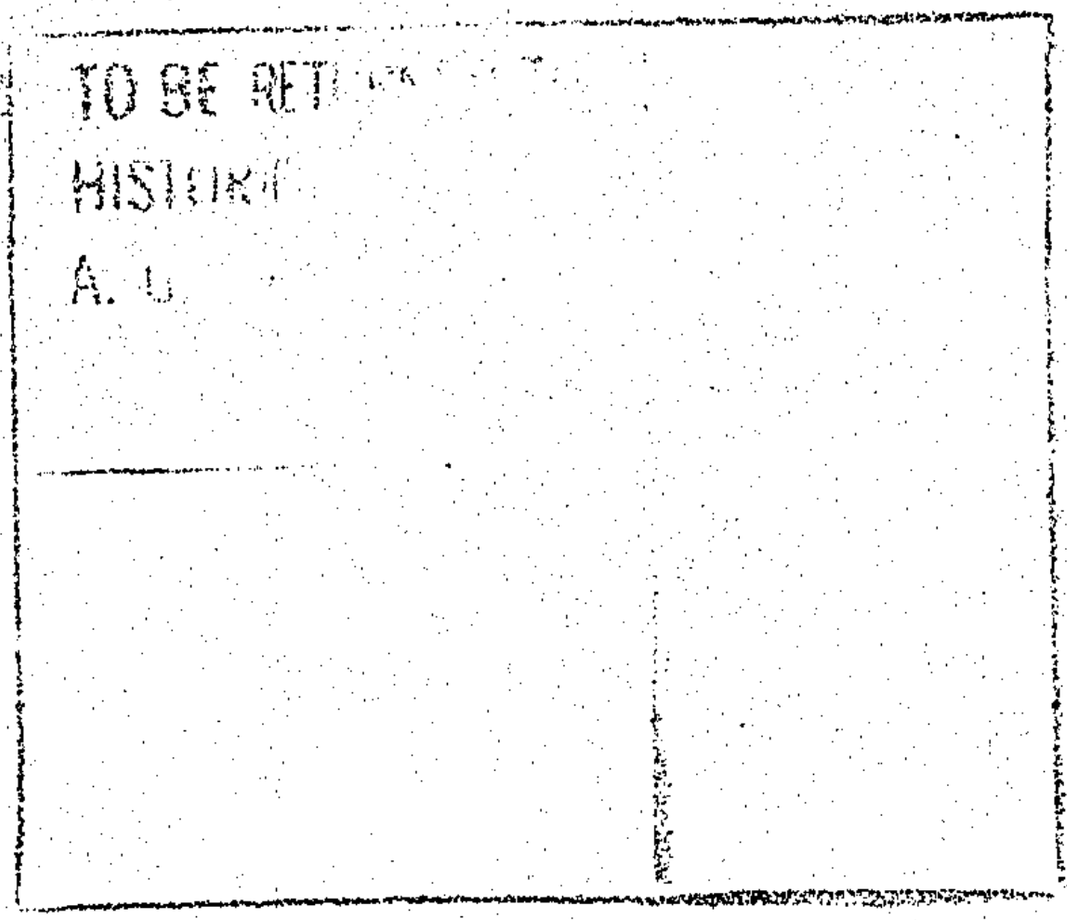
PETROLEUM FACILITIES OF HUNGARY



THE PETROLEUM FACILITIES OF

HUNGARY

Prepared by

The Enemy Oil Committee

For the

Division of Fuels and Lubricants
Office of The Quartermaster General

May, 1944

R E V I S I O N

Arrangements for the preparation and distribution of supplementary information pertinent to this report are contemplated. Request is made that advices concerning corrections and useful addenda for the report be sent to the:

Director, Division of Fuels and Lubricants
Office of the Quartermaster General
Washington, D. C.

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MEZŐKÖVESD

NITRA

GARAM

DANUBE RIVER

KOMÁROM

VACUUM OIL CO (ALMAS FUZITO)

GYÖR

SOPRON

MIHALYI

SHELL OIL CO KOOLAJ (CSEPEL)

BUDAPEST

FANTO (BUDAPESTI ÁSVÁNYOLAJGYARÁK)

PETROLEUM IPAR (DR. FREUND)

6" PIPELINE (PROBABLE)

AUSTRIA

SZOMBATHELY

PET COVT PLANT

SZÉKESFEHÉRVÁR

KÁPOLNÁSNYÉK

TO RUMANIA

VESZPRÉM

LEPSÉNY

GRAZ

2½" BUTANE PROPANE LINE

LOVASZI OILFIELD

ORTEHÁZA

ZALAEGERSZEG

KESZTHELY

8" PIPELINE FOR CRUDE OIL

FONYOD

Hahót

Szentmiklos

SZENTES

MURA

KERETTYE

UJUDVÁR

NAGYKANIZSA

Selenica

Peklenica

DRAVA

Inke

KAPOSVÁR

SZEKSZÁRD

DANUBE

Totkomlos

SZEGED

TO RUMANIA

BUDAFAPUSZTA OILFIELD

Ludbreg

2" GASOLINE PIPELINE

BAJA

SZOREGI PETROLEUM

TO TRIESTE

PÉCS

SUBOTICA

SENTA

Sedlarica

DRÁVA

ZAGREB

YUGOSLAVIA

RIVER

OSIJEK

SISAK

Gelle

KARLOVAC

Bulavica

DANUBE RIVER

NOVI SAD

SAVA

BROD

RIVER

15°

16°

17°

18°

19°

20°

45°

46°

47°

48°

PETROLEUM FACILITIES OF HUNGARY

1.0 INTRODUCTION

1.1 Summary

Scope.- The purpose of this report is to present briefly all significant aspects of the Hungarian petroleum economy and facilities pertaining thereto.

Producing.- The earliest wells in search of oil were drilled in Hungary just prior to 1924 by the Anglo-Iranian Oil Company Ltd. They were dry holes and the company became discouraged and left the country in 1924. The Hungarian Government then undertook exploration work but failed to develop commercial production. The European Gas and Electric Company (a) began investigations in 1931 and found commercial production in November, 1937, near the Yugoslav border, 165 miles southwest of Budapest, in what became known as the Budafapuszta field. This was followed in 1940 by the discovery of another major field in this same area, the Lovászi. In the latter part of the same year the Germans succeeded in obtaining a concession on prospective oil lands lying to the east of the American concession and of approximately the same size. Hungarian production currently is reported as around 800,000 metric tons a year (6,160,000 barrels) or 16,876 barrels a day (b).

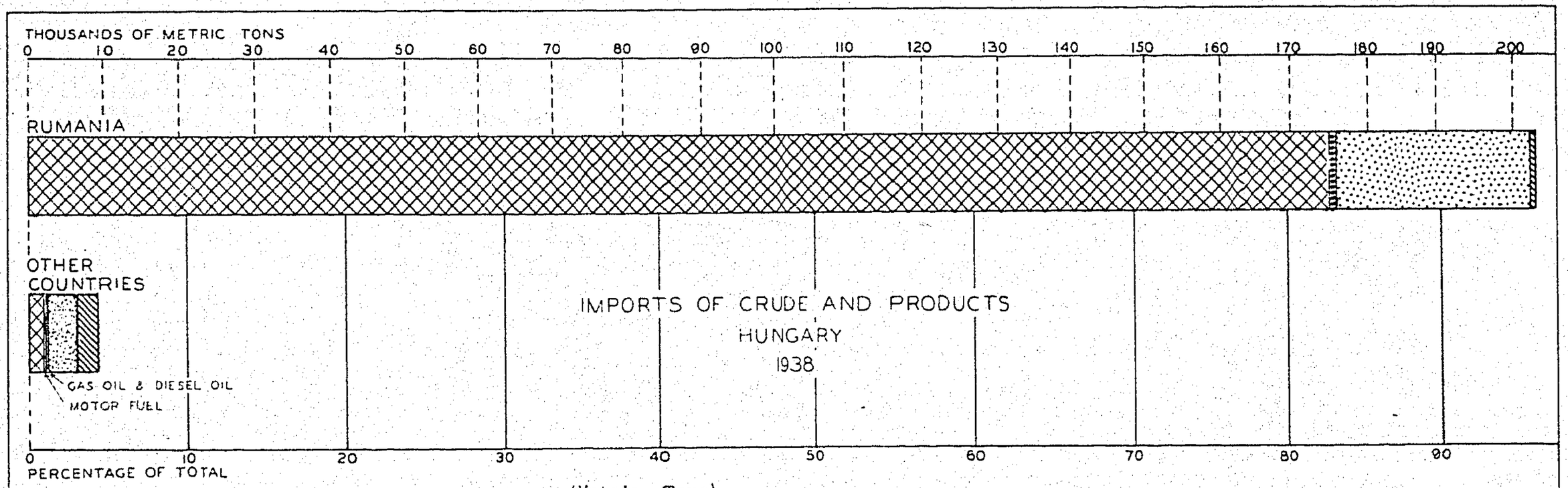
Refining.- Of the twelve Hungarian refineries with a total throughput capacity of 8,844 barrels a day, only two are of importance, that of the Royal Dutch Shell group at Budapest with a capacity of 150,000 metric tons (1,155,000 barrels) a year, and that of the Socony-Vacuum Oil Co. Inc., located near Komárom on the Danube River some 45 miles northwest of Budapest, with a capacity of 90,000 metric tons or 693,000 barrels a year.

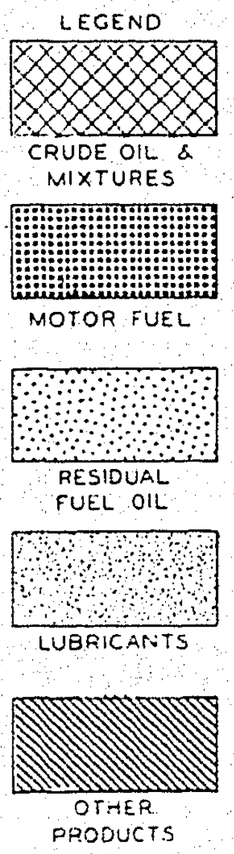
Distributing.- The bulk plants of the various companies were adequate and fairly well distributed throughout the country. There were no service stations in Hungary but there were a few drive-in dispensing stations in or near the larger cities, and there was an adequate number of hand-operated curb pumps located in front of shops and garages in all cities and towns of importance.

Consumption.- The peacetime consumption of petroleum in Hungary, including that of the returned territories, was about 3,500,000 barrels a year or 9,589 barrels a day, including gasoline, kerosine, diesel oil, fuel oil and lubricating oil.

Until 1941 there were very few restrictions on the use of private cars other than gasoline rationing, which was not very effective. Nevertheless, during that year, domestic requirements were covered and through restrictions on consumption a certain quantity was made available for export as well. The Enemy Oil Committee's estimate of current minimum civilian requirements, plus war industry requirements, dated April 26, 1943, is given in the table on page 9.

(a) Formed by American Independents particularly interested in gas and later changed to a Hungarian company called Magyar Amerikai Olijipari Részvénytársaság, controlled by the Standard Oil Company (N.J.).
(b) Per calendar day. Wherever the word "barrels" appears in this report, a barrel of 42 U.S. gallons is meant.





(Metric Tons)

	Crude Oil and Mixtures	Motor Fuel	Kero-sine	Gas Oil & Diesel Oil	Resid-ual Fuel Oil	Lubri-cants	Other Pro-ducts	Total	% of Total
Imports - Including Re-Exports									
Rumania	174 952	723	-	-	26 932	-	538	203 145	95.66
U. S. A.	444	-	-	-	-	3 747	83	4 274	2.01
Germany	563	-	-	-	-	395	1 635	2 593	1.22
Italy	1 186	-	-	-	-	-	-	1 186	.56
Poland	30	-	-	-	-	-	776	806	.38
Czechoslovakia	30	-	-	-	-	8	-	38	.02
Austria	-	21	-	-	-	-	40	61	.03
United Kingdom	-	-	-	4	-	178	28	210	.10
Holland	-	-	-	2	-	-	34	36	.02
Belgium	-	-	-	-	-	10	-	10	-
Sweden	-	-	-	-	-	9	-	9	-
Other Countries	-	1	-	-	-	4	4	9	-
Total	177 205	745	-	6	26 932	4 351	3 138	212 377	100.00
Exports - Including Re-Exports									
United Kingdom							35	35	40.70
Switzerland							15	15	17.44
Czechoslovakia							11	11	12.79
Holland							11	11	12.79
Rumania							1	1	1.16
Germany							2	2	2.33
Italy							5	5	5.82
Poland							1	1	1.16
France						1	-	1	1.16
Yugoslavia						1	-	1	1.16
Denmark						-	2	2	2.33
Other Countries							1	1	1.16
Total						2	84	86	100.00

Estimated Civilian Demand, Including War Industries, 1943

(In Barrels)

Product	Total	Automotive	Inland Marine	Railway	Utilities and Industrial	Agriculture and Farm	Household and Lighting
Motor Fuel	400,350	396,100	-	-	4,250	-	-
Refined Oil	499,875	-	-	-	-	114,700	385,175
Distillate Oil	300,030	14,600	10,220	-	216,810	58,400	-
Residual Fuel Oil	300,300	-	-	-	300,300	-	-
Lubricants	149,800	16,100	2,100	13,300	115,500	2,800	-
TOTAL	1,650,355	426,800	12,320	13,300	636,860	175,900	385,175

Conversions from metric tons to barrels were effected by using the factors shown in Appendix 1 of this report.

Companies operating in Hungary.- The producing companies operating in Hungary were the Magyar Amerikai Olijipari Részvénytársaság (M.A.O.R.T.), affiliated with the Standard Oil Co. (N.J.), and the German syndicate, operated by Wintershall A.G., Berlin. The most important refiners and marketers were the Shell Kőolaj Részvénytársaság, affiliated with the Royal Dutch Shell group and the Vacuum Oil Co., R.T., the Hungarian subsidiary of the Socony-Vacuum Oil Co. Inc. A table identifying the main companies operating in Hungary is shown on page 10. The available information covering key personnel of the affiliated American and British companies are shown below (a).

Magyar Amerikai Olajipari Részvénytársaság (M.A.O.R.T.) Hungarian-American Oil Co.

Office address: Budapest V, József-tér 5 Ferenc
Ownership: European Gas and Electric Company has controlling interest.
Business: Producing and marketing of petroleum and its products in Hungary. Taken over by Hungarian Government in December 1939.
Key pre-war personnel: (1) C. H. Lieb, President, Chairman of the Board of Directors, 30 Rockefeller Plaza, New York, American; (2) Paul Ruedemann, Vice-president, Manager and Director, 30 Rockefeller Plaza, New York, American; (3) R. P. Bolton, Director, c/o Standard Oil Company, S.A. Argentina, Buenos Aires, Argentina, British; (4) Admiral Emil Konek, Director, Budapest, Hungarian; (5) Dr. Simon Papp, Director, Budapest, Hungarian; (6) George A. Bannantine, Director, c/o Creole Petroleum Corp., Caracas, Venezuela, American; (7) R. P. Walters, Director, 30 Rockefeller Plaza, New York, American; (8) J. F. Conway, Director, c/o Creole Petroleum Corp., Caracas, Venezuela, American; (9) E. Hauer, Director, Budapest, Hungarian; (10) E. Schudel, Treasurer and Comptroller, Tegar Building, Room 402, Edmonton, Alberta, Canada, Swiss (now American citizen); (11) Walter Graf, member of Board of Supervisors, Budapest, Hungarian; (12) Bodog Abel, member of Board of Supervisors, Hungarian; (13) G. W. Martin, member of Board of Supervisors, c/o Standard Oil Company of New Jersey, Hersh Tower, Elizabeth, New Jersey, American.

(a) In listing the individuals who have been associated with the various oil companies, it should be understood that these individuals may be looked to for information of possible value in their respective fields, but insofar as concerns the non-Americans no implication should be drawn as to their political sympathies or affiliations.

Shell Kőolaj Részvénytársaság

Office address: József Nádor-tér 5, Budapest
Ownership: Royal Dutch Shell Group
Business: Refining, storage and marketing
Key pre-war personnel: Requested of Shell, but not yet received.

Vacuum Oil Company, Részvénytársaság

Office address: Budapest V, Zrinyi utca 7
Ownership: Socony-Vacuum Oil Co. Inc.
Business: Refining, storage, marketing
Key pre-war personnel: (1) C. V. Barry, General Manager, c/o Socony-Vacuum Oil Company, Inc., 26 Broadway, New York, American; (2) P. Lienau, General Executive, c/o Socony-Vacuum Oil Co. Inc., 26 Broadway, New York, American; (3) A. J. Schwarz, Retired August 1939, 11 Temple Fortune Court, London N.W.11, England, Hungarian (4) K. Farkass, Manager, Hungary; (5) Mr. Pinter, Sales Manager, Hungary; (6) A. Hanft, Chief Accountant and Office Manager, Hungary; (7) E. Bunkeflod, Superintendent (Succeeding A. J. Schwarz) Hungary. The last four named are of Hungarian nationality.

Marketing positions in Hungary.- The marketing positions enjoyed by the various companies are shown on the chart on page 67.

IDENTIFICATION OF PRINCIPAL COMPANIES OPERATING IN HUNGARY

COMPANY		Affiliations of Company	
Name of Company	Address of Head Office of Company	Names of Owner Firms, Majority Interests or Control	Address of Owner Firms
Asphalt und Teerindustrie Aktiengesellschaft	Budapest VIII, Rakoczi-út 30	Asphalt und Teerindustrie Aktiengesellschaft	Budapest
Budapest-Nagytétény wirtschaftliche Aktiengesellschaft	Budapest	Budapest-Nagytétény wirtschaftliche Aktiengesellschaft	Budapest
Dél-Kárpáti Kőolaj Finomító és Kereskedelmi Részvénytársaság (a)	Munkács	Galizische Naphta Aktiengesellschaft "Galicia"	Poland
Fanto Egyesült Magyar Ásványolajgyárak Részvénytársaság	Budapest VII, Erzsébet körut 6	Société Continentale de Gestion, Monaco (b)	Monte Carlo
Hazai Kőolajipar Részvénytársaság	Budapest V, Nádor-utca 7	Société Française Industrielle et Commerciale des Pétroles	Paris
Magyar Amerikai Olajipari Részvénytársaság (M.A.O.R.T.)	Budapest, Ferenc József-tér 5	Standard Oil Co. (N.J.)	New York
Magyar Hydrobenzin Részvénytársaság	Budapest V, Nádor utca 21	Hungarian Government	Budapest
Magyar Petroleumipar Részvénytársaság	Budapest VI, Andrássy-út 53	Magyar Petroleumipar Részvénytársaság	Budapest
Nyirbogdányi Petroleum Részvénytársaság	Budapest V, Gróf Tisza Istvan u. 22	Nyirbogdányi Petroleum Részvénytársaság	Budapest
Schonberg, I.	Csap	Schonberg, I.	Csap
Shell Kőolaj Részvénytársaság	Budapest, József Nádor-tér 5-6	Royal Dutch Shell group	London
Steaua Magyar Kőolaj Részvénytársaság	Budapest V, Vilmos Császár-ut 32	Steaua Romana, S.A.	Bucharest
Szőregi Petroleumgyár Részvénytársaság	Budapest, József Nádor-tér 8	Szőregi Petroleumgyár Részvénytársaság	Budapest
Ungarische Asphalt Aktiengesellschaft	Budapest V, Nádor-u. 4	Ungarische Asphalt Aktiengesellschaft	Budapest
Ungarisch-Belgische Mineralöl-Aktiengesellschaft	Budapest V, Deák Ferenc ucca 16-18	Compagnie Financière Belge des Pétroles, (Petrofina, S. A.)	Antwerp
Ungarische Hydrobenzin Aktiengesellschaft	Budapest	Ungarische Hydrobenzin Aktiengesellschaft	Budapest
Vacuum Oil Co., Részvénytársaság	Budapest V, Zrinyi utca 7	Socony-Vacuum Oil Co. Inc.	New York
Weinberger & Ortner	Alsonhalyi	Weinberger & Orter	Alsonhalyi

(a) Also known as Jihokarpatska Rafinerie Minoralnich Oleja.

(b) Holding company owned by Austrian Creditanstalt, Wien.

2.0 PRODUCING

2.1 HISTORY OF OIL OPERATIONS

The earliest investigations for oil in Hungary were carried out by the Anglo-Iranian Oil Co. Ltd., just prior to 1924. They conducted geological surveys of much of Hungary and drilled two dry holes, one on the south flank of Budafapuszta to a depth of 1,730 meters (5,674 feet) and one east of Kurt to a depth of 622 meters (2,040 feet). This company became discouraged and left the country in 1924.

The Hungarian Government then undertook exploration work and drilled a number of holes on the Great Plain. None of these found oil but several found gas and water. About 1936, the Government found a little oil in the northeastern part of the country, near Bukkszék. The production was found at shallow depths, some 100-200 meters (328-656 feet), and proved non-commercial. Many wells were drilled but the maximum production for the field probably never exceeded 20-30 barrels, finally dropping to a few barrels daily. There was no pipe line and the oil was transported to the nearest railroad by tank truck.

In 1931, with the aid of Hungarian geologists, the European Gas and Electric Company began the selection of areas of interest, without, however, carrying out any geological work in the field.

In 1932 the Standard Oil Co. (N.J.) obtained certain options, which later were exercised, covering the purchase of a majority interest in the European Gas and Electric Company. Immediately upon obtaining control of the company the Standard Oil Co. (N.J.) began geological and geophysical work.

In 1933 the concession finally was granted. As shown on the map on page 12, it covered all of pre-war Hungary south and west of the Danube River--an area of 8,000,000 acres.

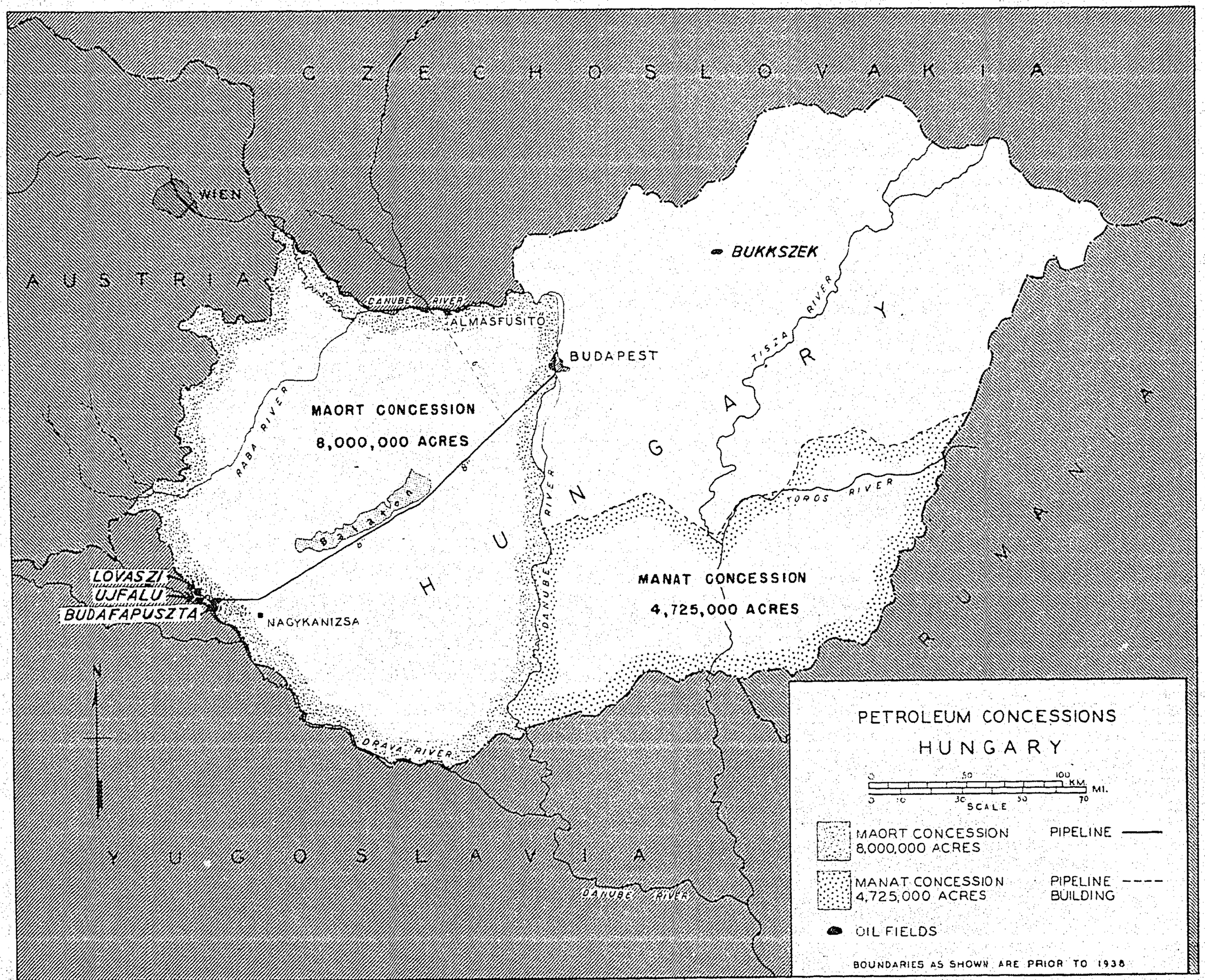
In 1935 the company completed its first test, a dry hole, on the Mihalyi structure in northwestern Hungary, some 14 miles southeast of Lake Neusiedl (Je:. Neziderske), shown on the map on page . The test was continued to a depth of 5,261 feet where basement rocks were encountered. A large production of CO_2 gas with traces of light oil was found and the test was completed as a CO_2 producer. An experimental plant for the manufacture of dry ice was erected.

In 1936 a second test was drilled at Gorgeteg, in the southern part of the concession approximately ten miles from the Yugoslav border. This test went to 6,754 feet and was abandoned because of stuck drill pipe without reaching its objective.

The third test well was on a structure farther west, the Inke anticline, 20 miles south of the western extremity of Lake Balaton. This well was drilled to a depth of 7,073 feet. The lower formations were given drill stem tests but no shows of oil or gas were noted. At a higher level a gas containing 25 per cent of CO_2 was found and the well was shut in as a gasser. The open flow capacity was rated at about three million cubic feet a day.

In February 1937, Well No. 1, a twenty million cubic feet wet gas well, was drilled on the Budafapuszta structure near the Yugoslav border, 165 miles southwest of Budapest. This test went to 5,787 feet where the drill pipe became stuck. The well was then plugged back to the 3,505 foot sand to test the gas shows noted in drilling.

The discovery of this wet gas led to the location of Budafapuszta Well No. 2, likewise, on the flank of the structure. This well was completed in November, 1937, for 365 barrels daily of 42° oil, flowing from two sands between the depths of 3,581 feet and 3,967 feet.


C Z E C H O S L O V A K I A
WIEN
A U S T R I A
DANUBE RIVER
ALMASFÜSITŐ
BUDAPEST
BUKKSZEK
TISZA RIVER
R A
MAORT CONCESSION
8,000,000 ACRES
RABA RIVER
SZOB
DANUBE RIVER
TOROS RIVER
MANAT CONCESSION
4,725,000 ACRES
LOVASZI
UJFALU
BUDAFAPUSZTA
NAGYKANIZSA
N
DRAVA RIVER
Y U G O S L A V I A
DANUBE RIVER
PETROLEUM CONCESSIONS
HUNGARY
0 50 100 KM
0 30 50 70 MI.
SCALE
MAORT CONCESSION
8,000,000 ACRES
PIPELINE
MANAT CONCESSION
4,725,000 ACRES
PIPELINE BUILDING
OIL FIELDS
BOUNDARIES AS SHOWN ARE PRIOR TO 1938

A 2 1/2 inch pipe line was then laid northeast to Ortehaza, a distance of seven miles, where a temporary loading rack was installed.

With the discovery of oil, it was necessary under M.A.O.R.T.'s contract with the Hungarian Government to form an Hungarian company, and in July 1938, the Standard Oil Co. (N.J.) organized a wholly-owned subsidiary, the Magyar Amerikai Olajipari Részvénytársaság (known as M.A.O.R.T.) which translated reads "Hungarian-American Oil Industries Stock Company".

During the period 1938 to December 9, 1941, a total of 80 wells were completed in the Budafapuszta field and about 5,443,000 barrels of oil were produced.

A second producing field was discovered in September 1940 at Lovászi, six or seven miles west-northwest of Budafapuszta, where a total of 23 wells were completed up to December 9, 1941.

At Ujfalu, south of Lovászi and close to the old Yugoslav frontier, two small oil wells were completed and one dry hole was drilled. Up to January 1942, commercial production had not yet been established in this field.

Four dry holes were drilled at Hahót, one at Kaposvár, two at Mihályi, 150 miles northeast of Lake Balaton, and two at Szentmiklós, 20 miles southwest of Lake Balaton. These holes, all of which were completed before December 1941, are shown on the map on page 6.

