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ENCLOSURE (J)

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X-38(N)-7

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REPORT ON
TEIKOKU NENRYO K. K. UBE WORKS

ENCLOSURE (J)

TABLE OF CONTENTS

| | |
|---|----------|
| I. Introduction | Page 329 |
| II. History and Organization | Page 329 |
| III. Description of Plant Equipment | Page 329 |
| IV. Production Output and Quality | Page 330 |

LIST OF TABLES
AND ILLUSTRATIONS

| | |
|--|----------|
| Table I(J) Data on Equipment at Ube Works | Page 330 |
| Table II(J) Actual Production - Ube Works | Page 331 |
| Table III(J) Typical Inspection of Refined Products - Ube Works ... | Page 331 |
| Figure 1(J) Flow Sheet of Operations - Ube Works | Page 333 |
| Plate I(J) Plant Layout | |
| Plate II(J) Flow Sheet of Carbonization, Gas Purification, and Oil Recovery Systems | |
| Plate III(J) Flow Sheet of Methanol System | |
| Plate IV(J) Flow Sheet of Oil Hydrogenation Plant | |

ENCLOSURE (J)I. INTRODUCTION

This report records and summarizes technical information obtained by the Petroleum Section of NavTechJep during an inspection of the Ube Works of Teikoku Nenryo K. K. on 28 October 1945. The following Japanese personnel were interviewed and assisted in supplying the information presented herewith:

Mr. K. IWAMOTO, Plant Manager
Mr. TFO, Head of General Affairs Dept
Mr. UWABA, Head of Production Dept.
Mr. IKI, Gas Engineer
Mr. TAWARDA, Business Manager

II. HISTORY AND ORGANIZATION

The Ube Works was founded in August, 1939, with a capitalization of 50,000,000 yen invested by the Teikoku Nenryo and the Ube Kosen K. K., and was called the Ube Yuka Kogyo K. K. (Ube Synthetic Oil Co.). In October, 1944, the company was taken over by Teikoku Nenryo and designated as its Dai-Ichi Jigyosho (First Plant). At the outset, it was planned to produce annually 40,000 kl. of gasoline by low-temperature carbonization of Ube brown coal and by hydrogenation of the light tar oil, and also synthetic ammonia.

Construction of the Koppers low-temperature ovens was started in February, 1942, together with auxiliary coal handling and oil recovery and refining apparatus. In October, 1941, the decision was made to install ten Lurgi retorts to produce 90,000 kl. tar, per year of low temperature and the first of these was completed in October, 1943.

Construction of a plant to make lubricating oil from rubber was started in February, 1943, and operation began in October of the same year. The methanol plant was also started in 1943.

The plant suffered very severe damage in four bombing raids, July 2nd, 15th, 23rd and August 5th, 1945, which stopped operations completely. Prior to these raids, two Koppers ovens and four Lurgi ovens were operating; but six Lurgi ovens, the hydrogen manufacturing plant, the oil hydrogenation plant, the ammonia synthesis unit, and the methanol plant had not yet been completed.

In spite of the extensive damage, plans were being laid to repair and convert the plant to manufacture synthetic ammonia to the extent of 150,000 tons per year.

The total number of plant employees before the bombing was 350 staff officials and 1,200 workmen.

III. DESCRIPTION OF PLANT EQUIPMENT

A layout map of the Ube Works, which also shows the extent of air raid damage is given by Plates I(J) and an over-all process flowsheet by Figure 1(J). Process flowsheets for the Koppers low-temperature carbonization ovens and oil recovery system, the methanol plant, and the oil hydrogenation unit are given by Plates II(J), III(J), and IV(J), respectively. Data relative to the designers and constructors of the several units are summarized in Table I(J).

