DECLASSIFIED - E.O. 11652 SECTION 3 (E)(2), MDR 93-

FLOW SHEET OF

SODA ASH PLANT

COKE 12.3 T

LIME STONE 107 T

SALT 231 T

SEA WATER

LIME KILN

MILK OF LIME

CARBON DIOXIDE

SATURATED BRINE

PURE SATURATED BRINE

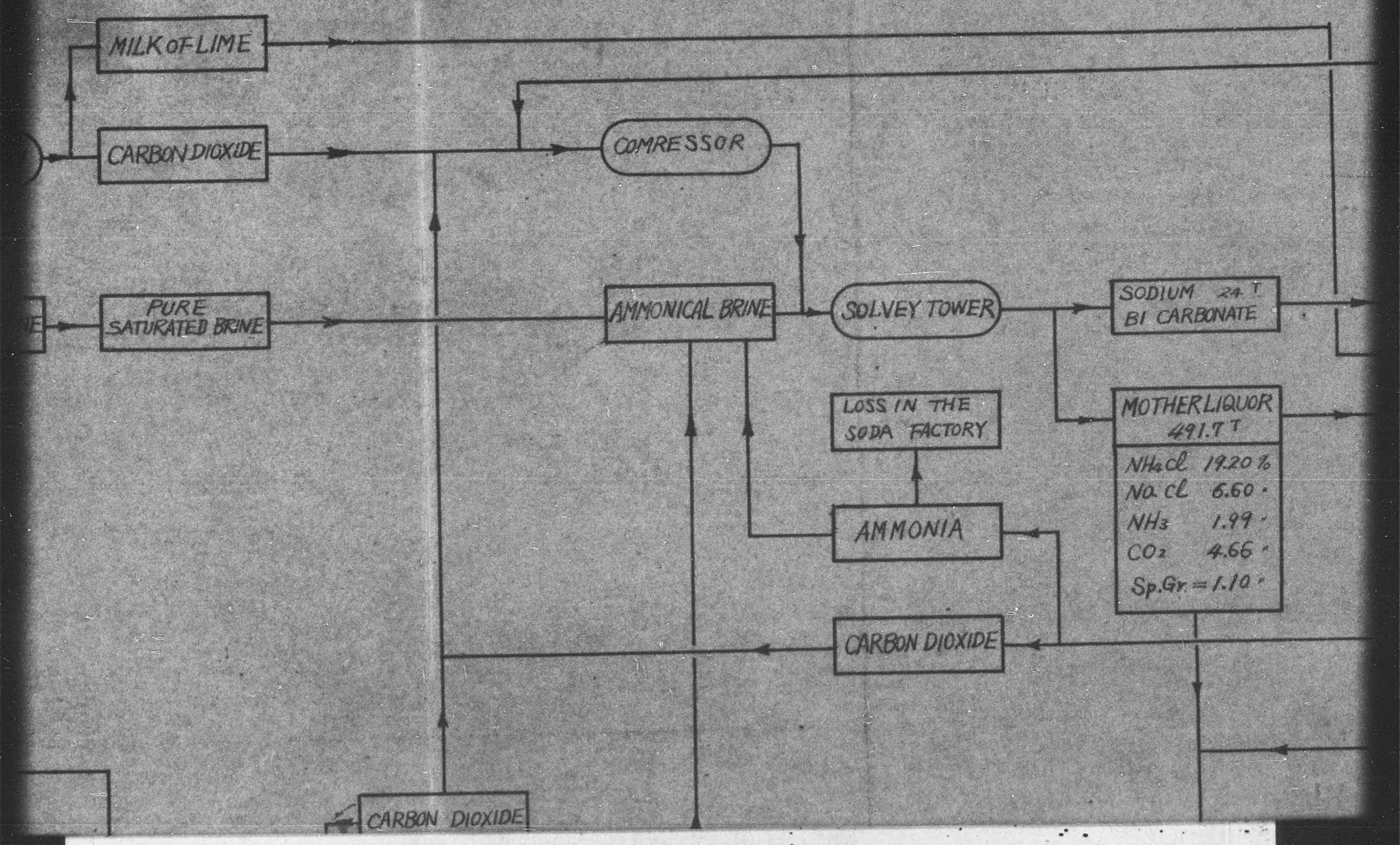
AMMONIA PLANT

STEAM

CARBON DIOXIDE

FLOW SHEET OF AMMONIUM CHLORIDE FER

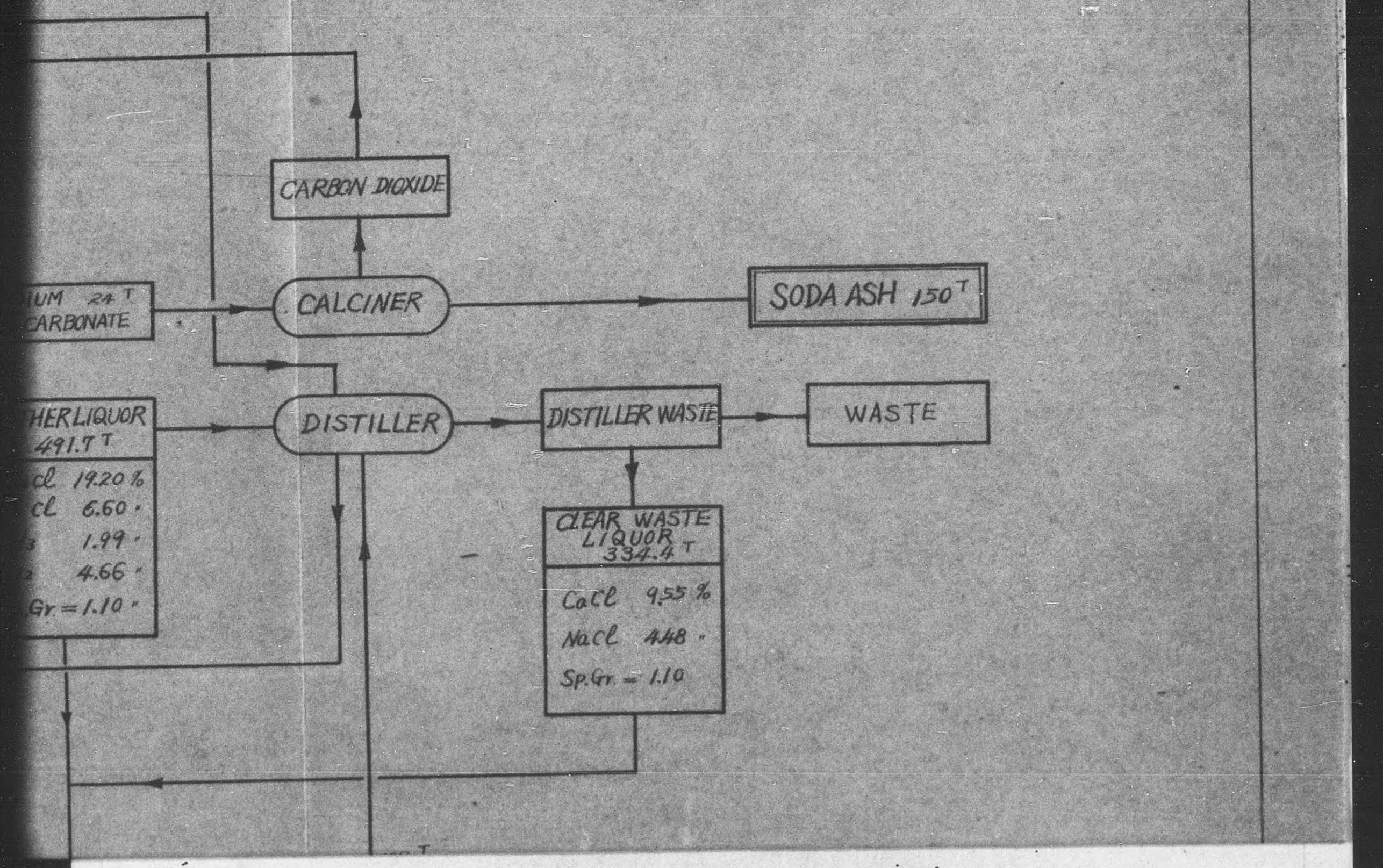
(150 TONS PER DAY)



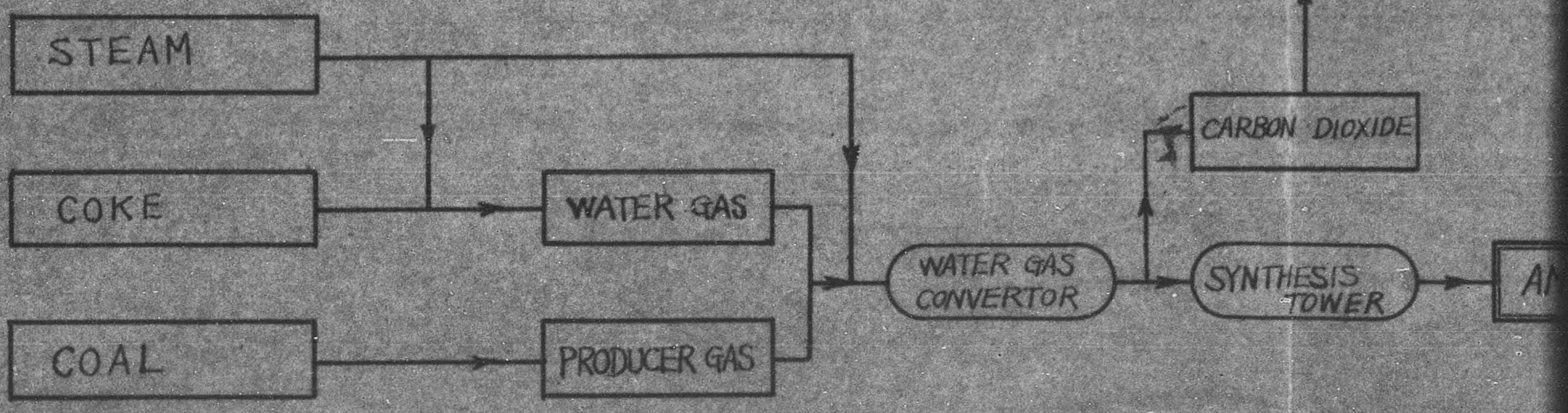
DECLASSIFIED - DOE/RL/05-33 Section B Page 101 of 1

DE FERTILIZER

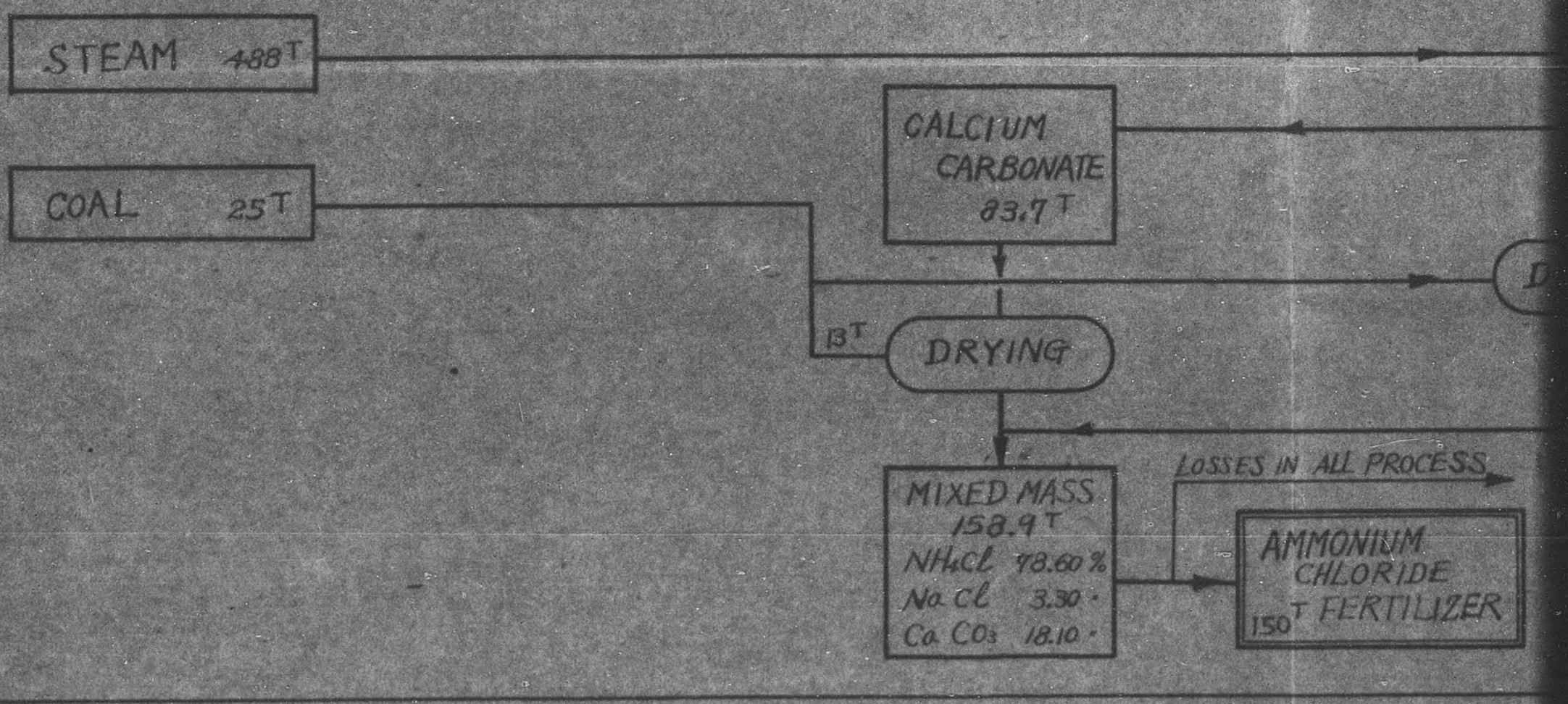
TOKUYAM SODA CO., LTD
AUG. 1949



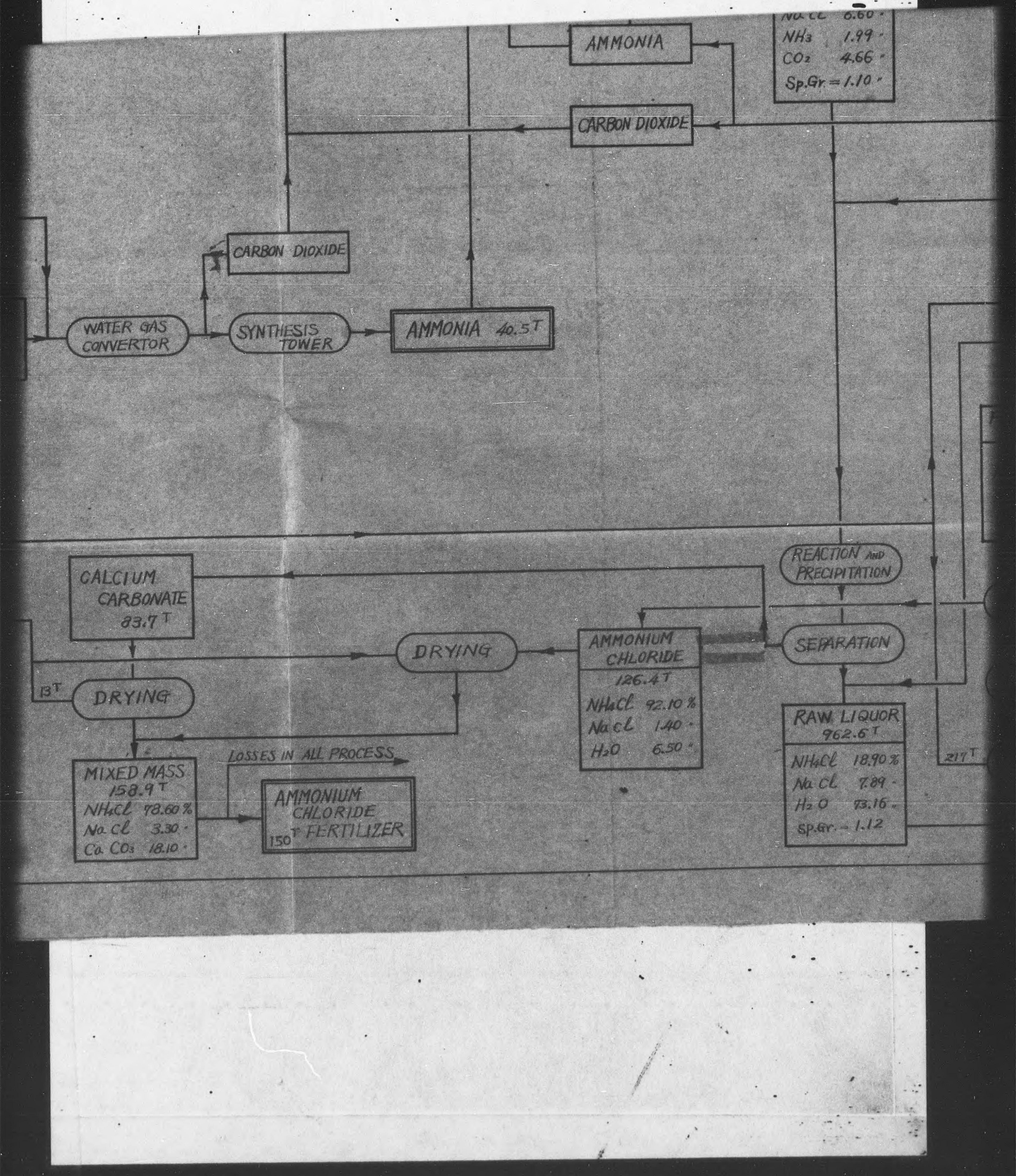
AMMONIA PLANT



FERTILIZER PLANT



DECLASSIFIED - EXCEPTIONS - SECTION 3 - E.O. 12065 NRS 4-5-82



6.60 "
1.99 "
4.66 "
Sp. Gr. = 1.10 "

CLEAR WASTE LIQUOR
334.4 T
CaCl 9.55 %
NaCl 4.48 "
Sp. Gr. = 1.10

149 T

122 T

EVAPORATION
100°C

H_2O 188.4 T

WASH WATER
4.2 T

SEPERATION

FIRST MOTHER LIQUOR
432 T
NH_4Cl 14.60 %
NaCl 16.30 "
Sp. Gr. = 1.16

ACTION AND PRECIPITATION

SEPERATION

EPARATION

COOLING
15°C

AW LIQUOR
962.6 T
NH_4Cl 18.90 %
NaCl 7.89 "
H_2O 73.16 "
Sp. Gr. = 1.12

217 T

EVAPORATION
60°C

H_2O 384.2 T

SALT
47.6 T
NaCl 88.20 %
NH_4Cl 0.60 "
H_2O 11.20 "

LOSSES IN ALL PROCESS

BRINE FOR SODA FACTORY
NaCl 39.6 T

SECOND MOTHER LIQUOR
220.2 T
NH_4Cl 29.90 %
NaCl 14.00 "
Sp. Gr. = 1.22

TOKUYAMA SODA CO., LTD.,

8355 Tokuyama.

COPY

February 22, 1950

How our production is affected by

the increased Electric Power Charge

As from December 13 last year Electric Power Charge was increased from ¥1.20 to ¥1.80 per KWH. It seems almost likely that the charge will still be raised up around ¥3.50 when the projected decentralization into separate nine corporations of the Power Distribution Company is materialized.

We have been buying outside power 1,000,000-1,500,000 KWH monthly, so we are oblized to pay ¥600,000-900,000 more owing to the recent increase in the power charge. Therefore when the said decentralization is realized we will have to pay ¥2,000,000-3,000,000 more monthly based on ¥3.80 per KWH.

The following table will show the effect at the increase of charge in a conparison between Nov., 1949 and Jan., 1950.

Affect of Increase of Power Charge

Shown in comparison

(Between Nov. 1949 and Jan. 1950)

Month	Manufacture	Power consumed KWH			Unit KWH/T		Cost of power 1,000 yen		Cost of production
		own power	bought power	total	bought power	total	bought power (A)	total (B)	
Nov. 1949	Cement	798,053	977,000	1,775,053	89	162	1,065	1,854	54
	Soda Ash	1,089,300	116,910	1,206,210	36.8	380	140	2,042	52
	Liquid Caustic Soda	185,620	20,040	205,660	67.1	689	24	348	8
	Solid " "	820,510	88,050	908,560	74.4	764	106	1,559	38
Jan. 1950	Cement	569,000	1,000,240	1,569,240	104.1	163.4	1,853	2,669	37
	Soda Ash	1,016,690	87,340	1,104,030	27.7	350	173	2,913	59
	Liquid Caustic Soda	500,060	42,980	543,040	51.7	653	86	1,430	27
	Solid " "	222,101	19,072	241,173	53.2	675	38	623	14

2, 1950

increased
charge
tralization
pany is

H monthly,
ecent
ralization
thly based

of charge

KWH/T		Cost of power 1,000 yen		Cost of production (C)	Affect by the increase of charge			
					ratio of power to cost of production		per unit production	
	total	bought power (A)	total (B)		(A/C)	(B/C)	cost of total power	cost of production
	162	1,065	1,834	34,480	3.09 %	5.33 %	100 %	100 %
8	380	140	2,042	52,057	0.269%	3.93 %	100 %	100 %
1	689	24	348	8,451	0.284%	4.12 %	100 %	100 %
4	764	106	1,539	38,653	0.274%	3.98 %	100%	100 %
1	163.4	1,833	2,669	37,800	4.86 %	7.07 %	178 %	124 %
7	350	173	2,913	59,700	0.29 %	4.88 %	143 %	115 %
7	653	86	1,430	27,100	0.317%	5.28 %	148 %	116 %
2	675	38	623	14,450	0.263%	4.31 %	135 %	125 %

DECLASSIFIED E.O. 12065 SECTION 3 (E)(1), WAIVER NO. [illegible]

To cope with the situation we are now considering to increase waste-heat boilers in our own Cement Plant with a view to increasing waste-heat by 1,000 KWH, so as to reduce the purchase of outside power accordingly.

As for the manufacture of soda, we are now putting out only 150-200 tons a day, and this causes an unbalance of the required volume of steam and the capacity of our own power generation, compelling us to use outside power.

If we are allowed to turn out soda around 250 tons daily, instead. We will be able to avoid the purchase of outside power so far as the manufacture of soda is concerned to a great saving.

It is our earnest hope that the time may come as soon as possible when we are producing 250 tons of total soda ash.

ORIGINAL

Tokuyama, Feb. 6, 1950

To : The Commander,
Chugoku Civil Affairs Team, Kure City

Reports of the Products

1. Name of Firm : Tokuyama Soda Co., Ltd.
2. Location : 8355 Tokuyama City, Yamaguchi Pref.
3. Products : During January, 1950

Name of Products	Quantity
a. Soda Ash	3,153 metric tons
b. Caustic Soda (Solid)	357 "
(Liquid)	831 "
c. Portland Cement I Type	2,986 "
III "	0 "
JES "	6,622 "
Miscellaneous	0 "
d. Calcium Chloride	0 "
e. Sodium Silicate	146 "
f. Magnesium Bicarbonate	16 "
g. Commercial Sal Ammoniac (Ammonium Chloride)	20 "

For Tokuyama Soda Co., Ltd.