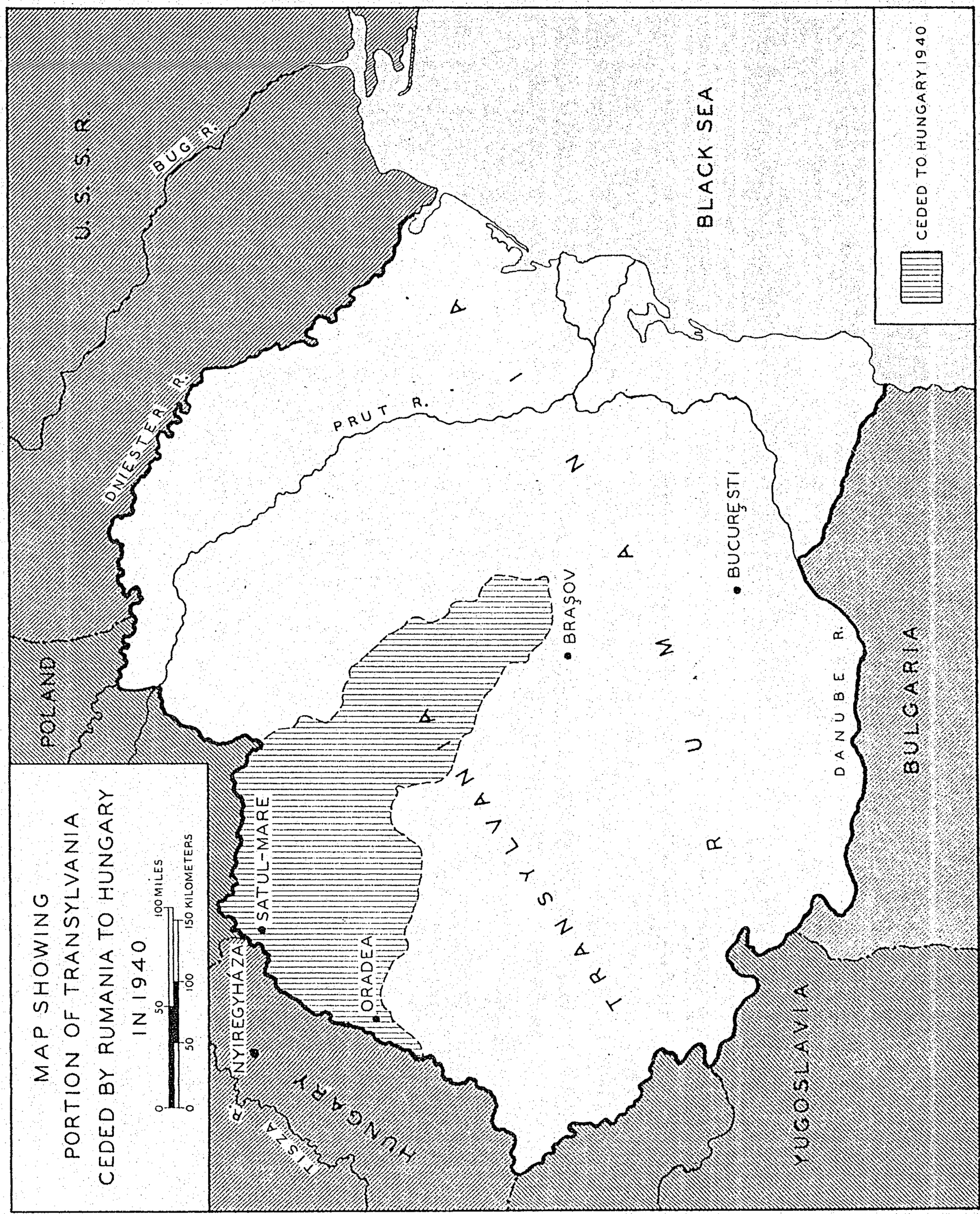
Thus, up to December 1941, a grand total of 119 wells were drilled in Hungary by the European Gas and Electric Company and its Hungarian subsidiary, M.A.O.R.T. Of this number, approximately 86 were productive oil wells, 10 were of uncertain commercial status, and 23 were either dry holes or gas wells. The total production during the period was 5,568,000 barrels.

On December 21, 1941, acting under the Defense Act of 1937, the Hungarian Government took over the operations of M.A.O.R.T. By this act the titles of the properties remain with the company but the Government conducts the operations. Dr. S. Papp, formerly Chief Geologist, was appointed Manager of the company for the Government. Under the Defense Act, the Government will have to account to the M.A.O.R.T. for all income and expenditures. The Act provides for the eventual return of the properties and operations to the owners.

The German syndicate's concession.- In the latter part of 1940, the Hungarian Government granted a concession of 4,725,000 acres in southeastern Hungary (page 12) to a German syndicate, usually referred to as the MANAT. The name is derived from the Hungarian for Hungarian-German Exploration Company. The acreage is all prospective oil territory. The German syndicate is owned by a combine participated in by a number of the major German oil-producing companies. The management of the concession is under the direction of the Wintershall Aktiengesellschaft in Berlin.

The German syndicate began seismic exploration work soon after the concession was granted. In January 1942 they were reported to have mapped eight structures on this concession. Unfortunately, no geologic data are available on this area.

Their first test was east of the Danube, on the Tótkomlós structure, which lies 50 kilometers southeast of Szentes, some 70 miles southeast of Budapest, and is shown on the map on page 6. In the spring of 1941 it blew out at 5,700 feet, spraying oil, from a horizon correlated with the Budafapuszta producing formation (lower Pannonian). The gas was reported to have contained a considerable percentage of CO_2. Since there were several hundred feet of open hole, it is not known at what depths the oil and gases originated. A second test was drilling at 4,800 feet on this structure in January, 1942; besides this rig, some five or six additional rigs were also being moved from Germany to Hungary for further drilling on this concession.


U. S. S. R.
BUG R.
DNIESTER R.
POLAND
BLACK SEA
CEDED TO HUNGARY 1940
PRUT R.
BUCUREŞTI
BRAŞOV
SATUL-MARE
ORADEA
NYIREGYHÁZA
TISZA
HUNGARY
TRANSYLVANIA
DANUBE R.
BULGARIA
YUGOSLAVIA
MAP SHOWING
PORTION OF TRANSYLVANIA
CEDED BY RUMANIA TO HUNGARY
IN 1940
100 MILES
150 KILOMETERS
50
100
0
50
0

In any calculation of Hungary's potential production it is believed that the possibilities of commercial production from this concession must be given due consideration. The prospects are discussed and a tentative estimate given in Appendix 2 of this report.

Government gas wells in eastern Hungary.- The Government has drilled a number of deep tests for gas in eastern Hungary. No truly commercial gas production was found and many of the wells drilled had little more than weak shows of gas. Most of them were drilled for the greater part of their depths in the Pliocene fresh-water formations and thus the gas found would appear to be of origin basically differing from that of the Miocene formations of the adjacent Transylvanian gas fields.

The Hungarian Government's drilling in Transylvania.- The Hungarian Government has undertaken to develop natural gas in the Transylvanian basin. There are a number of anticlines to be tested and in 1941 the Government had three rigs searching for gas in this area.

2.2 GENERAL GEOLOGY OF HUNGARY

Most of the country is a relatively flat plain covered by Pleistocene and Recent deposits. The surface is broken in the south and in the west central parts by ranges of hills formed by uplift of Mesozoic and older rocks.

Both the northern and southern plains areas are underlaid by a fairly complete Tertiary series with indications of oil in certain horizons. Oil is now being produced from the Oligocene in the Bukk Hills (Bukkszek), northeast of Budapest, and from the lower Pliocene (lower Pannonian) at Budafapuszta and Lovászi. Geophysical methods (gravimetric, seismic and magnetic) have been used successfully to locate buried structures in the plains areas.

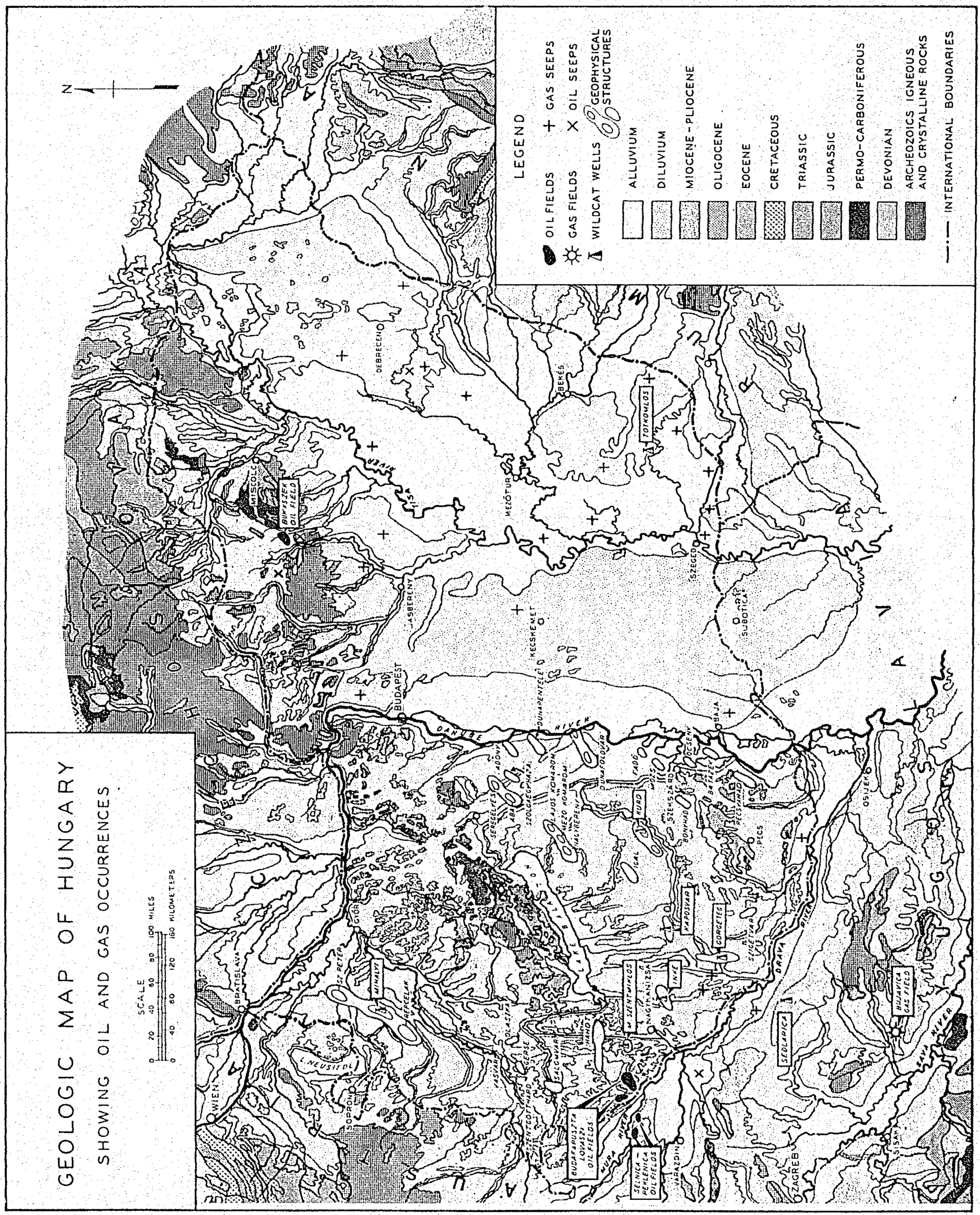
The stratigraphy appears to be generally favorable for oil and gas occurrence, with best prospects in the lower part of the Pannonian series and less promising possibilities in the Sarmatian beds of upper Miocene age and in the Oligocene and Eocene beds in northern Hungary.

Owing to the widespread blanket of Pleistocene and Recent deposits, surface geologic surveys are of little value in the plains areas, and the general procedure is to carry out a broad scale geophysical reconnaissance with torsion balance or gravimeter and magnetometer and then check the more interesting looking anomalies with a reflection seismograph. The drilling of test wells then follows on the more favorable structures.

Results of the numerous wildcat tests have shown that many of the structural features outlined by geophysical methods are basement uplifts of Paleozoic or Mesozoic rocks which are overlaid across their crestal areas by an incomplete sectio of Pliocene beds. Several of the dry holes indicated on the map recorded only the upper beds of the Pannonian series and then entered the Mesozoic core. It appears likely, however, that a more complete section will be found upon the flanks of these uplifts, and the producing sands of the lower Pannonian beds may be present in some of these areas which on first testing appeared unfavorable.

The several productive sands of the lower Pannonian series are shown in the type sections on the maps of the Budafapuszta and Lovászi fields. These sands have been grouped and named and it has been possible to make general correlation between the groups of sands in the different wells. However, the individual sand bodies are lenticular, and widespread correlation upon a particular sand could not be carried out.

Geologic map



GENERAL STRATIGRAPHIC CHART OF THE TERTIARY SEDIMENTS OF HUNGARY

GEOLOGIC AGE		MARGINAL MOUNTAINS				BIG HUNGARIAN PLAIN
		MECSEK	BAKONY VERTES GYERGOS	MATRA	BUKK	
HOLOCENE		Humus and Slope Drift				Sand Gravel 1 - 50 m
PLEISTOCENE		Löess	Löess Gravel	Löess	Löess Sand Gravel	Sand Gravel 50 - 300 m Clay CH_4 in small quantities
PLIOCENE	Levantine	Complete Regression with Denudation				Sand, Clay Peat, Lignite 100- 1000 m CH_4 in small quantities
	Pannonian Practically no lower Pannonian exposed	Rhodan-Wallachian Mountain Movements with Uplifts Sand Sandstone Clay	Sand, Sandstone, Clay, Fresh Water, Limestone	Sand Clay Lignite	Sand, Sandstone, Lignite Rhyolite tuff	Sand,, Sandy Clay Gravel 1300 - 1600 m Lignite (Lower Pannonian expected in southern half of B.H.P. only) CH_4 in wells drilled in vicinity of Debreczin. Oil in Budafapuszta
		Erosional and Tectonic Unconformity				
MIOCENE	Sarmatian	Cavernous Limestone, Marl and Clay	Coarse Limestone, subordinately Clay and Volcanic tuff	Diatomaceous shale, Fresh Water, Limestone and Rhyolite tuff	Rhyolite tuff subordinately Clay and Sand, Andesite tuff and Breccia	Oolitic coarse Limestone and Rhyolite tuff. Asphalt sands west of Tard 30 - 230 m
	Tortonian Helvetian Burdigalian Aquitanian	Leitha Limestone alternating Fresh Water, Brackish and Marine Clay, Sand, Sandy Marl Fresh Water and Marine Gravel and Sandstone. Dacitic tuff Beds, Andesite	Leitha Limestone, Marine sand and Clay Beds, Coarse Gravel Transgression at the end of the lower Miocene	Leitha Limestone and Fossiliferous Andesite tuff Middle Miocene Volcanic Activity Sandy Marl Lower Miocene Coal Seams. Lower Rhyolite tuff. Mountain movements, local regressions. Thick series of oil impregnated Volcanic tuff	Rhyolite tuff Clayey Marl Marine sand, and Sandstone Dislocated Coal seams Rhyolite tuff Local regressions	According to the wells drilled, the presence of these deposits is questionable Asphalt ash beds - Tard
OLIGOCENE	Chattien	Deposits missing	Sand, Sandstone, Sandy Clay, Marine and subordinately Fresh Water Beds	Sand, Sandstone, Sandy Clay. Glauconitic Sandstone (Marine)	Sandy Clay and predominantly Marine Clay. Small oilfield north flank Bukk Mts.	These formations are unknown. Probably the Palaeogene will be developed in the area of Hajduszoboszlo. According to the information available at present the greatest part of the low land was not covered by seas
	Rupelian	Deposits missing	Coarse Shore Sandstone and predominantly Clayey Foraminiferous Beds	Marine Clayey Deposits		
EOCENE	Ligurian	Deposits missing	Regression with denudation	Regression with denudation		
	Bartonian	Deposits missing	Regression with denudation	Regression with denudation		
	Lutetian	Deposits missing	Nummulina and Mollusca Clay, Marl & Limestone	Hiatus	Hiatus	
	Thaneti	Hiatus	Brackish and Fresh Water deposits with Coal Seams	Hiatus	Hiatus	
		Mezozoic and Granite Basement	Predominantly Triassic Limestone and Dolomite	Palaeozoic Basement probably crystalline schists	Mezozoic-Palaeozoic Basement	Predominantly Palaeozoic crystalline schists, subordinately Mezozoic-Palaeozoic Basement

2.3 MATERIALS AND SUPPLIES

General.- Prior to the Second World War, most of the materials and supplies required for oil operations were normally available within the country. Gravel, sand and stone were usually found in the vicinity of operations. Bricks were made from clays commonly found near the oil fields. Adequate supplies of cement are available. The following items were manufactured in Hungary: seamless or lap-weld casing and line pipe of good quality, mud pumps, drag bits, drill collars, drill pipe, nails, hardware, cartridges for gun perforators. Tool joints were imported from Germany. Gun perforators and cable were imported from Paris by way of Germany. Rock bits were imported from the United States--German makes were inferior. Drilling equipment also was imported from the United States. While in recent years the German drilling equipment was improved in type it was still inferior to the American equipment.

Other supplies.- Rubber was imported, hence rubber supplies were scarce. The same is true of any material not manufactured in the country. However, other than drilling equipment, practically everything needed could be obtained in the country, including: steel cable, tanks, steel derricks, valves, separators, drag bits, specialty tools, small tools, rotary hose, clamps, gauges, meters, electrical equipment, and motors. In January 1942, Lang and Company, a Hungarian corporation of Budapest, was manufacturing one compressor of 300 h.p. and with a daily capacity of 500,000 cubic feet. Provided this trial unit were successful, it was planned to manufacture in Hungary all compressors required in the country.

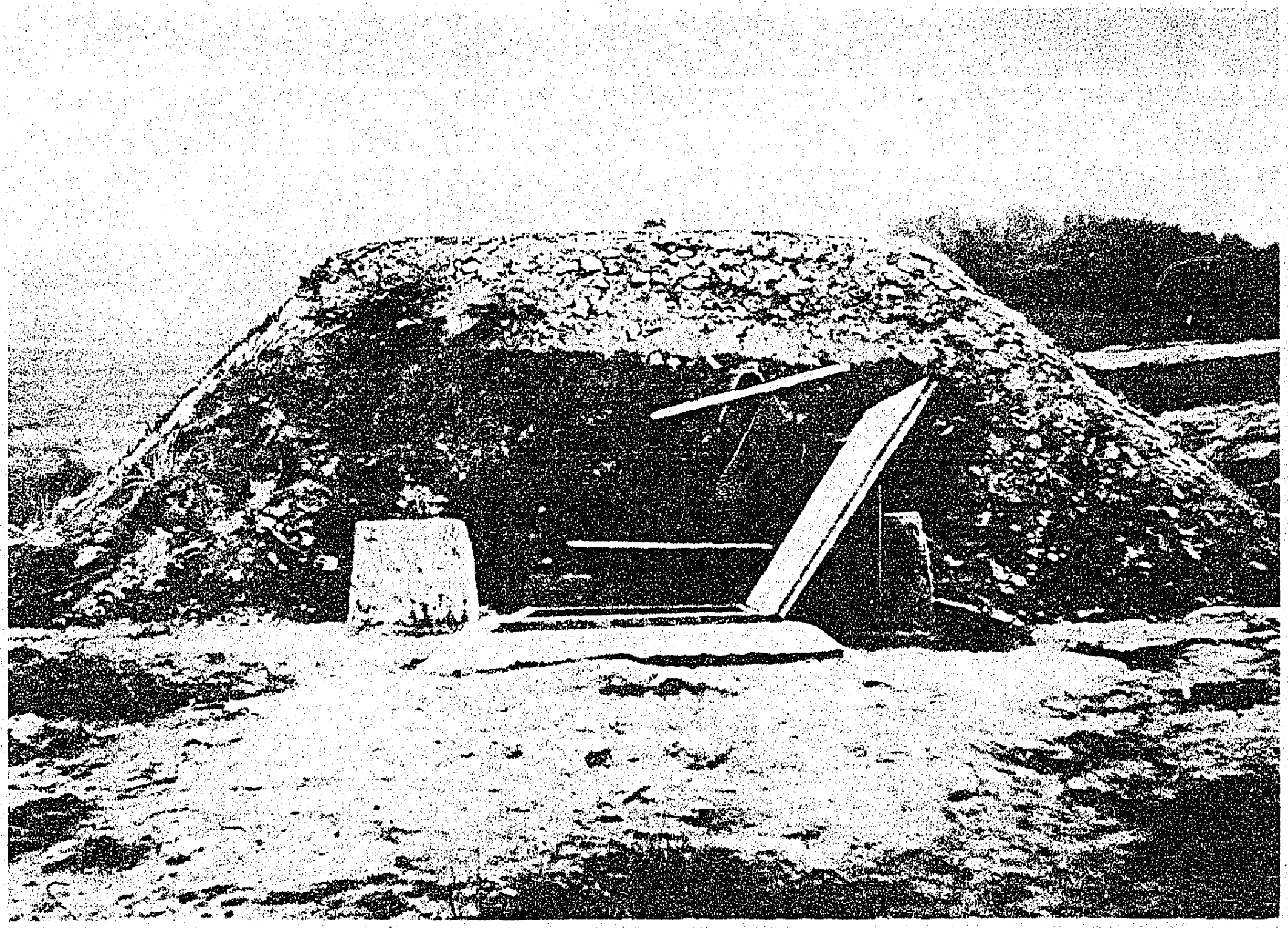
Drilling rigs and casing requirements.- In the Lovászi and Budafapuszta fields the drilling depths to the then existing oil producing horizons could be reached by medium-sized drilling rigs. The depths ranged from 3,500 to 4,500 feet.

Drilling in these fields was being carried out by four drilling outfits of ages varying from two to seven years. These were still in good working condition in 1941. Two heavy-duty outfits as well as a lighter outfit for geological test borings, were to have been delivered from Germany in 1942. The older units were reasonably modern, having been purchased in the United States before the war. The newer German types were more advanced in design than previous German types. All the rigs from Germany were to have been diesel-driven, whereas the American rigs were all steam-driven.

It seems reasonable to assume, that, as the war progressed and the need for oil increased, the fields in Hungary would have been more rapidly exploited. Thus it is quite probable that other rigs have been moved in to expedite development.

The drilling offered no particular problems. Generally, a short conductor string of several joints of 14-inch casing was set, then about 450 feet of 10-inch casing was set and cemented to the top as a surface string. Lastly 7-inch casing was run through the oil sands and cemented to the top of the gas sands above the oil. The oil horizons were determined by study of the cuttings and the electrical log and the 7-inch casing was then gun-perforated at the oil horizons. Because of the lenticular character of the sands it is not advisable to use any other completion program. The Schlumberger company had an electrical logging and gun-perforating outfit on the ground and was taking steps to assemble a second unit. Cartridges were manufactured in Hungary, the cable coming from stock in the Schlumberger warehouse in Paris, as did gun replacements. It is possible that there presently exists a shortage of this equipment. Lacking it, well completions would be slowed up very much.

Rather than tie up a drilling outfit all wells were completed by completion outfits. After drilling was completed the derrick was left standing, and with the exception of one pump the rig used in drilling was moved out and the completion unit moved in. The company had four completion outfits. One was a



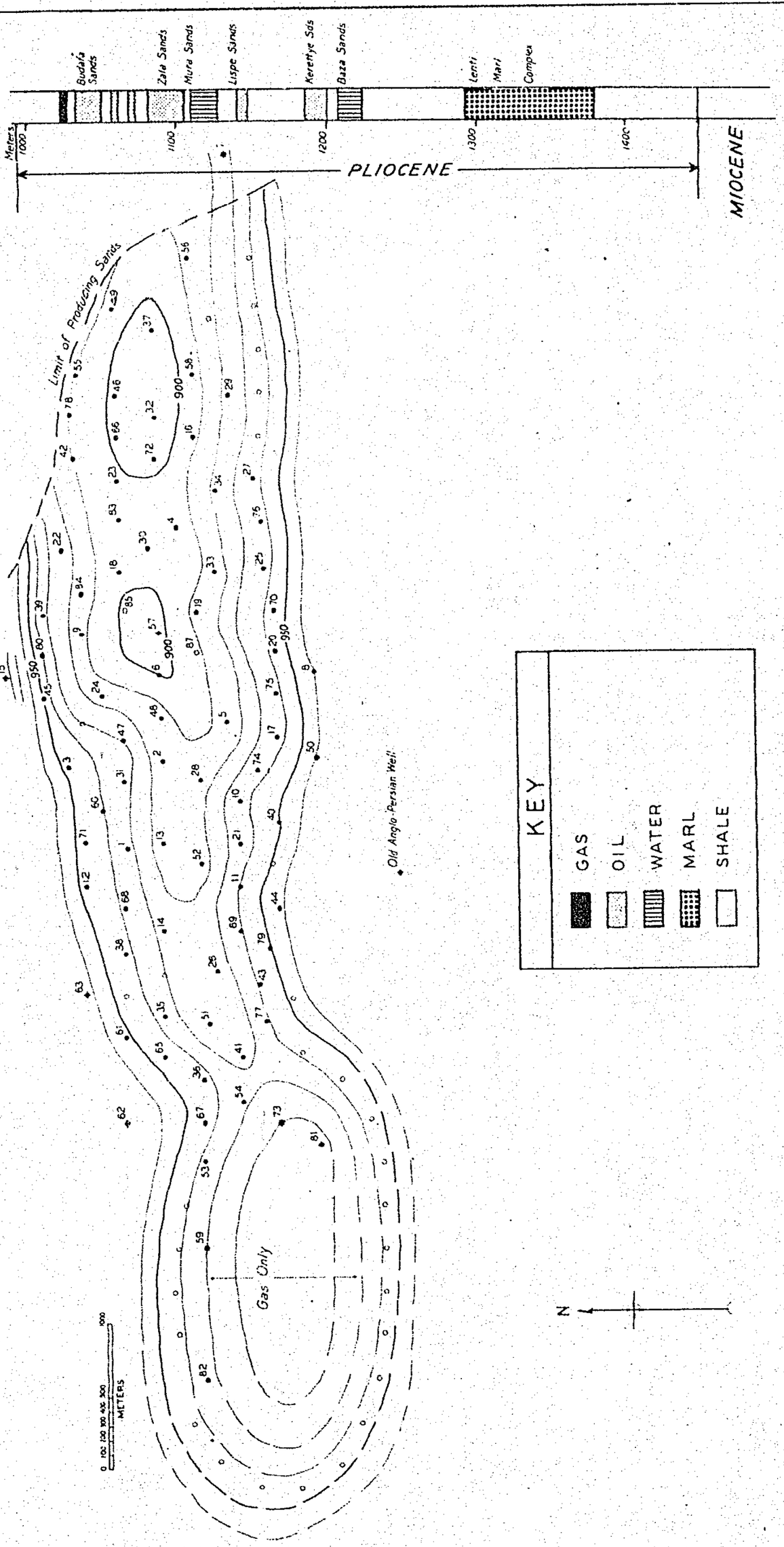
VIEW SHOWING A TYPICAL
CAMOUFLAGED AND PROTECTED OIL WELL

BUDAFAPUSZTA FIELD
HUNGARY
1938

BUDAFAPUSZTA FIELD

CONTOURS ON BASE OF MURA SERIES

CONTOUR INTERVAL 10 METERS



Cardwell and the others had been assembled from various pieces of equipment found on hand.

The company had seven steel derricks, all of 136-foot size. No pumping derricks were used in the fields as the wells produced by natural flow and as the sand was firm, few wells had to be repaired because of sanding up.

For exploitation drilling, 4 1/2-inch drill pipe is all that is required. Drill pipe was available in Hungary but the tool joints came from Germany.

It would have been profitable to drill the lower section with drag bits but this would have been a slow process. Rock bits are preferable. Here, too, there was a shortage, as the few rock bits made by the Germans were of inferior quality. A long-tooth, three-cone, self-cleaning type rock bit is preferable. A 9-inch hole was dug for the 7-inch casing.

The drilling mud needed no special chemicals. Viscosity was kept low to drop out gas. Mud cake on the sand faces was a drilling hazard.

2.4 BUDAFAPUSZTA FIELD

2.4.1 General

As of April 1940, the Budafapuszta field had 37 producing wells. Oil was being produced from five sands in the lower Pliocene formation. The depths of these wells ranged from 2,550 feet subsea to approximately 3,180 feet subsea. The five sands, in order of their occurrence geologically, were known locally as the Budafa, Zala, Upper Lispe, Lower Lispe and the Kerettye. Several of the wells were completed in more than one sand.