The process, utilized for manufacturing lubricating oils from rubber was as follows: Shredded natural rubber was mixed with calcined natural clay from Sendai Province, and with light oil recycled from the process, in the following proportions:

ENCLOSURE (J)

Rubber.....100 kg
 Clay.....100 kg
 Light Oil.....230 kl

This mix was charged to batch retorts 6 meters long and 2 meters in diameter and heated by direct firing and steam coils for a period of 24 hours to 300°C maximum. The mix was filtered to remove clay and sludge, and batch-distilled to produce light oil and machine oil of the desired viscosity.

IV. PRODUCTION OUTPUT AND QUALITY

Data on actual throughputs at the Ube Works, for the period April, 1944-June, 1945, are summarized in Table II(J). Data for other years was not available, due to destruction of records by fire.

Typical inspections of refined products are given in Table III(J).

Table I(J)
 DATA ON EQUIPMENT AT UBE WORKS

| Unit | Designer | Constructor | Catalyst |
|-----------------------------|-------------------------------------|---|------------|
| Koppers Ovens | Hainrich Koppers, A. U. | Eubota, I. W. Mitsubishi Kakoki, K. K. | |
| Lurgi Ovens | Lurgi, A. U. | Hitachi Kosen, K. K. | |
| Oil Hydrogenation | Third Naval Fuel Depot, TOKUYAMA | Kobe Seiko, K. K. | Navy Ovens |
| Hydrogen Manufacture | Kobe Seiko, K. K. | Kobe Seiko, K. K. | |
| Lubricating Oil from Rubber | Tsu Masuyo, K. K. | Hitachi Kosen, K. K. | |
| Ube Methanol synthesis | Teikoku Masuyo, K. K. | Osaka, K. K. | Navy Ovens |
| Ammonia Synthesis | | Nobuhara | Fansar |

ENCLOSURE (J)

Table II(J)
ACTUAL PRODUCTION, - UBE WORKS

| | | April, 1944 March, 1945 | April, 1945 June, 1945 |
|--------------|-----------------|----------------------------|---------------------------|
| Coal Charged | Koppers | 178,930 tons | |
| | Lurgi | 143,090 tons | |
| | Total | 322,020 tons | |
| Products | Motor Gasoline | 2831 kl | 543 kl |
| | Light Oil | 1423 kl | 186 kl |
| | Heavy Oil No. 1 | 207 kl | 1157 kl |
| | Heavy Oil No. 2 | 13825 kl | 2920 kl |
| | Machine Oil | 1720 kl | 16 kl |
| | Motor Oil | kl | 3 kl |
| | Total | 20,006 kl | 4,825 kl |
| | Cresols | 598 tons | 89 tons |

