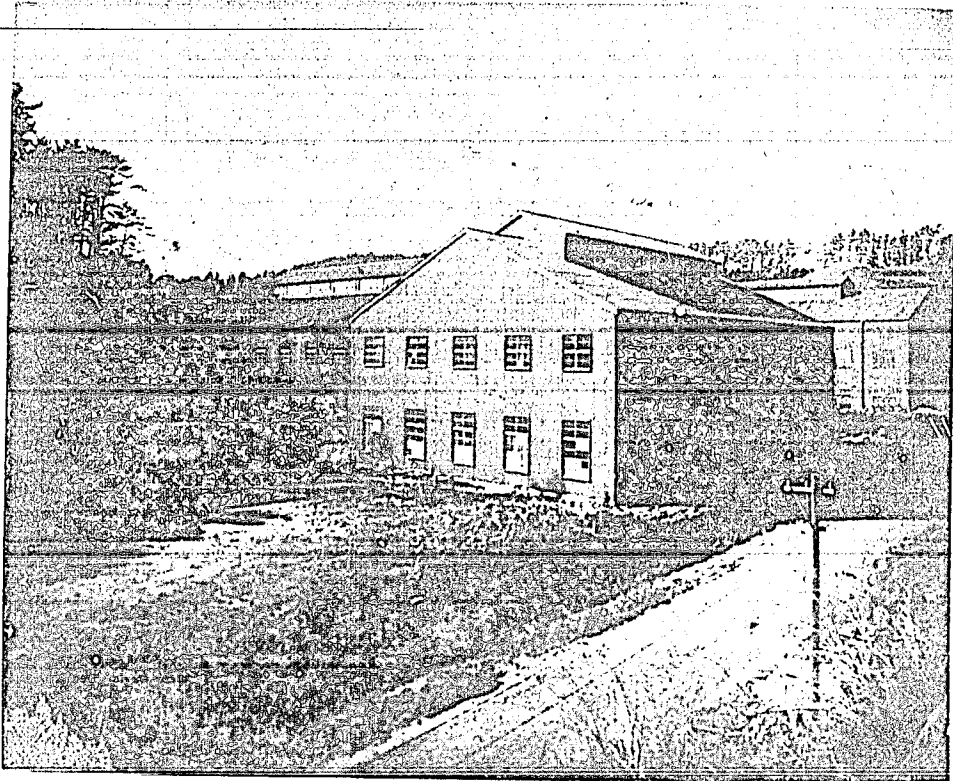


Figure 2(B)34  
GENERAL VIEW OF THE EXPERIMENTAL LABORATORY  