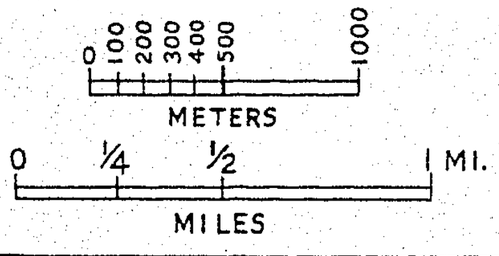
2.4.2 Budafa Sands

The average depth of the 14 wells completed in the Budafa sands as of April 1940, was 2,550 feet subsea, or an average well depth of 3,550 feet. The vertical closure was 99 feet. The average net sand thickness was 26 feet. The average porosity of the sand was found to be 20 per cent and was comparatively uniform in all the wells drilled to that date. A laboratory examination made of the cores from the wells showed an oil saturation of approximately 60 per cent of the effective pore space of the sand. Competent engineers who studied the reservoir conditions of this sand calculated from the available data that an ultimate maximum oil recovery equivalent to 40 per cent of the effective pore space might be obtained. They believed that this would be possible if, and only if, an effective water drive were present, a program of pressure maintenance were begun, and the fluid withdrawal from each well were held at a rate which would conserve the bottom-hole energy.

The static bottom-hole pressure, 1,550 pounds in 1938, had fallen to 1,450 pounds by February, 1940. The average gas-oil ratio was 2,368 cubic feet of gas per barrel of oil produced. The daily average production per well was 163 barrels.

An expansion of the gas cap had been observed, indicating that an excessively rapid producing rate was being employed. It was believed that by a proper control of the producing rate and the return of gas to the formation for pressure maintenance, that 90 per cent of the estimated ultimate production might be produced by natural flow. It was believed that unless these steps were taken, the flowing life of this field would be materially shortened and a serious loss in ultimate recovery would result.

CONTOUR MAP DRAWN ON THE TOP OF BUDAFA SAND NO.3



LEGEND

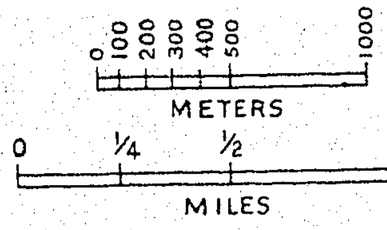
- WELL PRODUCING FROM BUDAFA SAND
- GAS-OIL CONTACT
- OIL-WATER CONTACT

300 METER DISTANCES

Not present

PRODUCING
Budafa sand

CONTOUR MAP DRAWN ON THE TOP OF ZALA SERIES



LEGEND

- WELL PRODUCING FROM ZALA SERIES
- — — POSSIBLE GAS–OIL CONTACT
- ——— OIL–WATER CONTACT

300 METER DISTANCES

CONTOUR MAP DRAWN ON THE TOP OF THE KERETTYE SERIES

0 100 200 300 400 500 1000
METERS

0 ¼ ½ 1 MI.
MILES

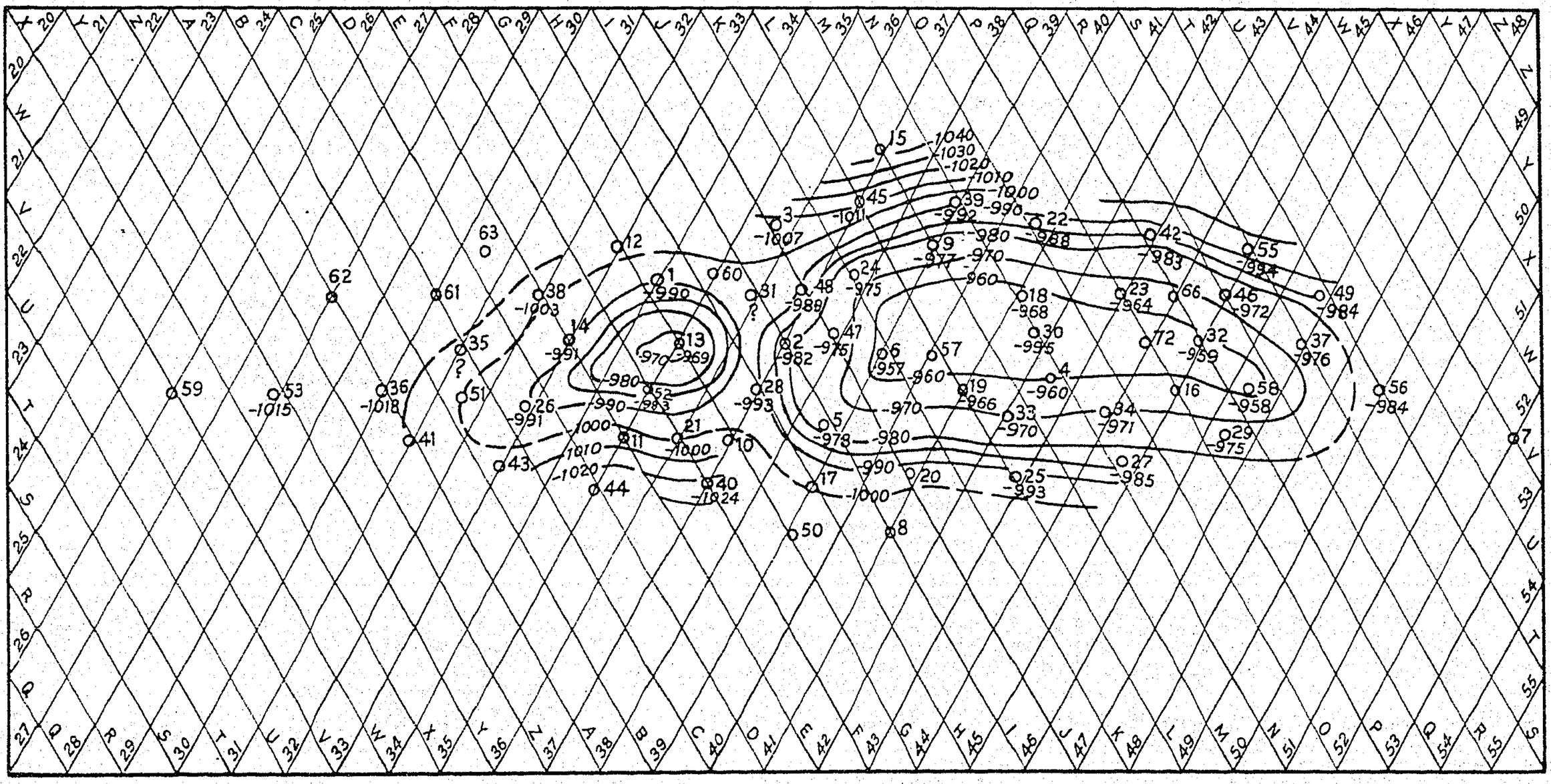
LEGEND

o WELL PRODUCING FROM KERETTYE SERIES

—— OIL-WATER CONTACT

-957 SUBSEA DEPTH

300 METER DISTANCES



2.4.3 Zala Sands

Thirteen wells had been completed in this sand, up to April, 1940, at an average well depth of 3,610 feet or a subsea depth of 2,840 feet. The vertical closure in this sand is 112 feet above the water-oil contact point. An average porosity of 23 per cent was found, with firm and uniform sand samples. The average daily production per well was 95 barrels. The average net sand thickness was 19 feet.

The initial static bottom-hole pressure in 1938 was 1,500 pounds, which had declined to 1,450 pounds by April, 1940, a loss of 100 pounds.

2.4.4 Upper Lispe Sands

Five wells were producing from this sand in April, 1940. The average well depth was 3,770 feet, an average subsea depth of 3,000 feet.

No gas cap was observed in any of the wells which were drilled into this sand. The average net sand thickness was 23 feet with a porosity of 17.9 per cent. The sand was firm and uniform in porosity but varied in thickness from well to well.

The average gas-oil ratio was 1,034 cubic feet per barrel of oil produced. The average daily rate of crude oil production per well was 75 barrels. The initial static bottom-hole pressure was 1,440 pounds, which had fallen to 1,290 pounds as of April, 1940, a decline of 150 pounds. It was recommended that a program of pressure maintenance should be followed and that a daily average of 500,000 cubic feet of gas should be injected into this sand.

2.4.5 Lower Lispe Sands

This is a stringer sand, with reservoir conditions similar to those prevailing in the Upper Lispe, and probably is connected with the Upper Lispe sand at some point. Four wells were producing from this sand as of April, 1940, with an average net sand thickness of 15 feet. The daily average production per well was 19 barrels, with a gas-oil ratio of 1,034 cubic feet per barrel. The average porosity of the sand was 21.8 per cent. The bottom-hole pressure, both initial and as of April, 1940, was the same as for the Upper Lispe sand.

2.4.6 Kerettye Sands

Thirteen wells were producing from this sand in April, 1940. The average well depth was 3,950 feet and the average subsea depth was 3,180 feet. No gas cap exists in this sand and the vertical closure is 92 feet above the water-oil contact. The average sand porosity was 23.2 per cent, with an average net thickness of 26 feet, the sand being firm and uniform as to texture. The average daily production per well was 83 barrels, with a gas-oil ratio of 764 cubic feet. The initial static bottom-hole pressure was 1,460 pounds, which had declined to 1,400 pounds by April, 1940.

2.4.7 Statistical Summary of Certain Wells Drilled in the Budafapuszta Field

These data are contained in the table on page 27.

STATISTICAL SUMMARY OF DATA ON CERTAIN WELLS DRILLED IN THE BUDAFAPUSZTA FIELD

(Measurements of casing and tubing expressed in inches. All other measurements expressed in meters)

- = Not Applicable

Well No.	Commenced Drilling	Completed Drilling	Total Depth	Well Elevation	Budafa Sands	Zala Sand	Mura Sand	Upper Lispe	Lower Lispe	Kerettye Sand	Perforations For Production	Sands Open To Production	Initial Gas-Oil Ratio (cu.ft./bbl.)	CASING & TUBING RECORD 14" Casing	10"	7"	3"	2½"	REMARKS
1.	7/15/36	1/3/37	1764	220	1066-1085	1100-1126	1130-1160	1172-1182	1204-1230	1232-1242	1059-1080	Budafa	10,000	242	1066	-	1009	-	Drill pipe stuck at 1085, hence completion in Budafa.
2.	4/14/37	12/9/37	1801	235	-1030	1102-1128	1130-1151	1168-1179	1208-1209	1216-1236	1168-1179 1204-1208	Upper Lispe Lower Lispe	400	210	1309	-	1165	-	Water in Kerettye at 982 m. subsea
3.	12/24/37	5/16/38	1341	214	-1039	1107-1130	1134-1160	1174-1180	1210-1212	1221-1237	1092-1097	Budafa	1,060	240	1340	-	-	1086	
4.	5/28/38	8/8/38	1438	213	-1052	1068-1096	1104-1121	1135-1138	-1162	1174-1192	1164-1191	Kerettye	410	205	1255	-	-	1176	
5.	8/24/38	8/24/38	1251	204	-1132	1130-1144	1164-1179	1194-1202	1226-1233	- -	1194-1203 1226-1232	Upper Lispe Lower Lispe	450	161	-	1247	-	1192	
6.	-	-	1222	214	-1053	1078-1088	1092-1114	1132-1134	1158-1161	1171-1180	1171-1186	Kerettye	-	-	108	1195	-	1170	
7.	-	-																	Off structure to east.
8.	-	-	1220	223	-1114	1138-1152	1162-1186	1208-1208	1230-1230	- -	1204-1209	Upper Lispe	-	-	111	1250	-	1200	
9.	-	-	1214	223	1050-1069	1086-1106	1110-1140	M	M	1199-1214	1062-1066 1086-1097 1102-1106 1199-1206	Budafa Zala Zala Kerettye	339	-	112	1214	-	1060	
10.	-	-	1203	205	1046-1062	1105-1115	1123-1143	1157-1168	1198-1200	1202-	1056-1062	Budafa	495	-	115	1145		1050	An open hole test was made of sands below the Budafa sands but results were not satisfactory. Produces now from Budafa.
11.	1/1/39	2/9/39	1249	274	1091-1116	1124-1162	1166-1180	1190-1198	1232-1242	1248-	1091-1096	Budafa	430	-	116	1183	-	1086	
12.	2/7/39	3/3/39	1250	236	1088-1128	1148-1154	1164-1185	1208-1214	1237-1243	-	1096-1104	Budafa	324	-	102	1226	-	1093	
13.	2/28/39	3/26/39	1231	233	1056-1082	1092-1107	1125-1140	1164-1174	1190-1195	1202-1218	1202-1212	Kerettye	389	-	112	1230	-	1198	
14.	3/27/39	4/27/39	1222	226	1061-1102	1120-1130	1136-1155	1162-1166	1206-1215	1216-	1084-1090	Budafa	561	-	80	1222	-	1068	Lower Lispe tested 2,800,000 cu.ft. Upper parts of Budafa sand, above 1084 feet showed like amount. Bottom Hole pressure was 1549 lbs.
15.	4/4/39	4/29/39	1321	272	1141-1198	1222-1254	1220-1254	1271-1274	1304-1306	1316-	All sands	-	-	-	81	1200	-	-	Dry hole. Salt water in all sands. Zala and Mura coalesce.
16.	5/10/39	6/5/39	1284	234	1044-1072	1096-1116	1125-1140	1160-1164	M	1199-1218	1096-1104 1111-1116 1160-1164 1210-1216	Zala Zala Upper Lispe Kerettye	1,278	-	50	1223	-	1092	Producing from all sands.
17.	5/24/39	6/12/39	1265	282	1107-1128	1158-1174	1180-1200	1216-1222	1244-1256	- -	116-1128	Budafa	405	-	52	1212	-	1113	The Upper & Lower Lispe tested salt water. Zala sand tested water.
18.	6/14/39	6/28/39	1182	196	1110-1126	1045-1075	1084-1098	M	M	1154-1171	1154-1171	Zala	619	-	54	1176	-	1149	Initial production 406 barrels per day--gas-oil ratio 619--10mm bean.
19.	6/30/39	7/16/39	1232	243	1060-1077	1106-1131	1138-1154	1170-1172	1198-1200	1210-1228	1118-1130 1210-1222	Zala Kerettye	557	-	51	1232	-	1114	Kerettye production small, hence opened in Zala as well.
20.	7/21/39	8/6/39	1237	248	1096-1133	1146-1160	1166-1186	1192-1206	1228-1232	- -	1098-1105	Budafa	573	-	49	1211	-	1092	
21.	7/9/39	8/4/39	1297	260	1108-1140	1144-1165	1189-1200	1209-1216	1256-1262	1268-1282	1118-1127 1210-1216	Budafa Upper Lispe	-	-	50	1285	-	1113	Well would not flow, probably due to low porosity.
22.	8/10/39	8/30/39	1196	195	1017-1043	1037-1063	M	M	M	1182-	1036-1049 1073-1078	Zala Zala	613	-	49	1126	-	1034	
23.	8/23/39	9/12/39	1264	268	1078-1116	1138-1149	1158-1178	M	M	1232-1249	1145-1149 1232-1249	Zala Kerettye	580	-	51	1264	-	1143	
24.	9/17/39	10/3/39	1277	250	1084-1142	1153-1171	1172-1197	1212-1216	M	1256-1276	1153-1166 1212-1216 1256-1260	Zala Upper Lispe Kerettye	575	-	52	1276	-	1131	Base of Kerettye contained salt water.
25.	9/27/39	10/16/39	1247	234	1079-1119	1138-1145	M	1186-1190	M	1227-1233	1080-1096	Budafa	399	-	50	1246	-	1044	
26.	10/9/39	11/2/39	1212	193	1016-1063	1074-1097	M	M	M	1184-1197	1048-1059 1074-1078	Budafa Zala	213	-	50	1189	-	1046	
27.	10/26/39	11/12/39	1257	253	1082-1123	1134-1164	1166-1183	M	M	1238-1251	1108-1114	Budafa	-	-	49	1254	-	-	Tested salt water and 1,000,000 cu. ft. gas at 92 atm pressure. All other sands salt water.
28.	11/7/39	11/21/39	1234	230	1084-1086	1106-1122	1138-1148	1168-1177	1208-1209	1224-1232	1110-1123 1168-1177 1208-1209	Zala Upper Lispe Lower Lispe	984	-	52	1233	-	1106	
29.	11/26/39	12/12/39	1246	247	1092-1114	1129-1148	1164-1173	1186-1188	M	1242-1238	1129-1136	Zala	350	-	45	1244	-	1126	
30.	12/12/39	12/24/39	1199	205	1065-1082	1090-1093	1093-1108	M	M	1160-1177	1172-1177	Kerettye	731	-	52	1216	-	1170	
31.	12/19/39	1/10/40	1235	234	1050-1088	1112-1138	1146-1168	1190-1198	M	1115-1125	1115-1125	Kerettye	448	-	49	1224	-	1109	
32.	12/26/39	1/20/40	1217	227	1040-1074	1093-1111	1117-1134	1146-1148	-	1166-1199	1190-1196	Kerettye	-	-	52	1216	-	1182	No gas oil ratio test made.
33.	2/3/40	2/20/40	1223	220	1047-1087	1096-1116	1124-1144	1161-1166	-	1216-1220	1068-1070	Budafa	602	-	53	1172	-	1063	

M = Sand named is missing in the well indicated

2.4.8 Casinghead Gasoline and Pressure Maintenance Plants, Budafapuszta Field

At Budafapuszta there was a combination absorption and pressure maintenance plant. It was being extended early in 1942, the extension being designed to give the plant a capacity of about 10,000 gallons of casinghead gasoline daily and the same amount of liquid gas. Both projects were piped to Ujudvar for shipment by tank car.

The gasoline plant at Budafapuszta was a Braun Seal Oil type plant, of 300-pound maximum operating pressure. When operating at the maximum pressure, it had a daily gas throughput capacity of 10,000,000 cubic feet. The plant was operated at 50 pounds gas (a) pressure, the gas being taken directly from the battery of oil-gas separators handling the production of the field. The gas produced in the field at that time was not of a sufficient volume to maintain maximum operations. The gasoline content of the gas, as recorded by the plant, averaged approximately .5 gallons per thousand cubic feet of the gas processed.

The plant was in good working order as of January, 1942, and was complete with all necessary tankage, lines and other equipment.

2.4.9 Compressor Station for Pressure Maintenance, Budafapuszta Field

The compressor station for gas injection in the Budafapuszta field began operating late in 1940. Two 300-h.p. Cooper-Bessemer compressors had been installed. These machines were operating on approximately 30 pound intake and 1,200-pound output pressures and under these working conditions had a daily capacity of approximately 1,500,000 cubic feet of gas. Due to the breakage of a crank shaft, these machines did not operate from August, 1941 to January 1, 1942; it was very difficult to secure repair parts for these American machines. In the meantime, thirteen 150 h.p. Thomassen compressors had been received from Germany. These machines, each of a capacity of 300,000 cubic feet a day, were mounted and ready to be placed in operation by January, 1942.

Eight additional Thomassen compressors of like capacity to those installed, were on order in January, 1942. The capacity of the plant, as it existed in January, 1942, with all machines in proper running order, was 5,400,000 cubic feet per day. If the eight machines on order were received and placed in operation, the daily injection capacity should be more than 8,000,000 cubic feet.

2.4.10 Repressuring Program Followed

Well No. 6, producing from the Kerettye sand, was selected as the first input well. The formation began taking gas at 1,200 pounds pressure, and 1,000,000 cubic feet of gas per day were injected until a total of 3,000,000 cubic feet had been returned to this sand. Operations were discontinued from August, 1941 to January, 1942, due to the breakdown of equipment. The bottom-hole pressure fall was arrested in wells Nos. 4 and 5, both wells in the Kerettye sand, and down-structure from No. 6, the injection well. However, the input pressure had advanced from 1,200 pounds to 1,400 pounds which would indicate that the input rate was somewhat higher than the rate which might be maintained. The use of additional input wells was planned and a slight reduction in the average volume to be handled by each well was contemplated.

It was intended to repressure the Zala and Upper Lispe sands as soon as the thirteen Thomassen compressors which in January, 1942 already were installed, had been tested. Well No. 27 was selected as the input well for the Zala sand and Well No. 2 was selected as the input well for the Upper Lispe sands.

(a) As of January, 1942. Throughout it should be borne in mind that since January, 1942, we have received no information on this field.

BUDAFAPUSZTA 18

Schlumberger Electrical Log and Completion Report

Company: Maort
Field : Budafapuszta
Well : Well No. 18
Date : 6-28-39
Location: Kerettye
Elevation:

Problem: Study of the open hole
Results: See diagram below

Casing shoe depth		
Driller	54.30	m
Schlumberger	54.30	m
Bottom depth		
Driller	1182	m
Max. depth reached by lower elect.	1179	m
Max. footage measured (p. or P. S.)	1125	m
Footage missed	3	m
Started run	5 a. m.	
Finished run	10 a. m.	
Time well occupied by outfit	5½	h.
Time waiting at well	1	h.
Mileage incurred by run		
Total time incurred by run		

Mud Characteristics

Nature	:	bentonite
Density	:	
Viscosity	:	1.13 Schlumberger
Resistivity	:	13.8 ohm/m
Level	:	6 m.
Meter of hole	:	8 7/8 in.
Going down	:	without trouble
Material	:	without trouble

Remarks and Interpretations

Maort
Completion Report

Nagykaniza
August 2, 1939

Field : Budafapuszta
Well No. 18

Summary Sheet:

Elevation of rotary table	196 m.
Total depth	1182 m.
Date commenced drilling	6-14-39
Date completed drilling	6-28-39
Date in production	7- 3-39
Method of bringing in	Swabbing
Initial Production	64.845 cu. m. (406 bbls.)
(Maximum Initial)	69.216 cu. m.
Initial Gas	7137 cu. m.
Initial G. O. R.	619 cu.ft.per bbl.
Initial Pressures	Casing 62 atm. Tubing 22 atm.
Initial bean	10 mm.
Initial gravity	0.812 at 15 C.
Initial B. S. and W.	1% emulsion
Zone open to production	Kerettye Series

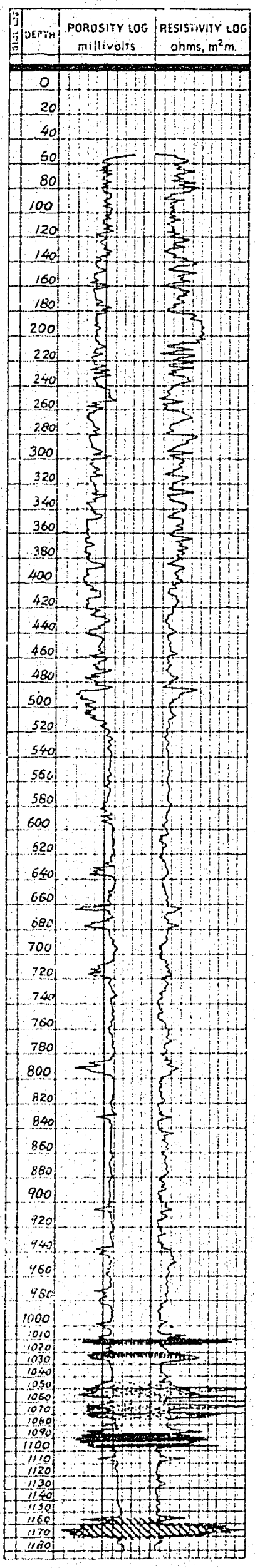
Casing Record:
10" casing cemented at 54.32 m.
7" casing cemented at 1178.67 m.

Perforation:
7" casing perforated from 1154-58 m.
and 1160-1171 m. 146 shots.

Tubing record :
2½" tubing to 1149.62 m.

Subsurface Horizons:

Budafa Series	
Sand No. 4	1010 to 1013 m.
Sand No. 3	1020 to 1026 m.
Zala Series	
Upper	1045 to 1058 m.
Lower	1061 to 1075 m.
Mura Series	1084 to 1098 m.
Lispe Sands	
Upper	Missing
Lower	Missing
Kerettye Series	1154 to 1171 m.



Electrical Survey:

Schlumberger Survey from 54 to 1182 m.
normal resistivity.
940 to 1182 m.
lateral resistivity.

Deviation Survey: None

Cored interval: 2 cores.
1067 1073,
1167.5-1173 m.

Number of actual drilling days: 12 1/3

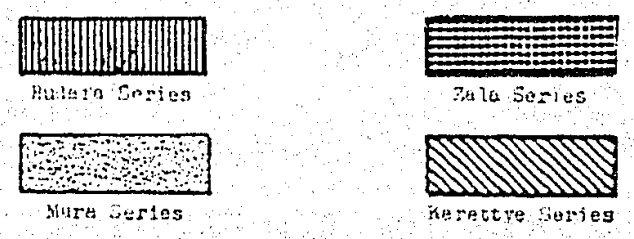
Number of days for final completion: 20

General Remarks:

This well is only 2 m. deeper structurally than the highest well in the field, No. 6. Both the Budafa Series and the Zala Series may be expected to be gas bearing on account of their high structural position. No. 18 is located to the east of the two Lispe sand lenses which are therefore not present.

The Kerettye Series is the only possible producing horizon and the results obtained are very much better than the usual Kerettye producer. It is thought that the sands must be locally much more permeable to account for this, and that well No. 4 lies on the edge of this permeable area, as it also was rather better than the other Kerettye wells.

Producing Department
By
H. R. Lovely
For
G. A. Bannantine



From the information derived from injecting gas into Well No. 6 it was concluded that several input wells would be necessary and that the gas volume injected per well should be reduced.

2.4.11 Notes on the Budafapuszta Field

The five producing sands of the field grade into shale and became impermeable in the eastern margin of the field. The lower sands grade into shale and became impermeable in the western flank of the structure.

Well No. 7 was drilled east of the productive limits of the field and only a thin Budafa stringer sand, which contained gas, was found.

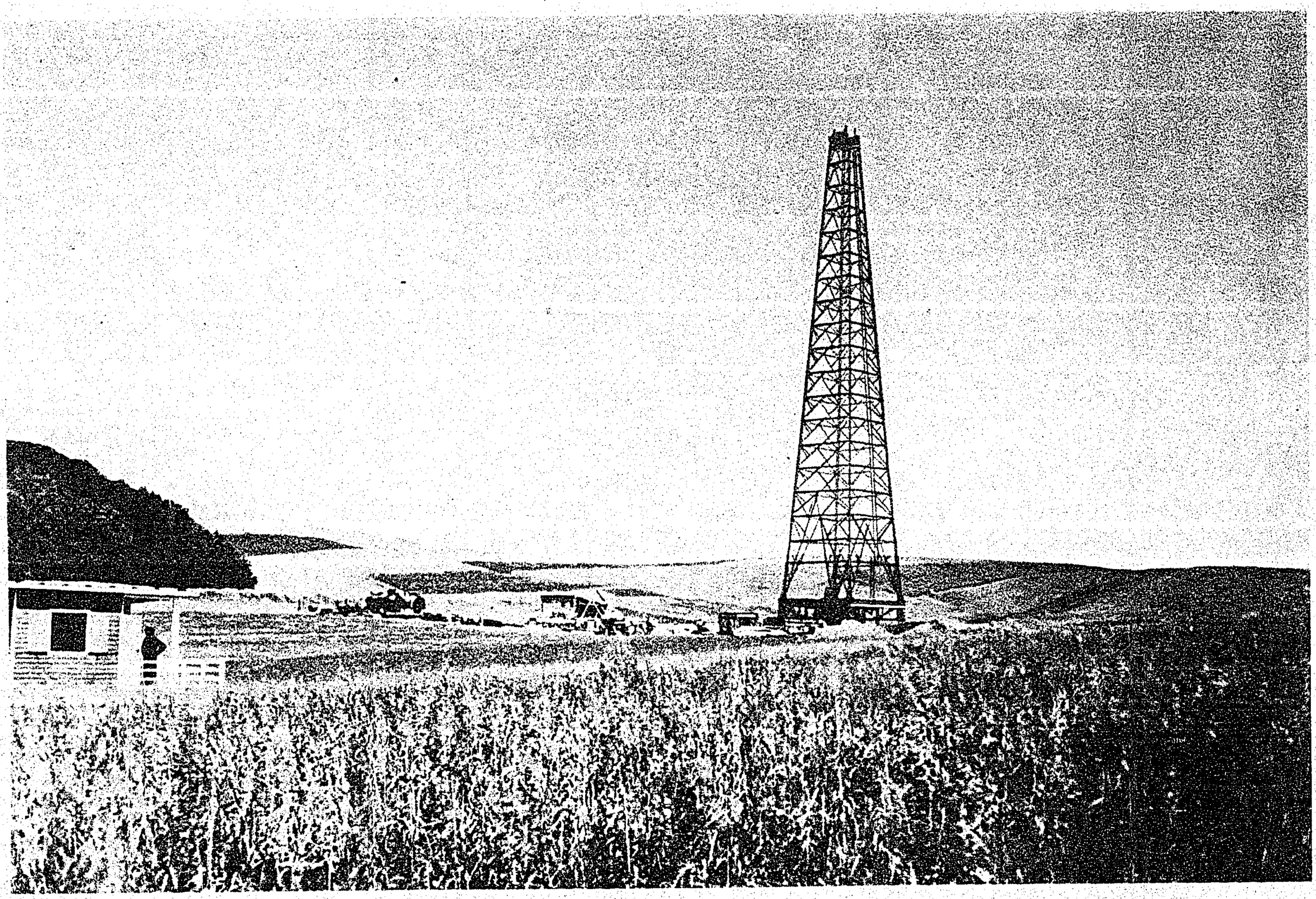
Well No. 64 was drilled about one mile east of No. 7, and penetrated the Miocene formations. These largely contained salt water, with two or three insignificant oil shows.