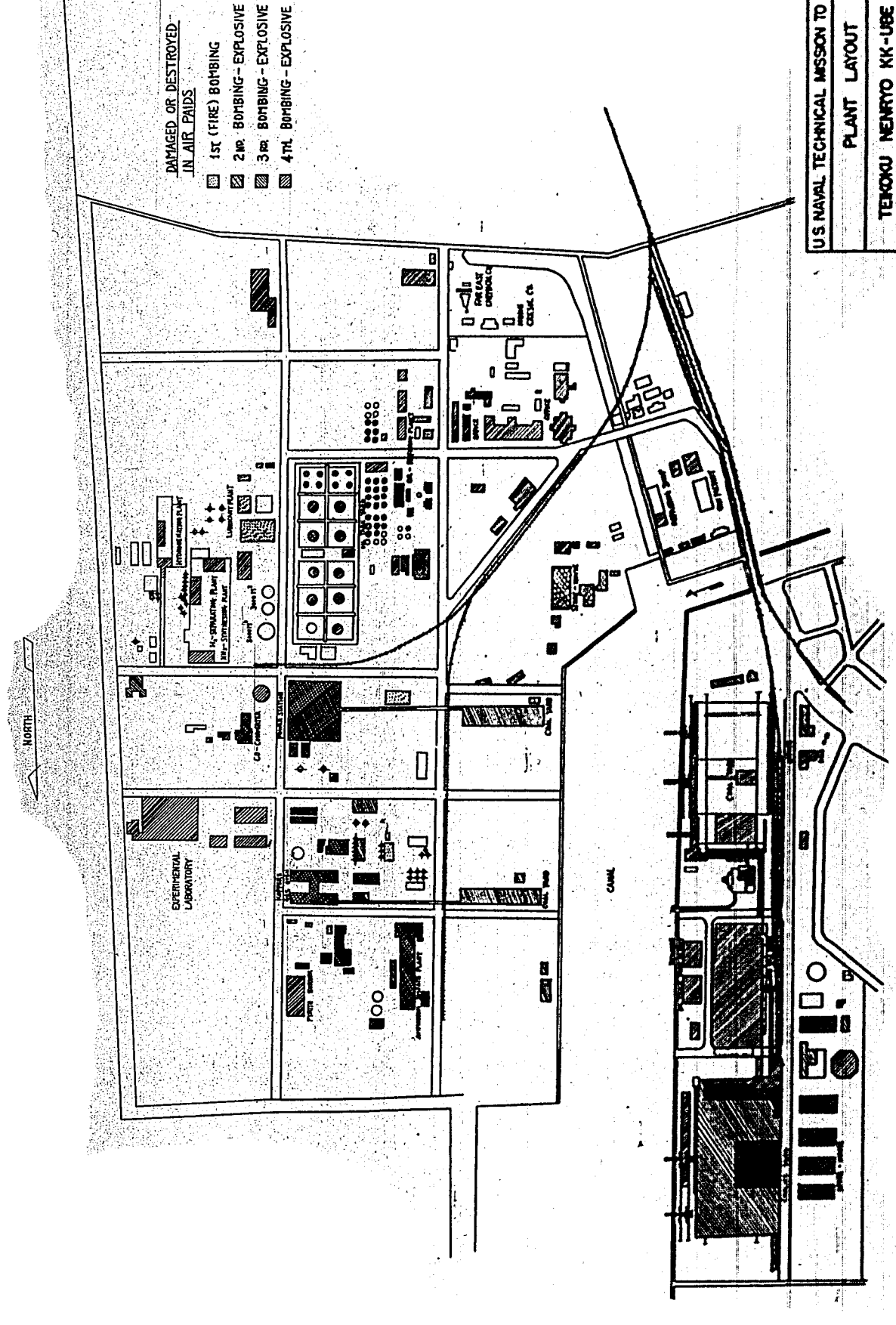
Table III(J)
TYPICAL INSPECTION OF REFINED PRODUCTS
UBE WORKS - JUNE, 1945

| | | Motor Gasoline | Light Oil |
|------------------------------|-----|----------------|----------------------------|
| Sp. Gravity (d_{4}^{15}) | | .812 | 0.910 |
| IBP | | 64°C | 231°C |
| Distillation (%) | 10% | 95°C | |
| | 50% | 141°C | 253°C |
| | 90% | 205°C | 284°C |
| | 97% | 223°C | |
| | F&P | | 310°C |
| Sulfur (wt %) | | 0.9 | |
| Reaction | | neutral | |
| Ignition point | | | 78°C |
| Appearance | | | yellowish-red and clear |

ENCLOSURE (J)

Table III(J) (cont.)
 TYPICAL INSPECTION OF REFINED PRODUCTS
 UBE WORKS - JUNE, 1945

| | Heavy Oil | | Lube Oil | |
|--------------------------|-------------------------|---------|-----------|----------|
| | No. 1 | No. 2 | Machine | Mobile |
| Reaction | neutral | neutral | | |
| Ignition point | 80°C | 129°C | 110°C | 130°C |
| Viscosity | at 50°C, secs., Red. #1 | 45 | | |
| | at 30°C, secs. | | 151 | |
| | at 80°C, secs. | | 75 | 210 |
| | at 100°C, secs. | | 41 | 51 |
| Freezing point | 15°C | 33°C | below 0°C | below 5% |
| Carbon Residue | 0.665% | 4.6% | | 0.8% |
| Ash | 0% | 0.08% | | |
| Water | 0.3% | 0.9% | | |
| Sulfur | 0.9% | | | |
| Tar acids | 23% | 25% | | |
| Specific gravity at 50°C | | 0.964% | | |