K. Nagaya
Director

ORIGINAL

Tokuyama, Jan. 7, 1950

To : The Commander,
Chugoku Civil Affairs Team, Kure City

Reports of the Products

1. Name of Firm : Tokuyama Soda Co., Ltd.
2. Location : 8355 Tokuyama City, Yamaguchi Pref.
3. Products : During December, 1949

Name of Products		Quantity	
a. Soda Ash		3,072	metric tons
b. Caustic Soda	(Solid)	590	"
	(Liquid)	1,065	"
c. Portland Cement	I Type	2,024	"
	III "	0	"
	JES "	6,443	"
	Miscellaneous	0	"
d. Calcium Chloride		0	"
e. Sodium Silicate		351	"
f. Magnesium Bicarbonate		9	"
g. Commercial Sal Ammoniac (Ammonium Chloride)		8	"

For Tokuyama Soda Co., Ltd.

H. Takazawa
Director

COPY

TOKUYAMA SODA CO., LTD.

Tokuyama, Jan. 31, 1950

To : The Commander,
Chugoku Civil Affairs Team
Kure City

Sir,

Enclosed please find herewith a copy of the application which we have sent in to the Japanese Government for their permission to grant us the temporary use of a part of the former Iwakuni Army Fuel Depot (located in Iwakuni City and Nakimura, Kuga-gun, Yamaguchi-Ken) for the manufacture of caustic in order to meet national aim of increasing the production of nitrogenous fertilizer as well as establishing soda industry by Solvay-method.

We should be very grateful to you, if you would be kind enough to extend to us all possible assistances for the realization of our hopes.

Yours faithfully,

Yukinobu Kageyama, President

COPY

Application to Borrow the State-owned

Property for Temporary Use

Mr. Hayato Ikeda, Minister of Finance

Mr. Heitaro Inagaki, Minister of International
Commerce & Industry

Gentlemen :

We hereby apply to borrow a part of the former Iwakuni Army Fuel Plant in Yamaguchi Prefecture for the manufacture of ammonia as per documents attached herewith.

Tokuyama Soda Co., Ltd.,

8355 Tokuyama City

Yukinobu Kageyama, President

DECLASSIFIED E.O. 12065 Section 3.3(b)(1)(2)(3) or (4)

I. Reason for Application

II. Object of the Projects

III. Extent of the Application

IV. Attached Documents

DECLASSIFIED E.O. 11652 SECRET Pg/Mac 6-30-77

1. Reason for Application

We are now engaged in making soda by ammonia-soda process with imported salt. 75% or the salt is converted to soda but the balance is wasted. Out of converted portion of the salt, sodium content is utilized while chlorine is not. On the other hand, ammonium sulphate is partly imported due to the shortage of pirites. Sulphuric acid contained in ammonium sulphate has no fertilizer value.

Our researches on ammonium chloride dates back to more than ten years ago. Now that fertilizer value is verified to be no less than that of ammonium sulphate, we intend to manufacture on industrial basis the ammonium chloride by way of utilizating salt in ammonia-soda industry and economizing sulphuric acid in ammonium sulphate industry.

In the present manufacturing process of soda, ammonium chloride is produced in the Solvay tower. It is at present distilled and the recovered ammonia is used over and over again. The liquor coming out of Solvay tower is filtered and condensed. Then ammonium chloride is made and salt is completely recovered: of course, ammonia must be supplied as required. This results in the saving of coal and limestone for the manufacture of soda. In order to make ammonium chloride our an industrial scale, it is necessary to own the equipment of ammonia synthesis. It so happens that the hydro-cracking equipment of the former army plant can be used for ammonia synthesis. That is why we make an application hereby.

Out of the former hydro-cracking equipment, what is necessary for ammonia synthesis is listed in the attached particulars.

With some renovation inside the high pressure cylinders, the equipment can turn out 50,000 tons ammonium chloride a year without further alteration.

A flow sheet is herewith attached to show how the equipment is converted to carry out ammonia synthesis.

Since we are convinced that the manufacture of ammonium chloride is the best way of rationalization of soda and fertilizer industries, we are anxious to have upon permission to use the former hydrocracking equipment for a source of ammonia.

II. Object of the Projects

Manufacture of ammonia

First project : to make 13,200 tons ammonia a year

Second project: to make 26,400 " " " "

III. Extent of Application

(A) Land as per attached layout of former Iwakuni fuel plant

(B) Building as per attached layout of former Iwakuni fuel plant

(C) Machines Equipment what is under "For 50,000 tons" in the Particulars of Machines & Equipment of the Projects.

DECLASSIFIED Per Letter Dated 10/31/95

Plan for Synthetic Ammonium Plant and Ammonium Chloride Fertilizer Plant

Tokuyama Soda Co., Ltd.

September, 1949

DECLASSIFIED E.O. 11652 SECTION 3 (E)(2) NARS Date

Contents

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A : History of the project

B : Fertilizer effect of ammonium chloride

II. Synopsis of the project

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B : Ammonium chloride fertilizer

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A : Synthetic ammonia

B : Ammonium chloride fertilizer

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A : Cost calculation of ammonia

B : Cost calculation of ammonium chloride fertilizer

C : Cost calculation of soda ash

D : Estimated profit per month

VI. Necessary funds and materials for construction

VII. Particulars of machines and equipment

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B : Ammonium chloride fertilizer plant

VIII. Diagrams

A : Diagram of synthetic ammonia

B : Diagram of ammonium chloride fertilizer

DECLASSIFIED E.O. 12065 Section 3 (b), Mar 31, 1983

I. Significance of the project

A. History of the project

It is needless to say that the manufacture of ammonium chloride fertilizer is essential to the economical management of ammonia soda industry as is widely known to the experts concerned. Realizing the importance of this project, this company had made necessary preparation to build synthetic ammonia plant by 1939 when the development of Sino-Japanese incident made it impossible to purchase the main machines. In consequence, the project had to be abondoned.

Since 1935, we have a number of our laboratory staff engaged in the experiments of manufacturing ammonium chloride and ascertaining its fertilizer effect. In July, 1941 we received bounty from the Ministry of Commerce & Industry to build a pilot plant. Various researches were made while we put out 150 tons between February and May, 1942, with the plant of 2 tons per day.

We first tried Schreib process. By keeping free ammonia at 3% and by cooling mother liquor with salt, precipitating ammonium chloride was easily obtained.(1) There was, however, a problem because the filtrate, after ammonium chloride is filtered out, contained too much ammonium chloride and other impurities to make sodium bicarbonate theroform. We, therefore, tried later the evaporation process. Corrosion is the problem in this process. By our basic researches on corrosion, we discovered that the addition of phosphates could successfully prevent the corrosion in manufacturing, for which we have a patent pending.(2)

We also have a patent with regard to moisture-absorbing problem of ammonium chloride.(3) By granulating, the surface area of ammonium chloride can be made much less and hygroscopy can be

decreased. By way of preventing the solidification of ammonium chloride, the addition of calcium carbonate has been contrived. The addition of calcium acid phosphates also serves this purpose.

Since the end of the war, our soda plant was rehabilitated and at the same time this project had been closely examined before we formulated this project.

Although we have no equipment for making synthetic ammonia, we have ascertained that, by utilizing idle equipment of former army fuel plant at Iwakuni, we can complete the equipment for manufacturing synthetic ammonia. This is why the synthetic ammonia has been included in this project.

B. Fertilizer effect of ammonium chloride

Since 1941, researches in the fertilizer effect of ammonium chloride were made at the Imperial University of Tokyo.(4) We also made experiments at Tokuyama on 1,000-tsubo land as well as pots in a laboratory to ascertain the fertilizer effect of ammonium chloride and its blended fertilizers.(5)

With regard to paddy, which is the main agricultural product in Japan and for which the majority of fertilizer is consumed, ammonium chloride is considered a more perfect fertilizer than ammonium sulphate by the Japanese scholars' circle. Frequently, ammonium sulphate has its sulphate reduced to sulphide and consequently does paddy a serious harm. On the other hand, chlorides strengthen the stems and leaves of plants and helps resist bacilli, insects and stern. This applies to other plants, especially textile plants where strength is required. Dr. Russel of England is also agreed with us and says that chlorides are better in areas where rain-fall is much.(6) In Japan whose rain-fall is more than

that of England, ammonium chloride is considered no less effective than ammonium sulphate.

(1) "Manufacturing method of ammonium chloride" in the Laboratory Report of Tokuyama Soda Co., Vol.

(2) Japanese patent pending for manufacturing method of ammonium chloride from mother liquor of ammonia soda process with the use of phosphates.

(3) Japanese patent for manufacturing method of granulated ammonium chloride.

(4) "Experiments of fertilizer effect of ammonium chloride" in the agricultural Department Report of Imperial University of Tokyo, Vol. II

(5) "Researches in the fertilizer effect of ammonium chloride" in the Laboratory Report of Tokuyama Soda Co., Vol. II

(6) "Plant nutrition and crop production." by Dr. Russel.

II. Synopsis of the project

A. Synthetic ammonia

The synthetic ammonia plant requires a capacity of 13,200 tons per year to produce 50,000 tons fertilizer when the usual loss of ammonia in soda plant is taken into account. The high pressure hydro-cracking equipment in the former army fuel plant at Iwakuni remains entirely intact through the bombing. With some minor repair job, the conversion to synthesis of ammonia can be accomplished at no big amount of expense. This plant may be used as ammonia synthesis plant with small reconstruction, rearrangement of pipe and repairing of machines and buildings. The capacity of the plant, as for ammonia, is estimated 40 tons per day under present condition. If we multiply twice the capacity of crude gas plant, we can produce 80 tons per day ammonia. This corresponds to 100,000 tons of 20.6% nitrogen fertilizer.

In view of the insufficient electric power in Yamaguchi Prefecture, we shall, in stead of electrolytic process, take up water

gas process using coke for material, and copper lye process to refine the gas. Fauser system will be taken up at 300 atmospheric pressure to make synthetic ammonia. Our first project is a plant with a capacity to manufacture 40 tons of ammonia per day, equivalent to app. 50,000 tons in term of ammonium sulphate. The ammonia thus manufactured at Iwakuni is sent to soda plant at Tokuyama in the form of ammonia water and ammonium carbonate solution for soda manufacturing by our tank boat.

B. Ammonium chloride fertilizer

On top of existing equipment of ammonia soda process will be added ammonium chloride manufacturing equipment consisting of reaction tank, separator & drier for calcium carbonate; evaporator, crystallizer, separator & drier for ammonium chloride crystallization; evaporator, separator & drier for salt recovery. The existing equipment of our company can be utilized for most of these purposes.

III. Synopsis of the Method of Manufacture

A. Synthetic ammonia

Following is the method for making synthetic ammonia as adopted in this project.

Material hydrogen is made with P.G.C. water-gas producer using coke for its material. Water gas is then mixed with producer gas to make up the ratio of hydrogen and nitrogen 3 : 1. This crude gas is de-sulphurized by dry process. Hydrogen content is increased by converting carbon monoxide to carbon dioxide with P.G.C. converter. This concerted gas is compressed at 300 atmospheric pressure through copper lye washer and ammonia washer. Carbon monoxide and dioxide are absorbed in the course of refining process. The refined gas is made into ammonia through Fauser synthesis tower and the ammonia is put into tank boat and carried to soda plant.

B. Ammonium chloride fertilizer

Several methods are contrived to make ammonium chloride in ammonia soda process. In the present project, mother liquor is taken at as high concentration as possible after sodium bicarbonate is separated and most of such liquor will be used as material liquid for making ammonium chloride. A part of waste liquor distillation in the ammoniua soda process is added thereto so as free ammonia in the mother liquor is approximately in an equivalent portion with calcium chloride in the waste liquor. The free ammonia then turns into ammonium chloride and precipitated calcium carbonate gets crystalized. The calcium carbonate, after separated and dried, is mixed with finished ammonium chloride to keep it dry. After calcium carbonate is separated, the filtrate (mother liquor) is mixed with cycling liquid and boiled up to half its quantity and then cooled to 15°C to get precipitating ammonium chloride. After ammonium chloride is separated, the remaining liquid contains ammonium and salt in about the same proportion as in the original liquor. Therefore, it can be utilized with the mother liquor. This is what we have Patent No. 131341 for.

With an equipment to produce 150 tons soda ash per day, about 150 tons ammonium chloride can be manufactured, but we estimate the production of ammonium chloride at 125 tons per day. With the aforesaid calcium carbonate addod, ammonium chloride fertilizer containg 20.6% nitrogen is manufactured at the rate of 150 tons per day.

IV. Characteristics of the Method of Manufacturing Ammonium Chloride Fertilizer under this project

There will be no objection to the manufacture of ammonium chloride fertilizer in view of scarcity of materials for making sulphuric acid, requirement for increased production of nitrogen fertilizer, and the necessity of complete utilization of chlorine and sodium

contents in salt used in ammonia soda industry.

Synthesis of ammonia is a well known industry and no explanation is necessary. Quite a few methods of making ammonium chloride are made public, each having merits and demerits. The characteristics of the method we are to take up follow :-

(1) No material salt of high purity is required as in Zahn process. The same quality of salt as is now used in ammonia soda plant well do.

(2) Ammonium chloride is crystalized when cooled to atmospheric temperature.

(3) The evaporation process has a disadvantage of corrosion of evaporators due to the decomposition of ammonium chloride. The free ammonia in the liquor is eliminated by the addition of a part of the distillation waste liquor to the mother liquor. The corrosion is remarkably decreased by the addition of phosphate, for which we have a patent pending. Thus corrosion problem is fairly settled in our company.

(4) Ammonia soda industry being a highly fabricated one, the manufacturing of soda will be put to a great disadvantage if complicated with additional cycling process of ammonium chloride. In our project, manufacturing of soda and manufacturing of ammonium chloride are independent of each other is operation.

(5) In our project, the rate of utilization of salt is set at app. 94% in consideration of its loss in cycling process and minimized steam consumption. The rate is theoretically 100%.

(6) In consideration of future use of recovered salt and Brine in the country, Sehreib system or Zahn process requiring pure salt is not suitable.

V. Profit & Loss

A) Cost Calculation of Ammonia

Item	When production 40 tons per day			When production 80 tons per day			Remarks
	Quantity per ton	@	Amount in yen	Quantity per ton	@	Amount in yen	
Coke	2.5	7,050	17,625	2.5	7,050	17,625	
Coal	1.35	3,838	5,181	1.35	3,838	5,181	
Elec. power	3,200KWH	1.1	3,520	3,000	1.1	3,300	
Maintenance			5,000			4,000	
Labor			6,000			3,830	550 & 700 man/day
Overhead exp.			3,800			2,280	
Depreciation			2,050			2,050	depreciation in 10 yrs.
Interest			2,580			2,420	10% per annum
TOTAL			45,756			40,686	

DECLASSIFIED E.O. 12065 Section 3 (b)(1) NSC Memo

B) Cost Calculation of Ammonium Chloride Fertilizer

Item	Quantity per ton	When production 150 tons per day @	When production 150 tons per day Amount in yen	When production 300 tons per day @	When production 300 tons per day Amount in yen	Remarks
	T					
Ammonia	0.264	47,000	12,408	41,700	11,009	Containing transportation Cost
Steam	2.9	720	2,088	720	2,088	for evaporation
Coal	0.1665	2,214	369	2,214	369	for drying product 3,800 Cal.
Elec. power	66 KWH	1.3	86	1.3	86	
Maintenance			533		400	
Labor			350		228	
Packing			850		850	
Overhead exp.			139		113	
Depreciation			149		110	
Interest			165		148	
TOTAL			17,187		15,401	

DECLASSIFIED E.O. 12065 Section 3.3(b)(1), NND 760

C. Cost Calculation of Soda Ash

a) When production 150 tons per day

Item	When ammonium chloride Fertilizer is not manufactured			When ammonium chloride fertilizer is manufactured		
	Quantity per ton T	@	Amount in yen	Quantity per ton T	@	Amount in yen
Salt	1.65	3,080	5,082	1.27	3,080	3,912
Ammonia	5 kg	56,400	282	5 kg	47,000	235
Limestone	1.50	590	885	0.713	590	421
Coke	0.19	7,050	1,340	0.099	7,050	698
Coal	0.30	5,200	1,560	0.30	5,200	1,560
Steam	2.50	720	1,800	0.553	720	398
Elec. power	200KWH	3.9	780	100KWH	3.9	390
Labor			1,800			1,467
Maintenance			1,624			1,291
Gen. exp.			200			118
Exp. of auxiliary dept.			710			413
Business exp.			700			410
Packing			1,850			1,850
TOTAL			18,313			13,163

b) When production 300 tons per day .

Item	When ammonium chloride fertilizer is not manufactured			When ammonium chloride fertilizer is manufactured		
	Quantity per ton	@	Amount in yen	Quantity per ton	@	Amount in yen
	T			T		
Salt	1.65	3,080	5,082	1.27	3,080	3,912
Ammonia	5 kg	56,400	282	5 kg	41,700	209
Limestone	1.50	590	885	0.713	590	421
Coke	0.19	7,050	1,340	0.099	7,050	698
Coal	0.30	5,200	1,560	0.30	5,200	1,560
Steam	2.50	720	1,800	0.553	720	398
Elec. power	200KWH	3.9	780	100KWH	3.9	390
Labor			1,032			815
Maintenance			1,123			814
Gen. exp.			115			70
Exp. of auxiliary dept.			522			321
Business exp.			401			240
Packing			1,850			1,850
TOTAL			16,772			11,698

D. Estimated Profits per Month

a) Estimated Profits per Month (150 T/D)

Ammonium Chloride Fertilizer

4,170 tons sold @	¥21,300	¥88,821,000	
" " Cost "	"17,187	"71,670,000	¥17,151,000

Soda Ash

4,170 tons sold @	¥18,950	¥79,021,000	
" " cost @	¥13,163	"54,890,000	¥24,131,000

Profit subject to taxation ---------- ¥41,282,000

b) Estimated Profit per Month (300 T/D)

Ammonium Chloride Fertilizer

8,340 tons sold @	¥21,300	¥177,642,000	
" " cost "	"15,401	"128,444,000	¥49,198,000

Soda Ash

8,340 tons sold @	¥18,950	¥158,043,000	
" " cost "	"11,698	" 97,561,000	¥60,482,000

Profit subject to taxation -- ---------- ¥109,680,000

DECLASSIFIED E.O. 12065 SECTION 3 (E)(1), NARS Date

VI. Necessary Funds and Materials for Construction

A) Ammonia synthesis plant

Note : 1st project : 50,000 tons ammonium chloride fertilizer
2nd " : 100,000 " " " "

(1) Land

Item	Material (iron & steel) in ton			Required expense in 1,000 yen		
	1st	2nd	Total	1st	2nd	Total
Leveling	10	0	10	1,500	0	1,500

(2) Buildings and other structures

Item	Material (iron & steel) in ton			Required expense in 1,000 yen		
	1st	2nd	Total	1st	2nd	Total
Water gas plant	15	540	555	3,750	21,400	25,150
Producer gas plant	10	0	10	3,440	0	3,440
CO conversion plant	18	98	116	2,780	6,120	8,900
Synthesis plant	60	50	110	31,960	2,500	34,460
Cu-lye regeneration plant	5	55	60	440	3,250	3,690
Substation	3	0	3	2,150	0	2,150
Water station	5	0	5	270	0	270
Boiler room	80	1	80	2,400	0	2,400
Power generating plant	25	0	25	12,600	0	12,600
Machine shop	50	0	50	3,050	0	3,050
Storehouse	50	0	50	3,050	0	3,050
Miscellaneous	29	57	86	4,110	730	4,840
TOTAL	350	800	1,150	70,000	34,000	104,000

DECLASSIFIED E.O. 11652 SECTION 3 (E)(1), MAR 10, 1978

(3) Machines & equipment

Item	Material (iron & steel) in ton			Required expense in 1,000 yen		
	1st	2nd	Total	1st	2nd	Total
Water gas producer	100	903	1,003	8,000	71,000	79,000
Gas producer	80	0	80	9,600	0	9,600
CO converter	74	376	450	16,000	44,000	60,000
CO_2 removal	15	25	40	4,200	1,500	5,700
CO "	10	215	225	6,500	53,500	60,000
Ammonia synthesis	155	145	300	41,000	35,000	76,000
Electric facilities	75	52	125	20,000	8,000	28,000
Water facilities	20	0	20	2,800	0	2,800
Boiler facilities	100	0	100	20,000	0	20,000
Transportation facilities	160	40	200	32,000	12,000	44,000
Power generating plant	100	0	100	10,000	0	10,000
Miscellaneous	23	44	67	1,900	1,000	2,900
Machine shop	40	0	40	15,000	0	15,000
TOTAL	950	1,800	2,750	187,000	226,000	413,000

(4) Summation

Item	Material (iron & steel) in ton			Required expense in 1,000 yen		
	1st	2nd	Total	1st	2nd	Total
Land as in (1)	10	0	10	1,500	0	1,500
Building and other structure as in (2)	350	800	1,150	70,000	34,000	104,000
Machines and equipment as in (3)	950	1,800	2,750	187,000	226,000	413,000
Miscellaneous	90	0	90	31,500	10,000	41,500
TOTAL	1,400	2,600	4,000	290,000	270,000	560,000

B) Ammonium chloride fertilizer plant

(1) Land —— Tokuyama Soda Co., Ltd., 8355 Tokuyama, Tokuyama City.

(2) Buildings and other structures

Item	Material (iron & steel) in ton			Required expense in 1,000 yen		
	1st	2nd	Total	1st	2nd	Total
Distillation waste filtering plant	0	0	0	0	0	0
Evaporation plant	50	0	50	3,000	0	3,000
Reaction, filtering, drystalling plant	50	0	50	2,400	0	2,400
Drying plant	60	60	120	2,200	3,000	5,200
TOTAL	160	60	220	7,600	3,000	10,600

(3) Machines & equipment

Item	Material (iron & steel) in ton			Required expense in 1,000 yen		
	1st	2nd	Total	1st	2nd	Total
Reaction & filtering plant	49.5	32.5	82.0	1,840	1,095	2,933
Calcium carbonate drying plant	47.0	0	47.0	2,260	0	2,260
Evaporation plant	481.6	400.5	836.1	29,150	24,280	53,430
Crystallization & separation plant	28.3	70.4	98.7	1,480	2,310	3,790
Ammonium chloride drying plant	61.6	73.6	135.2	3,300	3,540	6,840
Refrigeration plant	0	1.3	1.3	0	60	60
Electric jobs	9.0	5.0	14.0	2,000	1,000	3,000
Miscellaneous	18.0	0	18.0	7,370	4,715	12,085
TOTAL	695.0	583.3	1,278.3	47,400	37,000	84,400

DECLASSIFIED Dist. Unlimited

(4) Summation

Item	Material (iron & steel) in ton			Required expense in 1,000 yen		
	1st	2nd	Total	1st	2nd	Total
Buildings & other structures as in (2)	160	60	220	7,600	3,000	10,600
Machines & equipment as in (3)	695	583.3	1,278.3	47,400	37,000	84,400
Other misc. charge	0	0	0	5,000	0	5,000
TOTAL	855	643.3	1,498.3	60,000	40,000	100,000

IX. Funds

Funds required ;- (unit in 1,000 yen)

	1st project	2nd project	Total
For construction of ammonia synthesis plant	290,000	270,000	560,000
For construction of ammonium fertilizer plant	60,000	40,000	100,000
For operation	50,000	30,000	80,000
TOTAL	400,000	340,000	740,000

Method to raise the funds ;-

Construction to be financed by the counter part funds and operation by loar.

X. Time to start and finish the project

	1st project	2nd project
Time to start	as soon as permission granted	As soon as permission granted
Time to finish	In 10 months after start	In 18 months after start

DECLASSIFIED E.O. 12065 SECTION 3 NLJ/NARS DATE

A

Tokuyama Soda Co., Ltd., Tokyo

Ammonium Chloride Fertilizer in Korea

by Takeo Fukumoto,
formerly with Chosen Chisso Co.