FOR LOW TEMPERATURE AND LOW PRESSURE

ENCLOSURE (B)34

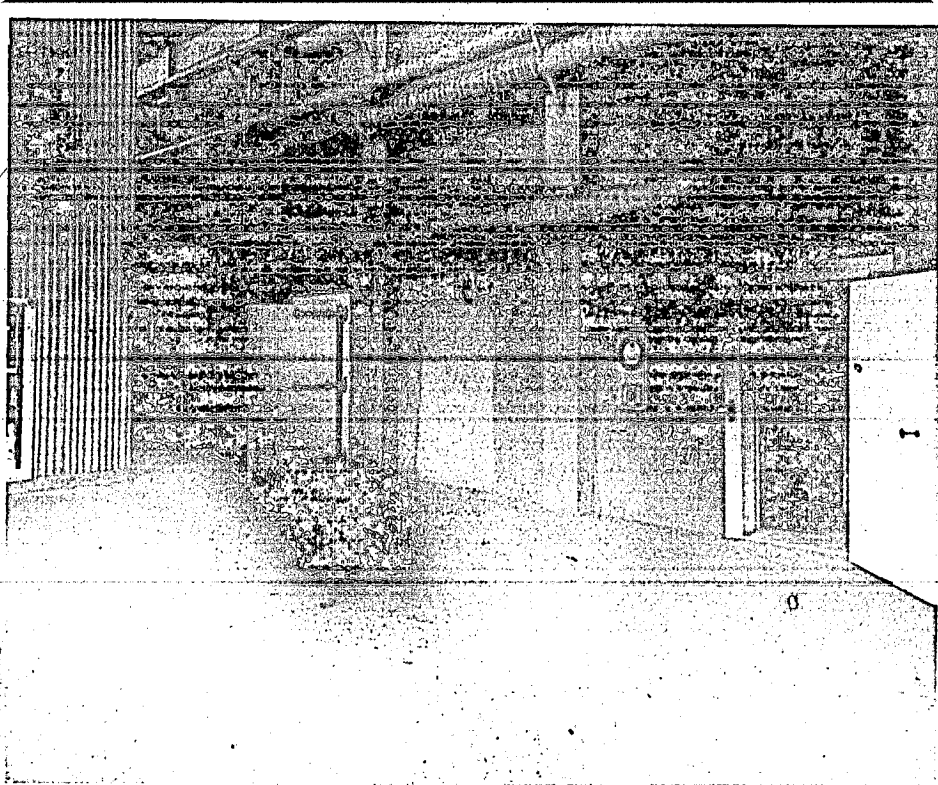