DAMAGED OR DESTROYED
IN AIR RAIDS

1ST (FIRE) BOMBING
2ND BOMBING - EXPLOSIVE
3RD BOMBING - EXPLOSIVE
4TH BOMBING - EXPLOSIVE

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PLANT LAYOUT

TEIKOKU NENRYO KK - UBE WORKS

OCT. 1945 PLATE I. J X-38(N)-7

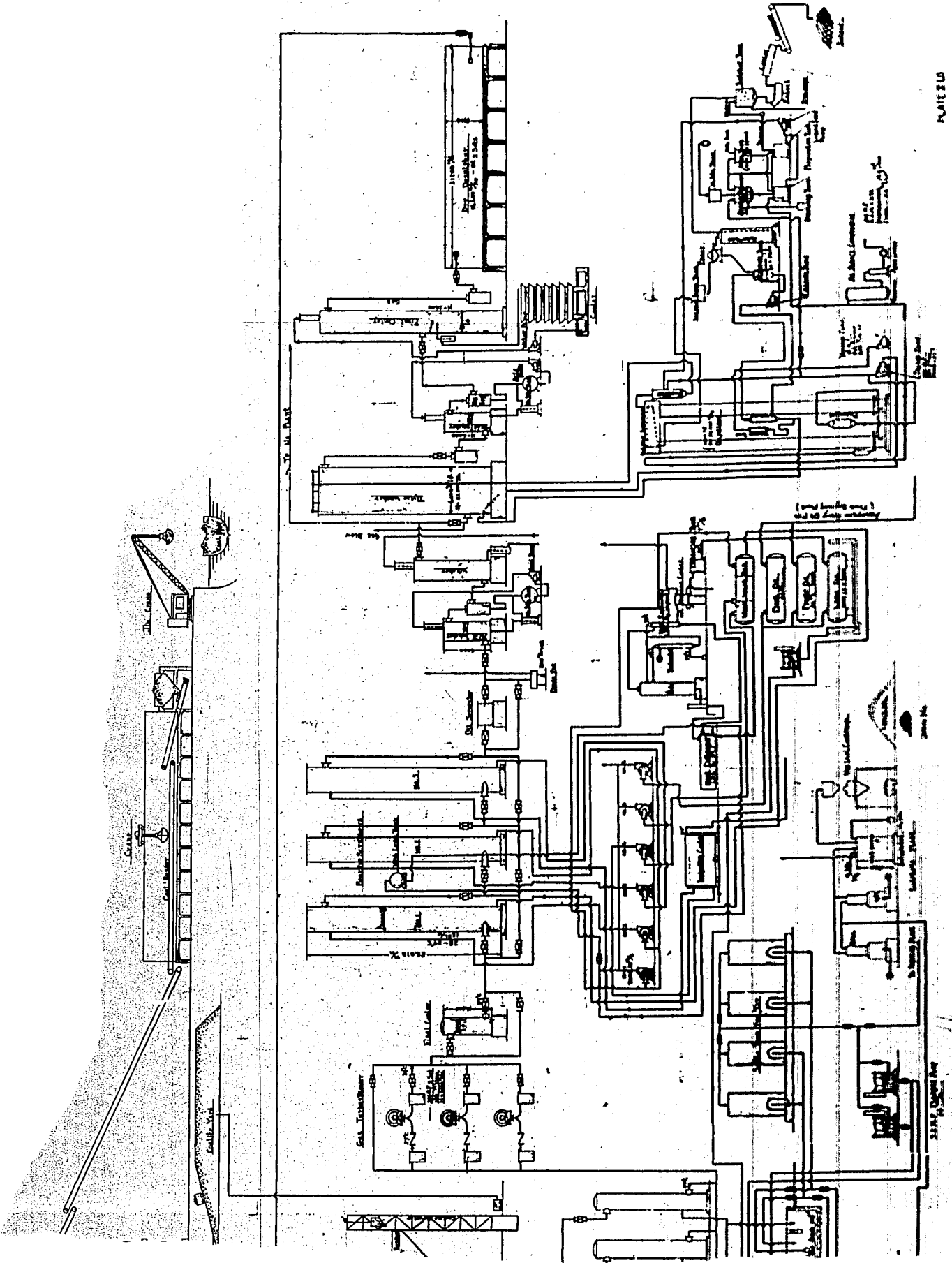
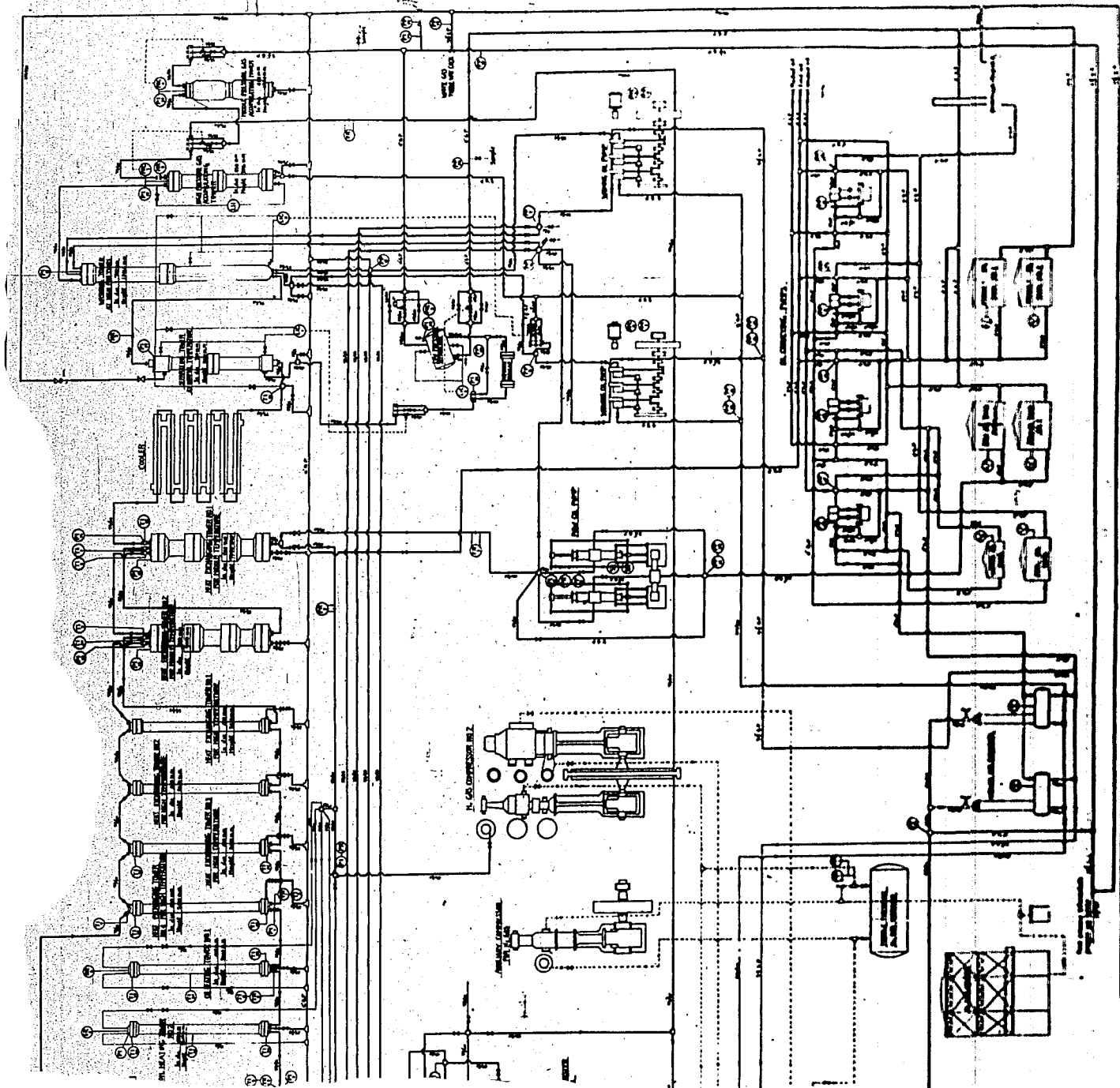