Ammonium chloride fertilizer was manufactured since 1936 at Hongu factory, Konan, by Chosen Chisso Co., Ltd., in Korea. The production is reported as follows:

4895 tons in 1941
5751 " " 1942
4918 " " 1943
5266 " " 1944
1453 " " 1945

The ammonium chloride fertilizer was consumed in Korea, mainly in provinces such as Kankyo Nando, Keikido, Zenra Nando, Zenra Hokudo, Keian Nando and Heian Nando. As it was greatly demanded, it was then allocated according to the result of ammonium sulphate distribution in the previous year.

The result was good, and it is reported to have attained the same fertilizer effect as ammonium sulphate for paddy, wheat, and potatoes. It was verified to be better than ammonium sulphate for cotton and flax.

No trouble was reported in respect to its storage and packing at the factory in Konan, Korea.

-- Ryuan Gijitsu (Technology of Ammonium Sulphate), Jan., 1948 --

DECLASSIFIED E.O. 12065 Section 3 (b), NARS Date

Tokuyama Soda Co., Ltd., Tokyo

Properties of Ammonium Fertilizers

	Ammonium Chloride	Ammonium Sulphate
Chemical formula	NH_4Cl	$(NH_4)_2SO_4$
Molecular weight	53.5	132
Nitrogen content		
in pure salt	26.2%	21.2%
in commercial salt	20.5%	20.5%
Other component effective as fertilizer	$CaCO_3$ app. 20%	---
Total effective component	app. 40.5%	20.5%

Composition of Mother Liquor from Ammonia-soda Plant

(Filtrate from raw sodium bicarbonate and can be used for making ammonium chloride fertilizer.)

S.G.	1.141
Ammonium Chloride	190 g/l
Ammonium Bicarbonate	100 g/l
Sodium Chloride	90 g/l

Composition of Ammonium Chloride for Industrial Use

Ammonium Chloride	99.3%
Sodium Chloride	0.5%

Corrosion Test of Evaporator Tubes

Ammonium chloride solution is so corrosive that no economical and resistant material is found for evaporator tubes.

By adding phosphoric acid to the ammonium chloride solution, we have succeeded in making ordinary steel tubes non-corrosive against ammonium chloride solution.

The weight of tubes in evaporator for ammonium chloride solution changed as follows after 2 month's operation

Group	No. of tubes	Initial weight	Last weight	Increase in weight
A	12	4.49 kg(av.)	4.55 kg.	0.06 kg.
B	12	4.615 kg(av.)	4.675 kg.	0.06 kg.

DECLASSIFIED E.O. 12065 SECTION 3 (E)(1), MDR 80-

Tokuyama Soda Co., Ltd., Tokyo

Partial Translation of Articles Relating to Ammonium Chloride Fertilizer by Noted Experts

Kagaku Kogyo Shiryo (Data on Chemical Industries)
Vol. 18, No. 1 (February, 1950), pages 12-13

On the Tendency of Nitrogen Fertilizer

by Goro Shima, Director of Tokyo Industrial Laboratory, MITI.

"Sulphuric acid used in the manufacture of ammonium sulphate and super-phosphate is not only useless but acidifies the soil resulting in AKIOCHI SUIDEN (paddy field collapsing root in autumn) and devastated soil, wasting costly sulphuric acid. Ammonium sulphate is liked and used generally by farmers simply because the fine unsticky crystals are handy for farmers who are used to it. It is much to be regretted that the production of fertilizer indispensable to the food increase is curbed by the limited supply of sulphuric acid. It is natural that a fertilizer requiring no sulphuric acid should be the talk of the town.

Urea, ammonium nitrate, ammonium chloride, ammonia water, phosphoric ammonium nitrate, molten phosphoric fertilizer are those fertilizers contrived and manufactured with a view to lessening the use of sulphuric acid. Several improved fertilizers and their application to eliminate sulphate radicals are investigated in America and Britain. The demand there has a general tendency to use such kinds, and blended fertilizers and synthetic fertilizers are commonly used along with high quality fertilizers."

Kogyo Mainichi
Vol. 4, No. 2 (1950)

Purging Ammonium Sulphate

by Ryutaro Tsuchida, Doctor of Science, Professor in Osaka University, Department of Science

"On application of ammonium sulphate, ammonia is useful but sulphuric acid is useless as a fertilizer. Plants need sulphur but not much of it. When ammonium sulphate is applied, sulphur in same or more quantity as nitrogen is given to the ground."

"On application of ammonium sulphate, sulphate ion is absorbed together with ammonia. Sulphate ion finally turns into hydrogen sulphide, which is harmful to animate things, as is easily conceived."

"Next is the harm by acid. Acidification by sulphuric acid remaining in the ground does harm in many ways. Among many harms what can be easily understood by a layman is the fact that paddy frequently collapses when ripe on acidified field. This is attributed to the weak stalk. It has much to do with acidification. It is, therefore, considered very hard to harvest more than 3 koku per tan (app. 0.25 acres) on field acidified by "ammonium sulphate."

"If you should be satisfied with harvesting about 3 koku of rice per tan, ammonium sulphate would not be too harmful. The average harvest by a Japanese farm is 2 koku to 2.3 koku at present. If an aim is placed at this much of harvest, ammonium sulphate can be said harmless. Those harvesting less than 3 koku would say "harmless", and those who want to harvest 4 koku to 6 koku call ammonium sulphate harmful."

Improvement of Acidified Soil

by Masao Endo, Agricultural Engineer

"Think of the calcium content in the soil of Japan which has much rainfall. Year after year, it runs out of calcium. How can the soil be free from acid as it is fed with ammonium sulphate and human manures."

Lecture on Feb. 8, 1950

Effect of Ammonium Chloride Fertilizer on Soil

by Dr. Shiori, Professor in
Tokyo University, Agricultural
Science Department

"It is necessary to apply non-sulphate fertilizer such as ammonium chloride to prevent the ferrous-source water fields from becomming AKIOCHI SUIDEN (water-fields where plants collapse in autumn) not to speak of such area which is already AKIOCHI CHITAI (areas where plants collapse in autumn).

Tokuyama Soda Co., Ltd., Tokyo

Comparative Fertilizer Effect of Ammonium Chloride & Sulphate

Summerized from Various Experiments Mostly in Japan

Use		Ref. No.
Paddy rice:	Generally speaking, there is no difference. When increase in crop is desired and excess fertilizer is necessary, the use of chloride is superior to sulphate. In AKIOCHI SUIDEN or fields where paddy plants collapse in autumn, sulphate is considered harmful, and chloride is recommended.	1-12
Upland rice:	Practically no difference. No experiment is reported for more-fertilizer-more-crop system.	13-16
Wheat:	No difference in most cases. Chloride is better in some cases as reported. When lime is added, chloride is much superior in many cases. In difference between the two.	17-25
Barley:	In many cases chloride is slightly better. When lime is added, chloride is remarkably superior. In case of more-fertilizer-more-crop system, chloride is very much superior to sulphate.	19, 24, 26-30
Rye:	Chloride is superior to sulphate.	31
Potato:	When little fertilizer is given, sulphate is slightly better than chloride. When fertilizer is increased, chloride shows much more increase of crop. Chloride also gives larger percentage of big potatoes and diminishes smaller size potatoes.	32-37
Sweet potato:	Chloride is better than sulphate. When excessively given, sulphate helps grow runners only and decreases the yield. Chloride is not so extreme. Chloride gives more big potatoes and diminishes tiny ones.	38, 39
Flax, ramie, rush, cotton, etc.:	Chloride is decidedly superior to sulphate. Chloride increases the crop and makes the textile fiber longer and softer.	40-45
Daikon (white radish):	Chloride is better than sulphate. Crop is increased, and better quality is obtained with chloride.	46-50
Turnip, egg plant, etc.:	Practically no difference.	51, 52
Chinese cabbage:	Sulphate is superior to chloride, giving better crop and tighter cabbages.	53
Perilla:	Practically no difference.	54
Tobacco:	Chloride increases the yield over sulphate but deteriorates the quality of tobacco leaves.	55

Tokuyama Soda Co., Ltd., Tokyo

Ref. No.	Technical Data of Experiments
1	Exp. 1, 1st Tokuyama Report
2	" 2, "
3	" 4, "
4	" 5, "
5	" 6, "
6	" 7, "
7	" 8, "
8	Exp. 1, Chap. 5, 2nd Tokuyama Report
9	Report of Shizuoka Agr. Research Lab., 1936-44
10	Report of Tochigi Agr. Research Lab., 1936-41
11	Report of Kumamoto Agr. Research Lab., 1935-41
12	Report of Hiroshima Agr. Research Lab., 1936-41
13	Exp. 3, 1st Tokuyama Report
14	" 9, "
15	Report of Tochigi Agr. Research Lab., 1936-38
16	Report of Kumamoto Agr. Research Lab., 1936-38
17	Exp. 10, 1st Tokuyama Report
18	" 11, "
19	" 12, "
20	" 13, "
21	" 14, "
22	" 18, "
23	" 19, "
24	" 3, Chap. 5, 2nd Tokuyama Report
25	" 4, " 5, "
26	" 15, 1st Tokuyama Report
27	" 16, "
28	" 17, "

Tokuyama Soda Co., Ltd., Tokyo

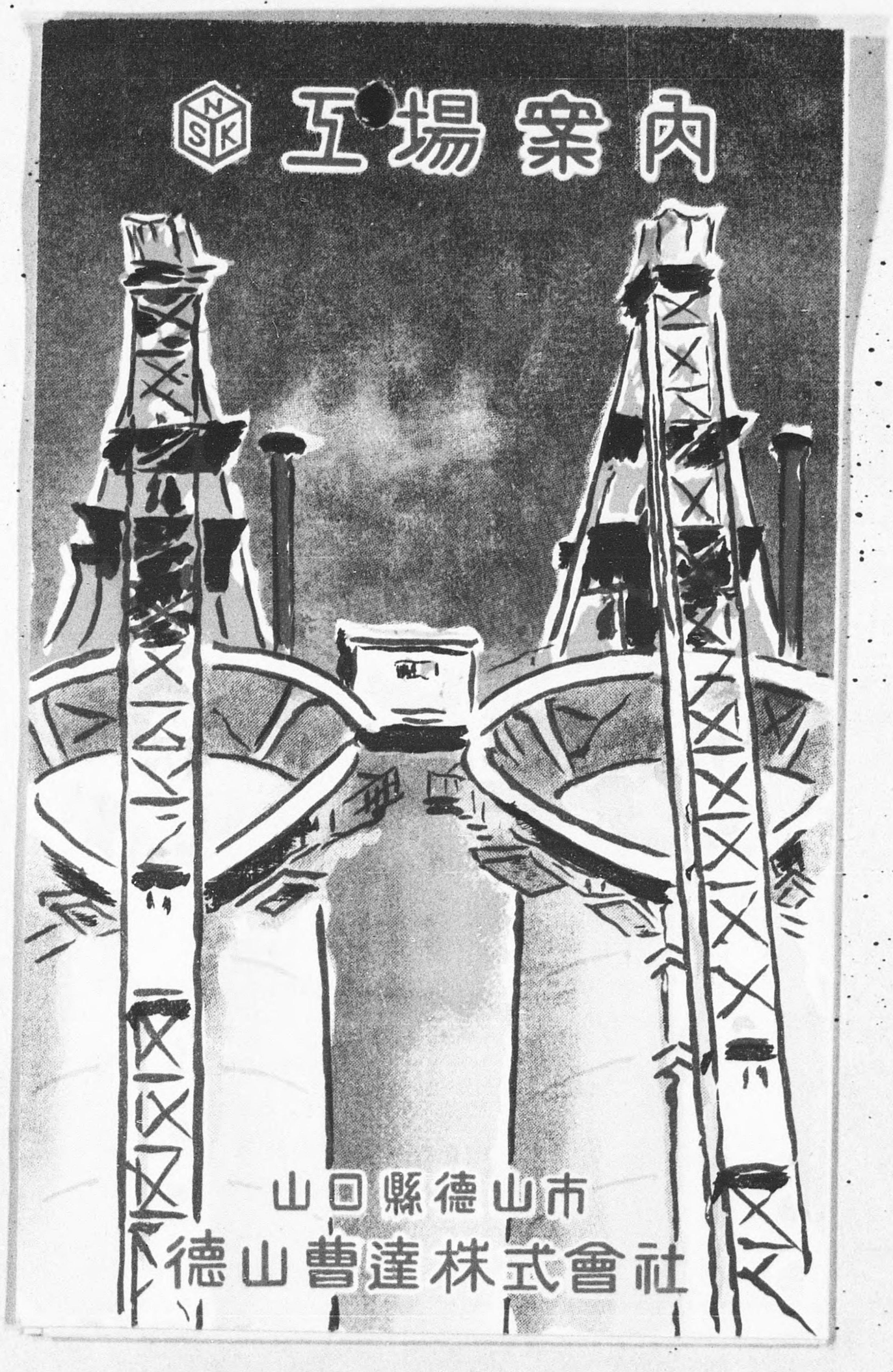
Ref. No.	Technical Data of Experiments
29	Exp. 2, Chap. 5, 2nd Tokuyama Report
30	" 5, " 5, "
31	Report of Kumamoto Agr. Research Lab., 1935-37
32	Exp. 20, 1st Tokuyama Report
33	" 21, "
34	" 22, "
35	" 23, "
36	" 24, "
37	" 5, Chap. 5, 2nd Tokuyama Report
38	" 25, 1st Tokuyama Report
39	" 4, Chap. 5, 2nd Tokuyama Report
40	" 1, " 6, "
41	" 2, " 6, "
42	" 5, " 6, "
43	" 3, " 6, "
44	" 4, " 6, "
45	" 6, " 6, "
46	" 29, 1st Tokuyama Report
47	" 30, "
48	" 1, Chap. 4, 2nd Tokuyama Report
49	" 2, " 4, "
50	" 3, " 4, "
51	" 3, " 4, "
52	" 5, " 4, "
53	" 6, " 4, "
54	" 9, " 3, "
55	Letter of Virginia-Carolina Chemical Corp., Montgomery, Alabama
56	Exp. 6, Chap. 4, 2nd Tokuyama Report

DECLASSIFIED - Not Need Security Review

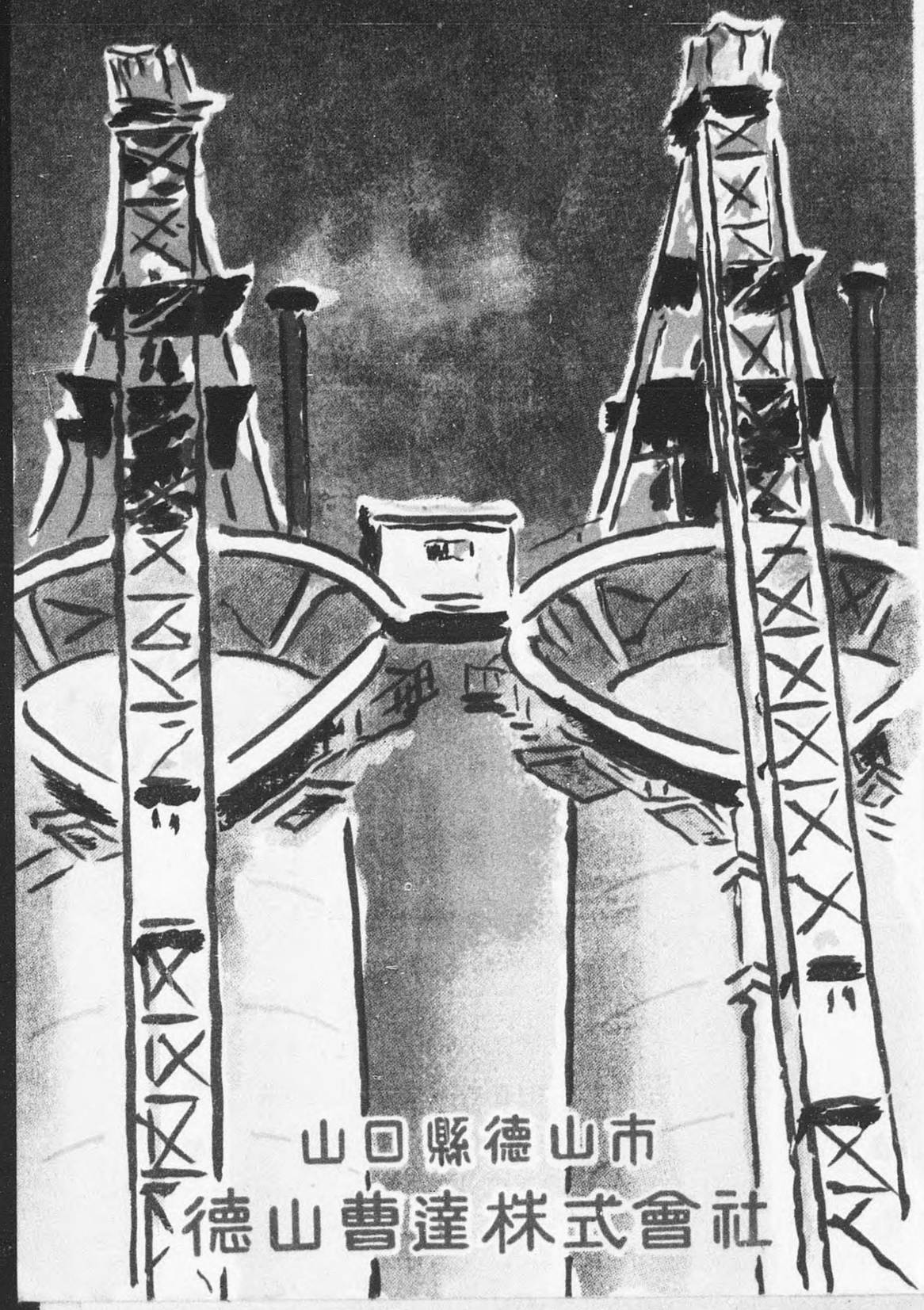
Tokuyama Soda Co., Ltd., Tokyo

Comparative Uses of Ammonium Chloride & Sulphate

(1)	Paddy field where ferrous ion is scarce, i.e. mainly around the Inland Sea, and about 15% of whole Japanese paddy field, Such area is called "AKIOCHI SUIDEN" and it is increasing year after year,	Ammonium chloride is far better than sulphate, which generates hydrogen sulphide harmful to root of plants.
(2)	Acidic aluminous soil like reclaimed land,	Ammonium sulphate is better than chloride.
(3)	If such aluminous soil is neutralized, i.e. if the free silica therein is neutralized for instance, with lime,	Ammonium chloride is as effective as sulphate.
(4)	Where rainfall is little like America, North China, etc. (Japan is much-rainfall country, over 1,000 mm. per year),	Ammonium sulphate is better than chloride.

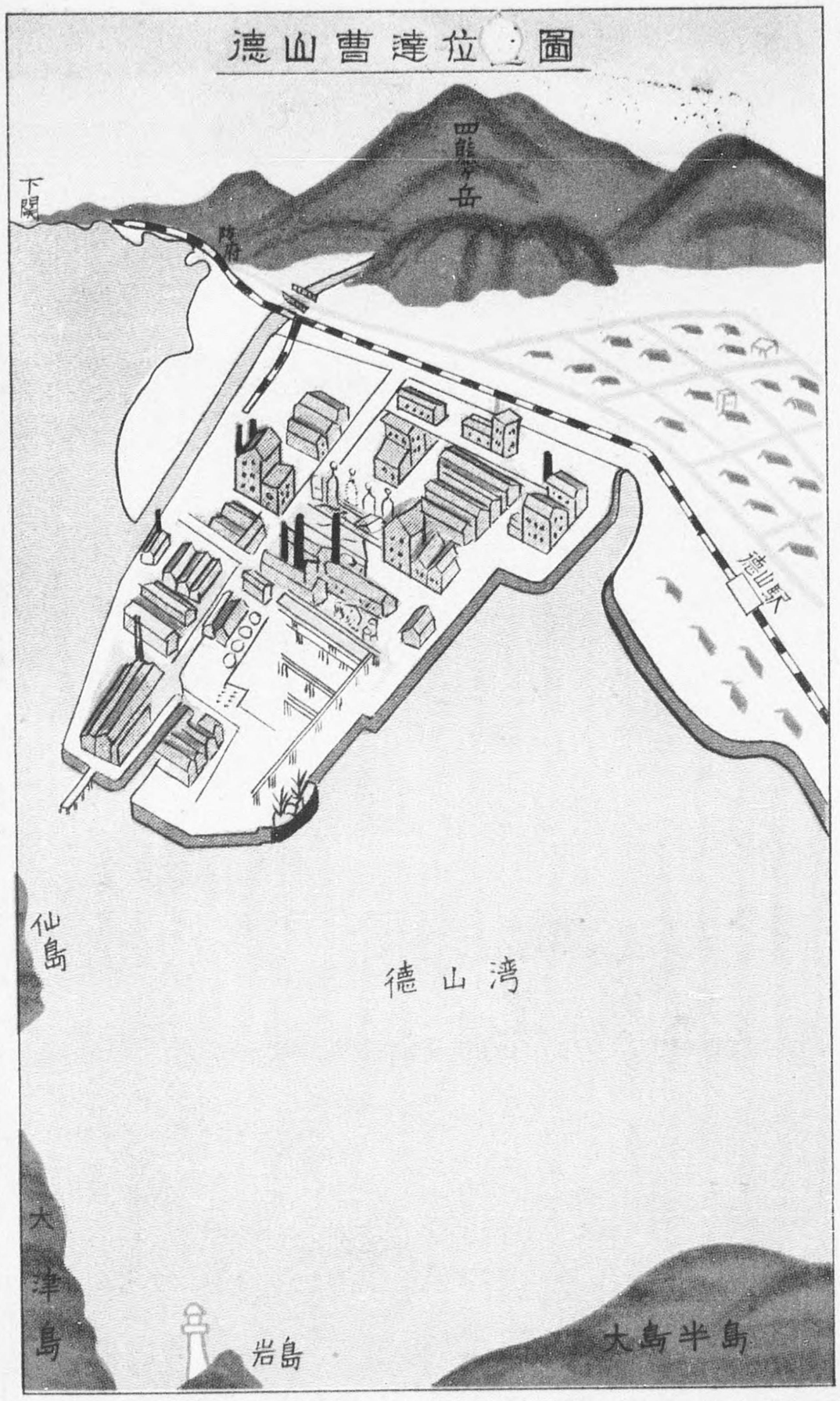

工場案内
山口縣德山市
德山曹達株式會社

工場案内

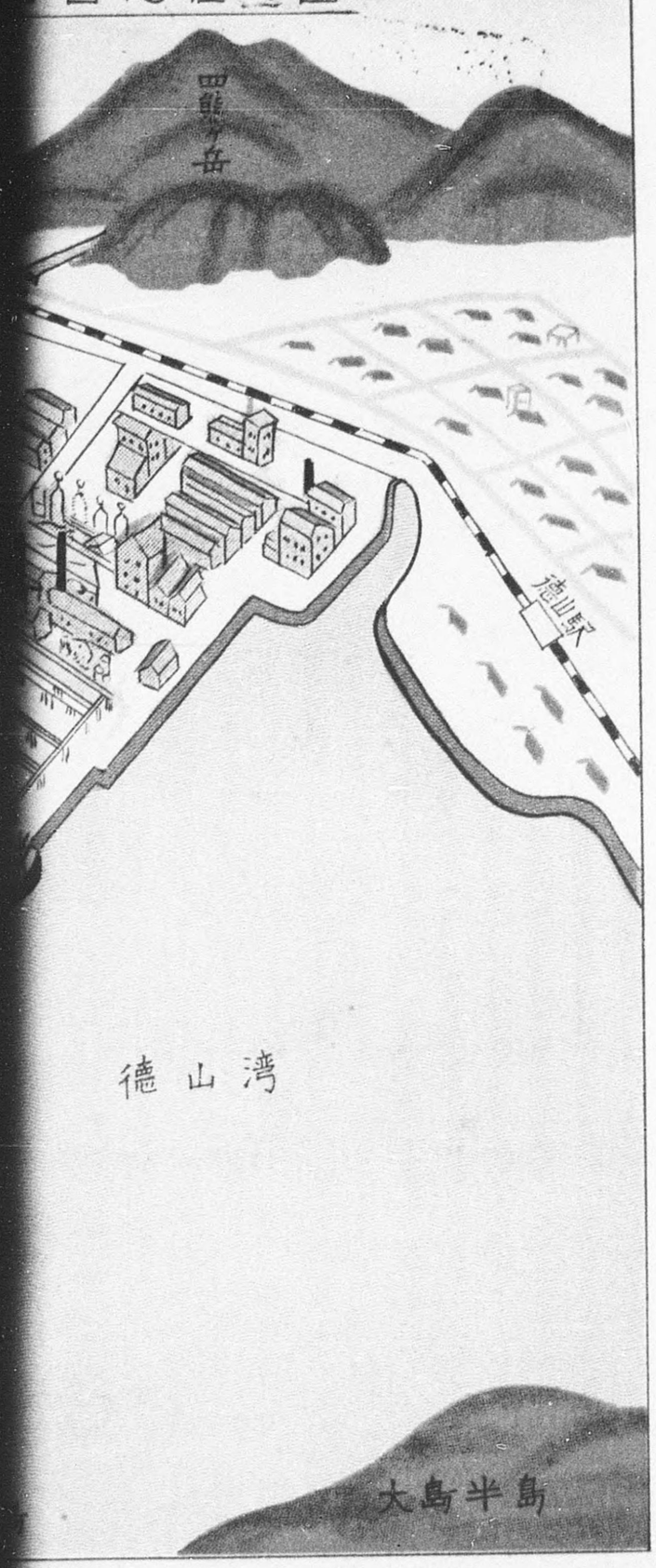


山口縣德山市

德山曹達株式會社



曹達位置圖



事　業　の　概　要

1. 沿　　革

大正7年2月資本金200万円を以て、日本曹達工業株式会社の名稱で山口縣德山町に設立、其後資本金を昭和7年500万円、昭和8年1000万円、同9年2000万円に增資し設備も其都度拡張す