Figure 5(B)34  
LOW TEMPERATURE AND LOW PRESSURE TESTING ROOM

ENCLOSURE (B)34

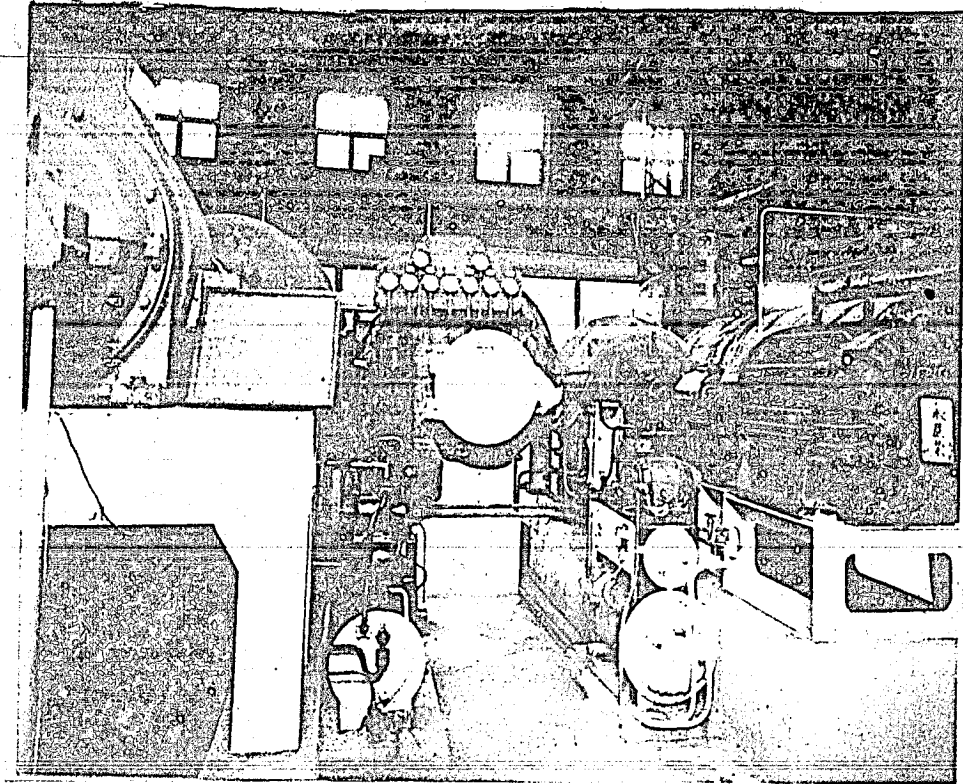