PLATE 11
 FLOW SHEET OF CARBONIZATION GAS PURIFICATION
 AND OIL RECOVERY SYSTEM

| REMARKS | |
|---------|-------------|
| 1 | NOISE |
| 2 | TEMPERATURE |
| 3 | PRESSURE |
| 4 | LEVEL |
| 5 | FLOW |
| 6 | PH |
| 7 | ANALYST |
| 8 | CONTROL |
| 9 | INDICATOR |
| 10 | RECORD |
| 11 | ALARM |
| 12 | RELAY |
| 13 | SOLENOID |
| 14 | VALVE |
| 15 | MOTOR |
| 16 | GENERATOR |
| 17 | TRANSFORMER |
| 18 | RESISTOR |
| 19 | CAPACITOR |
| 20 | INDUCTOR |
| 21 | DIODE |
| 22 | TRIODE |
| 23 | TRANSISTOR |
| 24 | RELAY |
| 25 | SOLENOID |
| 26 | VALVE |
| 27 | MOTOR |
| 28 | GENERATOR |
| 29 | TRANSFORMER |
| 30 | RESISTOR |
| 31 | CAPACITOR |
| 32 | INDUCTOR |
| 33 | DIODE |
| 34 | TRIODE |
| 35 | TRANSISTOR |
| 36 | RELAY |
| 37 | SOLENOID |
| 38 | VALVE |
| 39 | MOTOR |
| 40 | GENERATOR |
| 41 | TRANSFORMER |
| 42 | RESISTOR |
| 43 | CAPACITOR |
| 44 | INDUCTOR |
| 45 | DIODE |
| 46 | TRIODE |
| 47 | TRANSISTOR |
| 48 | RELAY |
| 49 | SOLENOID |
| 50 | VALVE |
| 51 | MOTOR |
| 52 | GENERATOR |
| 53 | TRANSFORMER |
| 54 | RESISTOR |
| 55 | CAPACITOR |
| 56 | INDUCTOR |
| 57 | DIODE |
| 58 | TRIODE |
| 59 | TRANSISTOR |
| 60 | RELAY |
| 61 | SOLENOID |
| 62 | VALVE |
| 63 | MOTOR |
| 64 | GENERATOR |
| 65 | TRANSFORMER |
| 66 | RESISTOR |
| 67 | CAPACITOR |
| 68 | INDUCTOR |
| 69 | DIODE |
| 70 | TRIODE |
| 71 | TRANSISTOR |
| 72 | RELAY |
| 73 | SOLENOID |
| 74 | VALVE |
| 75 | MOTOR |
| 76 | GENERATOR |
| 77 | TRANSFORMER |
| 78 | RESISTOR |
| 79 | CAPACITOR |
| 80 | INDUCTOR |
| 81 | DIODE |
| 82 | TRIODE |
| 83 | TRANSISTOR |
| 84 | RELAY |
| 85 | SOLENOID |
| 86 | VALVE |
| 87 | MOTOR |
| 88 | GENERATOR |
| 89 | TRANSFORMER |
| 90 | RESISTOR |
| 91 | CAPACITOR |
| 92 | INDUCTOR |
| 93 | DIODE |
| 94 | TRIODE |
| 95 | TRANSISTOR |
| 96 | RELAY |
| 97 | SOLENOID |
| 98 | VALVE |
| 99 | MOTOR |
| 100 | GENERATOR |



1. DRAWING TITLE: ...
 2. SHEET NO.: ...
 3. DATE: ...
 4. SCALE: ...
 5. PROJECT NO.: ...