昭和11年商号を德山曹達株式会社と改稱し、次で昭和16年には資本金を2500万円に增資、工場設備もセメント、化學石膏炭酸マグネシヤ、塩化石灰、珪酸曹達の各工場相ついで完成す

戰前には国産アルミナの製造を企図して、アルミナ試驗工場を設立せしも、其後カリ工場に転換、現在更に炭マグ工場に転換し改良した設備に依り生産を続けてゐる。

又ソーダ工場は昭和22年徹底的に設備を改良し現在斬新優秀なる設備を以て生産しつゝあるも更に新たに塩安肥料を生産すべく目下計劃中である、尙昭和24年7月資本金を5.000万円に增資した。

2. 本社及び營業所

本社及び工場	德山市大字德山8355番地
東京事務所	東京都港区芝新桜田町一九
大阪事務所	大阪市東区瓦町2丁目三和ビル
広島営業所	広島市石見屋町13
小倉営業所	小倉市鳥町63商工会議所ビル
宇部営業所	宇部市東区松山通1ノ3
大嶺採石場	山口縣美禰郡大嶺町北分
津久見営業所	大分縣津久見町セメント町

3. 資本金　全額拂込済 50.000.000円

4. 役員及び従業員

取締役社長	蔭山	如信
常務取締役	今津	清藏
〃	長屋	和夫
取締役	山内	英麿
取締役	田中	秀
〃	中沢	治
常任監査役	江口	信
従業員	2500名	

5. 製　　品

ソーダ灰
苛性ソーダ　1
セメント　1
塩化石灰
珪酸ソーダ
炭酸マグネシア

6. 工場の規模

敷地　15
建物
曹達工場　1
セメント工場
薬品工場
機械工場
動力工場
其他建物
自家発電能力
繫船設備
1万屯級 大型船接岸壁
3千屯、6千屯 〃
貯水池　容量
石灰石採掘設備　月産

7. 厚生施設

従業員の福利厚生施設として次の施設
附属病院、購買組合、浴場、従業員寮

事　業　の　概　要

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大嶺採石場	山口縣美禰郡大嶺町北分
津久見営業所	大分縣津久見町セメント町

3.　資　本　金　全額拂込済 50.000.000円

4.　役員及び従業員

取締役社長	蔭 山	如 信
常務取締役	今 津	清 藏
〃	長 屋	和 夫
取 締 役	山 内	英 麿
取 締 役	田 中	秀 男
〃	中 沢	治 男
常任監査役	江 口	信 一
従 業 員	2500名	

5.　製　　品

	設備能力（月産）
ソーダ灰	7,500 瓲
苛性ソーダ	10,500 〃
セメント	16,200 〃
塩化石灰	1,050 〃
珪酸ソーダ	580 〃
炭酸マグネシア	150 〃

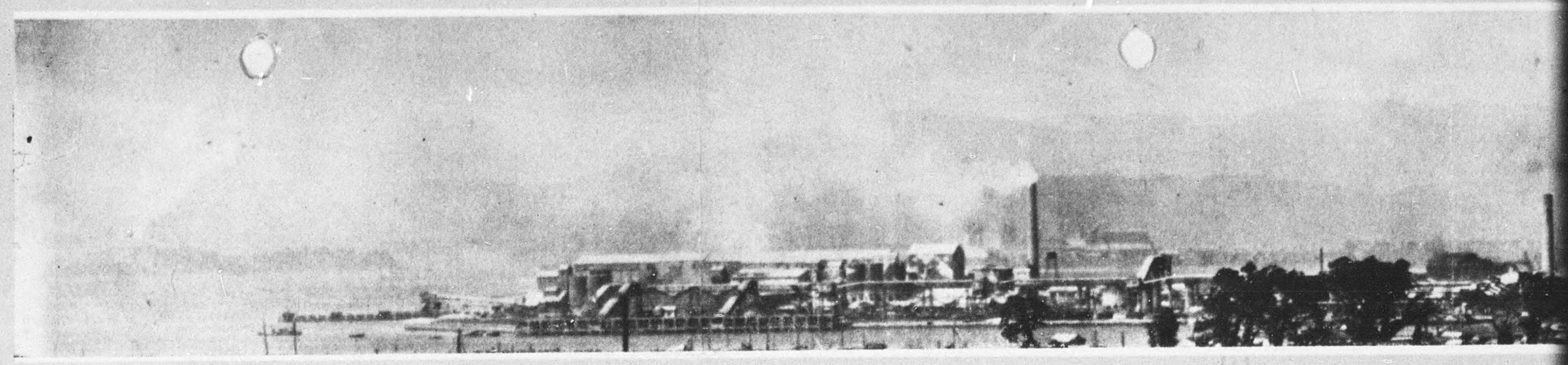
6.　工場の規模

敷地		155,600坪
建物		
	曹達工場	10,600坪
	セメント工場	2,000 〃
	薬品工場	2,400 〃
	機械工場	1,300 〃
	動力工場	700 〃
	其他建物	3,300 〃
	自家発電能力	14,500KW
繋船設備		
	1万屯級 大型船接岸壁	1ヶ所
	3千屯、6千屯 〃	2ヶ所
貯水池	容量	1,000,000立方米
石灰石採掘設備	月産	30,000屯

7.　厚　生　施　設

従業員の福利厚生施設として次の施設がある。

附属病院、購買組合、浴場、従業員寮及び食堂、其他



ソーダの用途

ソーダは化學工業に於ては基礎原料であつて、殆んど総ゆる化学製品はソーダを使用してゐると云つても過言でない。

即ちソーダ灰は硝子の製造に大量に使用され、其他ゴム充塡剤の炭マグ、水硝子、石鹸、製紙、精練薬品、局方重曹等の医薬品其他各種薬品の製造に用ひられる。

又食卓の調味料に使はれる味の素や代用醤油（アミノ酸醤油）はソーダ灰を使用して造られる。

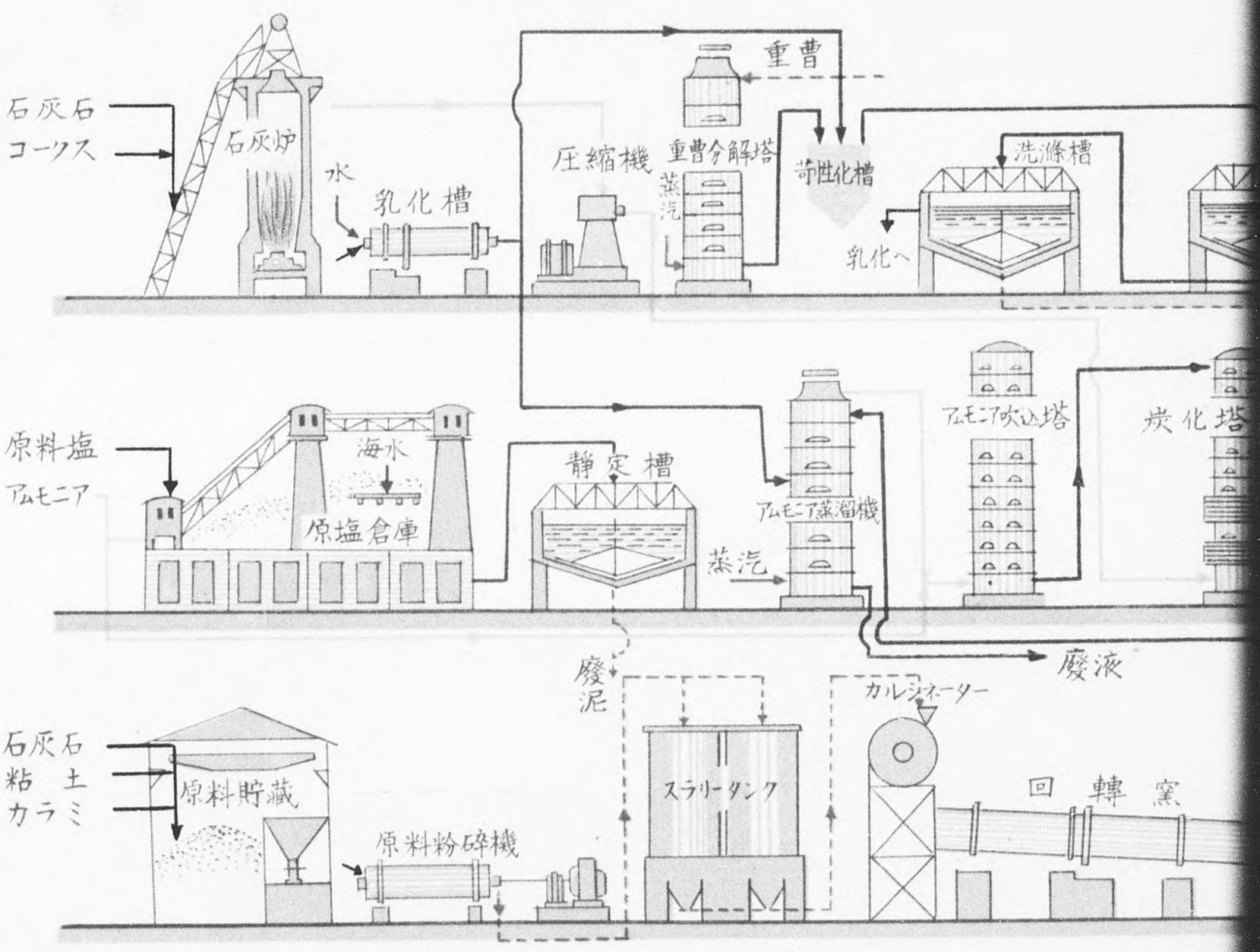
苛性ソーダはソーダ灰より製造され人絹スフ等の衣料品の製造にはなくてはならないものであり之等の製造に最も多量に使用され、其他アルミナの製造、石鹸、パルプ、染料、油脂の精製、ゴムの再製等に使用される。

斯様にソーダは総ゆる工業製品の製造に使用せられ其の用途は頗る広いのである。

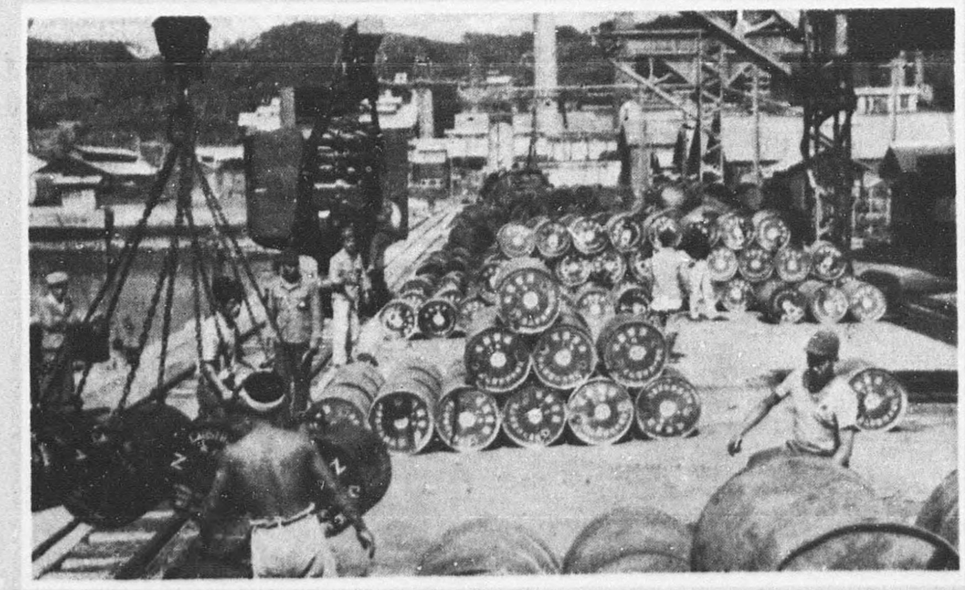
然るに之等の国内需要に対して現在我国の生産量は甚だ覚束ない状態であり化學工業の発達に伴ひその用途も年々拡大されてゐるので今後ソーダの需要は益々増大する傾向にある。