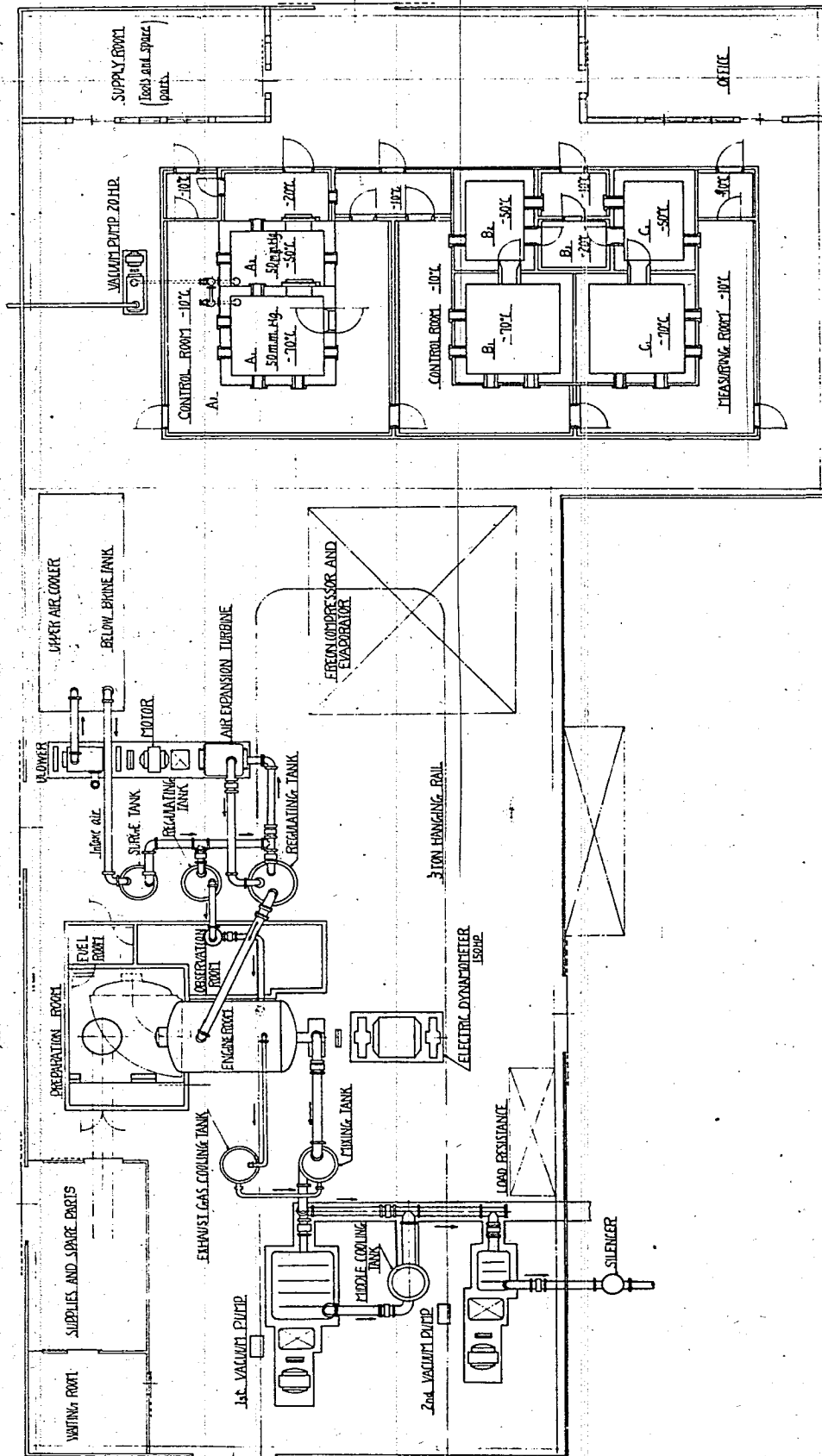
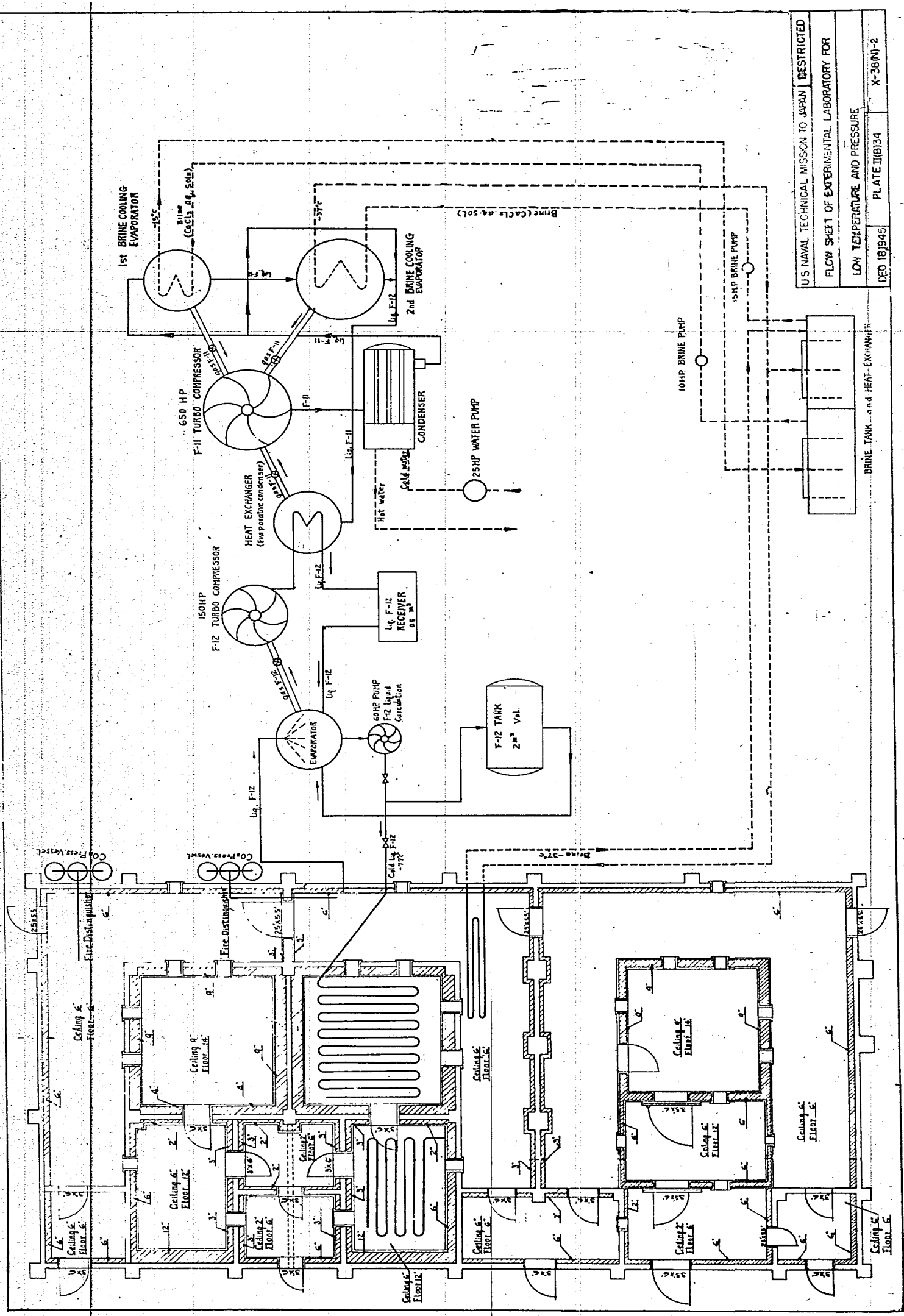