The Magyar Szentmiklós test(No. 1) located several kilometers east of Budafa No. 64 was abandoned on June 2, 1939 at 2,489 meters (7,980 feet). This test found the top of the Miocene at 2,338 meters (7,598 feet). The sands found were poorly developed. Some of the cores looked promising but drill stem tests uniformly showed water.

The following are reservoir data, Budapuszta field:

Reservoir Data, By Sands, Budafapuszta Field, April 1940

D a t a	Budafa	Zala	Upper Lispe	Lower Lispe	Kerettye
Average Net Producing Sand (in feet)	26	19	23	15	26
Porosity of Sand	20%	23.6%	17.9%	21.8%	23.2%
Solution Gas (cu. ft. per bbl.)	450	450	450	450	450
Average Production of gas (cu. ft. per bbl.)	2,368	455	1,034	1,034	764
Excess Gas Production (cu. ft. bbl.)	1,918	5	584	584	314
Average Daily Production (bbls. per well)	163	95	75	19	83
Number of Producing Wells	14	13	5	4	13
Average Daily Production (bbls. per day by sands)	2,282	1,235	375	76	1,079
Percentage Decline of Bottom-Hole Pressures	6.0%	6.5%	10.4%	10.4%	4.1%
Total Average Daily Production (barrels per day)			5,047		



RIGGING UP, BUDAFAPUSZTA FIELD

Miscellaneous Data, Budafapuszta Field

Well No.	Date	Bean m.m.	Producing Sand	Rate in Bbls. a Day	Flowing Pressure Pounds	Depth (In feet)	Production Factor
2	12/4/39	8	Lower Lispe) Upper Lispe)	198	576	3,761	.415
10	12/4/39	7	Budafa	191	146	3,400	.392
17	12/2/39	7	Budafa	327	1,008	3,640	1.400
22	11/29/39	9.5	Zala Lispe	204	418	3,350	.220
23	11/28/39	9.5	Kerettye) Lower Zala)	104	1,076	3,700	.394

Porosity determinations, Budafapuszta field.- Wells: 4, 9, 10, 11, 12, and 13, average porosity--20.1 per cent.

Sand thicknesses, Budafapuszta field.- Variable from 6 feet to 58 feet.

Lovászi field.- No basic reservoir data available.

Reservoir Pressures, Budafapuszta Field

Well No.	Sand	Datum Plane Feet	Original Pressure		Latest Pressure	
			Date	Press. lbs.	Date	Press. lbs.
2	Lower Lispe) Upper Lispe	3,000	10/1/38	1,241	11/8/39	1,035
10	Budafa	3,000	1/3/39	1,435	11/16/39	1,367
17	Budafa	3,000	7/1/39	1,429	11/13/39	1,307
22	Zala) Lispe)	3,000	11/5/39	1,427	11/5/39	1,427
23	Kerettye) Lower Zala)	3,000	11/24/39	1,387	11/24/39	1,387

Budafapuszta Field, Total Production to April 1940

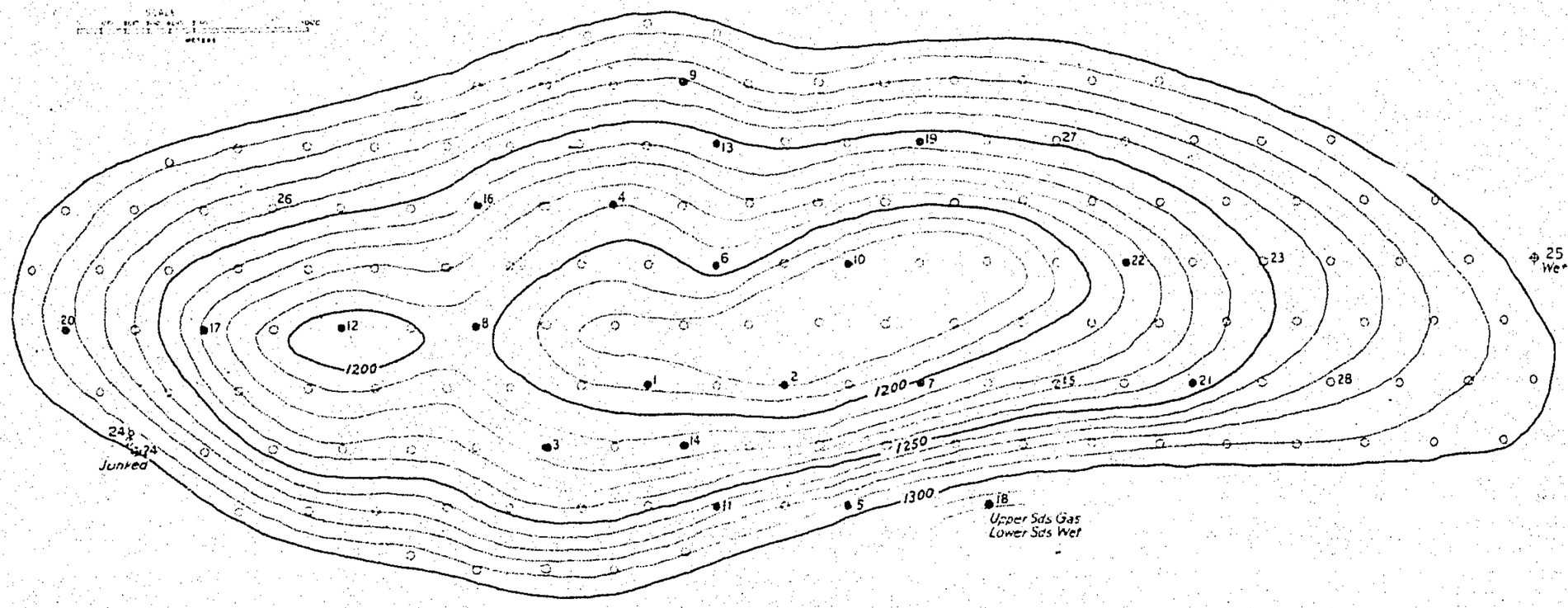
(In Barrels)

Sands	Production to April 1940
Budafa	810,795
Zala	438,747
Upper Lispe	133,220
Lower Lispe	26,895
Kerettye	383,343
Total	1,793,000

LOVASZI FIELD

CONTOURS ON BASE OF LENTI MARL

CONTOUR INTERVAL 10 METERS

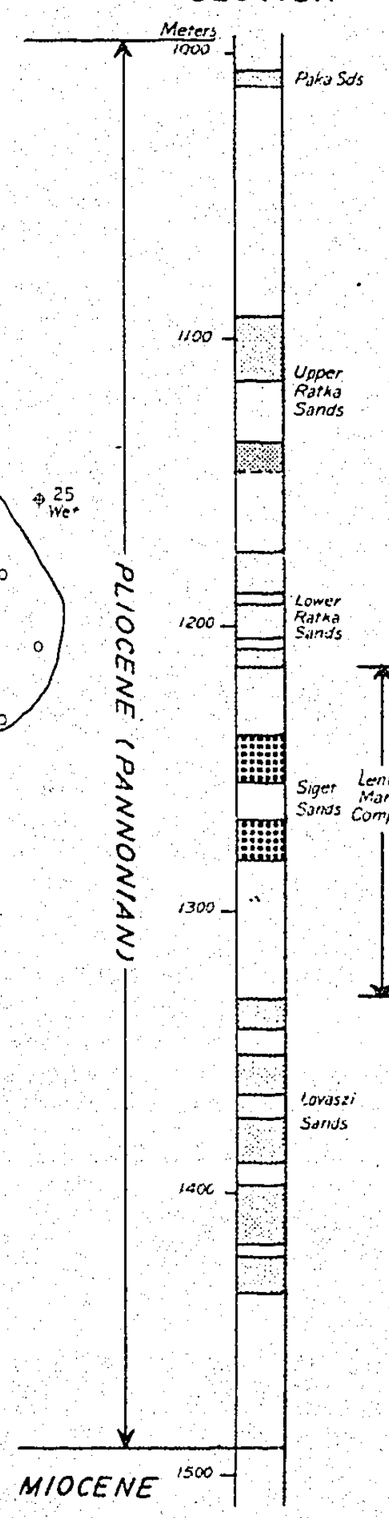


N

KEY

- OIL
- WATER
- SHALE

GENERALIZED SECTION



2.5 LOVÁSZI FIELD

2.5.1 General Producing Data

Twenty-five wells were completed in the Lovászi field up to January, 1942. The average net sand thickness, as shown elsewhere in this report, is 75 feet. The sand is similar in porosity and permeability to the sands producing in the Budafapuszta field. However, unlike Budafapuszta, only one sand section has proved productive of oil in the Lovászi field. Five sand strata have been tested in this field. A typical record of a drill stem test made on a typical well of this field follows:

Drill Stem Tests Made on Well No. 10, Lovászi

November 17, 1941

Sand	Depths in Meters	Results
Páka	1006-1010	Water
Upper Rátka	1091-1113	"
" "	1135-1145	"
Lower Rátka	1174-1187	Gas
" "	1192-1205	"
" "	1208-1214	"
Sziget	1240-1256 (?)	Some Water
"	1268-1273	Water
Lovászi	1332-1342	Gas
"	1352-1363	"
"	1373-1382	Oil or Gas
"	1385-1390	" " "
"	1395-1418	Oil
"	1422-1438	Water
	TOTAL:	81 meters of good sand.

The series of tests shown above were made during November, 1941. Since this well is high on structure and the Páka, Upper Rátka and Sziget sands were water-bearing at this point, it is improbable that they would be oil-bearing at any point on the Lovászi structure. The Lower Rátka, showing gas in this test, might possibly be productive of oil in some portion of the structure, although it had not been so proved up to January, 1942.

2.5.2 Plans for Casinghead Gasoline Plant and Pressure Maintenance Program

The M.A.O.R.T. had placed an order in Germany, before January, 1942, for two portable type, Luigi charcoal gasoline plants for the Lovászi field. This plant was designed to produce 8,500 gallons of gasoline daily and a like quantity of liquid gas. Both products were piped to Ujudvar for shipment by tank car. A third identical unit was being considered but had not been ordered up to January, 1942.

At the same time, bids for compressors for a pressure maintenance program for the same field from the Thomassen compressor firm of Germany had been accepted. These were 150 h.p. machines of approximately 300,000 cubic feet daily capacity, and were the same as the thirteen machines which had been installed in the Budafapuszta field. No information is available as to whether these machines were delivered and installed. However, since the German Government had such a vital interest in Hungarian oil production, it is probable that these machines were delivered and a pressure maintenance program instituted in the Lovászi field. Since sand permeability and porosity conditions in the Lovászi field are similar to those of the Budafapuszta field, it is assumed that bottom-hole pressure maintenance would be equally as necessary for the Lovászi field as for the Budafapuszta field. No exact bottom-hole pressure data are available on the Lovászi field and deductions made herein are based on the permeability and porosity found in the sands and the reports of producing well performances.

2.5.3 General Geologic Notes

The Lovászi field lies about eight kilometers west of the Budafapuszta field, but is a separate structural unit and is nearly five kilometers north of the westerly extension of the Budafapuszta structural trend, represented by the Lendva-Ujfalu structure, where three non-commercial wells were drilled.

The stratigraphy has changed considerably in this short distance and the lower marly beds of the basal Pannonian section at Budafapuszta have changed to include some good porous sands which are productive oil horizons. On the other hand, the upper producing sand horizons found at Budafapuszta are less well developed at Lovászi and, although they have showed some oil and gas, do not appear very promising for commercial production. Owing to lenticularity of the sands and this facies change it is only possible to make very broad correlations between the two fields. In general the upper and lower Rátka sands at Lovászi correspond to the group of productive sands at Budafapuszta and the Sziget sands at Lovászi occur in the interval of the Lenti marl complex at Budafapuszta. This brings the producing horizon of the Lovászi sand group below the Lenti marl horizon.

The important point, however, is that the lower portion of the Pannonian series although prevailingly marly in this area does contain good petroliferous sands which may lie as much as 400 meters above the Pannonian-Miocene contact, as at Budafapuszta, or may be within 150 meters of the base of the Pannonian, as at Lovászi.

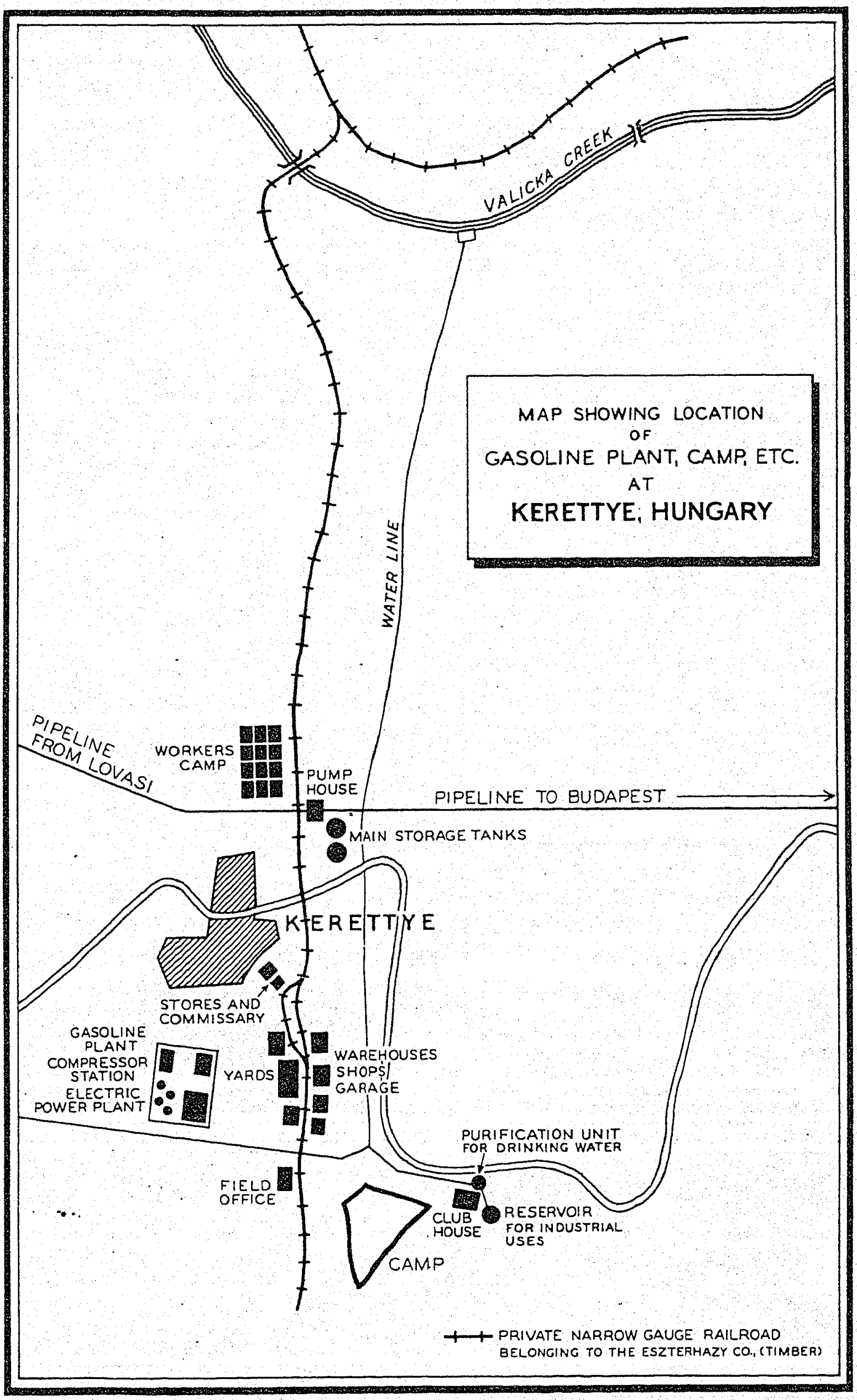
From the results of the first wells drilled at Lovászi it appears reasonable to assume that the Lovászi group of sands will be fairly continuous over the whole structure and provide a reliable horizon for development.

2.5.4 Producing Practice

Oil treatment.- Salt water and emulsions were found in a very few of the producing wells in the Budafapuszta and Lovászi fields. We have been informed by the officials of the Standard Oil Co. (N.J.) that these emulsions were dropped out quite readily by the application of heat. No serious trouble is anticipated in treating the oil in either of these fields wherever emulsions may occur.

Summary remarks.- Except for a few isolated cases, all production was flowing. The wells were flowed to a gathering station (about 10-15 wells to a station), and from there the oil was pumped to the pipe-line terminal.

A gathering station consisted of two or three separators and a battery of tanks. The latter were all of standard size with capacities of about 300 barrels each, and could be readily transported by railroad or truck.


VALICKA CREEK
MAP SHOWING LOCATION
OF
GASOLINE PLANT, CAMP, ETC.
AT
KERETTYE, HUNGARY
WATER LINE
PIPELINE FROM LOVASI
WORKERS CAMP
PUMP HOUSE
PIPELINE TO BUDAPEST
MAIN STORAGE TANKS
KERETTYE
STORES AND COMMISSARY
GASOLINE PLANT
COMPRESSOR STATION
ELECTRIC POWER PLANT
YARDS
WAREHOUSES
SHOPS
GARAGE
PURIFICATION UNIT FOR DRINKING WATER
FIELD OFFICE
CLUB HOUSE
RESERVOIR FOR INDUSTRIAL USES
CAMP
PRIVATE NARROW GAUGE RAILROAD
BELONGING TO THE ESZTERHAZY CO., (TIMBER)

The Budafapuszta main station consisted of two 10,000 barrel tanks. The erection of others was contemplated.

At Lovászi there was one 10,000 barrel tank.

There are no maps in the United States which show the location of gathering station, flow lines, gas lines, water lines, etc. In general it may be said that the field pipe-line system was adequate. All lines were buried.

The wells were flowed through beans. As a general average about 6 to 7 mm was most common. Some were on 10 mm, others as low as 4 mm. The gas was collected for the casinghead plant and most of the surplus gas was injected into the producing formations for pressure maintenance. Since the sands are very lenticular not all sands were being repressured.

At Lovászi no repressuring had been started. However, repressuring of this field was contemplated, to begin upon the completion of the charcoal absorption plant, scheduled for completion in 1942.

The oil is extremely paraffinous and in winter, special go-devil crews kept running go-devils through the flow lines. Some lines had to be freed of paraffin more than once daily. At each well there was a go-devil station for inserting the go-devil into the line and at the separator there was a station for the recovery of the instrument.

A go-devil was run through the main pipe lines about once a week.

STATISTICAL SUMMARY OF OPERATIONS, BUDAFAPUSZTA AND LOVÁSZI FIELDS

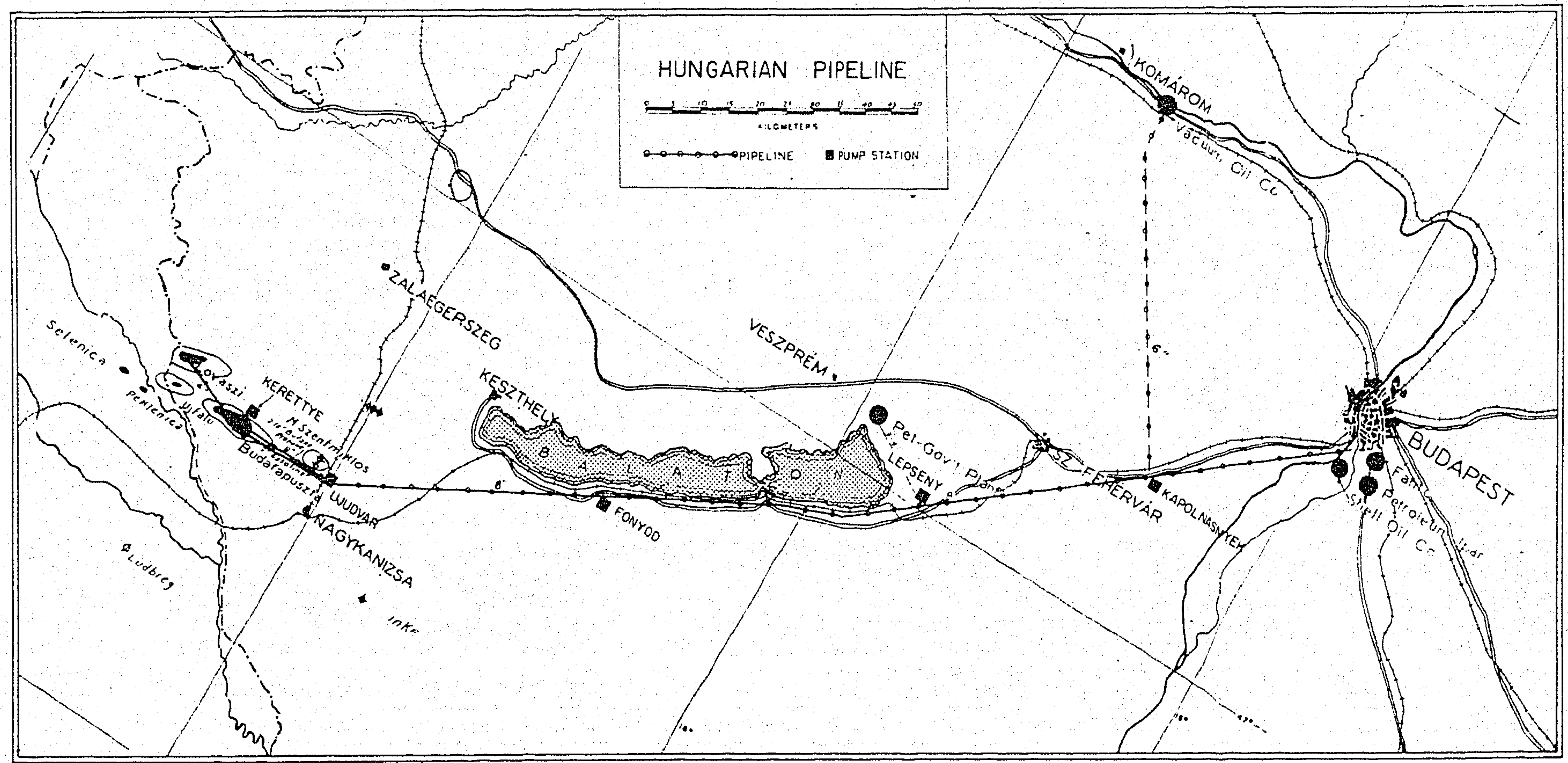
Hungary, Field	Year of Discovery	Area Proved Acres: Oil	Area Proved Acres: Gas	Total Oil Production, Barrels: To End of 1941	Total Oil Production, Barrels: During 1941	Total Gas Production Millions cu. ft.: During 1941	Number of Oil and/or Gas Wells: Completed to end of 1941	During 1941: Completed	During 1941: Abandoned	End of 1941: Temporarily Shut down	End of 1941: Producing Oil	End of 1941: Producing Gas
Budafapuszta	1937	3,000	640	5,442,800	2,187,090	About 10	66	15	-	-	56	2
Lovászi	1940	2,990	-	1,035,900	1,004,040	x	20	18	-	-	20	1

Hungary, Field	Oil Production Methods End of 1941: Number of wells Flowing	Oil Production Methods End of 1941: Number of wells Artificial Lift	Reservoir Pressure, lb. per square inch: Initial	Reservoir Pressure, lb. per square inch: Average at end of 1939	Repressuring Operation	Character of Oil: Gravity A.P.I. at 60° F. Weighted Average	Character of Oil: Sulphur, Per Cent	Producing Formation: Name	Age	Character	Porosity	Depth Average Feet: Top Producing Zone	Depth Average Feet: Bottom Producing Wells	Net Thickness Average Feet	Structure
Budafapuszta	About 60	-	Approx. 1,400	1,390	Pressure Maintenance	42°	0.15%	Budafa, Zala, Lispe	Pliocene	S	20%	4,500'	-	39	Anticline
Lovászi	About 20	-	-	-		47°	-	Rétka and Fákn	Pliocene	S	-	5,000'	-	75	Anticline

Hungary, Field	Deepest Zone Tested to end of 1941: Name	Deepest Zone Tested to end of 1941: Depth of Hole in Feet	Production Year 1937	Production Year 1938	Production Year 1939	Production Year 1940	Estimated No. Wells Completed 1940	Production Estimated 1941	Estimated No. Wells Completed 1941	Production Estimated 1942	Estimated No. Wells Completed 1942	Production Estimated 1943	Estimated No. Wells Completed 1943	Remarks
Budafapuszta	Miocene	7,500	10,120	998,420	1,102,640	1,914,550	25	2,187,090	15	-	Drilled	-	-	All locations drilled up
Lovászi	Top Miocene	-	-	-	-	21,160	2	1,004,040	18	5,619,300	41	9,696,500	60	All locations drilled up

2.6 PROSPECTIVE STRUCTURES

Hahót structure.- From the end of the year 1938 the Hungarian Government prohibited the export of maps. Since Hahót, a promising geophysical structure some 15 miles southwest of Lake Balaton, was discovered after that year, there are no geologic maps of it available in the United States. However, a well drilled on the western part of the Hahót structure strongly suggested that the lower Pannonian beds were present in that area and very possibly would extend in flank position around this structure. The Standard Oil Co. (N.J.) officials classify it as probably productive.



HUNGARIAN PIPELINE
KILOMETERS
PIPELINE
PUMP STATION
KOMÁROM
Vacuum Oil Co
ZALAEGERSZEG
VESZPRÉM
KESZTHELY
BALATON
Pet-Gov't Plant
LEPSENY
SZ. FEHÉRVÁR
KAPOLNASNYEK
BUDAPEST
Shell Oil Co
FONYOD
UJUDVAR
NAGYKANIZSA
KERETTYE
Budafapuszta
Selenica
Ludbreg
6"

Inke structure.- Inke, likewise a promising geophysical structure located some 20 miles south of the western extremity of Lake Balaton, was discovered, like Hahót, after the year 1938, hence, there are also no geologic maps of this structure available. However, the Standard Oil Co. (N.J.) officials classify it as probably productive.

A test of this structure during the year 1942 was contemplated. No later information has been obtained, but in view of the generally active exploration policy of the Germans it is considered probable that this structure actively is being tested.

Other geophysical structures.- In addition to the above, other geophysical structures were discovered by M.A.O.R.T. The gravity meter, checked by the magnatometer, and the torsion balance, likewise checked by the magnatometer, were the methods used in discovering them. The Budafapuszta and Lovászi fields were checked in detail with the reflection seismograph. Reflection seismograph profiles were also run over some of the other structures. The M.A.O.R.T. organization also did some detailed reflection seismograph work on Kaposvár as well as in the broken up Mecsek mountains southeast of the town of Pécs, in the southeastern part of the M.A.O.R.T. concession.

2.7 PIPE LINES

Pipe-line stations.- As indicated on the map on page 39, a pipe line has been constructed from the oil producing areas in southwestern Hungary to Budapest. This line is 8 inches in diameter and about 210 kilometers in length. It was begun by M.A.O.R.T. in May, 1940, and completed in December, 1941. Its capacity is dependent on the number of pipe-line stations which might be constructed. Our best information as to the status of these stations is as follows:

Kerettye and
Kápolnásynék: It is believed certain that these stations have been built.

Ujudvar : Construction of these stations is probable.

Lepsény :
Fonyód : Construction of these stations is possible.

The probable locations of these stations are indicated on the map on page 39. However, the locations shown should not be regarded as exact, inasmuch as the sites had not been finally decided upon when the last of the oil company executives left Hungary in January 1942.

Capacity of main line.- The capacity of the line will vary depending on the number of pump stations installed, as follows:

1 station	-	14,000 barrels per day
3 stations	-	20,000 " " "
5 stations	-	25,000 " " "

Other miscellaneous pertinent information concerning the pipe line is as follows:

(1) Lovászi to Kerettye.- This is a 6-inch line for the transportation of the Lovászi production.

(2) Kerettye.- There are believed to be from three to four 10,000-barrel tanks for storage at this station.

(3) Kerettye to Ujudvar.- A 2-inch line for casinghead gasoline, and a 2 1/2-inch line for butane-propane are laid alongside the 8-inch crude oil line.

(4) Ujudvar.- In addition to the pump station that probably has been constructed here, there is a 60-car loading rack for rail transport of crude. If a pump station should have been installed at this point, presumably there would also have been installed at least one 10,000-barrel storage tank.

Possibilities and projects.- (1) Fonyód.- A pump station with one 10,000-barrel storage tank may be built within two miles of this point.

(2) Lepseny.- A pump station with one 10,000-barrel storage tank may be built within one or two miles of this point.

(3) Lepseny to Pét.- A 3- or 4-inch pipe line to connect with the small Government refinery at Pét is known to have been under consideration by the Hungarian Government.

(4) Kápolnásnyék to Komárom.- A 6-inch line is known to have been projected, and probably has been built, to connect with the Vacuum Oil Company refinery near Komárom.

(5) Budapest tank farm.- A tank farm is located on a hill near Budapest, probably with three or four 10,000-barrel crude oil storage tanks. The crude oil is gravitated from these tanks to the Fanto and Shell refineries.