當社製品製造工程

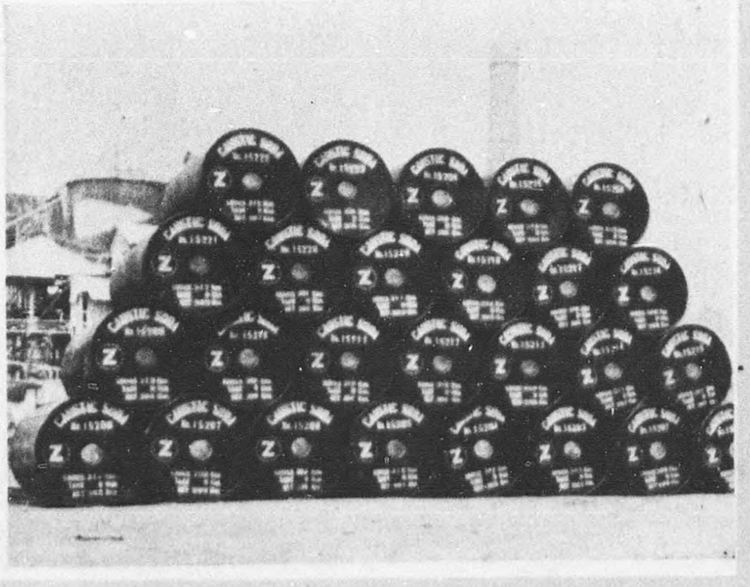
徳山曹達株式會社



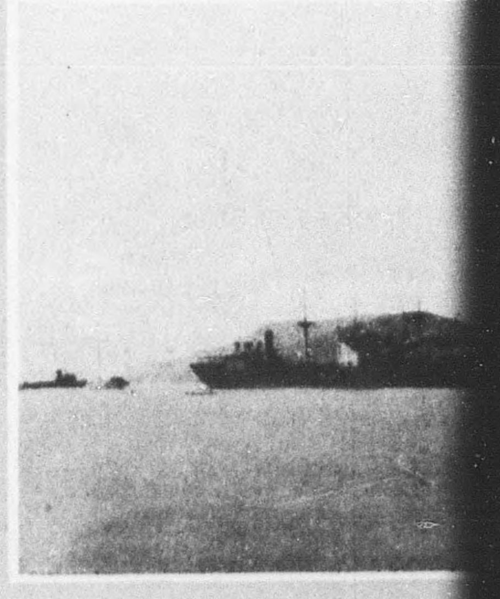
積出し作業

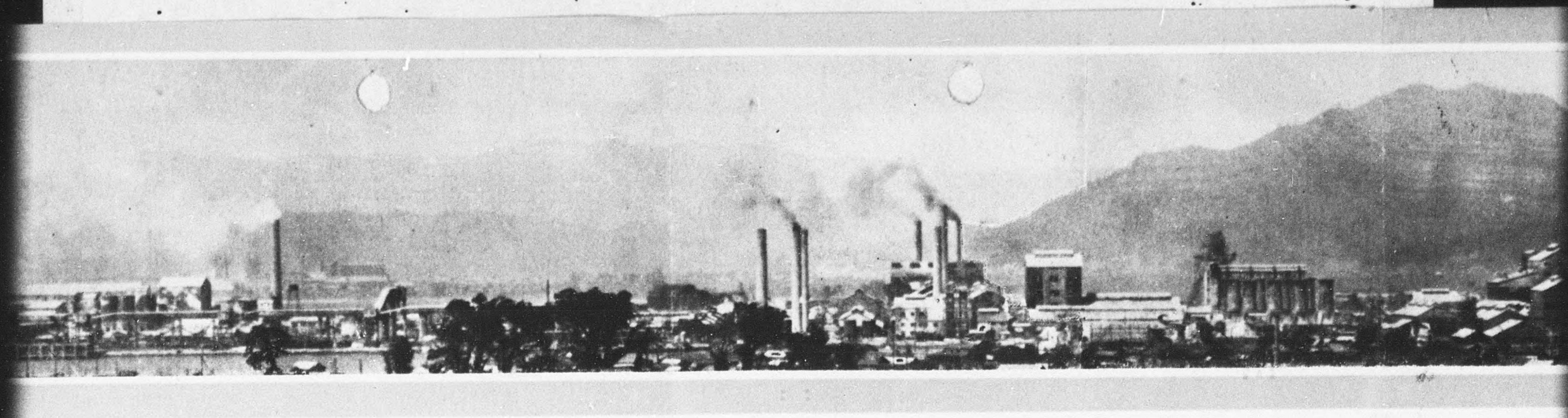


輸出用苛性ソーダ



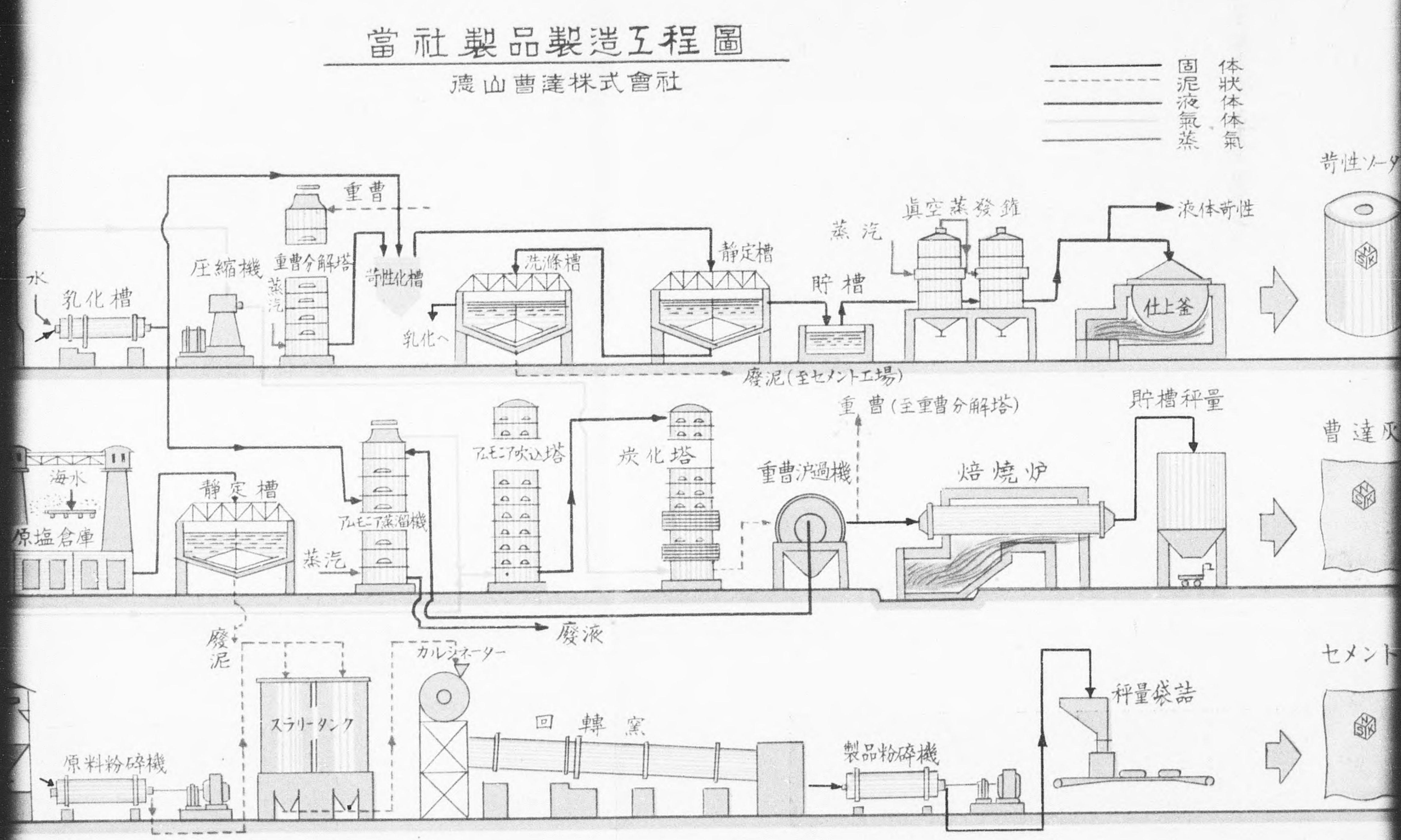
岸壁及て



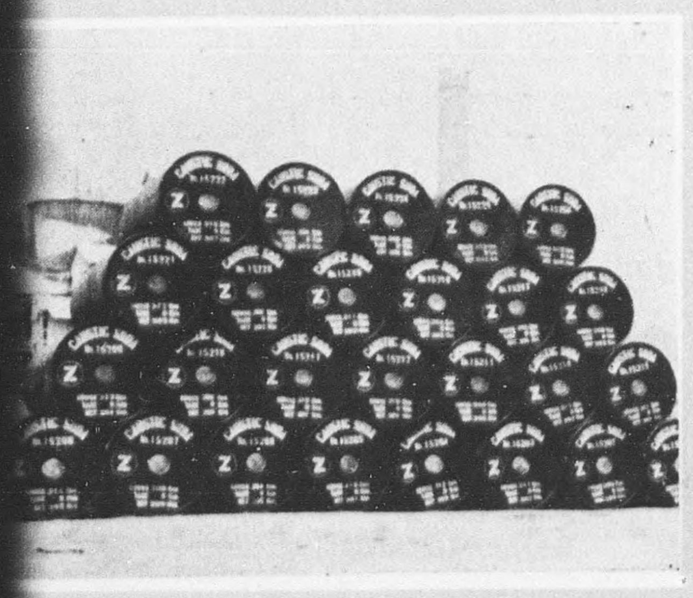


當社製品製造工程圖

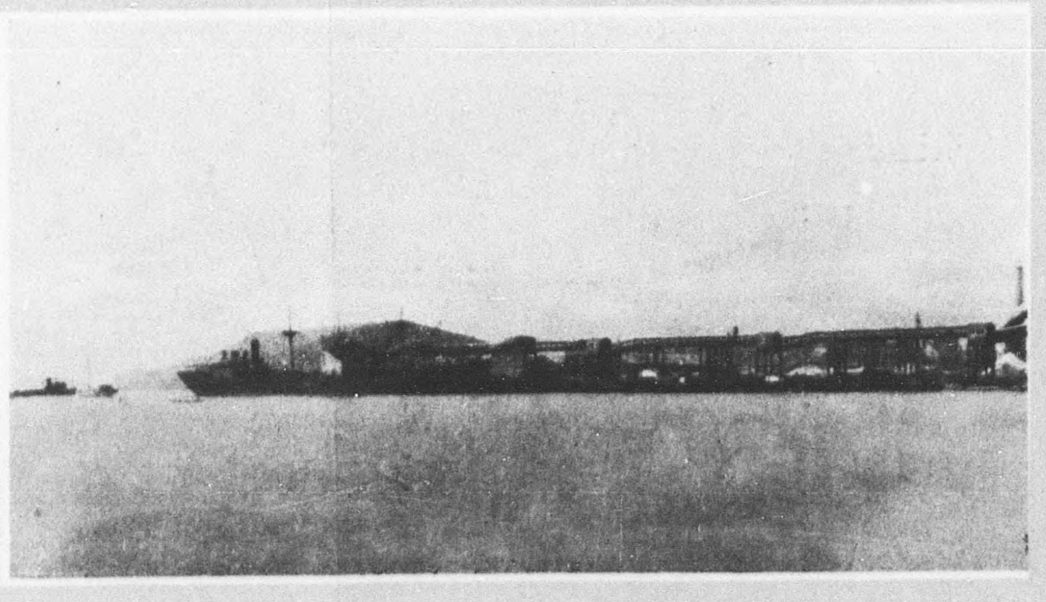
德山曹達株式會社



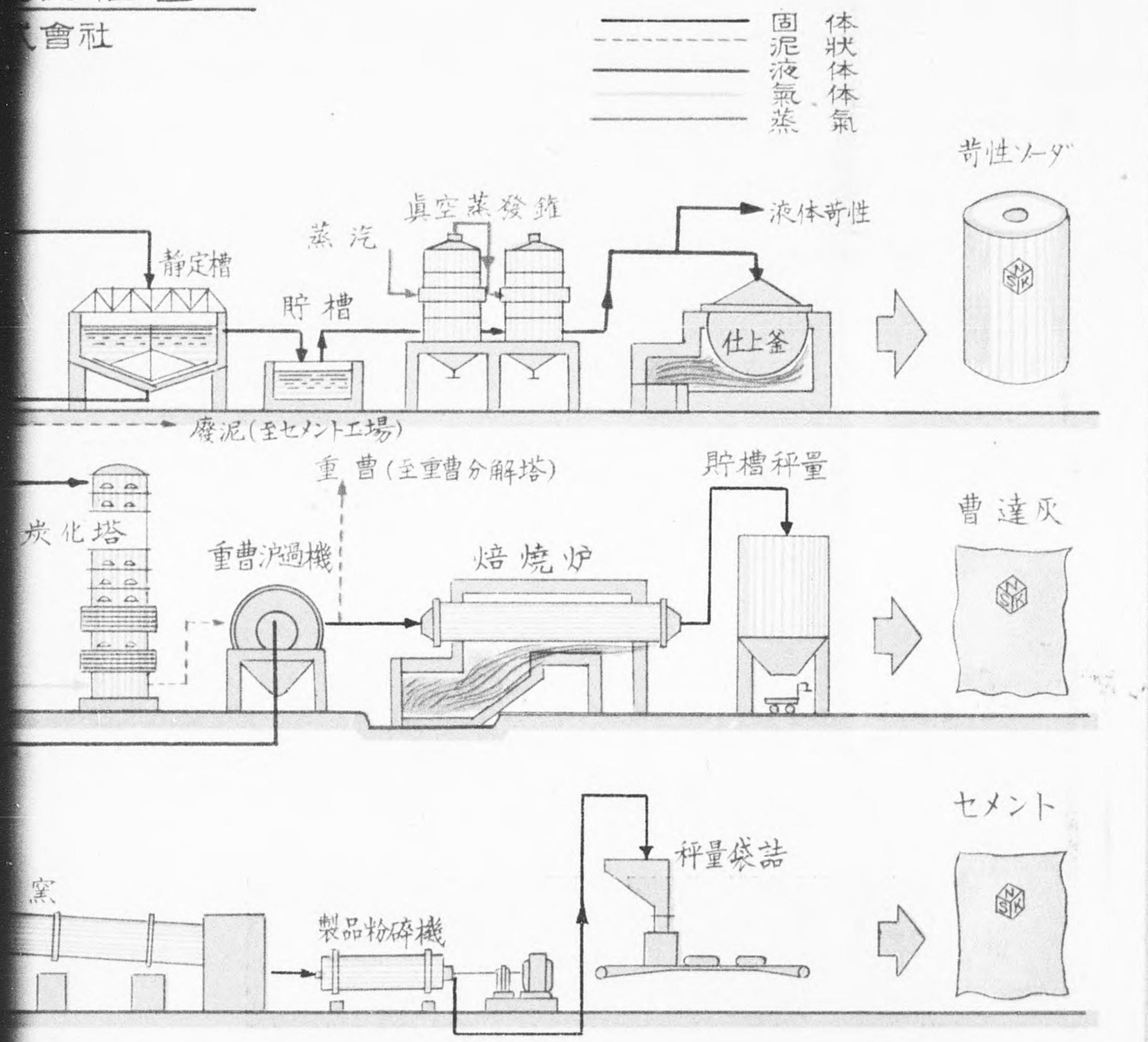
輸出用苛性ソーダ



岸壁及び塩コムベアー



セメントの荷役



我國ア法ソーダ工業の歴史と將來

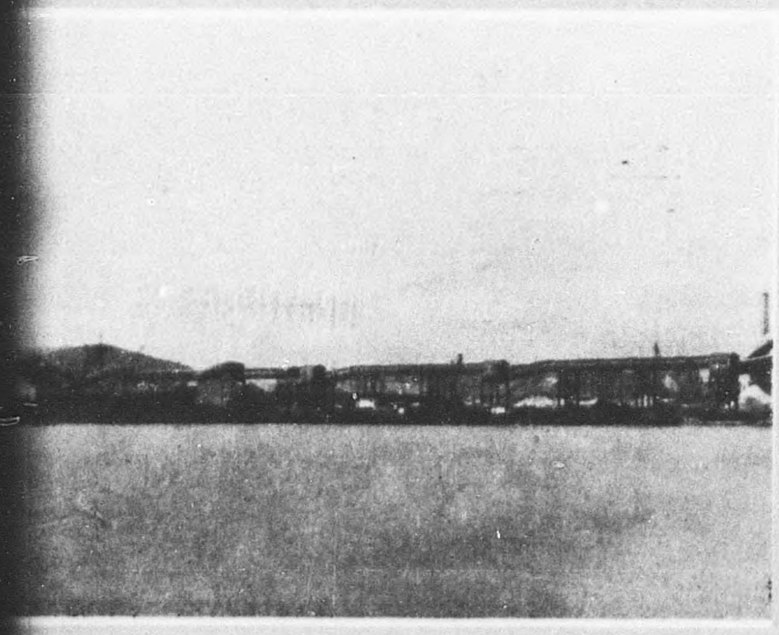
我国のソーダ工業は明治初年にルブラン法を以て製造されてゐたため、純度も悪く且つ生産原價も高くついてゐたので、工業としては成立せず遂に壞滅するに至つた。

然し第一次大戰勃発によつてソーダの輸入は僅少になつたため、識者の間では早くより純度の優良なアムモニア法に依るソーダの製造が計画されてゐたが種々の事情により幾多の蹉跌を来たしてゐた狀態であつた。

我が社は其の間幾多の辛酸をなめ乍ら遂に此の事業を確立し、ここに於て我国に於けるソーダ工業の基礎が漸く確立されるに至つたのである。

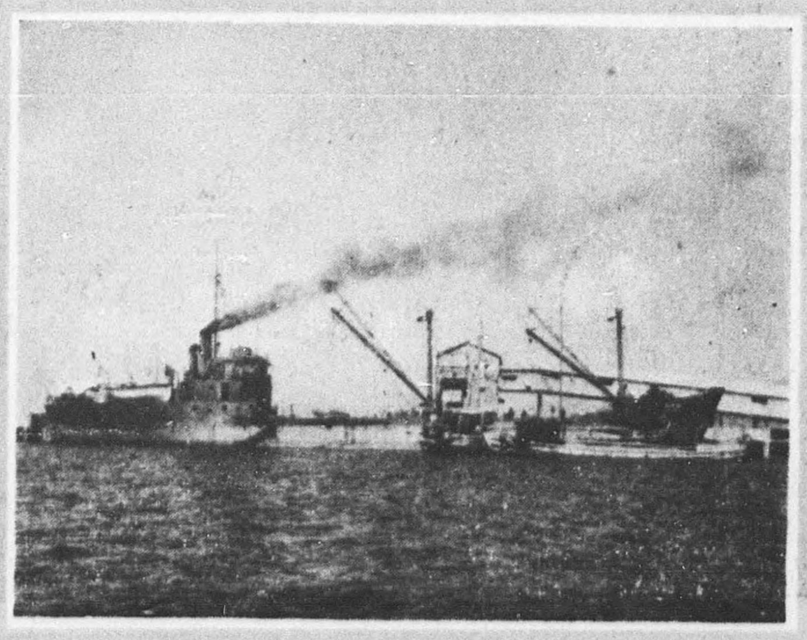
現在アムモニア法に依るソーダの製造は三社に於て操業されてゐるがソーダは化學工業に於ける基礎原料であり現在の生産量を以てしては到底需要を満すことは不可能の狀態である且つては世界市場に進出してゐた英国、及び世界第一の生産をほこる米国に於ても国内需要を充たすに精一杯で輸出の余力はない現狀にあるので戰前NSKのマークを以て我国ソーダ輸出の大半を占めてゐた我社製品は再び東洋市場は勿論のこと其他各国より輸出を待望されるものと信ずる。

壁及び塩コムベアー



セメントの荷役

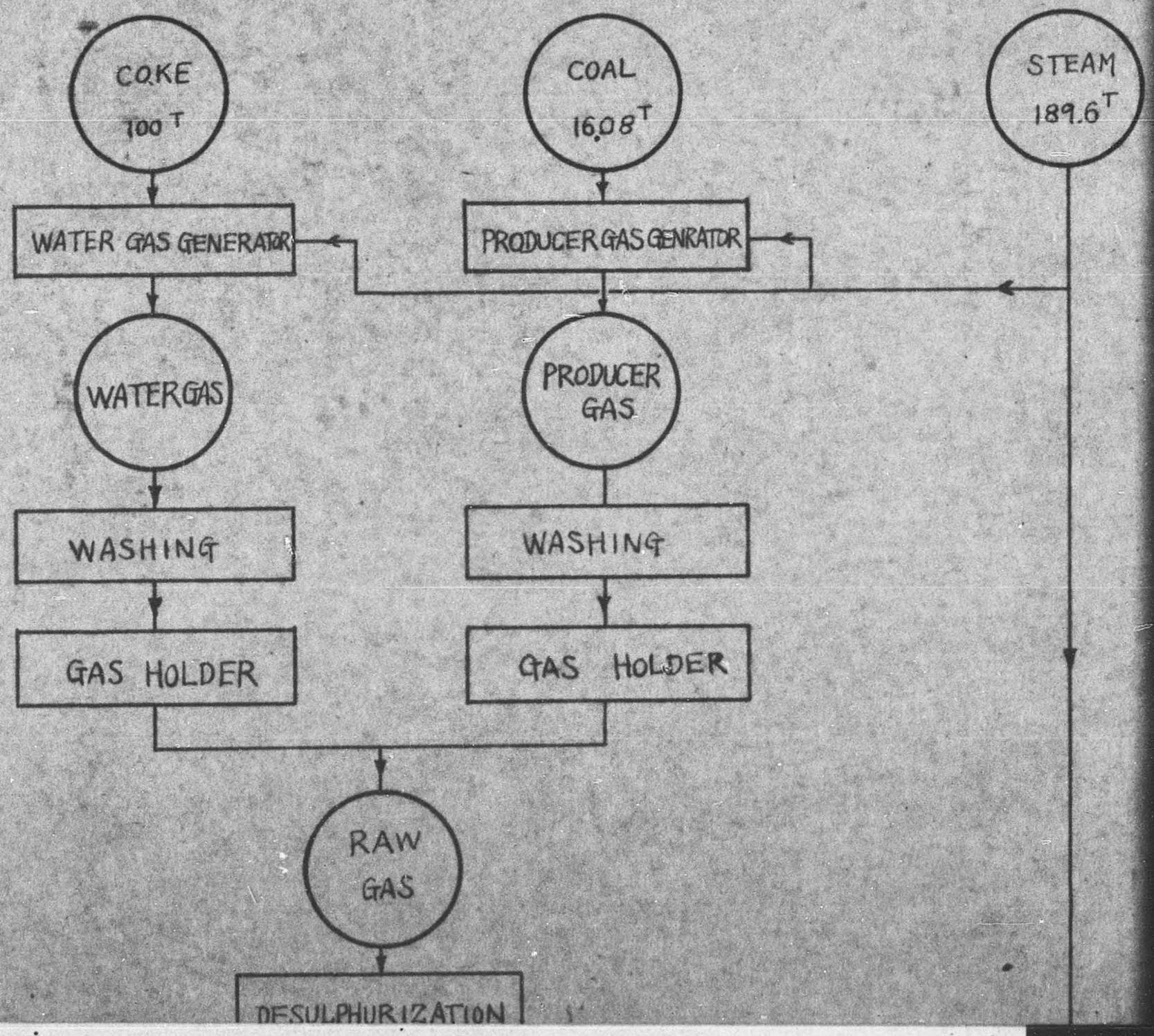
製品の出荷



FLOW SHEET OF AMMONIA SYNTHESIS PROC

(40 TONS PER DAY)

TOKUYAM



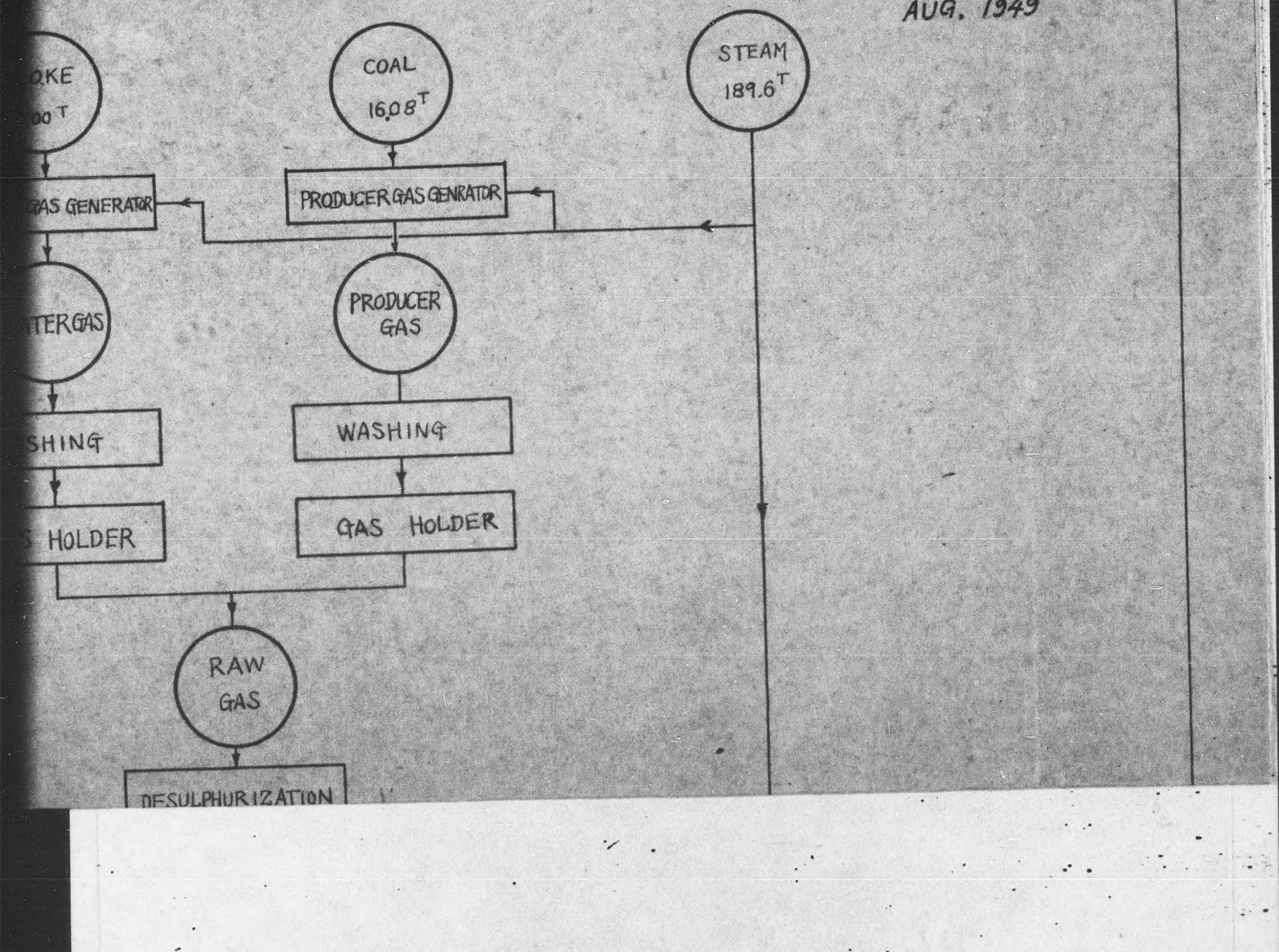
DECLASSIFIED E.O. 11652 SECTION 3 (E)(2) NSC MEMO

SHEET OF AMMONIA SYNTHESIS PROCESS

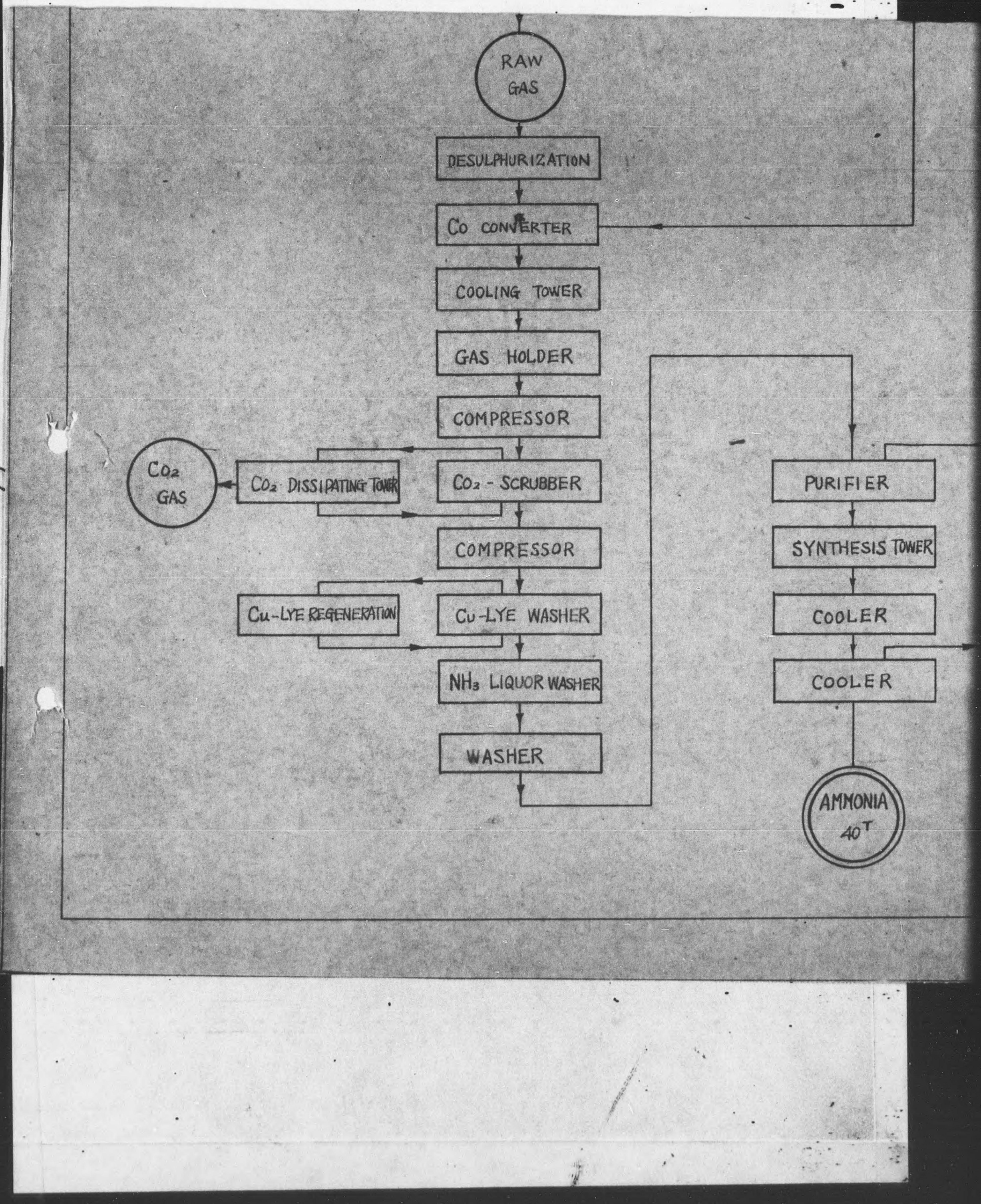
(40 TONS PER DAY)

TOKUYAMA SODA CO., LTD.