Figure 4(B)34  
FREON REFRIGERATOR



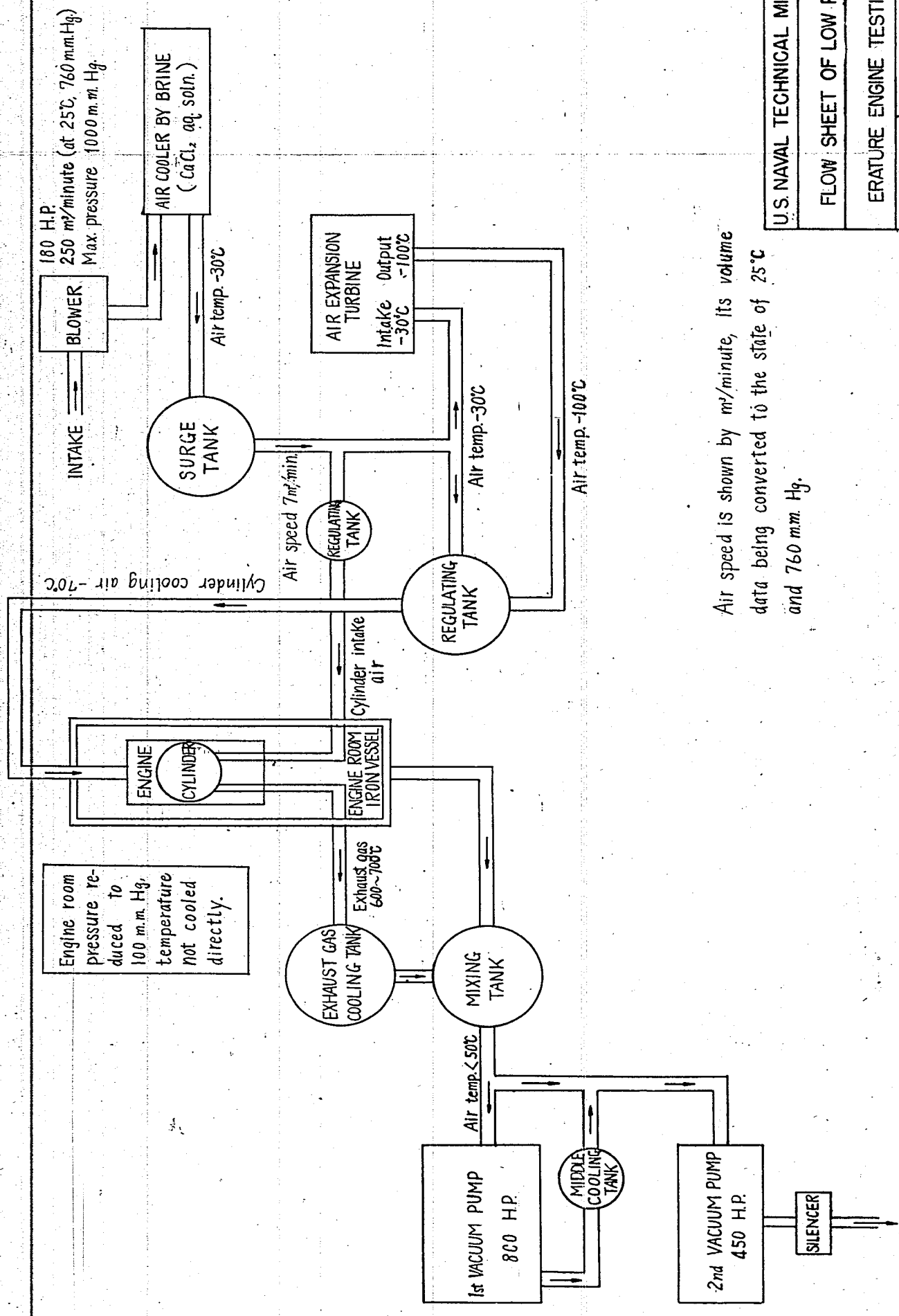


U.S. NAVAL TECHNICAL MISSION TO JAPAN RESTRICTED  
 GENERAL VIEW OF EXPERIMENTAL LABORATORY FOR  
 LOW TEMPERATURE AND PRESSURE  
 DEC. 14 1945 PLATE (IB)34 X-38(N)-2



U.S. NAVAL TECHNICAL MISSION TO JAPAN RESTRICTED  
 FLOW SHEET OF EXPERIMENTAL LABORATORY FOR  
 LOW TEMPERATURE AND PRESSURE  
 DEC 18/1945  
 PLATE II(B)34  
 X-38(N)-2

BRINE TANK and HEAT EXCHANGER



Air speed is shown by m<sup>3</sup>/minute, its volume data being converted to the state of 25°C and 760 m.m. Hg.

U.S. NAVAL TECHNICAL MISSION TO JAPAN	RESTRICTED
FLOW SHEET OF LOW PRESSURE AND LOW TEMP.	
ERATURE ENGINE TESTING PLANT	
DEC 21, 1945	PLATE III(B) 34
	X-38(N)-2