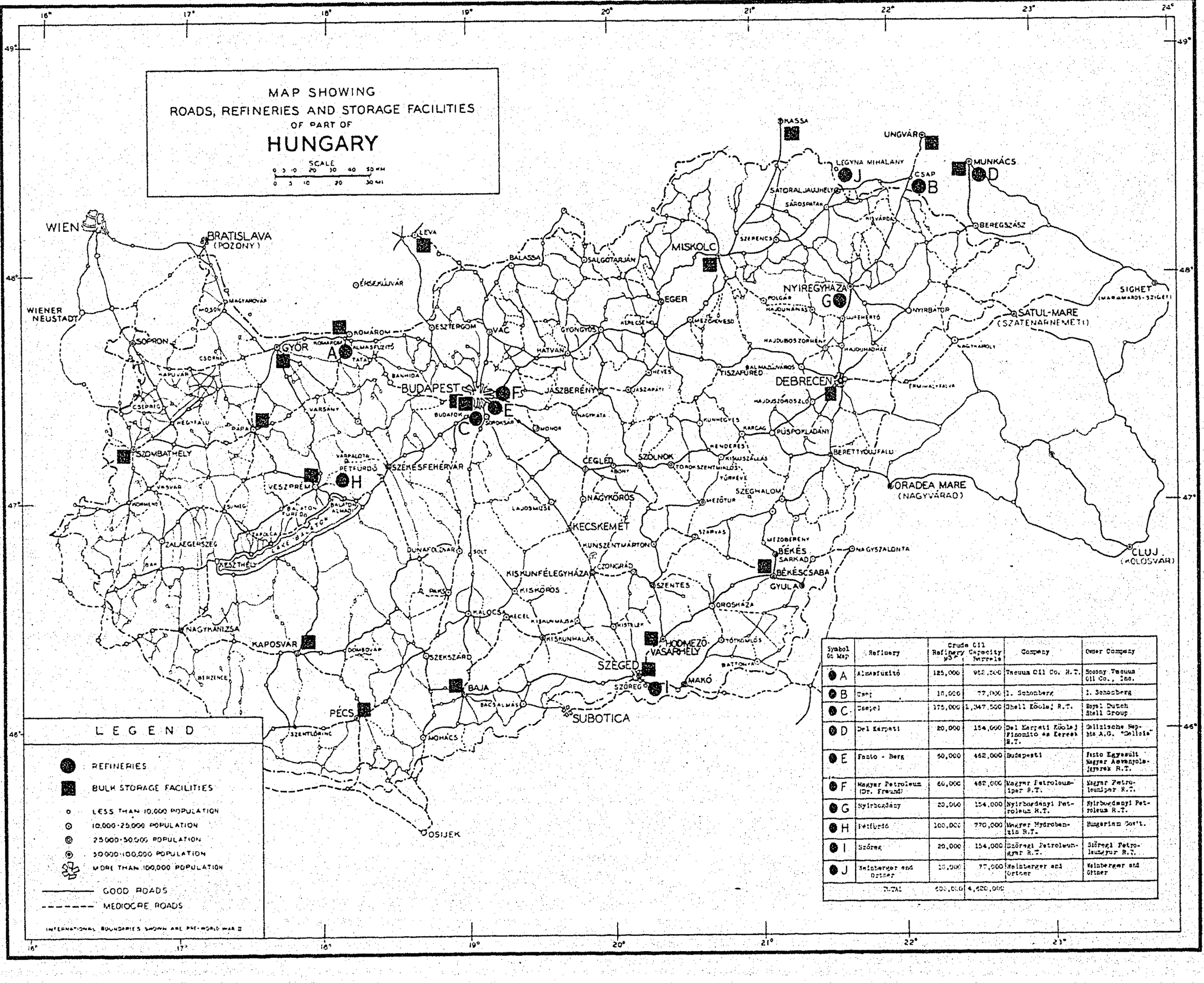
Pipe-line practices.- The pipe lines are all welded. Owing to the scarcity of asphalts for coatings, wherever the lines were laid through particularly corrosive soils, wrapping was applied. The ditches, about three feet deep, were hand dug by local labor. As the crude is very paraffinous it was necessary to provide go-devil stations on the main lines. No telephone line was installed along the right-of-way because the required material was not available at the time.

2.8 ESTIMATES OF PRODUCTION

See Appendix 2, pages 95 to 99.

MAP SHOWING ROADS, REFINERIES AND STORAGE FACILITIES OF PART OF HUNGARY

SCALE
0 5 10 20 30 40 50 KM
0 5 10 20 30 MI



LEGEND

- REFINERIES
- BULK STORAGE FACILITIES
- LESS THAN 10,000 POPULATION
- 10,000-25,000 POPULATION
- 25,000-50,000 POPULATION
- 50,000-100,000 POPULATION
- MORE THAN 100,000 POPULATION
- GOOD ROADS
- MEDIOCRE ROADS

INTERNATIONAL BOUNDARIES SHOWN ARE PRE-WORLD WAR II

Symbol on Map	Refinery	Crude Oil Refinery Capacity m³	Crude Oil Refinery Capacity Barrels	Company	Owner Company
A	Almásfüzitő	125,000	982,500	Vacuum Oil Co. R.T.	Socony Vacuum Oil Co., Inc.
B	Csap	10,000	77,000	I. Schonberg	I. Schonberg
C	Csepel	175,000	1,347,500	Shell Kőolaj R.T.	Royal Dutch Shell Group
D	Del Kárpáti	20,000	154,000	Del Kárpáti Kőolaj Finomító és Kereskedő R.T.	Galizische Naphta A.G. "Galicia"
E	Fanto - Berg	50,000	462,000	Budapesti	Fanto Egyesült Magyar Ásványolajipari Rt.
F	Magyar Petroleum (Dr. Freund)	60,000	462,000	Magyar Petroleumipar R.T.	Magyar Petroleumipar R.T.
G	Nyirbogdány	20,000	154,000	Nyirbogdányi Petroleum R.T.	Nyirbogdányi Petroleum R.T.
H	Petfürdő	100,000	770,000	Magyar Hydrobenzin R.T.	Hungarian Gov't.
I	Szőreg	20,000	154,000	Szőregi Petroleum-gyár R.T.	Szőregi Petroleumgyar R.T.
J	Weinberger and Ortner	10,000	77,000	Weinberger and Ortner	Weinberger and Ortner
	TOTAL	600,000	4,620,000		

3.0 R E F I N I N G

3.1 INTRODUCTION

3.1.1 General Remarks

There are ten operable refineries in Hungary. These are all comparatively small plants, only five being capable of running over 100 metric tons of crude oil daily. The latter, representing 85 per cent of the refining capacity of the country, are the Vacuum Oil Company's plant at Almásfüzitő, Shell's Csepel refinery on Csepel Island at Budapest, the Magyar Hydrogénbenzin refinery at Pétfürdő which belongs to the Hungarian Government, and the independent refineries of Fanto and Magyar Petroleumipar in Budapest.

All these plants were designed to run "artificial crude" imported from Rumania. This was a mixture of products in the proportions specified by the purchaser. This mixture was imported and then redistilled into its original components in Hungarian refineries. This practice was designed to save taxes, for Rumania heavily taxed exports of crude oil and Hungary imposed a heavy burden on imports of refined products.

After the discovery of oil in the Budafapuszta field of Hungary in 1937, the refineries were pressed by the Hungarian Government to run Hungarian crude oil. To do this the installation of dewaxing equipment to handle the waxy Hungarian crude was necessary and some of the more important plants began the installation of the equipment while others were shut down. Because of the high percentage of virgin naptha contained in the crude oil, cracking equipment is of no great utility for Hungarian crude oil except for octane improvement. Thus, while the Hungarian Government asked some of the companies to install cracking plants, the companies were not very responsive and in 1938 the Government built a more or less experimental unit at Pétfürdő with one cracking unit with a capacity of 420 barrels a day. High octane gasoline could not be made by any of the refineries of Hungary as none of them had polymerization, isomerization, alkylation or other units required for its manufacture.

3.1.2 An Evaluation of Hungarian Crude Oil

Practically all of the Hungarian crude comes from the Budafapuszta and Lovászi fields. These crudes are about 42° and 39° A.P.I. (American Petroleum Institute) gravity respectively and contain 30 per cent to 40 per cent of low sulphur gasoline. For a typical example, Budafapuszta crude shows 28 per cent of 300 end point (E.P.) gasoline (65 Octane(O.N.). The diesel oil is of moderately high index but rather high pour. A small amount of high pour lube stock is obtainable and only a very small percentage of heavy residuum is obtained.

In Appendix 3 of this report are given analyses and evaluations of Budafapuszta crude. Unfortunately, the M.A.O.R.T. organization failed to get samples of Lovászi crude out of the country and no analyses are available for the crude from this field. For this reason the final evaluation of Hungarian crudes may vary from that given in this section.

Gasoline.- Lead susceptibility characteristics of the gasoline are not stated; therefore, lead requirements to produce 80 octane (O.N.) can only be surmised.

The distillation data of the gasoline fractions are not sufficiently complete to predict with accuracy the volatility characteristics of the gasolines, but distillation curves were interpolated as well as possible. These are shown in the figure on page 102. On these bases it is estimated:

STATISTICAL SUMMARY OF DATA ON REFINERIES IN HUNGARY

For the Year 1943

- = Not applicable
x = Data unknown
MT = Metric Ton

1.	Common name of Refinery		Almásfüzitő				Csap				Csepel				Dél-Kárpáti				Fanto (Berg)			
2.	Location of Refinery (a) Place		At Almásfüzitő, on south bank of Danube, about 4½ miles E. of Komárom ▲				Csap				Petroleum Port, Csepel Island, Budapest ▲				Munkács in NE corner of Hungary				Budapest, Soroksári-út 95, (South) ▲			
	(b) Index Map Coordinates	Lat. (a)	47° 44'				48° 26'				47° 26'				48° 26'				47° 27'			
		Long.	18° 9'				22° 15'				19° 3'				22° 44'				19° 5'			
3.	Refinery Capacity:	MT/yr	125,000				10,000				175,000				20,000				60,000			
		Bbls/day	2,850				220				4,000				450				1,300			
4.	Normal Throughput:	MT/yr	125,000				10,000				175,000				20,000				60,000			
		Bbls/day	2,850				220				4,000				450				1,300			
5.	Crude for which designed		Rumanian artificial				Rumanian artificial				Rumanian artificial				Rumanian artificial				Rumanian artificial			
6.	Crude used currently		Hungarian				Hungarian				Hungarian				Hungarian				Hungarian			
7.	Products made, running for maximum		Diesel and fuel oil				Diesel and Fuel oil				Diesel and fuel oil				Diesel and fuel oil				Diesel and fuel oil			
			% of Total	Metric Tons A Year			% of Total(1)	Metric Tons A Year			% of Total	Metric Tons A Year			% of Total	Metric Tons A Year			% of Total	Metric Tons A Year		
	Gasoline		24	30,203			25	x			24	42,000			26	5,200			24	14,400		
	Kerosine (Gas oil & Diesel oil)		41	51,596			50	x			45	78,750			48	9,600			46	27,600		
	Lubes		5	6,293			12	x			4	7,000			-				5	3,000		
	Fuel oil		21	26,427			-	x			18	31,500			15	3,000			15	9,000		
	Asphalt		-	-			-	x			-	-			-	-			-	-		
	Refinery Fuel & Loss, and Misc.		9	11,326			13	x			9	15,750			11	2,200			10	6,000		
	Totals		100	125,844			100	x			100	175,000			100	20,000			100	60,000		
8.	Refining Units (a) Crude distillation facilities		Foster Wheeler atmospheric vacuum pipe still				x				Pipe still for 400 metric tons per day total				Shell stills				Shell Stills			
	(b) Cracking facilities		None				None				None				None				None			
	(c) White products finishing facilities		Yes				Yes				Yes				Yes				Yes			
	(d) Lube facilities		Usual acid treating; 12 rerun shell stills of 1,000 B/D total				x				Foster Wheeler vacuum pipe stills for 90 metric tons per day total				Yes				Acid treating			
	(e) Hydrogenation, Alkylation, etc.		None				None				None				None				None			
	(f) Asphalt facilities		Blowing plant (b)				x				Blowing plant (c)				x				x			
	(g) Gas Plant		x				x				x				x				x			
	(h) Specialties		Wax, grease (b)				x				Wax, butane and grease (d)				x				x			
	(i) Boiler Plant		Yes (b)				x				Yes (d)				x				Yes (f)			
	(j) Power Plant		x				x				Yes (d)				x				x			
9.	Tankage Capacity:	Black: M³	66,497				x				26,000				x				x			
		Bbls.	418,934				x				163,800				x				x			
		White: M³	15,100				x				31,000 (e)				x				x			
		Bbls.	95,132				x				195,300				x				x			
		Total: M³	81,597				x				57,000				x				x			
		Bbls.	514,067				x				359,100				x				x			
10.	Construction: (a) When built:		Foster Wheeler atmospheric pipe still--1929				x				Pipe stills--1938				x				x			
	(b) Built by what concern:						x				Foster Wheeler				x				x			
	(c) Flow plans and working drawings in possession of whom:		Foster Wheeler and Vacuum Oil Co. H.T.				x				Foster Wheeler and Shell Kőolaj H.T.				x				x			
11.	Name of Company		Vacuum Oil Co., H.T.				I. Schonberg				Shell Kőolaj H.T.				Dél-Kárpáti Kőolaj Finomító és Kereak, H.T.				Fanto Egyesült Magyar Ásványolajgyárak H.T.			
12.	Address of Company		Budapest V, Zrinyi utca 7				x				Budapest V. József-tér 5				Munkács (Mukacevo)				Budapest VII., Erzsébet körut 6			
13.	Affiliations of Company. (a) Name of owner firm)		Socony-Vacuum Oil Co. Inc.				x				Royal Dutch Shell group				Galicia				Société Continentale (h)			
	(b) Address of owner firm		26 Broadway, New York, N.Y.				x				St. Helen's Court London, E.C.3, England											

1.	Common name of Refinery	Magyar Petroleumipar R.T.																		
2.	Location of Refinery (a) Place	Budapest Ken-utca 8, (South) ▲																		
	(b) Index Map Coordinates Lat. (a)	47° 27'																		
	Long.	19° 6'																		
3.	Refinery Capacity: MT/yr	60,000																		
	Bbls/day	1,300																		
4.	Normal Throughput: MT/yr	60,000																		
	Bbls/day	1,300																		
5.	Crude for which designed	Rumanian artificial																		
6.	Crude used currently	Hungarian																		
7.	Products made, running for maximum	Diesel and fuel oil																		
		% of Total	Metric Tons A Year																	
	Gasoline	23	13,800																	
	Kerosine (Gas oil & Diesel oil)	44	26,400																	
	Lubes	5	3,000																	
	Fuel oil	20	12,000																	
	Asphalt	-	-																	
	Refinery Fuel & Loss, and Misc.	8	4,800																	
	Totals	100	60,000																	
8.	Refining Units (a) Crude distillation facilities	Shell stills																		
	(b) Cracking facilities	None																		
	(c) White products finishing facilities	Yes																		
	(d) Lube facilities	Acid and dewaxing																		
	(e) Hydrogenation, Alkylation, etc.	None																		
	(f) Asphalt facilities	Yes																		
	(g) Gas Plant	x																		
	(h) Specialties	Wax and axle grease (g)																		
	(i) Boiler Plant	Yes (f)																		
	(j) Power Plant	x																		
9.	Tankage Capacity: Black: M³	x																		
	Bbls.	x																		
	White: M³	x																		
	Bbls.	x																		
	Total: M³	x																		
	Bbls.	x																		
10.	Construction: (a) When built:	x																		
	(b) Built by what concern:	x																		
	(c) Flow plans and working drawings in possession of whom:	x																		
11.	Name of Company	Magyar Petroleumipar R.T.																		
12.	Address of Company	Budapest VI, Andrássy-út 53.																		
13.	Affiliations of Company. (a) Name of owner firm)	Magyar Petroleumipar R.T.																		
	(b) Address of owner firm	Budapest VI, Andrássy-út 53																		

REMARKS: (a) Latitudes and longitudes taken from Index-Gazetteer to The Times Sunday Atlas of the World, London, 1922; edited by John Bartholomew, The Edinburgh Geographical Institute, except those marked ▲ which are estimated. (b) Orally from R. G. Niezel of Standard-Vacuum of Croatia, Ltd; also in the Socony-Vacuum Oil Co. Inc. written reports on Hungarian facilities. (c) Letter of June 28, 1943 from Mr. Frank J. Hopwood, Asiatic Petroleum Corp., to Mr. E. M. Butterworth, PAW. (d) Refinery layout, with letter dated December 9, 1943 from Mr. J. P. Berkin, Asiatic Petroleum Corp., to Mr. E. M. Butterworth, PAW. (e) Including intermediate oils. (f) From aerial photographs. (g) Letter of March 23, 1943 from Mr. N. Feith to Mr. E. M. Butterworth. (h) Société Continentale de Gestion, Monaco--holding company by Austrian Creditanstalt, Wien. (i) Date for 1938.

1. The 0-400° F. range gasoline (end point 383° F.) would probably not quite meet U.S.A. Grade A distillation specifications, particularly after stabilization to eight pounds Reid Vapor Pressure (R.V.P.). In addition it would likely require more than 3 cc. tetra ethyl lead to meet octane requirements.

2. The 0-350° F. range gasoline (end point 351° F.) would almost certainly meet Grade A distillation specifications even after the stabilization required to meet eight pounds Reid vapor pressure (R.V.P.) specification. It might possibly meet Grade B distillation specifications, being somewhat doubtful at the 10 per cent point. It would not require stabilization to meet Reid vapor pressure (R.V.P.) requirements of Grade B. By a slight reduction in average boiling point with small reduction in yield, Grade B specifications as to boiling range and Reid vapor pressure can certainly be met, but probably more than 3 cc. tetra ethyl lead would still be required to meet octane specifications.

3. The 0-300° F. range gasoline (end point 298° F.) will meet Grade B and proposed grade specifications as to boiling range but will require stabilization to meet proposed Reid vapor pressure requirements and probably to meet Grade B requirements. It is believed that this product would become 80 octane with not to exceed 3 cc. tetra ethyl lead.

Inasmuch as Hungary is north of the 45th parallel, it is suggested that Grade B gasoline would be required. The crude will yield approximately 40 per cent of a product (351° end point), which should meet all Grade B specifications, except that it may not meet octane requirements with a maximum of 3 cc. tetra ethyl lead. It will almost certainly yield 32 per cent of a product (298° end point) which when stabilized would meet all Grade B and proposed grade specifications with not to exceed 3 cc. tetra ethyl lead.

In all cases it is almost certain that stability requirements will be met without the use of an inhibitor.

Automotive diesel fuel.- Evaluation data again are not sufficiently complete to predict precisely the yield of automotive diesel fuel obtainable from the crude after producing 80 octane motor fuel base stock. It is believed, however, that the following may be done:

1. If 300° F. end point gasoline is made (32.0 per cent) the fraction 32.4 to 75.0 per cent should pass all specification requirements except probably flash point. To meet flash point specifications it will likely be necessary to make a slop naphtha cut between the gasoline and the diesel fuel. This fraction would amount to approximately 5 per cent and might be blended into fuel oil bottoms. The net yield of diesel fuel would be about 37 per cent.

2. If gasoline with an end point higher than 300° end point is taken, a smaller amount of slop would have to be taken, decreasing as the end point of the gasoline is increased. With 350o end point gasoline (very likely as low as 325 end point) no slop would be cut and about 33 per cent of gas-oil could be made which would meet specifications except as to pour point (+5° F).

Fuel oil.- The fuel oil which will be left after taking off this specification automotive diesel fuel would be characterized by a pour point of 100-110° F. It would, therefore, have to be cut back by a substantial part of the diesel oil, or be visbroken, in order to render it suitable for use except where heating arrangements are available to overcome its high pour. This 24 per cent bottom contains motor lubricating oil which after dewaxing and acid treating would have a viscosity index of about 75 and would represent about 7 1/2 per cent on crude.

46 - REFINING
Summary

STATISTICAL SUMMARY OF DATA ON REFINERIES IN HUNGARY
For the Year 1943

\- = Not applicable
x = Data unknown
MT = Metric Ton

1. Common name of Refinery		Nyirbogdányi		Pétfürdo		Szőreg			Neiraeuser & Orther		
2. Location of Refinery (a) Place		Nyirbogdányi		Pétfürdő ▲		Szőreg			Lenyna Refinery		
(b) Index Map Coordinates	lat. (b)	48° 3'		47° 11'		46° 13'			48° 21'		
	long.	21 52'		18 9'		20 12'			21 37'		
3. Refinery Capacity	MT/yr	20,000		100,000		20,000			10,000		
	Bbls/day	450		2,300		450			220		
4. Normal throughput:	MT/yr	20,000		100,000		20,000			10,000		
	Bbls/day	450		2,200		450			220		
5. Crude for which designed		Rumanian artificial		Rumanian artificial		Rumanian artificial			Rumanian artificial		
6. Crude used currently		Hungarian		Hungarian		Rumanian			Hungarian		
7. Products made, running for maximum		Diesel and fuel oil		Diesel and fuel oil		Diesel and fuel oil			Diesel and fuel oil		
		% of Total	Metric Tons a Year	% of Total	Metric Tons a Year	% of Total	Metric Tons a Year		% of Total	Metric Tons a Year	
Gasoline		26	5,200			20	4,000		x	x	
Kerosine Gas oil & Diesel oil)		63	12,600			60	12,000		80	x	
Lubes		-	-	D . T .		-	-		-	x	
Fuel oil		11	2,200			20	4,000		-	x	
Asphalt		-	-	U N K N O W N		-	-				
Refinery Fuel & Loss, etc.-Etc.		10	2,000			10	2,000		10		
Totals		100	21,800			100	20,000		100	x	
8. Refining Units (a) Crude distillation facilities		Shell stills		Pipe still for 2,250 B/D		Shell stills			x		
(b) Cracking facilities		None		Small experimental Dubbs cracker for 400 B/D		None			None		
(c) White products finishing facilities		Yes		Yes		Yes			Yes		
(d) Lube facilities		Yes		Modern lube plant		Yes			x		
(e) Hydrogenation, Alkylation, etc.		None		None		None			None		
(f) Asphalt facilities		Yes		x		x			x		
(g) Gas Plant		x		x		x			x		
(h) Specialties		Axle grease (b)		x		x			x		
(i) Boiler Plant		x		x		x			x		
(j) Power Plant		x		x		x			x		
9. Tankage Capacity: Black:	M3.	x		x		x			x		
	Bbls.	x		x		x			x		
White:	M3	x		x		x			x		
	Bbls.	x		x		x			x		
Total:	M3	x		x		x			x		
	Bbls.	x		x		x			x		
10. Construction: (a) When built:		x		Orsecer--1938		x			x		
(b) Built by what concern		x		Universal Oil Products		x			x		
(c) Flow plans and working drawings in possession of whom:		x		Universal Oil Products ; Magyar Hydrobenzin R.T.		x			x		
11. Name of Company		Nyirbogdányi Petroleum R.T.		Magyar Hydrobenzin R.T.		Szőregi Petroleumgyar R.T.			Weinberger & Orther		
12. Address of Company		Nyirbogdány, Hungary		Ilador utca 21, Budapest V		József Nádor-tér 6 Budapest V					
13. Affiliations of Company (a) Name of owner firm		Nyirbogdányi Petroleum R.T.		Hungarian Government					x		
(b) Address of owner firm		Nyirbogdány, Hungary		-		József Nádor tér 6 Budapest V			x		

REMARKS: (a) Latitudes and longitudes taken from Index-Gazetteer to "The Times" Sunday Atlas of the World, London, 1922; edited by John Bartholomew, The Edinburgh Geographical Institute, except those marked ▲ which are estimated. (b) Letter of March 22, 1948 from Mr. N. Feith to Mr. E. M. Butterworth, [illegible] (c) This data for 1938.

3.1.3 Refinery Situation in Hungary in 1938 (a)

Refinery	Crude Oil Refining Capacity Barrels Per Day	Origin of Crude Used	Company	Owner Company
Almásfüzitő	1,500	Hungarian and Rumanian	Vacuum Oil Co., R.T.	Socony-Vacuum Oil Co., Inc.
Csap	60	Rumanian	I. Schonberg	I. Schonberg
Csepel	2,860	10% Hungarian and 90% Rumanian	Shell Kőolaj, R.T.	Royal Dutch Shell group
Dél-Kárpáti	775	Rumanian	Dél-Kárpáti Kőolaj Finomitó és Keresk R.T.	Galizische Naphta A. G. "Galicia"
Fanto (Berg) (Movi)	910 120(b)	x Shut down	Budapesti Ásványolaj-Fanto	Fanto Egyesült Magyar Ásványolaj-gyárak R.T.
Hazai	610	Shut down	Hazai Kőolaj-ipar, R. T.	Société Française Industrielle et Commerciale des Pétroles.
Magyar Petroleumipar	1,219	Hungarian and Rumanian	Magyar Petroleumipar R. T.	Magyar Petroleumipar R. T.
Nyirbogdányi	300	Rumanian	Nyirbogdányi Petroleum R.T.	Nyirbogdányi Petroleum R. T.
Pétfürdő	(c)	Hungarian	Magyar Hydrobenzin R. T.	Hungarian Gov't.
Szőreg	245	Hungarian and Rumanian	Szőregi Petroleumgyár R. T.	Szőregi Petroleumgyár R. T.
Weinberger and Ortner	245	Rumanian	Weinberger and Ortner	Weinberger and Ortner
Total	8,844			

3.1.4 Indigenous Crude Oil Supplies

A pipe line was completed in 1942 from the oil fields, located in the southwestern part of the country to the Budapest refining area with a connecting line to the Vacuum Oil Company's plant at Almásfüzitő. By the same year the country's ability to produce crude oil surpassed refining capacity of the country and the Hungarians began to export a limited amount of crude oil and probably opened up certain small refineries which had been inactive.

3.1.5 Extensions and New Plants

It had been planned to add vacuum facilities to the pipe still at the

(a) From a letter from Socony-Vacuum Oil Co. Inc., dated March 26, 1943.
(b) A gasoline treating plant.
(c) Cracking capacity of 630 barrels per day or 90 metric tons per day.

Almásfüzitő refinery, increasing its capacity from 1,520 barrels per day to 2,860 barrels per day. However, the Socony-Vacuum Oil Co. Inc. believes this work was not carried out, but this plant did increase its lube oil facilities.

The Csepel refinery of the Royal Dutch Shell group has been reported to have expanded its crude distillation facilities to 175,000 metric tons (4,000 barrels a day). The Fanto refinery in Budapest, likewise, is believed to have been expanded recently.

A modern lube plant is understood to have been installed at the recently completed Pétfürdő refinery. This plant is the only one in Hungary that has cracking facilities but this equipment is believed to be only an experimental unit. Prior to the installation of lube facilities here and at Almásfüzitő, lube products were of low quality and consisted principally of cylinder oil.

It has been reported that a new plant is under construction at Lispe, in the heart of the producing fields. According to reports, this refinery is being built by M.A.O.R.T. (Magyar Amerikai Olajipari R.T.), a Standard Oil Company subsidiary and the owner of the Budafapuszta oil fields, and was still under construction in August 1943. It is assumed that it is not yet in operation.

Aerial reconnaisance shows that a new refinery has been constructed on the Danube, approximately two miles east of the Almásfüzitő refinery. There is not yet sufficient material available to permit the estimating of the capacity of this refinery.

3.1.6 Present Situation

The following summarizes the present status of Hungarian refineries according to the best available information:

Status of Hungarian Refineries in 1944

Symbol on Map	Refinery	Crude Oil Refinery Capacity Per Year		Company	Owner Company
		Metric Tons	Barrels		
A	Almásfüzitő	125,000	962,500	Vacuum Oil Co.R.T.	Socony Vacuum Oil Co. Inc.
B	Csap	10,000	77,000	I. Schonberg	I. Schonberg
C	Csepel	175,000	1,347,500	Shell Kőolaj R.T.	Royal Dutch Shell group
D	Dél-Kárpáti	20,000	154,000	Dél-Kárpáti Kőolaj Finomitó és Keresk R.T.	Galizische Naphta A.G. "Galicia"
E	Fanto (Berg) (a)	60,000	462,000	Budapesti Ásvány-olaj-Fanto	Fanto Egyesült Magyar Ásványolajgyárak R.T.
F	Magyar Petroleum-ipar	60,000	462,000	Magyar Petroleum-ipar R.T.	Magyar Petroleum-ipar R.T.
G	Nyirbogdányi	20,000	154,000	Nyirbogdányi Petroleum R.T.	Nyirbogdányi Petroleum R.T.
H	Pétfürdő	100,000	770,000	Magyar Hydrobenzin R.T.	Hungarian Gov't.
I	Szőreg	20,000	154,000	Szőregi Petroleum-gyar R.T.	Szőregi Petroleum-gyar R.T.
J	Weinberger and Ortner	10,000	77,000	Weinberger and Ortner	Weinberger and Ortner
	TOTAL	600,000	4,620,000		

(a) Not to be confused with the Fanto (Movi) plant which is shut down.