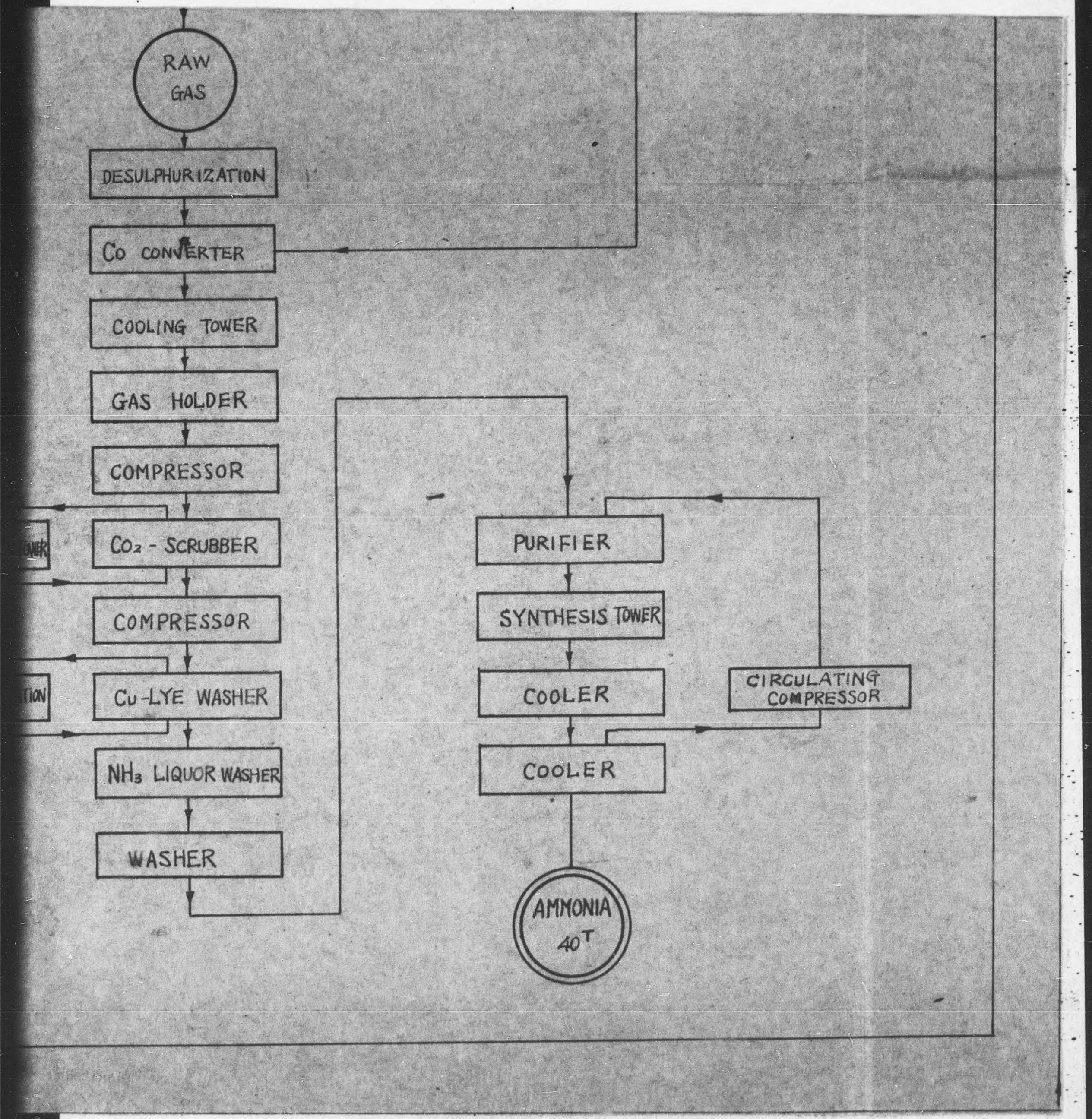
AUG. 1949



DECLASSIFIED - E.O. 11652 - SECTION 3 (E)(1)(2) NLE



DECLASSIFIED - E.O. 12065 SECTION 3 NARA DATE



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FLOW SHEET O

SODA ASH PLANT

COKE 12.3 T

LIME STONE 10 T

LIME KILN

MILK OF LIME

CARBON DIOXIDE

SALT 23 T

SATURATED BRINE

PURE SATURATED BRINE

SEA WATER

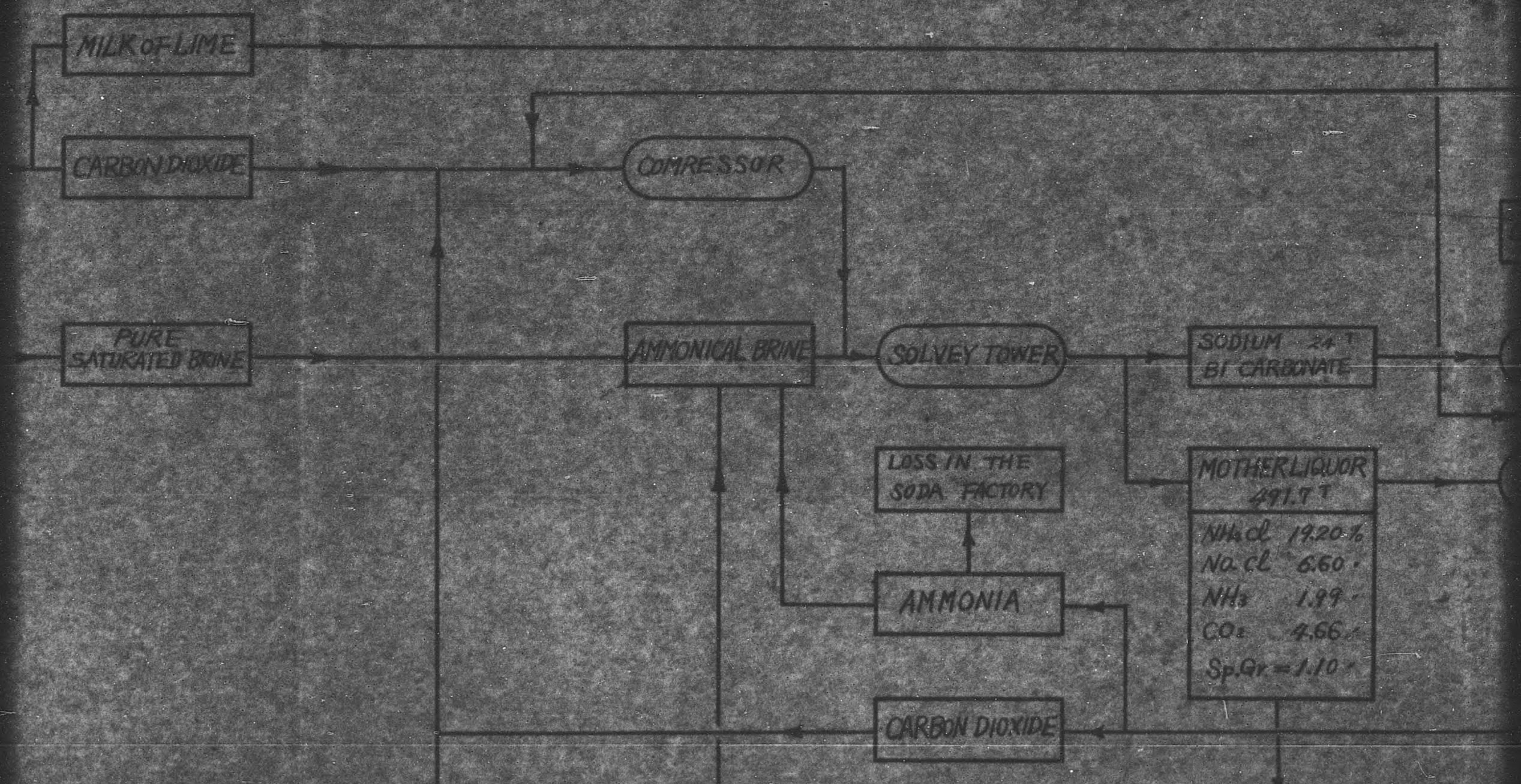
AMMONIA PLANT

STEAM

DECLASSIFIED E.O. 11652 SECTION 3 (E), MRS NO.

FLOW SHEET OF AMMONIUM CHLORIDE FERT

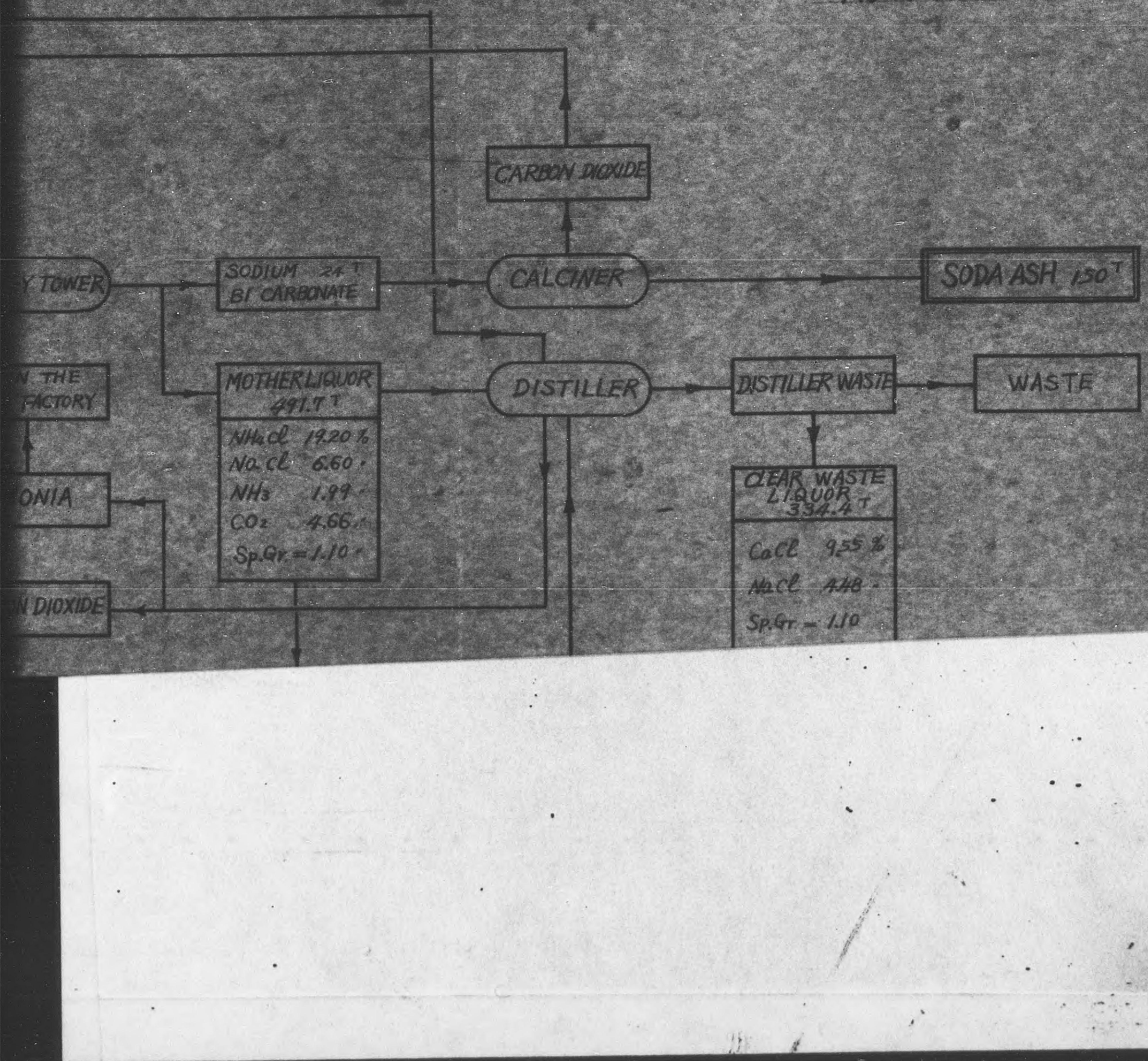
(150 TONS PER DAY)



M CHLORIDE FERTILIZER

AY)

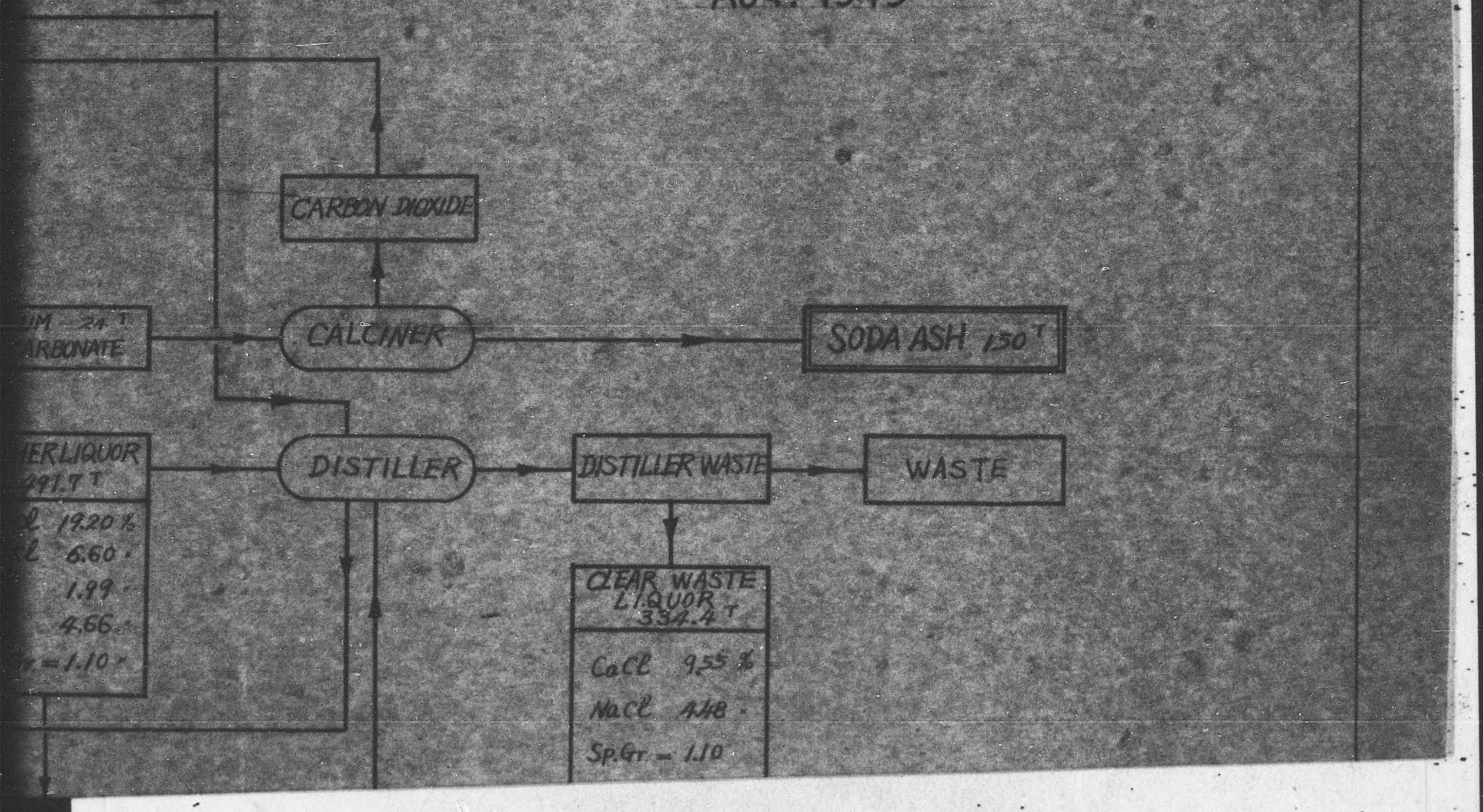
TOKUYAM SODA CO., LTD
AUG. 1949



DECLASSIFIED E.O. 11652 SECTION 3 (E)(1)(2) NSC MEMO

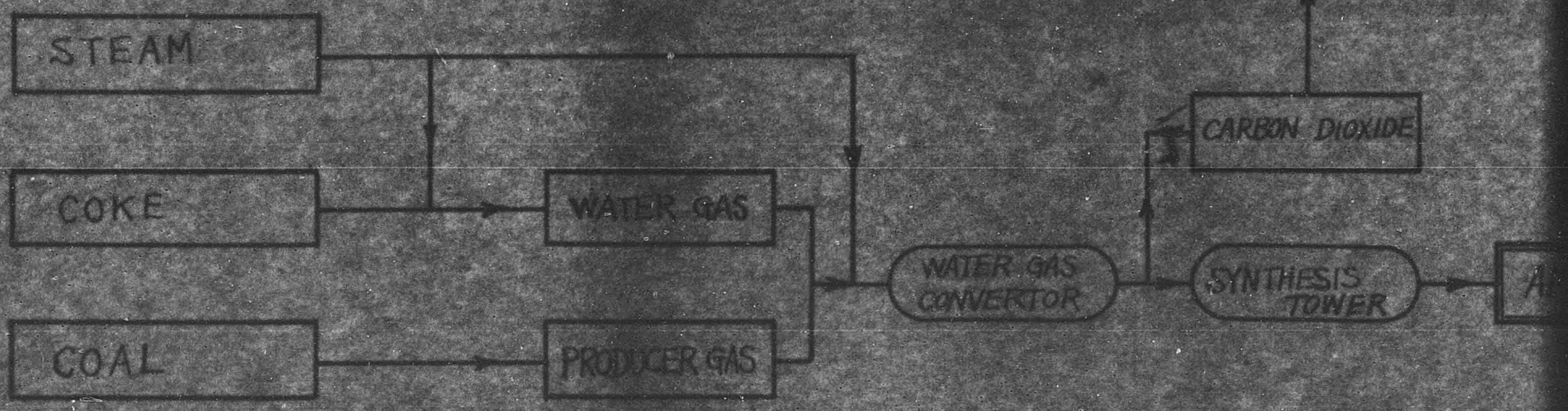
DE FERTILIZER

TOKUYAM SODA CO., LTD
AUG. 1949

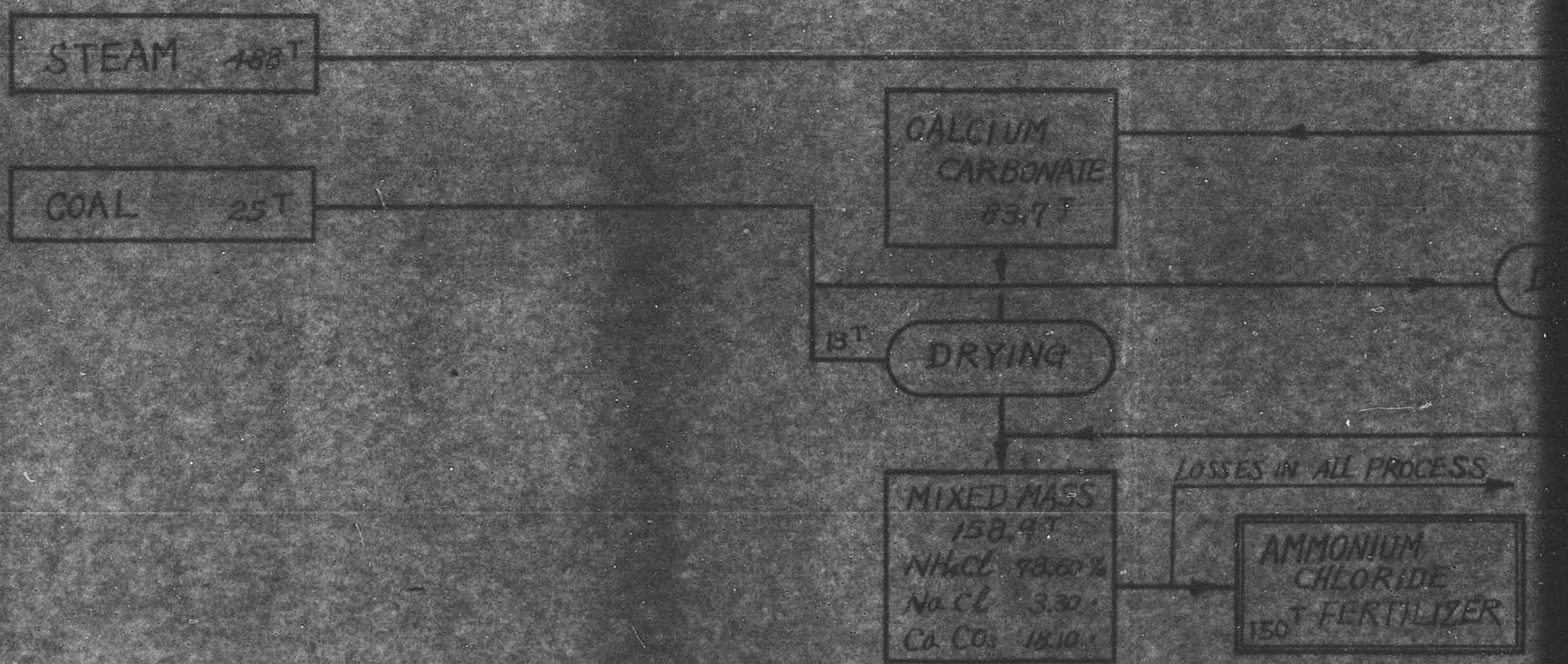


DECLASSIFIED - E.O. 12065 - SECTION 3 (E)(1) AND 3(E)(2)

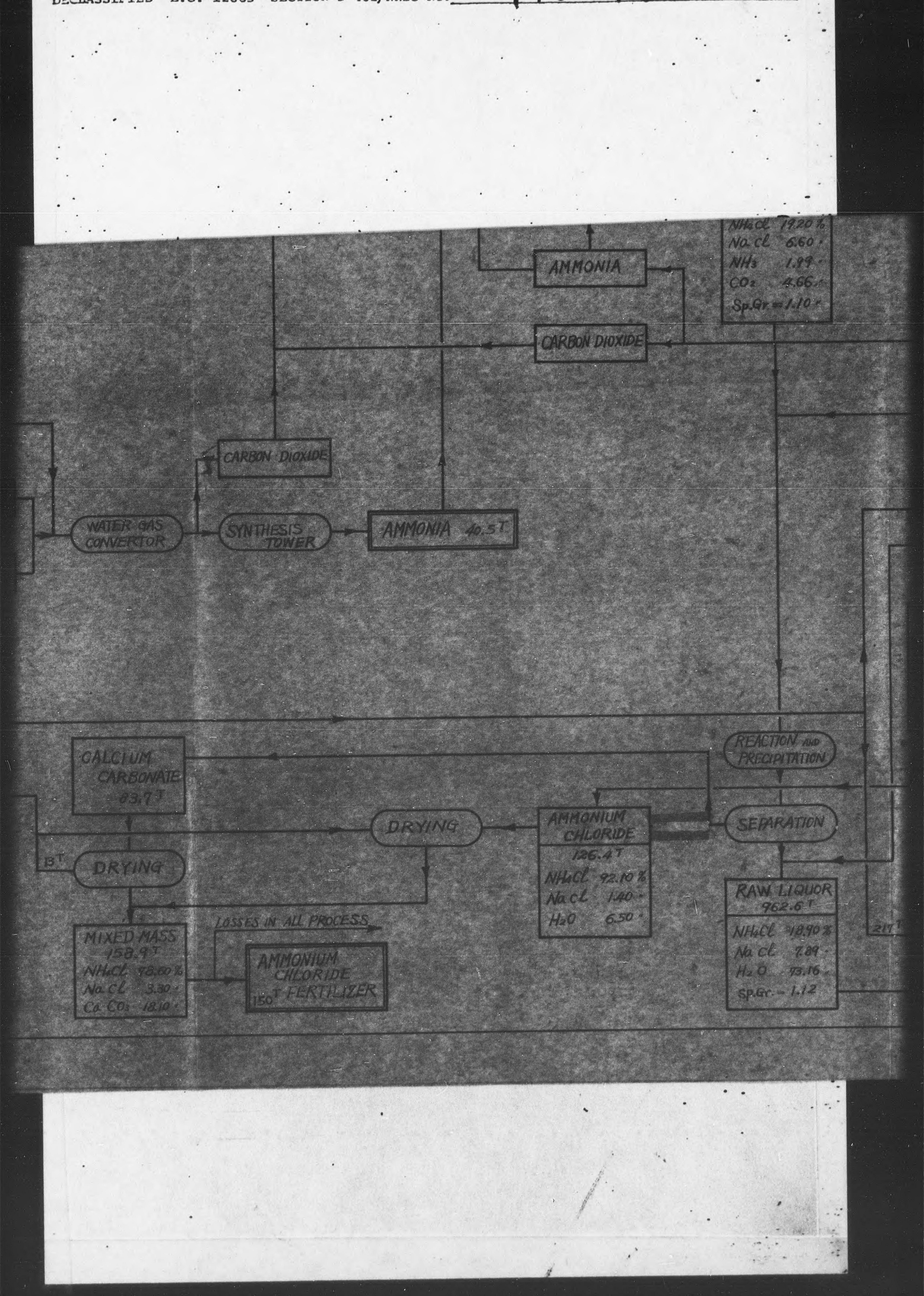
AMMONIA PLANT



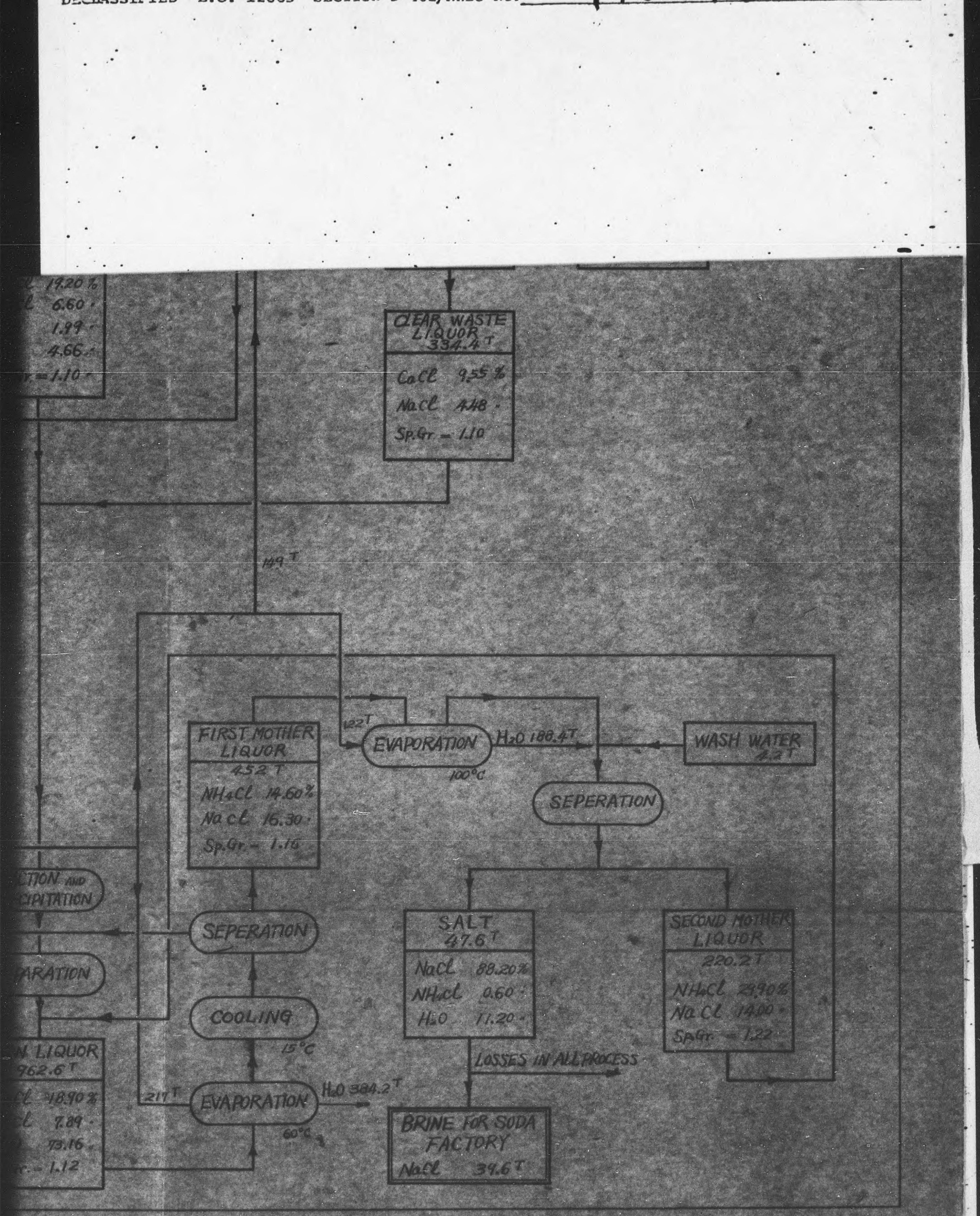
FERTILIZER PLANT



DECLASSIFIED E.O. 11652 SECTION 3 (E)(2)(B) NSC 10/2



DECLASSIFIED E.O. 12065 SECTION 3 (E)(2) NARA DATE

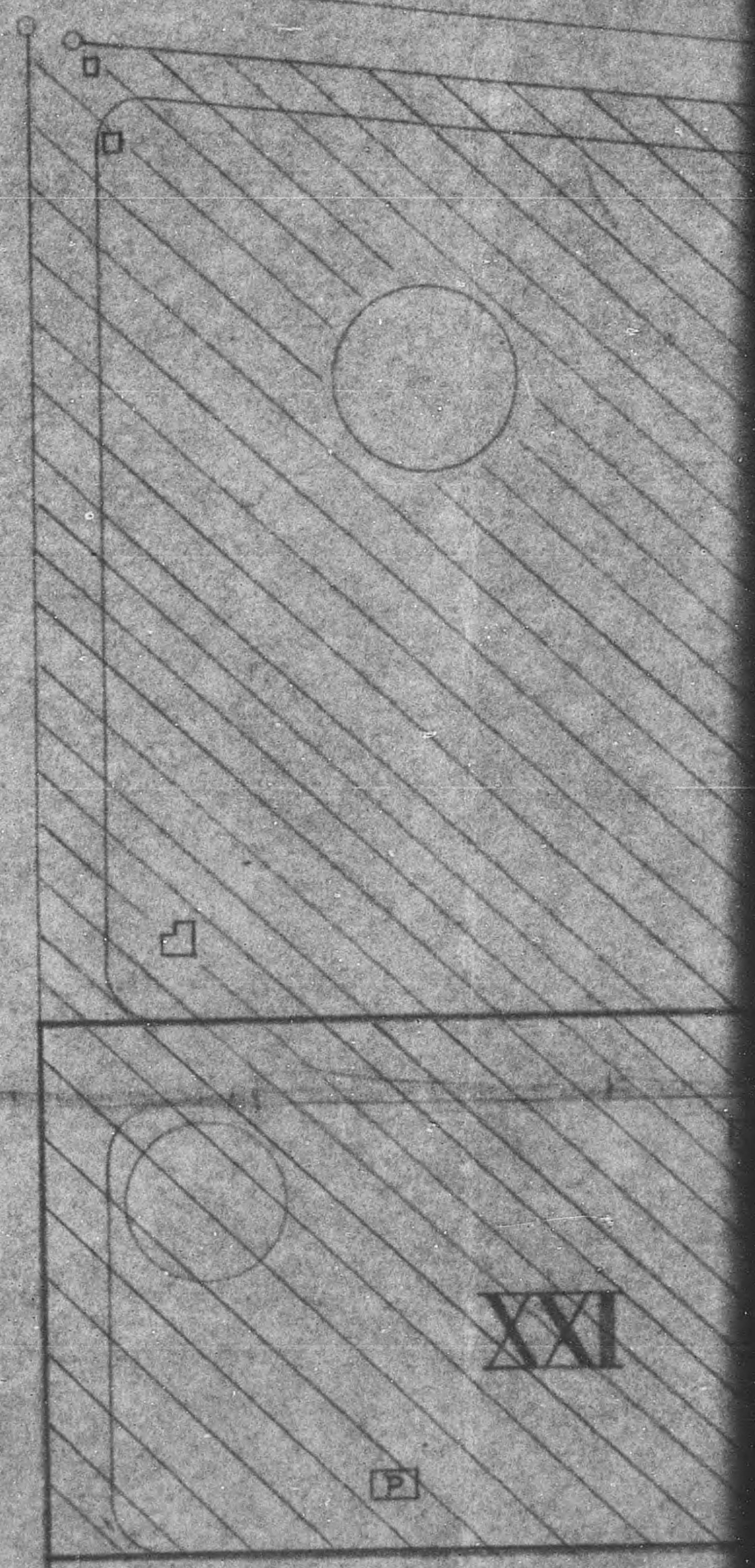


PLAN OF FORMER

INDICATIN

使用申請

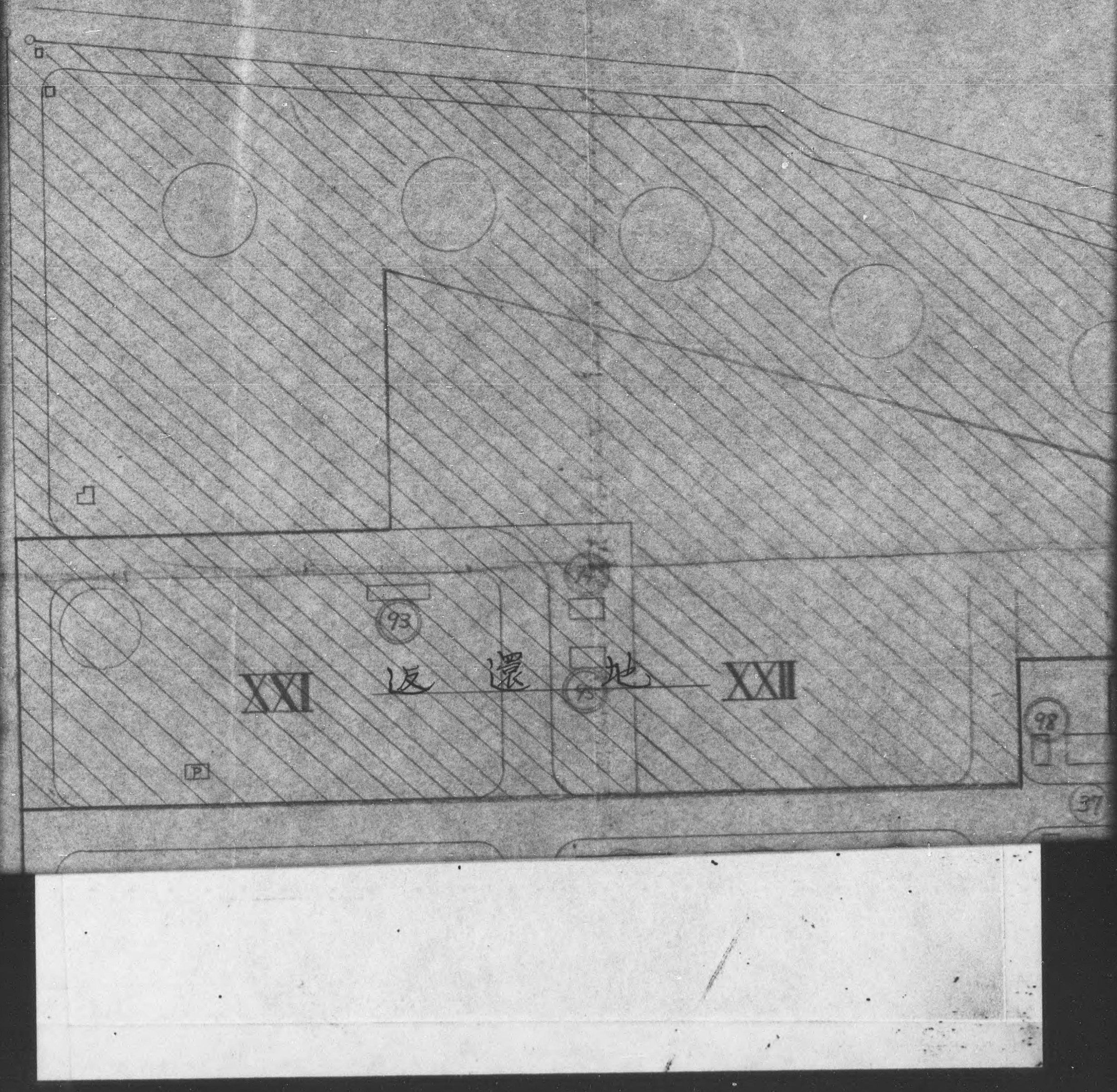
INVEN-TORY NO.	PLANT NO.	NAME OF PLANT
F1	/	LUBURICATING OIL PLANT
F1	5	VACUM DISTILLATION PLANT
F1	10	ACID WASHING PLANT
6	6	SOLVENT EXTRACTION PLANT (DUO-SOL)
7	7	DEWAXING PLANT (BARI-SOL)
F1	8	CONTACT RERUN PLANT
36	36	SOLVENT EXTRACTION PLANT (EDELEANU)
F1	499	DRUM CLEANING PLANT
F1	146	DRUM FILLING PLANT
F2	/	CRUDE OIL DISTILLATION PLANT
F2	21	NNO TYPE (2UNITS)
3	3	CONTINUOUS GASOLINE TREATING PLANT
F3	24	HYDRO CRACKING PLANT
F4	25	WATER ELECTROLYSIS PLANT
F4	26	OXYGEN FILLING PLANT
F5	/	HYDROGEN PRODUCTION PLANT
F5	27	WATER GAS PLANT (P.G.C.)
F5	28	METHANE CRACKING PLANT (KOPPERS)
F5	29	CO CONVERTER
F5	31	CO REMOVING PLANT
F5	30	CO_2 REMOVING PLANT



OF FORMER IWAKUNI ARMY FUEL DE

INDICATING INVENTRY NO. OF PLANTS

使用申請土地及建物　70,500坪（返還地 33,800坪を含む）



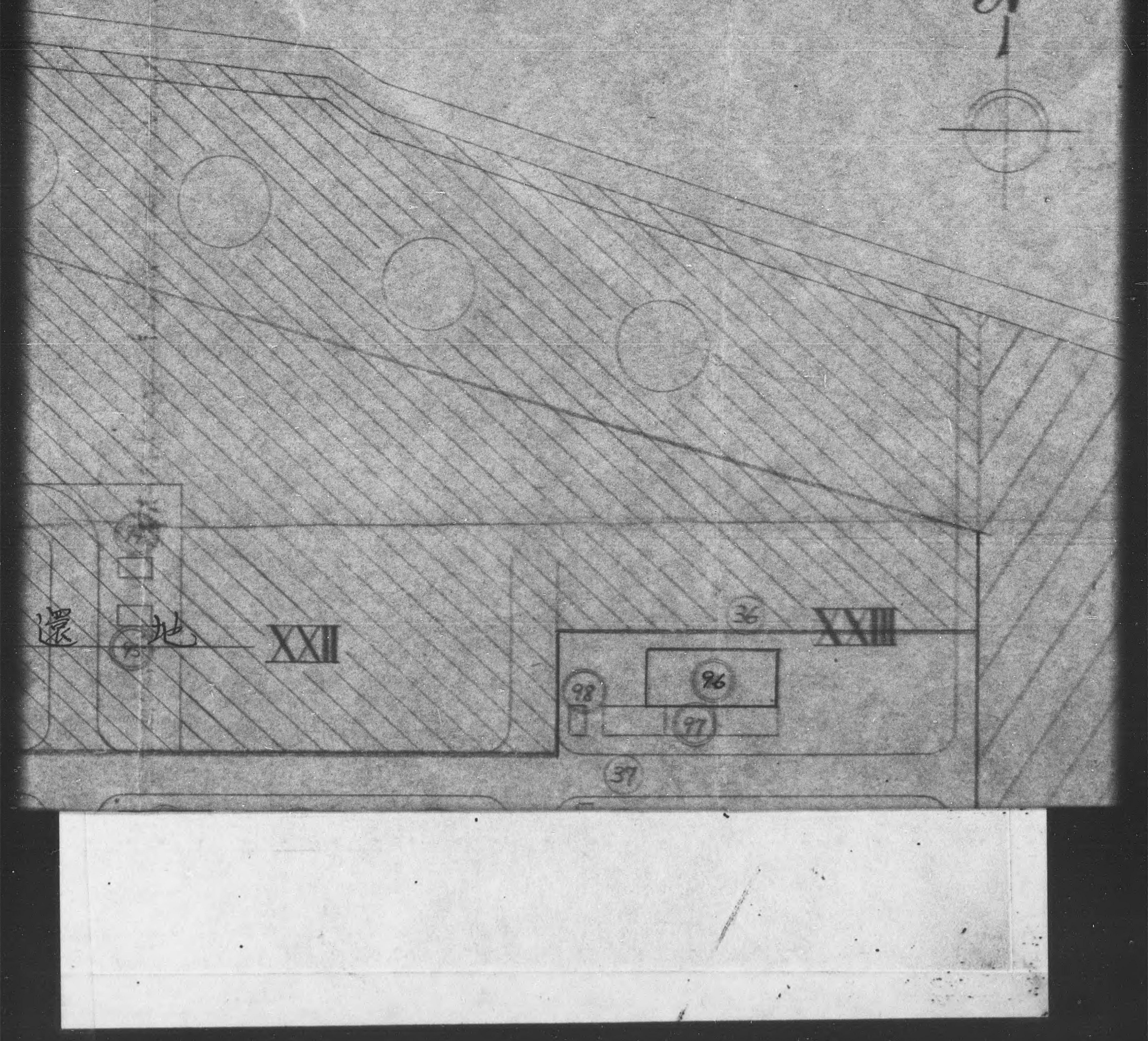
AKUNI ARMY FUEL DEPOT

VENTRY NO. OF PLANTS

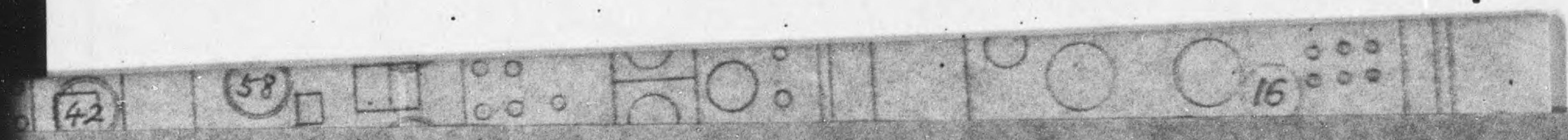
建物　70,500坪（返還地 33,800坪を含む）

SCALE 1/2000

N



DECLASSIFIED E.O. 12065 SECTION 3 (E)(2) NSC MEMO

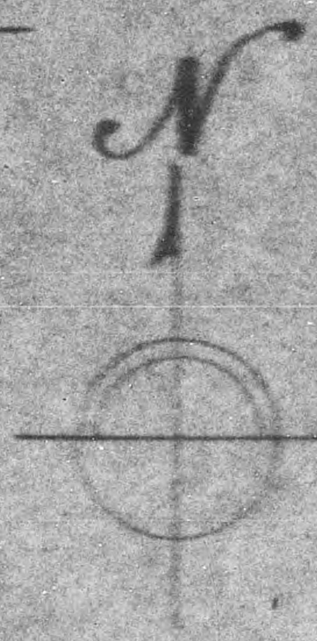


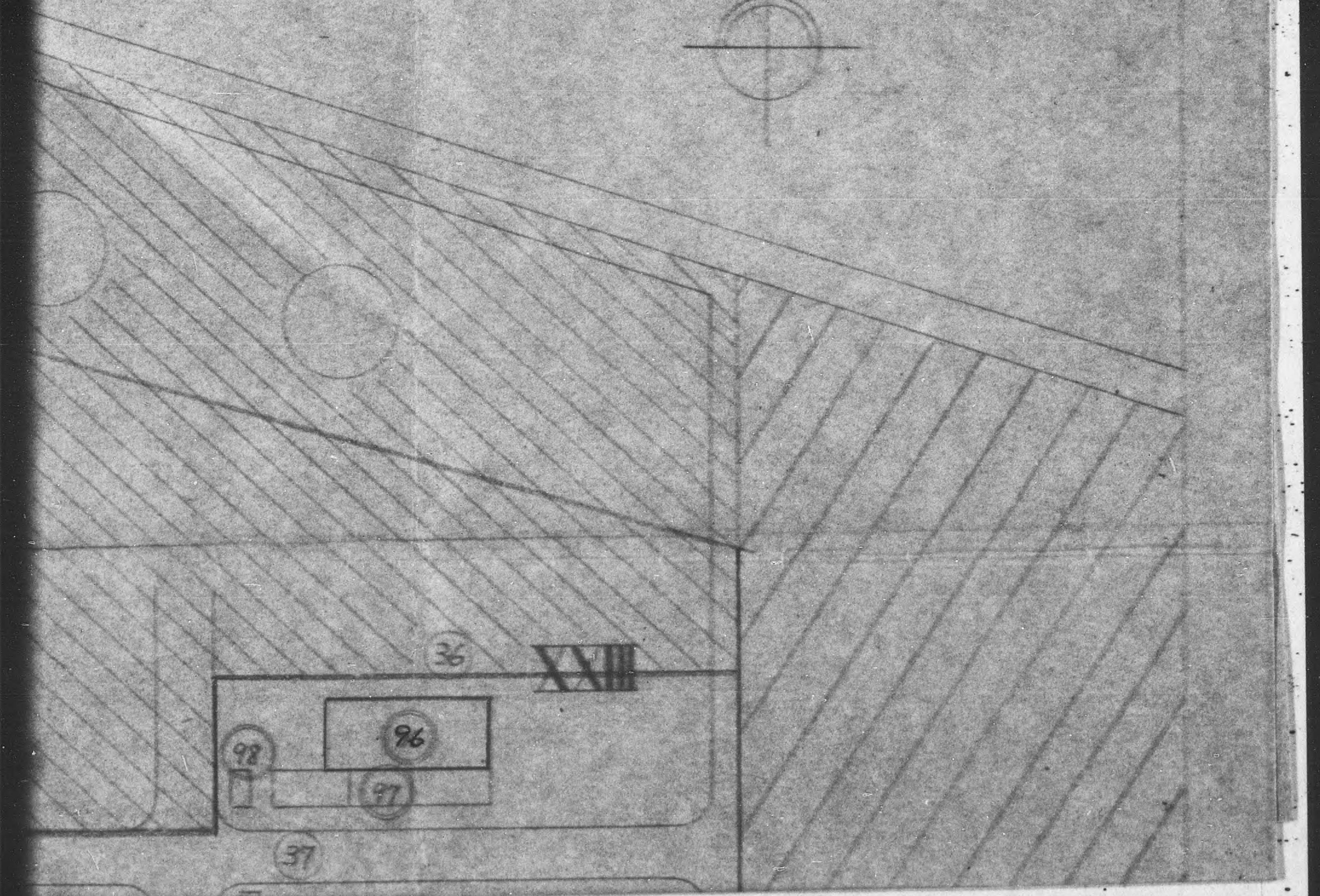
FUEL DEPOT

ITS

800坪を含む)