3.1.7 Inactive Plants

The Hazai refinery in Budapest.- The location of the Hazai refinery is shown on the map on page 60. The Enemy Oil Committee carries it as shut down and most of the equipment transferred to Shell's Csepel refinery. The Socony-Vacuum Oil Co. Inc reports its capacity in 1938 at 120 barrels a day.

The plant is located at Budapest-Kőbánya, Gyömröi -út 140, (East), and the full name of the company and the office address is: Hazai Kőolajipar Részvénytársaság (National Mineral Oil Industry Co.), Budapest V, Nádor-utca 7.

The Hazai company was controlled by a Czechoslovak firm, the "Apollo" Mineralöl-Raffinerie A.G. (Apollo Mineral Oil Refinery Co.), Bratislava, a controlling interest in which was held by the French owned Société Française de Pétroles de Tchéco-Slovaquie. This company in turn belonged to the French concern of Société Française Industrielle et Commerciale des Pétroles (the so-called Malopolska group) whose principal interests were in Poland.

In 1940 it was reported that Dynamit Nobel A.G., a subsidiary of the German Dye Trust, I.G. Farbenindustrie A.G., had acquired a majority shareholding in "Apollo" and it must thus be assumed that Hazai is now also under German control (a).

The Fanto plant in Pesterzsébet (South Budapest).- There was a fifth plant in the Budapest area, Balzsam-utca, in the district of Pesterzsébet, in the south of Budapest, sometimes called the MOVI plant, owned by Fanto. It is believed that this plant has been shut down for a long time and it is likely to have been dismantled. This small, old unit, was, however, not an oil refinery, properly speaking, but a gasoline treating plant. It was operated by the Magyar Olaj és Vegyi Ipar R.T., M.O.V.I., (Hungarian Oil and Chemical Industry Co.) which, as will be shown later was absorbed by Fanto.

3.2 STRATEGIC CONSIDERATIONS

Value to enemy.- While the capacities of the Hungarian refineries are small compared with other larger refineries in other Axis held European countries, their value to the enemy is greatly out of proportion to their capacities because of their strategic locations and because Hungarian crude oil is being produced in excess of Hungarian refining capacity. It may be assumed that the enemy will operate these refineries to capacity until forced out of the area and that he will destroy them upon leaving.

Possible value to Allies if captured intact.- Due to their proximity to ample crude supplies, large centers of consumption and cheap river transportation, these refineries would be invaluable to the Allies if captured intact--always bearing in mind the small capacity of the plants involved.

Effects of damage.- Successful bombing of the pipe stills of any one of the refineries would knock it out for at least six months. Destruction of specialized equipment such as hot oil pumps and control panels would probably cause refinery shut-downs of appreciable duration.

Owing to the high temperatures employed in the operations, refineries are more susceptible to sabotage operations than are distributing and producing operations. However, the mere bombing or firing of storage tanks alone, without accompanying damage to refinery machinery and stills would not necessarily cause any stoppage of actual refining operations.

(a) For discussion of the Hazai plant, see 3.1.3 and 3.1.6, pages 47 and 48.

TANKS			
VOC NUMBER	MEASUREMENTS DIAMETER	HEIGHT	USE
1,2,3	78'11"	37'9"	CRUDE OIL
6	39'5"	19'8"	BENZINE
7,8,9,10,22,26,45,46	32'10"	19'8"	BENZINE & DIST.
11,12,13	52'7"	29'7"	GAS OIL & S.W.O.
14,15,16,17,18,19,20,23,24,25,27,29,30,32,33 37,40,41,42,47,48,49,52,53,54,55,150,172	26'3"	13'2"	RUNNING TANKS & STORAGE
31,56,57,58,59	19'8"	9'10"	BENZINE LUBE OILS
34,35,36	29'7"	19'8"	PFF. DIST.
38	32'10"	19'8"	HOT WATER
39	32'10"	32'10"	INDUSTRY WATER
43,44	29'7"	13'2"	S.W.O.
51,52	26'3"	5'11"	TAR
INDECIPHERABLE	19'8"	11'6"	STRONG ACID
INDECIPHERABLE	26'3"	26'3"	SCALE WAX
145,146,147,152,153,154	92'1"	32'4"	CRUDE OIL & DIST.
INDECIPHERABLE	23'7"	29'7"	LUBE OIL
160,161,162,163	19'8"	13'2"	BENZINE
165	39'5"	32'10"	WAX DIST.
166,167,168,169,170,171	26'3"	19'8"	LUBE OILS

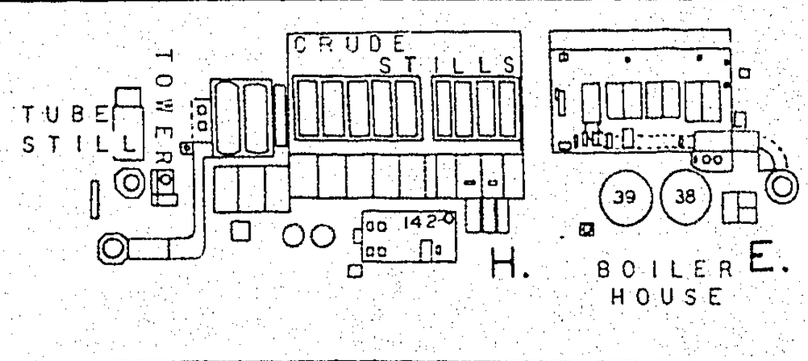
TANKS WITH FLOATING ROOF			
TANK NO.	DIAMETER	HEIGHT	USE
4,5	39' 5"	26' 4"	Benzine
21,28	26' 3"	19'	"

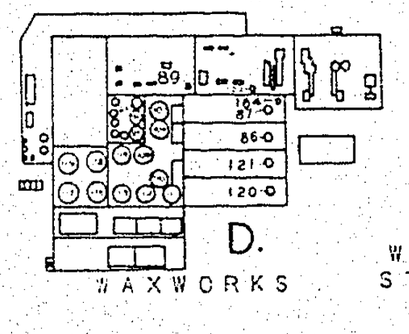
TANKAGE CAPACITIES	
	BARRELS,42's
Crude Oil	268.657
Gasoline and Kerosine	95.132
Lube Oils	55.532
Gas,Oil and Diesel Fuel	84.745
TOTAL	514.067

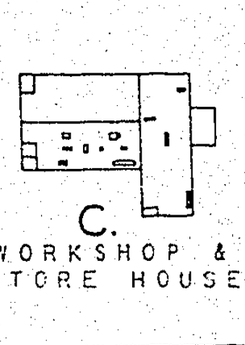
REFINERY OF VACUUM OIL CO., R.T. ALMASFÜZITŐ. HUNGARY

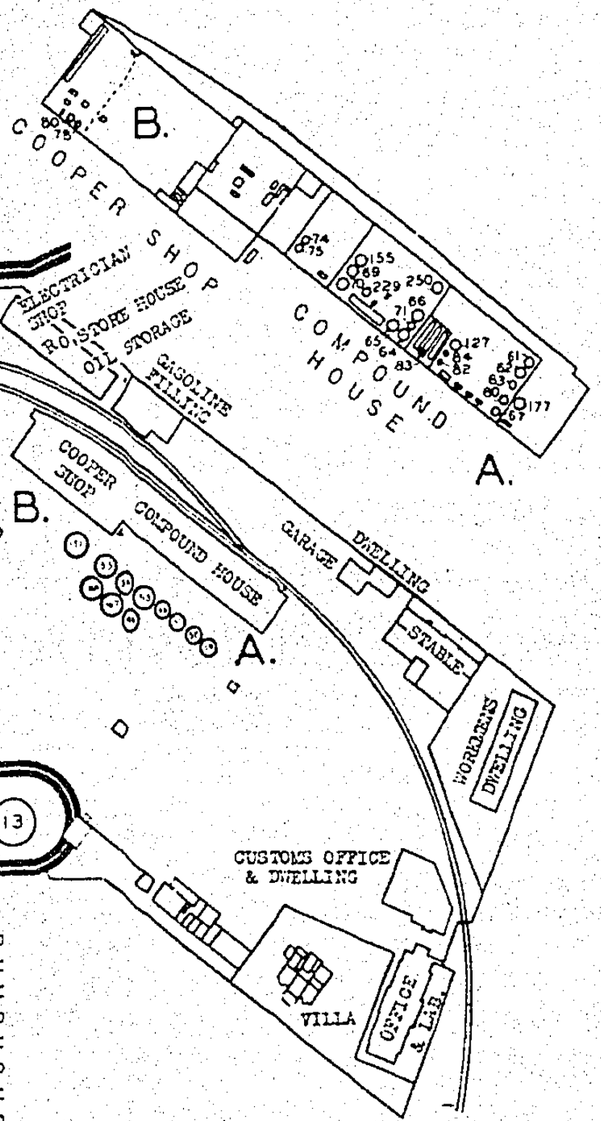
SCALE
0 100 200 300 400 500 FEET

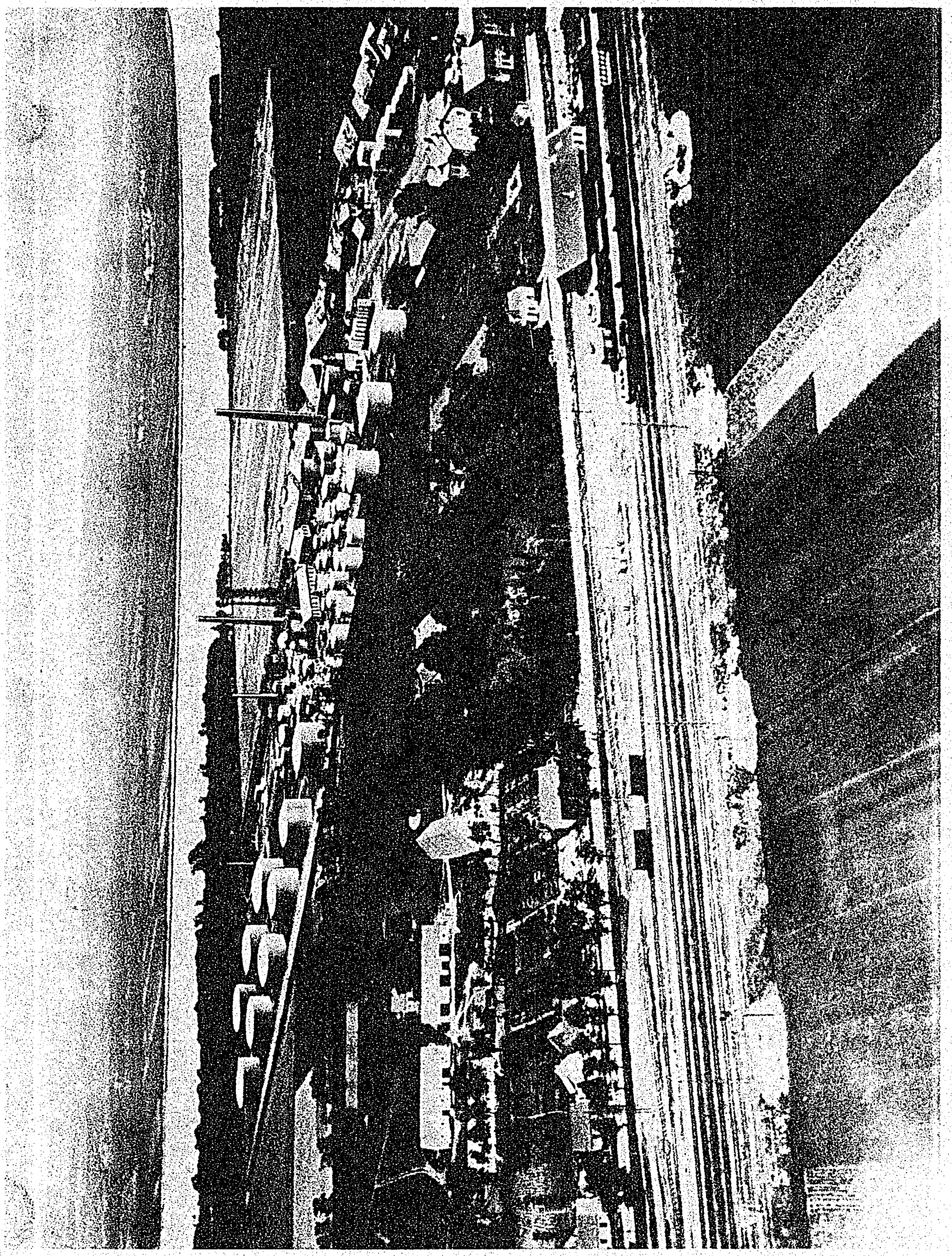
(DETAIL PLANS ARE DRAWN TWICE THE SCALE OF MAIN PLAN)











ALMÁSFÜZITŐ REFINERY, HUNGARY

3.3 ALMÁSFÜZITŐ - VACUUM REFINERY

Location.- This refinery is located at Almásfüzitő (map symbol A, page 42), on the south bank of the Danube, about 4 1/2 miles to the east of Komárom. Almásfüzitő is situated on the main railway and highway, Wien to Budapest.

Description.- This plant, owned by the Vacuum Oil Co. R.T., a subsidiary of Socony-Vacuum Oil Co. Inc., is the second largest in Hungary (a). Its pipe still, built by Foster Wheeler in 1929, had no vacuum stage at the time, but in 1941 Foster Wheeler planned to add the vacuum stage. Whether this has been done by the Germans is unknown. Lube facilities consisted of the usual acid treating and twelve rerun vacuum shell stills having a total daily capacity of 1,000 barrels. In 1940 a De Laval centrifuge two stage dewaxing unit was added to the plant. The grease manufactured is of a high grade. Asphalt facilities consist of a blowing plant. In addition, this refinery had an ethyl mixing unit, products of which were sold exclusively to airlines and to the Hungarian Government. A plan of this refinery is shown on page 50 and a general view on page 51.

The following more detailed catalog of facilities at this refinery was furnished by the Socony-Vacuum Oil Co. Inc. (b):

Description of Equipment Owned by Company - Manufacturing

Process Departments and Equipment	Daily Rated Capacity (Barrels-42 Gallons)
1 Foster Wheeler Pipe Still, Atmospheric Stage	2,850
12 Crude Shell Stills	1,500
4 Asphalt Shell Stills	
2 Steam Stills (Shell Type)	
Wax Plant - Pressing, sweating and filtering wax distillates - low temperature. Contact or Percolation filtering - Packing of paraffin scale wax and cake wax.	
Dewaxing - Lube Oils - 3 De Laval centrifuges	
Continuous Acid Treating - Lube Oils - 2 De Laval Centrifuges	
Asphalt blocking plant for Pitch and road asphalt	
Separating and regenerating used acid	
Compounding of lube oils	
Grease manufacturing	
Barrel preparation and re-conditioning plant	
Storage and running tanks, as follows: - as of 12/31/39	
Crude oil	268,657
Gasoline and kerosine	95,132
Lube oils	65,532
Gas - diesel - fuel oils	84,745
Total	514,066
Boiler house and water treating plant	
Control laboratory, fully equipped	

(a) The largest plant is Shell's Csepel refinery in Budapest.
(b) In mimeographed report dated January 11, 1944, received by the Foreign Division, Petroleum Administration for War, New York, New York.

Mechanical shops - Storehouse

Office building - Employees' living quarters

Superintendent's dwelling house

Cafeteria and first aid

Office furniture and fixtures

On February 15, 1944, the following detailed information on this refinery was furnished by Mr. F. H. Langner, formerly of the Engineering Staff of the Vacuum Oil Company R.T., Budapest, who left Hungary in July, 1941--through the Socony-Vacuum Oil Co. Inc:

1. Distillation.- The Foster Wheeler atmospheric pipe still furnace was rebuilt so as to be able to increase the daily charge from 1,500 to 3,100 barrels (42 gallons). New oil and gas burners were also installed in the furnace.

2. Wax distillate pressing.- The chilling and refrigeration system of the wax distillation pressing was revamped. A hot and cold water circulating system of the sweating pans was installed to cut down the time cycle.

3. Dewaxing plant.- A complete centrifugal dewaxing plant was installed including chilling equipment and refrigeration producing machines. This installation resulted in a production of high grade dewaxed oils and also high melting-point petrolatum. A total equivalent of approximately $70,000 had been spent for equipment and labor by July 1941. One "Separator-Nobel" E-2-P centrifuge had been installed and two additional machines were purchased, each machine costing the equivalent of approximately $15,000.

A part of this plant had been converted from direct current to alternating current so as to be able to obtain constant speed, and explosion proof motors for use at this plant.

4. Contant filtration.- Additional contact filter presses had been installed at this plant to take care of the increased requirements.

5. Compounding plant.- At this plant, the barrel preparation section had been revised to give more efficient handling and filling.

6. Boilerhouse.- The water treating plant had been revised so as to give scale free operation of the boilers. A lime pre-treating installation had also been made to give improved results and arrangements had been made to use process heated water at the water treating plant. Moreover, arrangements had been made to burn acid sludge under the boilers.

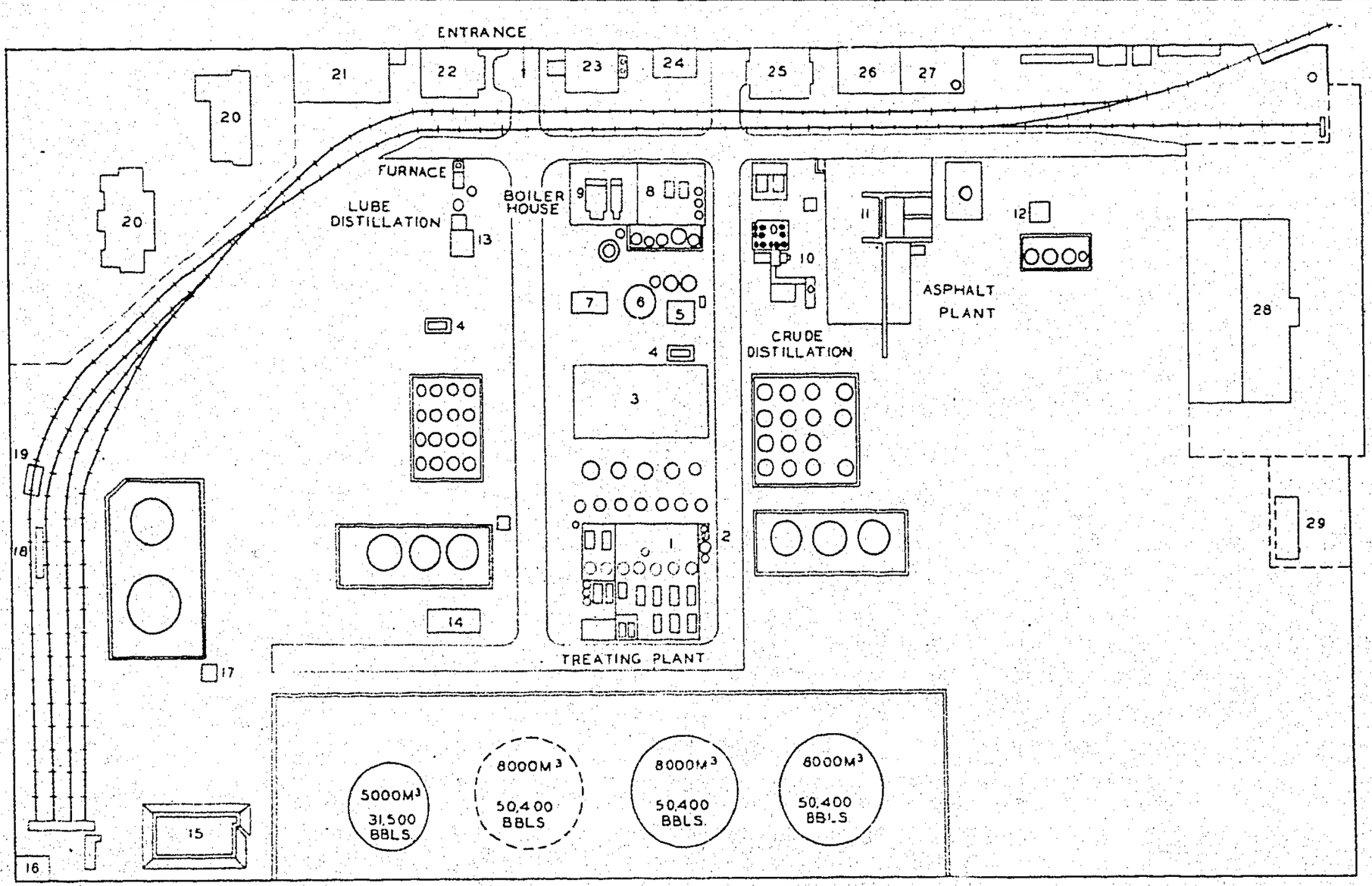
7. Steam distribution system.- The steam distribution system was revised so as to utilize the exhaust steam to better advantage and reduce wastage.

8. Loading facilities.- The loading facilities at the refinery had been doubled by adding a second railway siding at the compounding and shipping building.

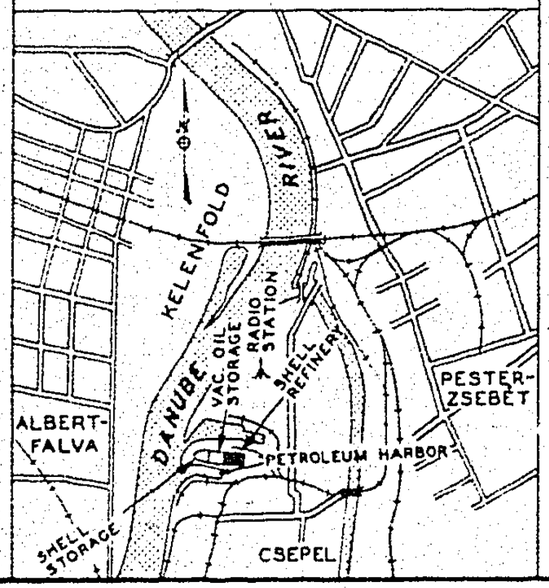
Supplementary land had been purchased adjacent to the refinery, so that houses for the operating personnel could be built. Plans had also been approved for the construction of these new houses, and by July 1941 some purchases had been made for this program of new construction.

3.4 CSAP - SCHONBERG REFINERY

Location.- This plant is located at Csap (Cop), (map symbol B, page 42), in the extreme northeastern part of the country, and approximately 30 miles west of Munkács at 48° 26' N. latitude and 22° 15' E. longitude.



LOCATION SKETCH



LEGEND

1 TREATING PLANT	16 WATER PUMPHOUSE
2 ALCOHOL TREATING PLANT	17 CRUDE PUMPHOUSE
3 CENTRAL PUMPHOUSE	18 FILLING STATION
4 FIRE SHED	19 LOCOMOTIVE SHED
5 FIRE FOAM INSTALLATION	20 DWELLING HOUSES
6 WATER TOWER	21 LABORATORY
7 OIL CATCHER	22 OFFICE
8 ASPHALT BLOWING	23 POWER STATION
9 BOILER HOUSE	24 WASH ROOM
10 DISTILLING PLANT	25 WORKSHOP
11 ASPHALT MOULDING	26 STORE
12 ASPHALT MIXING	27 GREASE MANUFACTURING
13 LUB. OIL DISTILLATION	28 GARAGE
14 OIL CATCHER	29 BUTANE STORAGE
15 OIL CATCHER	

SHELL CSEPEL REFINERY

BUDAPEST, HUNGARY

REFINERY LAYOUT

SCALE (APPROXIMATE)

0 100 200 300 FEET

0 50 100 METERS

REFINING - 33
Csepel

Csepel

Description.- Very little information is available on this small refinery which is owned by I. Schonberg. It is believed to be operating at its maximum capacity of 10,000 metric tons a year or 220 barrels per day on Hungarian crude. In 1938, it is reported to have been operating on Rumanian crude at 60 barrels per day and to have produced 25 per cent gasoline, 50 per cent kerosine, 12 per cent lube oil and 13 per cent gas oil, fuel oil, diesel oil and refinery losses.

3.5 CSEPEL REFINERY - ROYAL DUTCH SHELL GROUP

Location.- This refinery is located on the island of Csepel, a large island in the Danube River in the southern section of Budapest (map symbal C, page 42). The refinery is on the "Petroleum Harbor" in the northwestern part of the island (see map, page 60).

Description.- Of all the refineries in Hungary, this refinery is the largest and most important. It is owned by the Shell Kőolaj R.T., a subsidiary of the Royal Dutch Shell group. The Foster Wheeler atmospheric vacuum pipe still has a daily total capacity of 400 metric tons (2,800 barrels) of crude and was built in 1928. The Foster Wheeler vacuum pipe still, which constituted the lube producing facility, has a total daily capacity of 90 metric tons. The Trumble plant, consisting of a battery of shell stills, is used for rerunning and standby. A plan of this refinery is published on page 55.

It has been recently reported that the crude distillation unit has been expanded to 4,000 barrels per day (175,000 metric tons per year). It has also been reported that the equipment for this expansion was derived from the Hazai refinery, also located in Budapest and which has been dismantled (a).

3.6 DÉL-KÁRPÁTI REFINERY

Location.- This plant is located at Munkács (Mukacevo) in the extreme northeast corner of Hungary just north of the former boundary of Czechoslovakia at 48° 26' N. latitude and 22° 44' E. longitude (map symbol D, page 42).

Description.- This is a small refinery, never modernized, with a daily capacity of 450 barrels. It is owned by Dél-Kárpáti Kőolaj Finomitó és Keresk R.T., a subsidiary of the Galizische Naphta A.G. "Galicia". Very little is known about the plant other than the distillation units consists of shell stills and it has lube facilities. Its capacity is 20,000 metric tons a year or 450 barrels a day.

3.7 FANTO (BERG) REFINERY

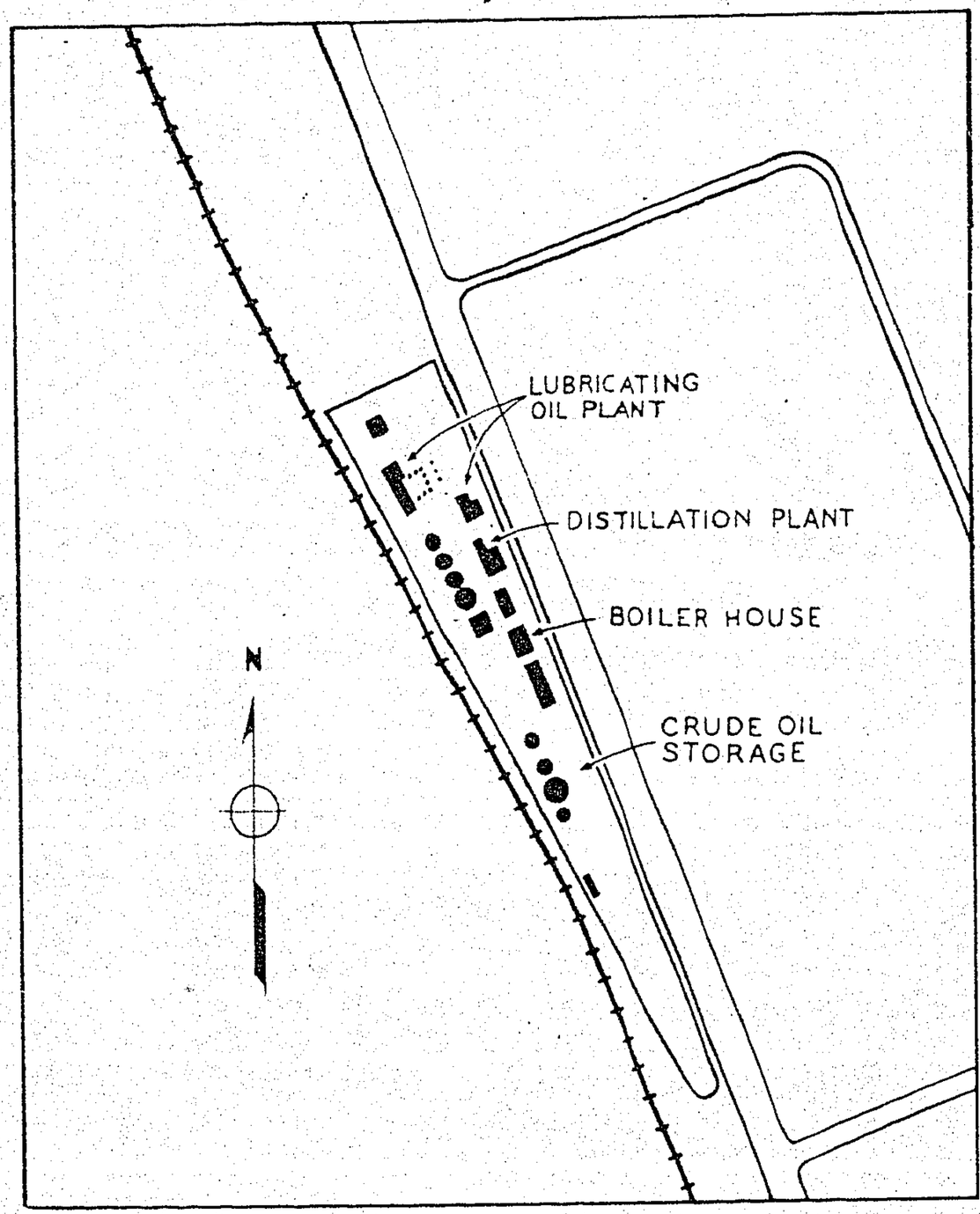
Location.- This refinery, which is also known as Egyesült refinery, is in a closely built-up section in Ferencváros district in the southeastern part of Budapest (map symbol E, page 42; also page 60).

Description.- Very little information is available on this old refinery, owned by the Budapesti Ásványolajgyár, R.T. (who acquired it from Berg and Co.), which is a subsidiary of the Fanto Egyesült Magyar Ásványolajgyárak R.T. This firm later was taken over by Société Continentale de Gestion, Monaco. Distillation unit consists of shell stills and the refinery is equipped to produce lube oils. It has been reported that the distillation unit has been expanded recently from a capacity of 910 barrels a day to 1,300 barrels per day. A plan of this refinery is shown on page 57.

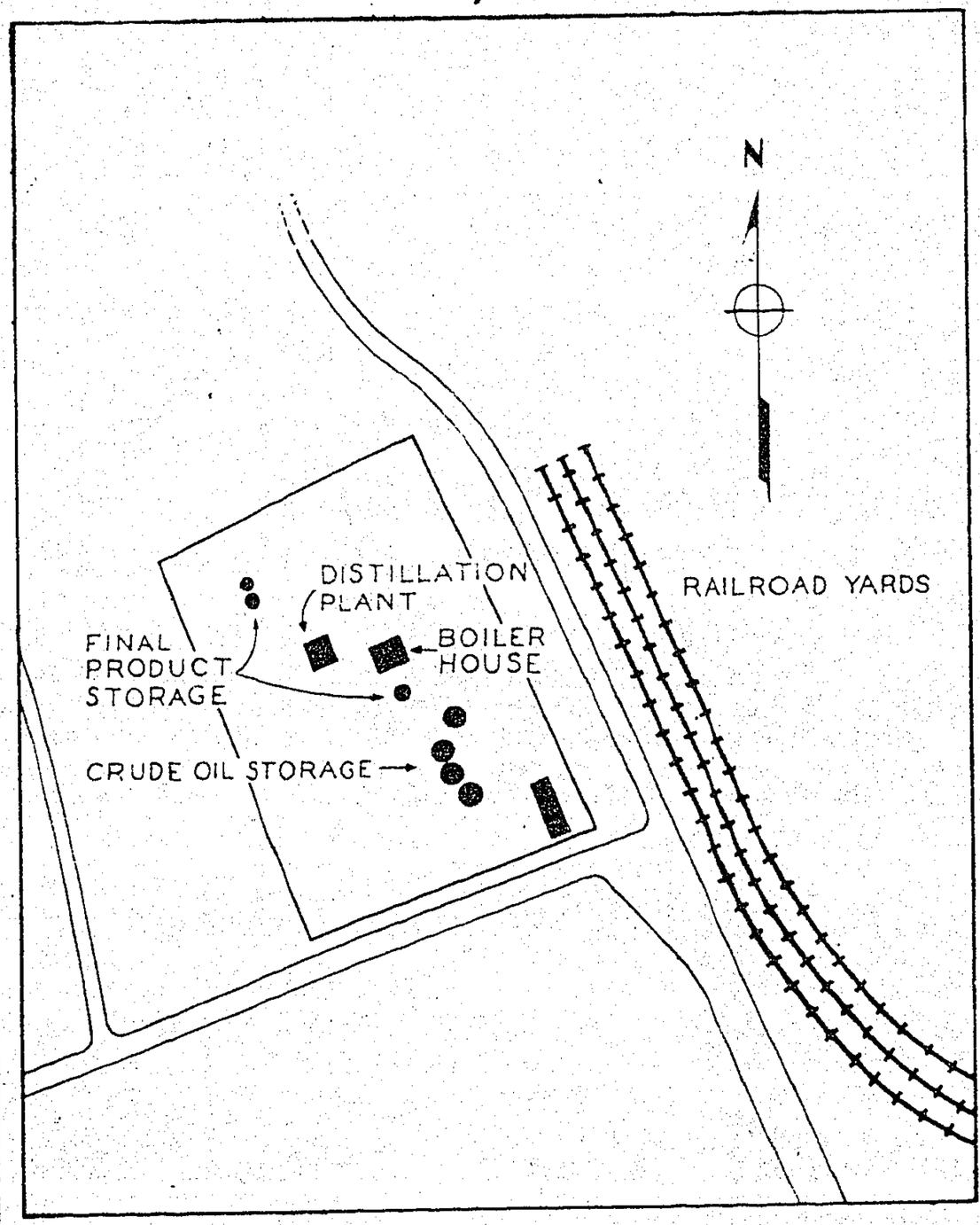
The owners of this refinery also own a small installation called Movi refinery located in the northern part of Budapest. This old unit has been shut down for years (b).

(a) For a discussion of this plant, see 3.1.3 and 3.1.6, pages 47 and 48.
(b) For a discussion of this plant, see 3.1.3, page 47.

Refinery of
FANTO EGYESŰLT MAGYAR ÁSVÁNYOLAJGYÁRAK R. T.
SOROKSÁRI-ÚT 9.5 (south)
BUDAPEST, HUNGARY



Refinery of
MAGYAR PETROLEUMIPAR R. T. (Dr. Freund)
KÉN-ÙTCA 8, (South)
BUDAPEST, HUNGARY



3.7.1 History of the Fanto Group

This concern, which had oil interests throughout the old Austrian-Hungarian monarchy, had to be reorganized after the last war to take care of its business in the several new nations. In Hungary these interests were taken over by the Magyar Fantomüvek Részvénytársaság (Hungarian Fanto Works Co.), which in 1925 acquired, inter alia, a gasoline refinery at Gátoraljaujhely, situated in northeast Hungary, and the Pesterzsébet plant.

Some time later this company acquired a controlling interest in the Budapesti Ásványolajgyár Részvénytársaság (Budapest Mineral Oil Works Co.), which owned the oil refinery at Soroksári-út, 95 and which it had itself formerly acquired from the firm of Berg and Co. The Budapesti was subsequently amalgamated with the Ásványolaj Finomitó Részvénytársaság (Mineral Oil Refining Co.) with the latter firm disappearing. Both these companies, the Budapesti and Ásványolaj, had been controlled by the Dutch "Photogen" concern before they were acquired by Fanto.

Some years before the war all the Fanto interests in Hungary were merged into one company, the Fanto Egyesült Magyar Ásványolajgyárak Résvénytársaság (Fanto Associated Hungarian Mineral Oil Works Co.), which absorbed, in addition to the above mentioned companies, (Magyar Fantomüvek and Budapesti Ásványolaj), the Magyar Olaj-és Vegyi-Ipar R.T. - M.O.V.I.- (Hungarian Oil and Chemical Industry Co.), together with the following distributing companies controlled by the latter: Felsö Magyar Olaj és Vegy-Ipar R.T. - F.O.V.I.- (Upper Hungarian Oil and Chemical Industry Co.), Nyugat Magyar Olaj és Vegy-Ipar R.T. - N.Y.O.V.I. (Western Hungary Oil and Chemical Industry Co.), and "Unio" Olaj Gépkenöcs és Vegyitermék Gyar R.T. (Union Manufacturing Co. for Oil, Machine Greases and Chemical Products).

In the course of this amalgamation, which was carried out in connection with a reorganization of all Fanto interests in Europe, in the early 'thirties, the Hungarian Fanto like all other Fanto companies came under control of a newly formed Dutch holding company, the Maatschappij voor Beheer van Effecten, Amsterdam (Company for the Administration of Securities). All the shares of this company were in turn taken over by the Société Continentale de Gestion, Monaco, a company formed for the concentration and utilization of the foreign assets of the Austrian Creditanstalt, Wien.

What has happened to the group's interests since the beginning of the war is not known.

3.8 MAGYAR PETROLEUMIPAR REFINERY

Location.- This refinery, is located near the Ferencváros freight terminal in southeast Budapest (map symbol F, page 42 also on page 60).

Description.- All that is known about this old plant is that it has shell stills for crude distillation and lube oil facilities, and that it is owned by Magyar Petroleumipar R.T. (Hungarian Petroleum Industry Co.) of Budapest VI, Andrássy-út 53. It has not been modernized. Its capacity is 60,000 metric tons a year or 1,300 barrels a day. A plan of the refinery is given on page 57.

3.9 NYIRBOGDÁNYI REFINERY

Location.- The refinery is located at Nyirbogdányi near Nyiregháza in northeastern Hungary at 48° 3' latude, 21° 52' longitude (map symbol G, page 42).

Description.- Information pertaining to this small refinery is not available. All that is known is that it is an old plant and has not been modernized. Crude distillation facilities consist of shell stills with a capacity of 20,000 metric tons a year or 450 barrels a day. The plant has equipment to produce lube oil. It is owned by the Nyirbogdányi Petroleum R.T.

3.10 PÉTFÜRDŐ REFINERY (GOVERNMENT)

Location.- This refinery is located at Pétfürdő just north of the northern end of Lake Balaton at 47° 11' N. latitude, 18° 8' E. longitude (map symbol H, page 42).

Description.- Details of this modern plant, which is owned by Magyar Hydrobenzin R.T., a Government owned company, are unavailable. It is known that the pipe still is capable of handling 2,200 barrels of crude oil per day, that a small experimental Dubbs cracker was installed in 1938 with a rated capacity of 420 barrels per day feed stock; and that the refinery has treating, rerun and sweetening facilities for 300 barrels per day. It has been reported that a modern lube plant has been installed.

3.11 SZŐREG REFINERY

Location.- This refinery is located at Szőreg which is just south of Szeged on the Tisza River at 46° 13' N. latitude, 20° 12' E. longitude (map symbol I, page 42).

Description.- Otner than the fact that this small refinery is an old plant and has shell stills for crude distillation and lube facilities with a capacity for crude of 20,000 metric tons a year or 450 barrels a day, nothing else is known. It is owned by the Szőregi Petroleumgyar R.T.

3.12 WEINBERGER AND ORTNER REFINERY

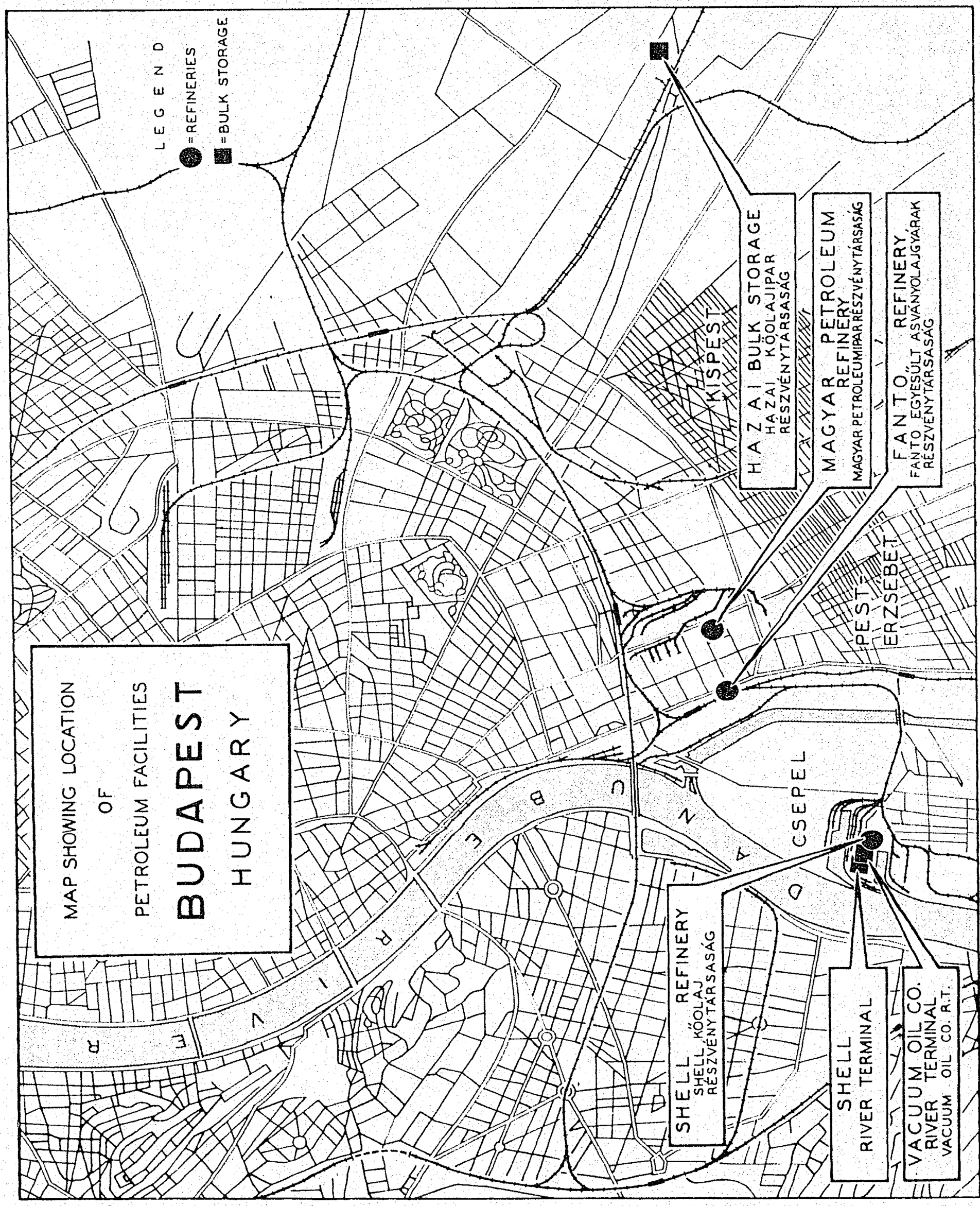
Location.- This refinery is reported to be located at Alsonhályi or Legyna Mihalány near Sátoraljaujhely in northeastern Hungary (map symbol J, page 42).

Description.- There are no data available relative to this small refinery, which is owned by Weinberger and Ortner. It is reported to have produced in 1938, gasoline-35 per cent; kerosine-50 per cent; lube oils-5 per cent and gas oil, diesel oil, fuel oil, refinery fuel and losses--10 per cent. Its capacity is 10,000 metric tons a year or 220 barrels a day.

3.13 MISCELLANEOUS REFINERIES

The Salgótarján Coal Company is known to have operated in 1937 a pilot plant for the hydrogenation of coal. This plant was located in the town of Salgótarján, about 50 miles northeast of Budapest. The size of the pilot plant is unknown.

Budapest


LEGEND
= REFINERIES
= BULK STORAGE
MAP SHOWING LOCATION
OF
PETROLEUM FACILITIES
BUDAPEST
HUNGARY
HAZAI BULK STORAGE
HAZAI KŐOLAJIPAR
RÉSZVÉNYTÁRSASÁG
MAGYAR PETROLEUM
REFINERY
MAGYAR PETROLEUMIPAR RÉSZVÉNYTÁRSASÁG
FANTO REFINERY
FANTO EGYESÜLT ASVANYOLAJGYÁRAK
RÉSZVÉNYTÁRSASÁG
KISPEST
PEST
ERZSEBET
CSEPEL
SHELL REFINERY
SHELL KŐOLAJ
RÉSZVÉNYTÁRSASÁG
SHELL
RIVER TERMINAL
VACUUM OIL CO.
RIVER TERMINAL
VACUUM OIL CO. R.T.

4.0 DISTRIBUTING

4.1 INTRODUCTION

4.1.1 General Remarks

In this section of the report are presented all the available information on distributing facilities in Hungary. The paucity of data on distributing facilities reflects in some degree the comparatively unimportant nature of the Hungarian market.

4.1.2 Strategic Considerations

Petroleum storage facilities are, of course, essential to the enemy's military and civil operations. Crude production must be cut down if there is no storage space available for the crude oil coming from the wells. Refineries cannot operate satisfactorily without adequate storage for crude oil, intermediate and finished products. Bulk storage at major transshipping and distributing centers is also of importance.

Oil storage, however, has not proven an exceptionally good target for aerial bombardment since it is seldom that any one plant is destroyed in its entirety and much of the damage is of a type that can be repaired or replaced comparatively easily. The most important Hungarian storage plants, however, present a highly concentrated target since they are located at the plants and refineries in and around Budapest (a). This tankage is above ground and fire basin walls usually consist of low earthen dykes between the tanks.

Owing to the inflammable nature of the contents, oil storage is susceptible to sabotage, though not to the extent that is commonly supposed. It is usually necessary to let the contents of a tank run to waste in the open before they can be fired. Larger tanks usually have a water seal which has to be drawn off first, thus increasing the difficulties. With the possible exception of operating refinery units extensive results from sabotage can hardly be expected. Acids or abrasives, properly introduced, are effective to a limited extent.

It is not considered likely that new additions to storage, due to wartime conditions, have been made.

Oil products in Hungary are moved by railway tank cars and by barges on the Danube River. Transportation is perhaps the weakest point in the Axis oil economy and likewise one of the most important. Unfortunately, transport is both a difficult and highly dispersed target and successful operations generally do not result in permanent damage. However, even temporary damage, if repeated often enough, both in the case of storage and of transport facilities, would have a serious result on enemy's oil economy.

4.2 DISTRIBUTING COMPANIES

The companies owning extensive distributing facilities in Hungary were as follows:

(a) Exceptions: The Vacuum Oil Company refinery at Almásfuzitő and the small inland bulk plants. The latter, although numerous, have very small individual capacities.

STATISTICAL SUMMARY OF STORAGE FACILITIES, HUNGARY

- = Not applicable
x = Data unknown
* = Capacities estimated.

IDENTIFICATION OF PLACES			IDENTIFICATION OF PLANTS		SITUATION OF STORAGE TANKS		CAPACITY OF STORAGE TANKS								REMARKS
	Locations on Index Map						Black		White		Total Plant		Total Place		
Places	Lat. ° m	Long. ° m	Owners of Plants	Locations of Plants	Under-ground	Above ground	M³	Barrels	M³	Barrels	M³	Barrels	M³	Barrels	
REFINERIES (a)															
Almásfüzitő ▲	47 44	18 9	Vacuum Oil Co. R.T.	About 7 miles east of Komárom, approximately 70 miles west of Budapest on the Danube.			56,096	353,402	25,402	160,664	81,598	514,066	81,598	514,066	
Budapest	47 27	19 5	Panto (See page	On eastern bank of the Danube River, Budapest			x	x	x	x	x	x	x	x	
	47 28	19 13	Hazai Kőolajipar R.T.	Southeast section of Budapest			x	x	x	x	x	x	x	x	Refining equipment reported dismantled.
	47 27	19 6	Magyar Petroleum-ipar R.T.	Southeast section of Budapest			x	x	x	x	x	x	x	x	
	47 26	19 3	Shell Kőolaj R.T.	On Island of Csepel, lower Danube. Southern tip of city.		26	x	x	x	x	x	x	42,150	265,608	Storage tanks only, excluding refinery working tanks. Total tankage, all types, equals 57,000 M³ or 359,100 barrels
Csap	48 26	22 15	I. Schenberg	30 miles west of Munkacs			x	x	x	x	x	x	x	x	Small capacity
Munkacs	48 26	22 44	Dél Kárpáti Kőolaj Finomító és Kereskedelmi R.T.	Extreme NE corner of Hungary			x	x	x	x	x	x	x	x	Small capacity
Nyirbogdány	48 -3	21 52	Nyirbogdányi Petroleum R.T.	Northeastern Hungary			x	x	x	x	x	x	x	x	
Pétfürdő ▲	47 11	18 8	Magyar Hydrobenzin R.T.	"			x	x	x	x	x	x	x	x	Modern plant. Company owned by Hungarian Government.
Sátoraljaujhely	48 24	21 40	Heinberger & Ortner	Alsohalyi or Legyma Mihalany			x	x	x	x	x	x	x	x	Small capacity
Szőreg	46 13	20 12	Szőregi Petroleum-gyar R.T.	On Tisza River just south of Szeged			x	x	x	x	x	x	x	x	Small capacity
RIVER TERMINALS															
Budapest ▲	47 26	19 3	Shell Kőolaj R.T.	On island of Csepel, lower Danube. Southern tip of city.		18	x	x	x	x	8,139	51,156	-	-	
	47 26	19 3	Steaua Magyar Kőolaj R.T.	Ibid.			x	x	x	x	x	x	x	x	
	47 26	19 3	Ungarisch-Belgische Mineralöl-A.G.	Ibid.			x	x	x	x	x	x	x	x	
	47 26	19 3	Vacuum Oil Co. R.T.	Ibid.		19	376	2,370	3,141	19,790	3,517	22,160	11,646	73,316	Two of these tanks, 25 barrels each, inside lub. oil warehouse.
INLAND BULK PLANTS															
Baja (Buta)	46 11	18 58	Vacuum Oil Co. R.T.	In or alongside R.R. freight yard.	4		-	-	102	640	102	640	102	640	
Békéscsaba	46 39	21 5	Vacuum Oil Co. R.T.	Ibid.	2		-	-	100	630	100	630	100	630	
Debrecen	47 32	21 37	Shell Kőolaj R.T.	Ibid	*		-	-	111	700	111	700	-	-	
	47 32	21 37	Vacuum Oil Co. R.T.	Ibid.	3		-	-	136	860	136	860	247	1,560	
Győr	47 41	17 38	Shell Kőolaj R.T.	Ibid.	*		-	-	111	700	111	700			

IDENTIFICATION OF PLACE

Places	Locations on Index Maps (a) Lat. ° m	Long. ° m	IDENTIFICATION OF PLANTS Owners of Plants	Locations of Plants	SITUATION OF STORAGE TANKS Under-ground	Above ground	CAPACITY OF STORAGE TANKS Black M³	Black Barrels	White M³	White Barrels	Total Plant M³	Total Plant Barrels	Total Place M³	Total Place Barrels	REMARKS
INLAND BULK PLANTS															
Győr	47 41	17 39	Vacuum Oil Co. R.T.	Ibid.	3		-	-	96	603	96	603	207	1,303	
Hódmezővásárhely	46 26	20 19	Vacuum Oil Co. R.T.	Ibid.	2		-	-	95	600	95	600	95	600	
Kaposvár	46 22	17 46	Fanto	Ibid.	*		-	-	87	550	87	550	-	-	
	46 22	17 48	Shell Kőolaj R.T.	Ibid.	*		-	-	111	700	111	700			
	46 22	17 48	Vacuum Oil Co. R.T.	Ibid.	4		-	-	102	640	102	640	300	1,890	
Kassa (Kosice)	48 44	21 16	Vacuum Oil Co. R.T.	Ibid.	3		-	--	120	756	120	756	120	756	
Komárom(Komarno)	47 46	18 8	Vacuum Oil Co. R.T.	Ibid.	1		-	-	26	167	26	167	26	167	
Léva (Levice)	48 14	18 36	Vacuum Oil Co. R.T.	Ibid.	1		-	-	21	133	21	133	21	133	
Miskolc (Borsod Village)	48 7	20 48	Fanto	Ibid.	*		-	-	40	250	40	250			
	48 7	20 48	Shell Kőolaj R.T.	Ibid.	*		-	-	87	550	87	550			
	48 7	20 48	Vacuum Oil Co. R.T.	Ibid.	3		-	-	51	320	51	320	178	1,120	Capacity may actually be somewhat greater.
Munkács(Mukacevo)	48 26	22 44	Vacuum Oil Co. R.T.	Ibid.	2		-	-	58	367	58	367	58	367	
Pápa	47 19	17 27	Fanto	Ibid.	*		-	-	87	550	87	550			
	47 19	17 27	Shell Kőolaj R.T.	Ibid.	*		-	-	111	700	111	700			
	47 19	17 27	Vacuum Oil Co. R.T.	Ibid.	3		-	-	76	480	76	480	274	1,730	
Pécs	46 4	18 13	Shell Kőolaj R.T.	In or adjacent R.R. freight yard.	*		-	-	87	550	87	550			
	46 4	18 13	Vacuum Oil Co. R.T.	Ibid.	2		-	-	95	600	95	600	182	1,150	
Szeged	46 15	20 9	Shell and others	Ibid.	*		-	-	317	2,000	317	2,000			
	46 15	20 9	Vacuum Oil Co. R.T.	Ibid.	3		-	-	132	830	132	830	449	2,830	
Székesfehérvár	47 12	18 25	Shell Kőolaj R.T.	Ibid.	*		-	-	40	250	40	250			
	47 12	18 25	Vacuum Oil Co. R.T.	Ibid.	3		-	-	104	656	104	656	144	906	
Szolnok	47 11	20 11	Shell Kőolaj R.T.	Ibid.	*		-	-	40	250	40	250			
	47 11	20 11	Vacuum Oil Co. R.T.	Ibid.	1		-	-	105	660	105	660	145	910	
Szombathely	47 14	16 37	Shell Kőolaj R.T.	Ibid.	1		-	-	87	550	87	550			
	47 14	16 37	Vacuum Oil Co. R.T.	Ibid.	1		-	-	21	133	21	133	108	683	
Tata	47 39	18 19	Vacuum Oil Co. R.T.	Ibid.	1		-	-	21	133	21	133	21	133	
Ungvar (Uzhorod)	48 40	22 16	Vacuum Oil Co. R.T.	Ibid.	2		-	-	58	367	58	367	58	367	
Veszprém	47 6	17 55	Shell Kőolaj R.T.	Ibid.	*		-	-	40	250	40	250			
	47 6	17 55	Vacuum Oil Co. R.T.	Ibid.	4		-	-	102	640	102	640	142	890	
Zalaegerszeg	46 51	16 51	Vacuum Oil Co. R.T.	Ibid.	1		-	-	49	310	49	310	49	310	

NOTE: Both Fanto and Shell are understood to have additional small inland bulk plants about which no details are available. Allocation of [illegible] products is on basis of pre-war operations and may have since been changed to meet current needs.

(a) Latitudes and longitudes taken from Index-Gazetteer to "The Times" Sunday Atlas of the World, London, 1922; edited by John Bartholomew, The Edinburgh Geographical Institute, except those marked ▲ which are estimated.

Company	Common Name or Symbol	Address of Head Office of Company	Name and Address of Owner Firm
Fanto Egyesült Magyar Ásványolajgyárak Részvénytársaság	Fanto	Budapest, VII, Erzsébet - körut 6	Société Continentale de Gestion, Monaco (a)
Shell Kőolaj Részvénytársaság	Shell	Budapest V. József-tér 5-6	Royal Dutch Shell group London, England
Vacuum Oil Co., Részvénytársaság	Vacuum	Budapest V, Zrinyi utca 7	Socony-Vacuum Oil Co. Inc., New York, New York

4.3 RIVER TERMINALS

The river terminals of the various companies were located on the Island of Csepel in the Danube River at Budapest. They were designed for the reception, storage and distribution of finished products. A layout plan for the Vacuum Oil Company plant is given on page 77. No plan of the Shell bulk plant is available, but the plan of the Shell Csepel refinery appears in the Refining Section, page 55, of this report. The Steaua Magyar Kőolaj, R.T. and the Ungarisch-Belgische Mineralöl A.G. both had bulk plants on Csepel Island but details concerning them are not available.

Bulk storage facilities of the Fanto Egyesült Magyar Ásványolajgyárak R.T., the Hazai Kőolajipar R.T., and the Magyar Petroleumipar, R.T. were located at their Budapest refineries.

Known locations of petroleum facilities are indicated on the map on page 60.

4.4 INLAND STORAGE FACILITIES

The three major distributing companies in Hungary, i.e., Fanto Egyesült Magyar Ásványolajgyárak R.T., Shell Kőolaj Részvénytársaság, and Vacuum Oil Co., R.T., owned a large number of small bulk plants scattered throughout the country. These bulk plants were generally supplied by rail and were, almost without exception, located in or near railway freight yards. In many cases the land belonged to the railways and the oil companies were permitted to lease the areas they required (b).

Railway tank cars varied in capacity between 10 and 16 metric tons (75 to 120 barrels approximately), the majority being of 15 tons (approximately 112 barrels) capacity. The Vacuum Oil Company owned 181 railway tank cars.

The average plant consisted of two or three underground tanks, a small warehouse for packaged products, a drum and tank truck filling rack, and a small office. Tanks were of the horizontal cylindrical type and of capacities varying between 150 and 450 barrels. Bulk products were received by railway tank cars which, in most cases, were unloaded into the storage tanks by gravity. Pumping equipment for filling drums and tank wagons within the plants was usually limited to small semi-rotary hand pumps. Layout plans of bulk plants owned by the Vacuum Oil Company and the Hazai Kőolajipar R.T. appear on pages 73 to 92 incl.