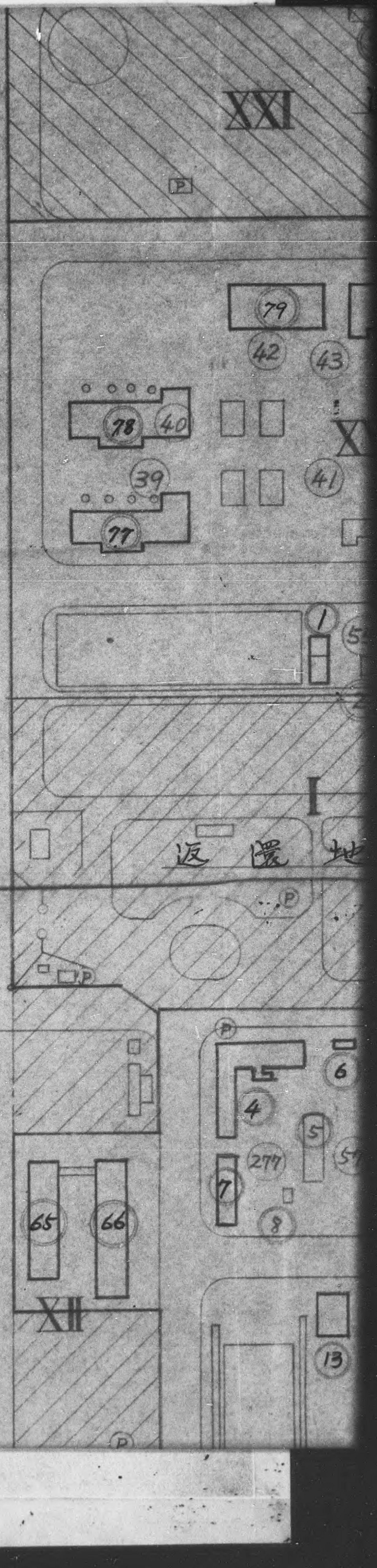
SCALE 1/2000





DECLASSIFIED E.O. 12065 SECTION 3 (E) AND 5 (E)

F4	25	WATER ELECTROLYSIS PLANT
F4	26	OXYGEN FILLING PLANT
F5	/	HYDROGEN PRODUCTION PLANT
F5	27	WATER GAS PLANT (P.G.C.)
F5	28	METHANE CRACKING PLANT(KOPPERS)
F5	29	CO CONVERTER
F5	31	CO REMOVING PLANT
F5	30	CO_2 REMOVING PLANT
F5	33	HYDROGEN PURIFICATION PLANT
F5	32	NITROGEN GAS SEPARATION PLANT
F5	277	LIQUID AIR SEPARATION PLANT
F6	43	ALCOHOL PLANT
F7	499	DRUM MANUFACTURING PLANT
/	/	CRACKING PLANT
22	22	NNC THERMAL TYPE (2 UNITS)
11	11	CATALYTIC CRACKING PLANT (ARMY)
23	23	CATALYTIC CRACKING PLANT(NNK)
12	12	RERUN TOPPING PLANT
F8	4	CLAYTREATING PLANT FOR CRACKED GASOLINE
F8	48	CLAY DRYING FURNACE
35	35	HIGH PRESSURE HYDROGENATION PLANT
F9	/	ISO-OCTANE PLANT
18	18	GAS SEPARATION PLANT
20	20	PROPANE REFINING PLANT
17	17	NO.1 ISO-OCTANE PLANT
F9	40	BUTANOL DEHYDRO POLYMERIZATION PLANT
19	19	SPECIAL EMULSION PLANT
F9	41	NO.2 ISO-OCTANE PLANT
49	49	CATALYST PLANT
F10	/	SYNTHETIC LUB OIL PLANT
F10	42	PLANT FOR DESTRUCTIVE DISTILLATION OF RUBBER
13	13	PARAFFINE CRACKING
14	14	OLEFFINE POLYMERIZATION PLANT
15	15	CONTACT RERUN PLANT FOR POLY PLANT
16	16	TANK AND PUMP FOR ABOVE PLANT
24	24	PITCH COKE PLANT
F11	38	PRODUCER GAS PLANT
F12	37	HIGH PRESSURE EXPERIMENTAL PLANT
F13	46	STEAM BOILER PLANT
F14	45	HIGH PRESSURE STEAM BOILER PLANT
F15	55	WATER FEEDING PUMP PLANT



DECLASSIFIED E.O. 11652 SECTION 3 (E)(2) NARS DATE

XXI 返還地 XXII

93 79 80 42 43 86 87 88 83 84 85 49

78 40 XVIII 39 41 77 81 82 XVIII

1 55 47 2 3 19 28 29 27 20 21 22 23 V 24

I 返還地 17 18 25 26 16 17 25

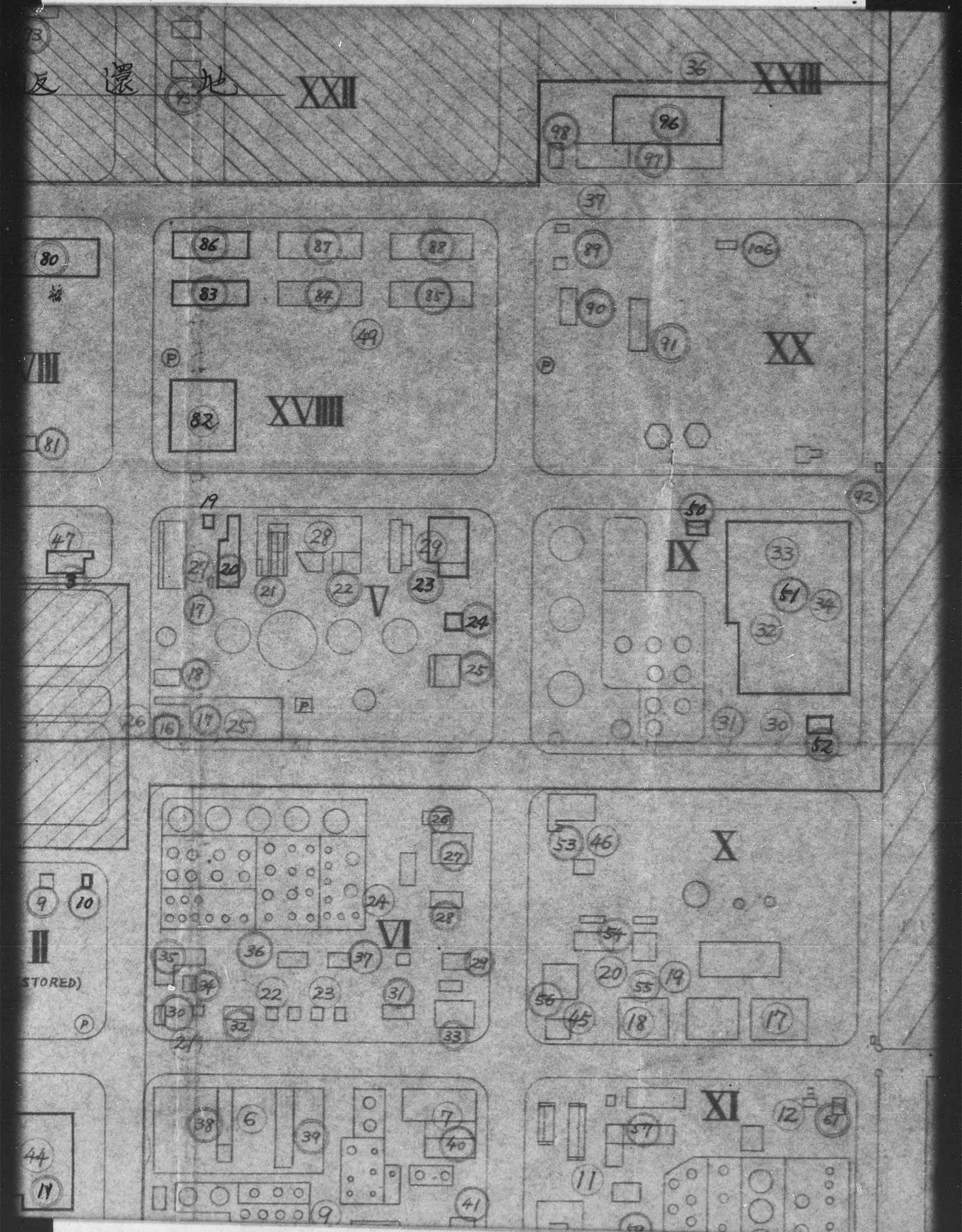
6 9 10 4 5 II 7 277 57 (STORED) 8

65 66 XII 13 44 14

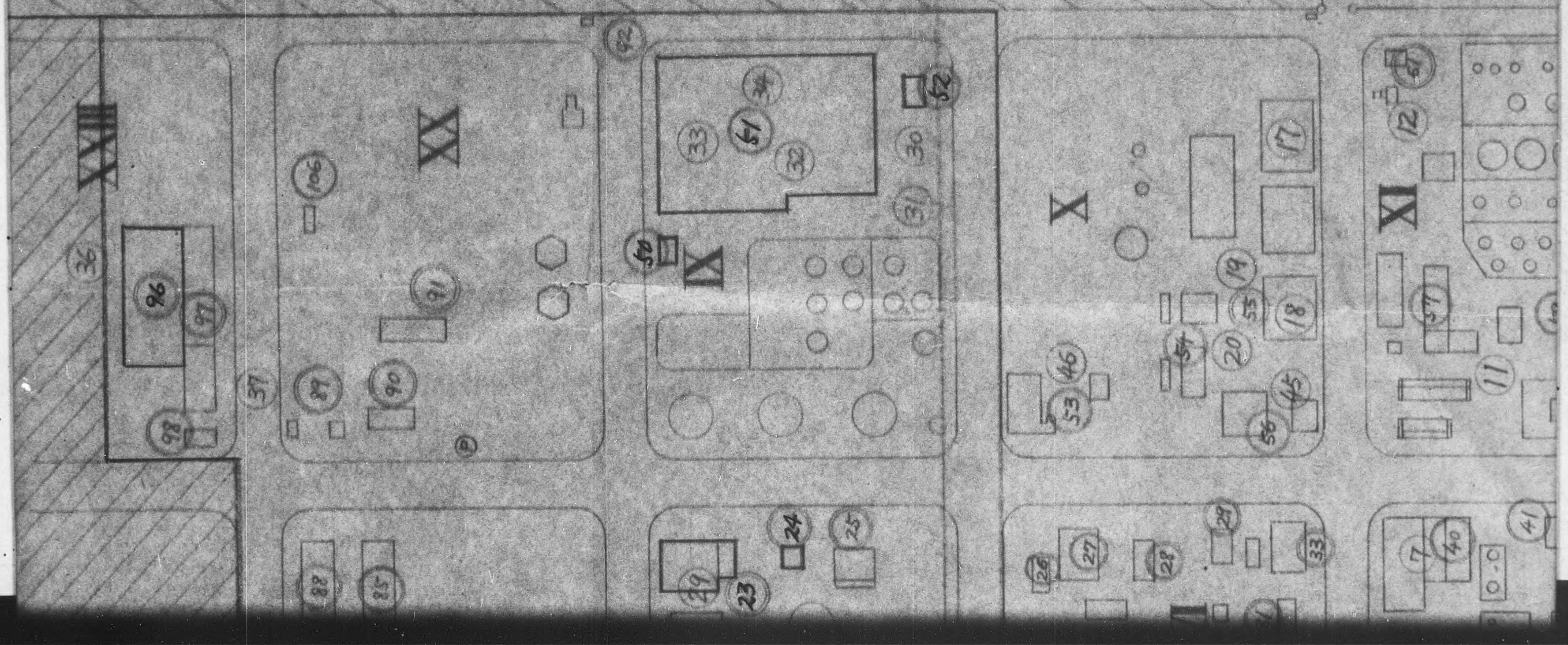
VI 38 6 39 7 40 41 9

P

DECLASSIFIED E.O. 11652 SECTION 3 NLE/NARS DATE



Kōa Oil Co.



F11	38	PRODUCER GAS PLANT
F12	37	HIGH PRESSURE EXPERIMENTAL PLANT
F13	46	STEAM BOILER PLANT
F14	45	HIGH PRESSURE STEAM BOILER PLANT
F15	55	WATER FEEDING PUMP PLANT
F16	50	SEA WATER PUMPING PLANT
F17	52	CRUDE OIL TREATING PLANT
F18	144	WASTE ACID TREATIG PLANT
F19	57	5GALS. CAN MANUFACTURING PLANT
F20	246	5GALS. CAN FILLING PLANT
F21	44	POWER STATION

: Released Area

: Plant No.

: Building No.

XII

XIII

P

13

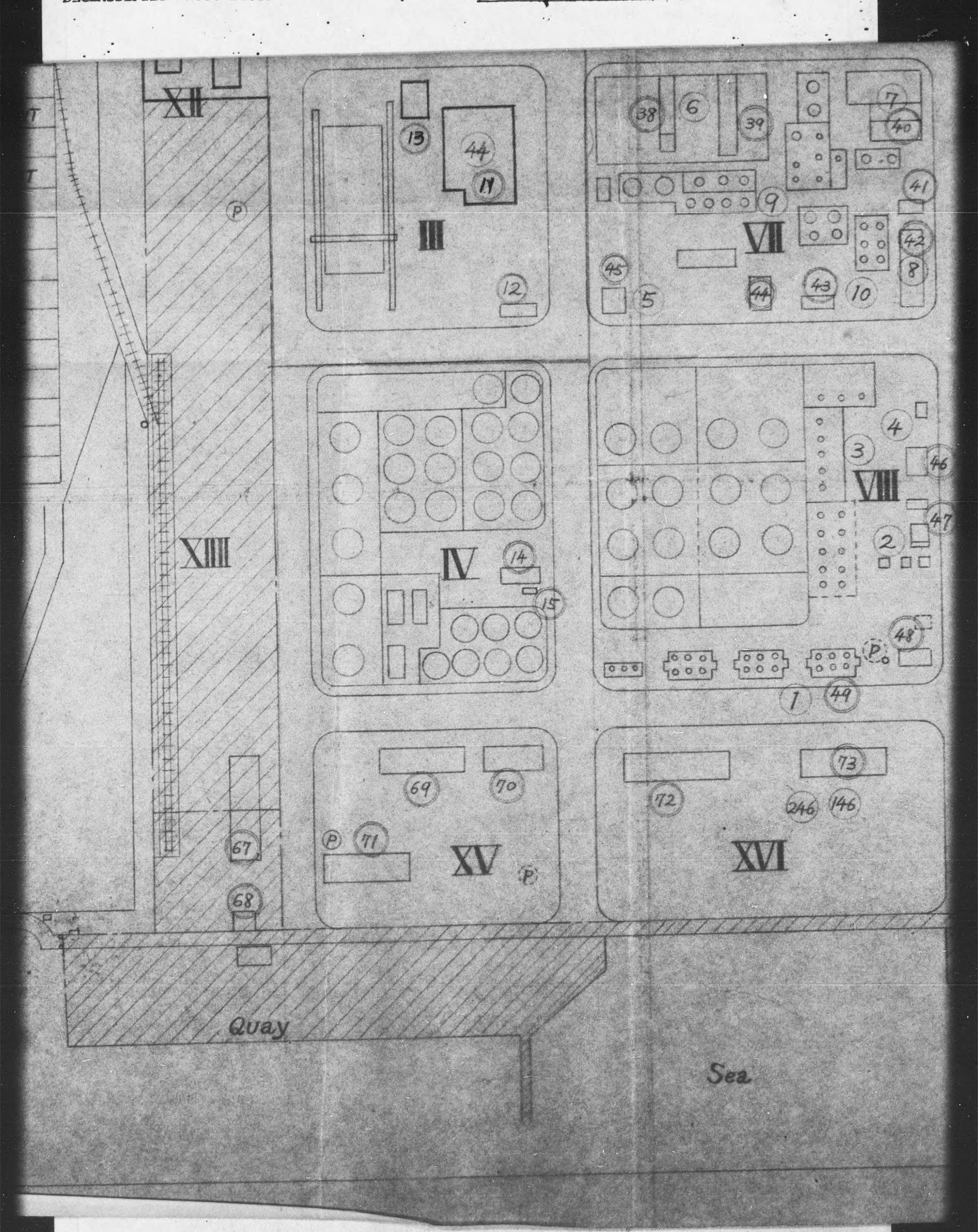
69

P 71

67

68

Quay


XII
P
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III
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41
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VII
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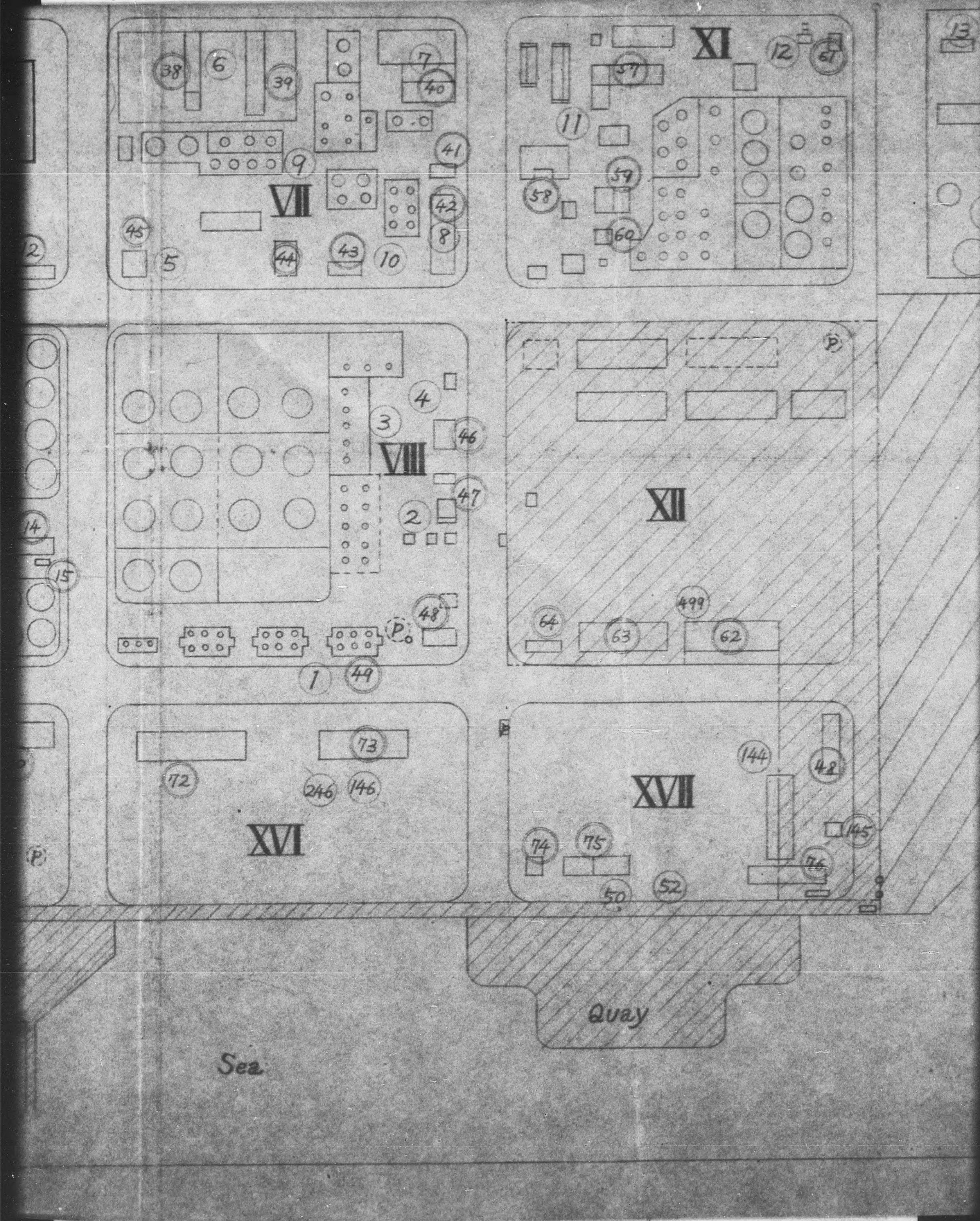
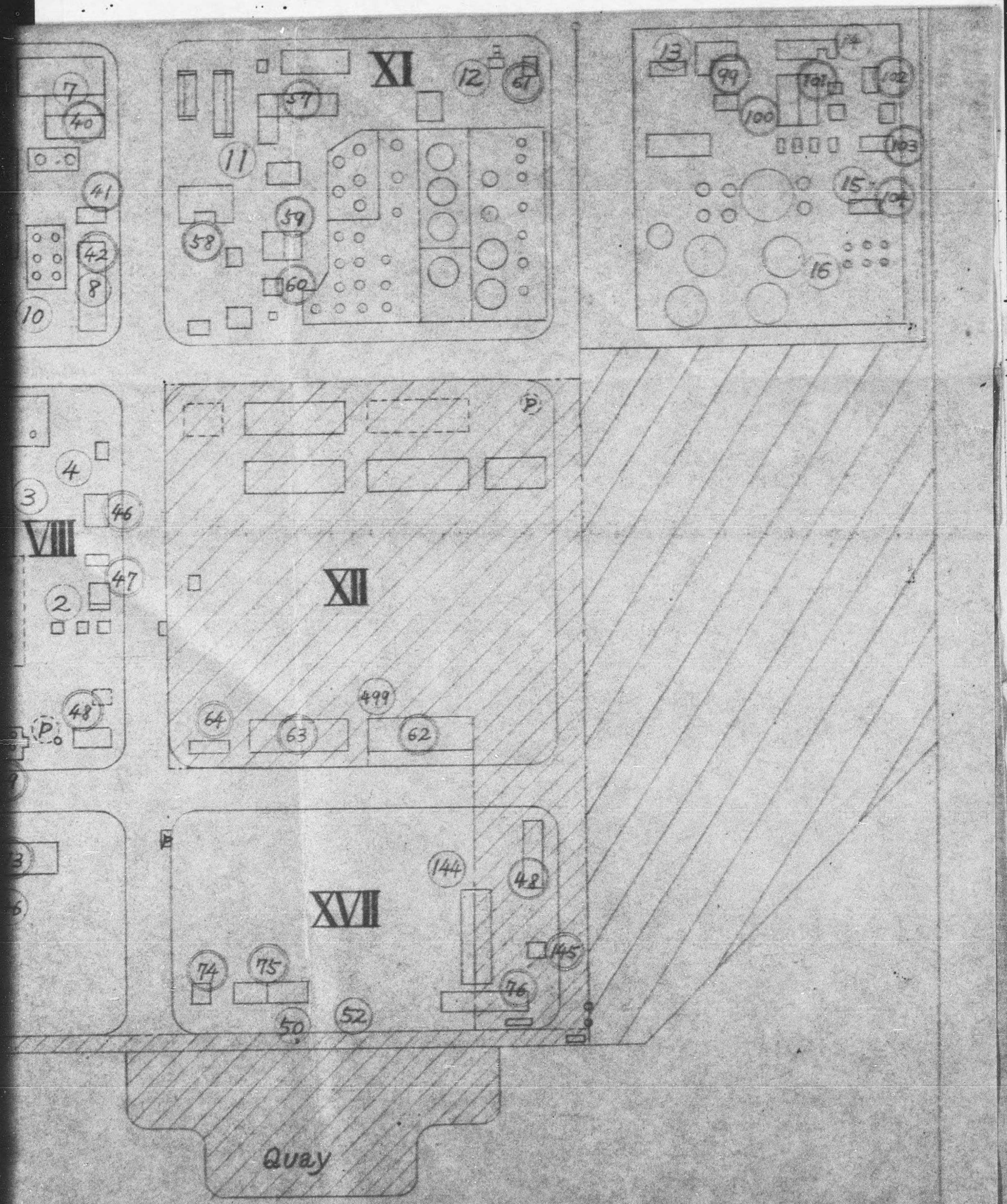
43
10
XIII
IV
14
15
4
3
VIII
46
47
2
48
P
1
49
67
68
69
70
P
71
P
XV
72
73
246
146
XVI
Quay
Sea

DECLASSIFIED E.O. 11652 SECTION 3 (E)(2) NLE NO.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