A summary of available data on the location and capacities of these bulk plants appears on page 62. The data concerning the Vacuum Oil Company's plants was supplied by that company via the Foreign Operations Committee(c). The data

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(a) Holding company owned by Austrian Creditanstalt, Wien.
(b) The Vacuum Oil Company reports that their bulk plants at Kaposvár, Kassa, Miskolc, Munkács, Székesfehérvár, Pécs and Ungvar were built on company owned land and all their other plants were built on leased land.
(c) Foreign Operations Committee of the Petroleum Administration For War. This committee requested similar information from London on the Shell companies' installation, but as yet none has been received for inland bulk stations.

on the Shell and the Fanto plants are incomplete, having been given by the former Vacuum Oil Company's Technical Supervisor of warehouses and service stations for Hungary (a), drawing on his personal memory of the area. Those data should, therefore, be used with caution. Information from this same source indicates that in most towns where the Vacuum Oil Company owned plants the Shell also owned plants of approximately similar design and capacity and also owned smaller kerosine tank plants in some 30 or more other localities. A partial list of towns where these tanks probably existed is as follows:

a. Region West of Budapest

Balatonfüred	Dombovár	Sopron
Bánhida	Kapuvar	Szekszárd
Berzencze	Keszthely	Varsány
Csepreg	Mohács	Vasvár
Csorna	Nagykanisza	

b. Region East of Budapest

Budafok	Kunszentmárton	Nagyváred
Karcag	Makó	Nyiregyháza
Kecskemet	Máramaros-sziget	Szarvas
Kiskunfélegyháza	Mezöberény	Szatmárnémeti
Kiskunhalas	Nagykáta	Szeghalom
Kolozsvár	Nagyszembat	

Products were delivered from the bulk plants to dealers and consumers by horse drawn wagons and tank carts as well as by motor trucks and tank trucks.

Many villages and rural communities received their supplies entirely in drums. Drum storage yards on railway land at the freight stations were usually rented by the companies for the purpose.

4.5 RETAIL MARKETING

Products.- The principal products handled in the interior bulk plants were motor gasoline and kerosine. Very little diesel or fuel oil was marketed, Hungary being predominantly an agricultural country with comparatively limited industrial development. A table showing consumption by products and the marketing position of each company for a representative year, 1938, **are given on pages 66 and 67.**

A large quantity of kerosine was sold, particularly in the villages and rural areas, for lighting purposes. Some was sold in drums, but much of it was delivered in bulk by horse-drawn tank wagons. These wagons, having capacities ranging from 400 to 800 gallons, operated out of the bulk plants and covered regular routes throughout the towns and countryside. Most of the grocery, hardware, and general merchandise shops were also kerosine retailers and had kerosine dispensing tanks in their shops. These shop tanks, which were usually on loan from the oil companies, varied in capacity from 20 to 60 gallons and were usually fitted with a simple piston pump and a gauging glass (b). A few of the larger dealers owned their own tanks.

Gasoline pumps, tanks, and filling stations.- Prior to the war Hungary was adequately supplied with retail gasoline outlets, exceeding 1,000 in number. These outlets usually consisted of a curbside pump with a small underground tank located in front of a shop or garage. A very few drive-in filling stations

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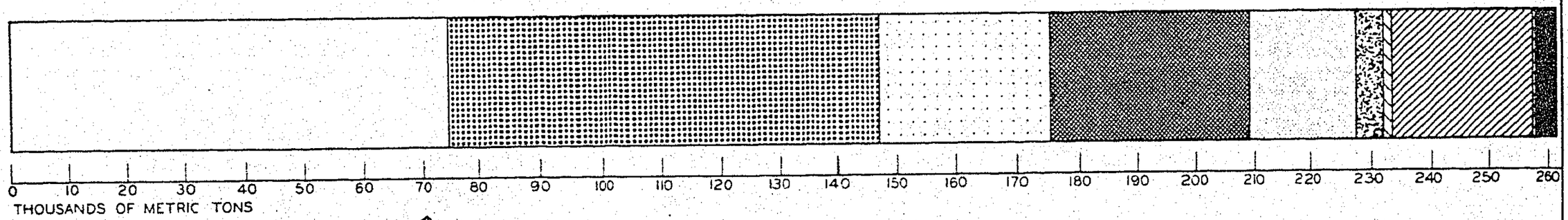
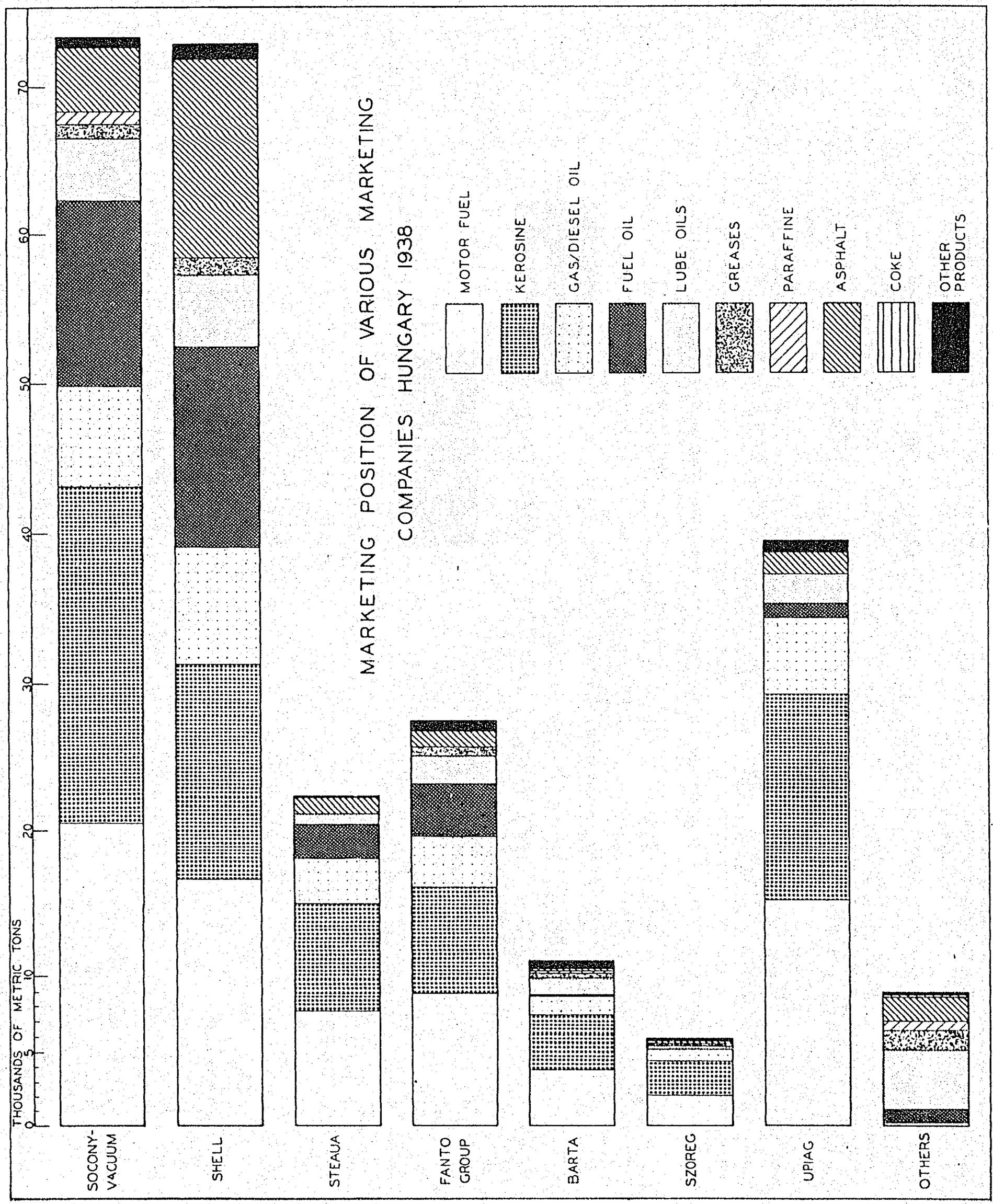
(a) Mr. P. A. Hohenberg
(b) The Vacuum Oil Company had 5,000 such tanks on loan to retailers and operated 50 horse-drawn kerosine tank wagons.

TOTAL CONSUMPTION HUNGARY 1938



(Metric Tons)

	Total Consumption	Vacuum	Shell	Steaua	Fanto Group	Barta	Szöregi	Upiag	Others
Motor Fuel	74 996	20 486	16 479	7 609	9 028	3 823	2 191	15 206	174
Kerosine	71 741	22 616	14 765	7 348	7 000	3 585	2 248	14 179	-
Gas/Diesel Oil	28 444	6 709	7 809	3 031	3 630	1 345	845	5 075	-
Fuel Oil	33 900	12 433	13 480	2 455	3 426	122	-	918	1 066
Lube Oils	18 698	4 271	4 782	626	1 916	1 081	245	1 868	3 909
Greases	4 155	959	1 052	-	615	240	90	-	1 199
Paraffine	1 539	876	-	-	-	7	-	-	656
Asphalt	23 644	4 364	13 509	1 200	1 200	121	121	1 499	1 630
Coke	184	-	-	-	-	-	-	-	184
Other Products	4 151	655	1 057		694	748	112	774	111
Total	261 452	73 369	72 933	22 269	27 509	11 072	5 852	39 519	8 929
Percentage of Total	100.0	28.2	27.4	8.6	10.5	4.3	2.3	15.5	3.2
Ship Bunkers	307	77	170	-	-	-	-	60	-
Percent	100.0	25.0	55.6	-	-	-	-	19.4	-


MARKETING POSITION OF VARIOUS MARKETING COMPANIES HUNGARY 1938
THOUSANDS OF METRIC TONS
0
5
10
20
30
40
50
60
70
MOTOR FUEL
KEROSINE
GAS/DIESEL OIL
FUEL OIL
LUBE OILS
GREASES
PARAFFINE
ASPHALT
COKE
OTHER PRODUCTS
SOCONY-VACUUM
SHELL
STEAUA
FANTO GROUP
BARTA
SZOREG
UPIAG
OTHERS

existed in or near the larger cities, but there were no modern service stations in the complete sense of the word. The pumps were hand-operated and of various makes, both American and European. "Satam" pumps manufactured in France were widely used. The Vacuum Oil Company employed Gilbert and Barker pumps extensively. The underground tanks were not large, varying in capacity between 500 and 1,500 gallons. Motor tank trucks were operated by the companies to deliver gasoline from the bulk plants to the dealers.

4.6 SUBSTITUTE FUELS IN HUNGARY DURING 1943

4.6.1 The Use of Substitute Fuels

Road transportation.- Though Hungary's domestic crude oil production exceeded total requirements by a large margin, strenuous efforts were made to convert motor vehicles to the use of substitute fuels in order to increase the exportable surplus of liquid fuel. A decree was passed in May 1943, requiring that all vehicles converted to producer gas must retain their liquid fuel equipment in good condition, so that immediate reconversion to gasoline could take place (Oel und Kohle, July 1, 1943). At that time the process of conversion to solid fuels was as yet still in its first phases, even though, under German pressure, a conversion program had been decided upon for some time.

Somewhat earlier a limited number of vehicles had been converted to the use of propane, butane, and natural gas (Nachrichten fuer den Aussenhandel, August 10, 1942). Such conversions, however, could only be made with the special permission of the authorities. Available quantities of gaseous fuel and the number of steel bottles were both limited. Early in 1943, the Hungarian Natural Gas Valorization Company, which was charged with the production and distribution of gaseous fuels, stated that it supplied liquid gas to only 600 vehicles (Petroleum Times, April 17 and Jun 26, 1943). Plans were made in October 1943 to use increased quantities of compressed natural gas from Transylvania to replace liquid motor fuel (Oel und Kohle, November 1, 1943). The Transylvanian Natural Gas Company was founded for that purpose (Deutsche Volkswirtschaft, October, 1943).

Solid fuel supplies were also limited. In 1940 the output of charcoal amounted to 25,000 metric tons and in 1941 to 20,000 metric tons; a further decline took place in 1942. Because wood was needed for domestic heating purposes, the number of licenses for the production of charcoal was actually reduced (Nachrichten fuel den Aussenhandel, August 17, 1942), and output fell short of demand (Deutsche Bergwerks Zeitung, October 24, 1943). Small quantities of lignite and wood were also used as generator fuel (Oel und Kohle, November 1943).

The total number of vehicles converted to gaseous and solid substitute fuels as of July 1943 was very small, probably not exceeding 1,500 vehicles. This total includes some 250 of the 750 Budapest taxis (Oel und Kohle, August 19, 1942 and British Enemy Oil Intelligence Committee, August 16, 1943). In addition, some private cars in the gas producing regions and some trucks, where local supplies of substitute fuels were available, were converted. Solid fuels were probably used to some extent, especially in Transylvania.

Railways, shipping, agriculture, industry and household.- There is no intelligence which indicates that substitute fuels were used in other branches of the economy besides road transportation.

4.6.2 Alcohol

For several years prior to the war, in compliance with legislation favoring the local production of alcohol from agricultural products, all gasoline sold in Hungary for motor fuel was blended with dehydrated alcohol. These government regulations and the operating methods required by them closely resembled those in effect in a number of other European countries with large agri-

cultural production but little or no indigenous petroleum supplies.

Hungary, being predominantly an agricultural country, found it advantageous to bolster her internal economy by producing alcohol from agricultural products for use as motor fuel at the expense of importation of oil from abroad. Two hundred proof dehydrated alcohol was produced, largely from grain and beets, and sold to the oil companies at prices fixed by the government. The administration of the laws regulating the petroleum and alcohol industries rested in the hands of a bureau of the Ministry of the Interior. Under these laws the oil companies were required to add to every 100 parts of gasoline sold as motor fuel, 20 parts of dehydrated alcohol, calculated on a weight basis. This resulted in a motor fuel composed of approximately 83 1/3 per cent gasoline and 16 2/3 per cent alcohol.

Extensive documentation exists on the economics, production, and use of alcohol as a motor fuel. For the purpose of this report, it suffices to say that the conventional gasoline automotive engines will operate more or less satisfactorily on an alcohol gasoline mixture such as described in the preceeding paragraph. Among the most commonly observed characteristics of such a fuel are a certain loss of power as compared with the same volume of pure gasoline; a greater tendency toward vapor lock; the solvent action of the alcohol in the fuel feed systems, as well as on some types of gaskets, carburator floats and pump diaphragms; and, finally, the affinity of alcohol for moisture which makes the mixture unstable and which if present in sufficient quantities will cause the alcohol to completely separate from the gasoline.

Prior to the war, alcohol distilleries in Hungary were numerous, though the capacities of the individual units were small. Hungary was composed largely of big estates and most of these estates owned and operated their own distilleries. This resulted in a large number of small distilleries, scattered throughout the country, rather than a few large centrally located units.

The present status of the distilling industry in Hungary is not known, but it is believed that most of the alcohol produced in Axis Europe is consumed by the munitions industry and that in view of the adequate petroleum supplies presently produced in Hungary, little is used as motor fuel.

4.7 INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN HUNGARY DURING 1943 (a)

Overall consumption.- Compared with pre-war requirements, Hungary's present oil consumption has been maintained at a very high level. Obviously Germany has so far been unable to exert sufficient pressure either to increase Hungary's crude oil production to its possible maximum or to reduce her domestic consumption to a level comparable to the rest of Axis Europe. However, considering the fact that Hungary has acquired large new territories and has made rapid progress in the mechanization of agriculture an estimated annual consumption of 250,000 metric tons in 1943 actually does represent a decline from the pre-war level of demand. It is estimated that about 70,000 metric tons consisted of light motor fuels (including 8,000 tons of bottled gas, see Donauzeitung, 28 July 1943), 82,000 metric tons of kerosine, 17,000 metric tons of lubricants, 36,000 metric tons of gas oil, and 45,000 metric tons of fuel oil.

Road transportation.- Motor fuel rations were cut in March and April 1943 but were raised again in May 1943. The scale of rationing, as established by decrees published between February 1942 and May 1943, is shown in the following table:

(a) "Industrial and Civilian Consumption of Liquid Fuels and Lubricants in Axis Europe During 1943", Enemy Oil Committee, January 1944.

Motor Fuel Rationing In Hungary

(liters per month)

	As of May 1943	From March 5, 1943 to April 30, 1943	From February 12, 1942 to March 4, 1943
Motorcycles	5	2.5-5	5-10
Private cars	10-20	7.5-12.5	15-25
Trucks and Tractors	20-60	20 - 60	40-120

Though rations were increased on May 1, 1943 they remained in most cases below those of 1942. Further restrictions on road transportation were imposed in October 1943 (British Enemy Oil Intelligence Committee, November 8, 1943). Consumption for road transportation in 1943 has therefore been reduced by 10 per cent as compared with 1942.

Railways.- Locomotive kilometers in 1942 increased over-1941 by about 14 per cent. During 1943 some further increase probably took place. Because of stricter economy lubricating oil consumed by the railroads was probably unchanged.

Inland shipping.- River shipping, especially on the Danube, plays a very important role in Hungarian transportation and in the transit traffic between Germany and the Balkans. Oil requirements for the latter traffic are, however, included with the Rumanian estimates. It is interesting to note that the number of ships arriving in Budapest declined from 22,263 in 1941 to 18,389 in 1942 (Pester Lloyd, May 1, 1943). This reduction was probably due to restrictions imposed on the use of motorboats. Unfavorable water conditions on the Danube also interfered with shipping.

Agriculture.- On March 27, 1943 it was decreed that agricultural consumption should be curtailed to 80 per cent of the 1942 level (Oel und Kohle, May 1,1943). The order was revoked in April (Pester Lloyd, April 29, 1943). A large expansion in the use of Agricultural machines is responsible for a sustained high level of agricultural consumption. The number of tractors increased, e.g., from 227 to 694 between 1939 and 1941)Petroleum Times, April 17, 1943 and June 26, 1943). Estimates for agricultural consumption in 1943 were increased some 10 per cent over the 1942 level.

Industry and household.- According to the Hungarian Economic Yearbook for 1942, the horsepower used in Hungarian industry increased from 1.7 million to 2.2 million in 1941. However, it must be assumed that the use of oil in industry has been curtailed and is now somewhat below the pre-war level.

Kerosine rations for lighting purposes were cut in March 1943 from 85 per cent to 50 per cent of the 1942 rate of consumption (Pester Lloyd, 21 March 1943). They were most likely restored to their old level in May 1943.

Estimated Industrial and Civilian Consumption of Liquid Fuels and Lubricants in Hungary, 1943 (a)

(In Metric Tons)

	Light Motor Fuel	Kerosine	Lubricants	Gas Oil	Fuel Oil	Total
Road Transport	37,000	--	1,000	3,000	--	41,000
Railways	1,000	--	2,000	3,000	--	6,000
Inland Shipping and Fishing	4,000	--	1,000	6,000	5,000	16,000

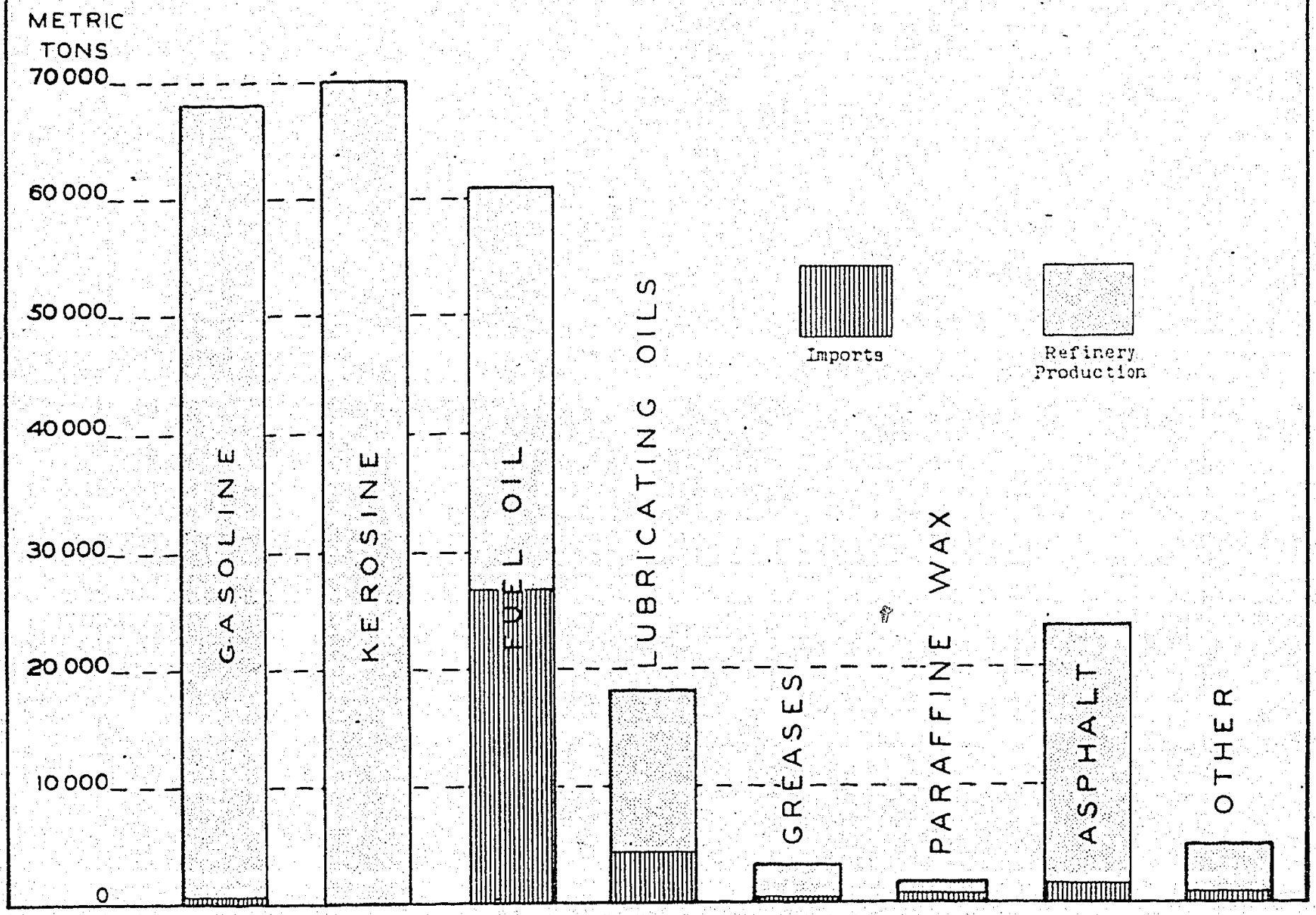
Continued on next page.

(a) Appendix to "Industrial and Civilian Consumption of Liquid Fuels and Lubricants in Axis Europe During 1943", Enemy Oil Committee, January 1944.

SUPPLIES OF REFINED PRODUCTS HUNGARY
1938 (a)
(Metric Tons)

Finished Products	Imports	Refinery Production	Total
Gasoline	745	67 287	68 032
Kerosine	-	70 193	70 193
Gas/Diesel Oil	6	34 002	60 940
Fuel Oil	26 932		
Lubricating Oils	4 304	13 856	18 160
Greases	47	2 958	3 005
Paraffin Wax	708	918	1 626
Asphalt	1 627	22 016	23 643
Other	803	4 029	4 832
Total	35 172	215 259	250 431

(a) Data from Socony-Vacuum Oil Co., Inc.



Estimated Industrial and Civilian Consumption of Liquid Fuels and Lubricants in Hungary, 1943 (a)

Continued

Bunkers	--	--	--	--	--	--
Commercial Aviation	3,000 (b)	--	--	--	--	3,000
Agriculture	17,000	35,000	5,000	16,000	--	73,000
Industry	8,000	2,000	8,000	8,000	40,000	66,000
Household	--	45,000	--	--	--	45,000
Total	70,000	82,000	17,000	36,000	45,000	250,000

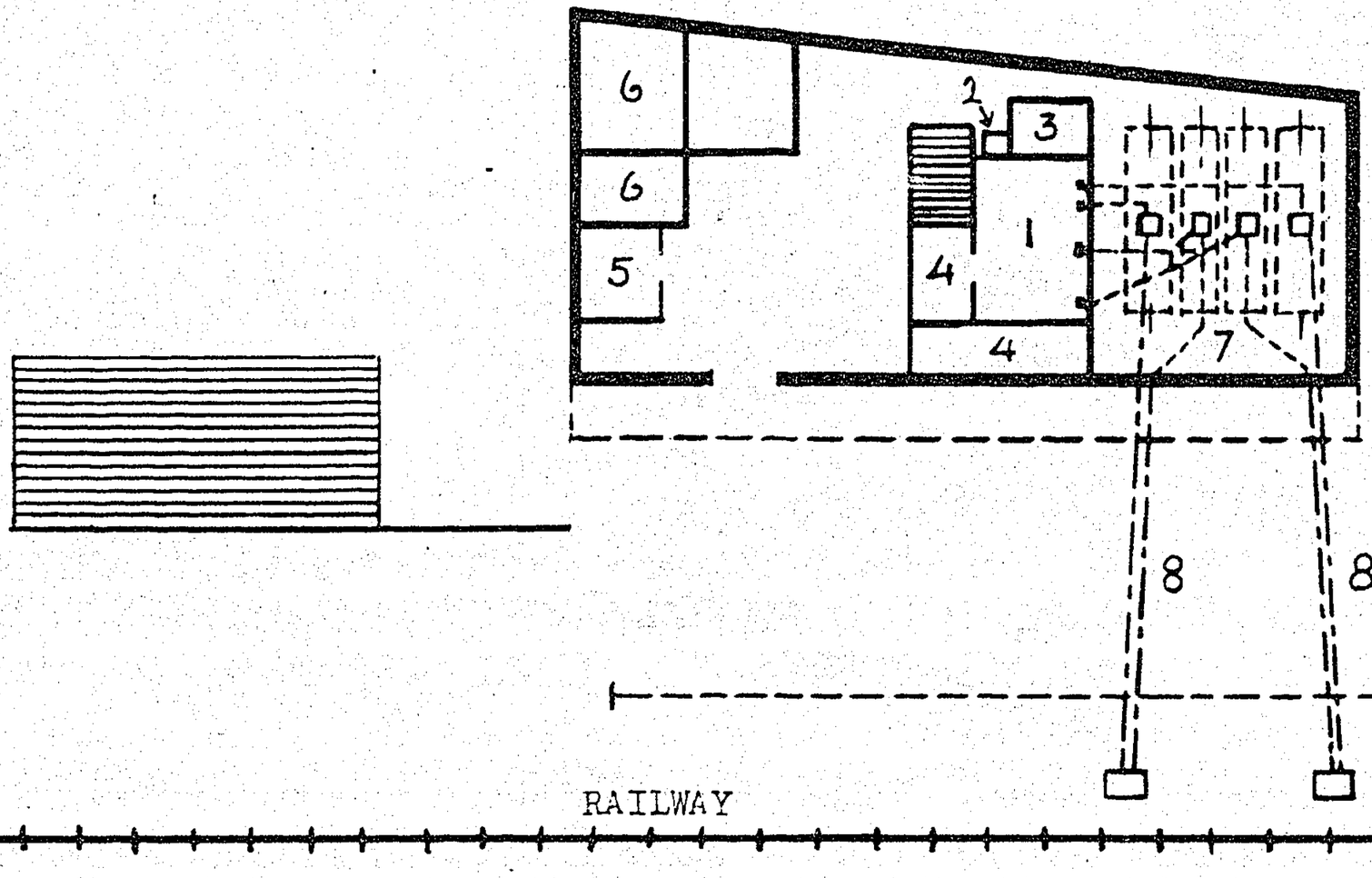
Estimated Industrial and Civilian Consumption of Liquid Fuels and Lubricants in Hungary, 1938 (a)

(In Metric Tons)

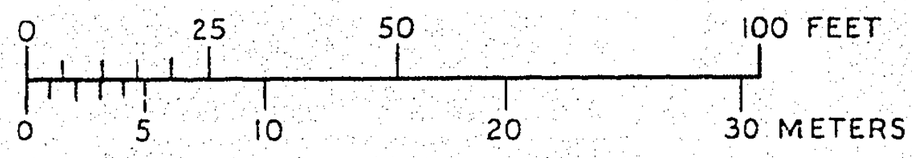
	Light Motor Fuel(c)	Kerosine	Lubricants	Gas Oil	Fuel Oil	Total
Motor Cycles	2,000	--	--	--	--	2,000
Private Cars	21,000	--	1,000	--	--	22,000
Busses	8,000)	--	1,000	3,000	--	34,000
Trucks	22,000)					
Total Road Transport	53,000	--	2,000	3,000	--	58,000
Railways	1,000	--	2,000	3,000	--	6,000
Inland Shipping	2,000	--	1,000	4,000	4,000	11,000
Bunkers	--	--	--	--	--	--
Commercial Aviation	3,000	--	--	--	--	3,000
Agriculture	5,000	24,000	3,000	10,000	--	42,000
Industry	12,000	3,000	6,000	10,000	45,000	76,000
Household	--	45,000	--	--	--	45,000
Total	76,000	72,000	14,000	30,000	49,000	241,000

(a) Appendix to "Industrial and Civilian Consumption of Liquid Fuels and Lubricants in Axis Europe During 1943", Enemy Oil Committee, January 1944.
(b) Aviation Gasoline.
(c) Includes alcohol.

BULK PLANT
VACUUM OIL COMPANY, R.T.
BAJA
HUNGARY

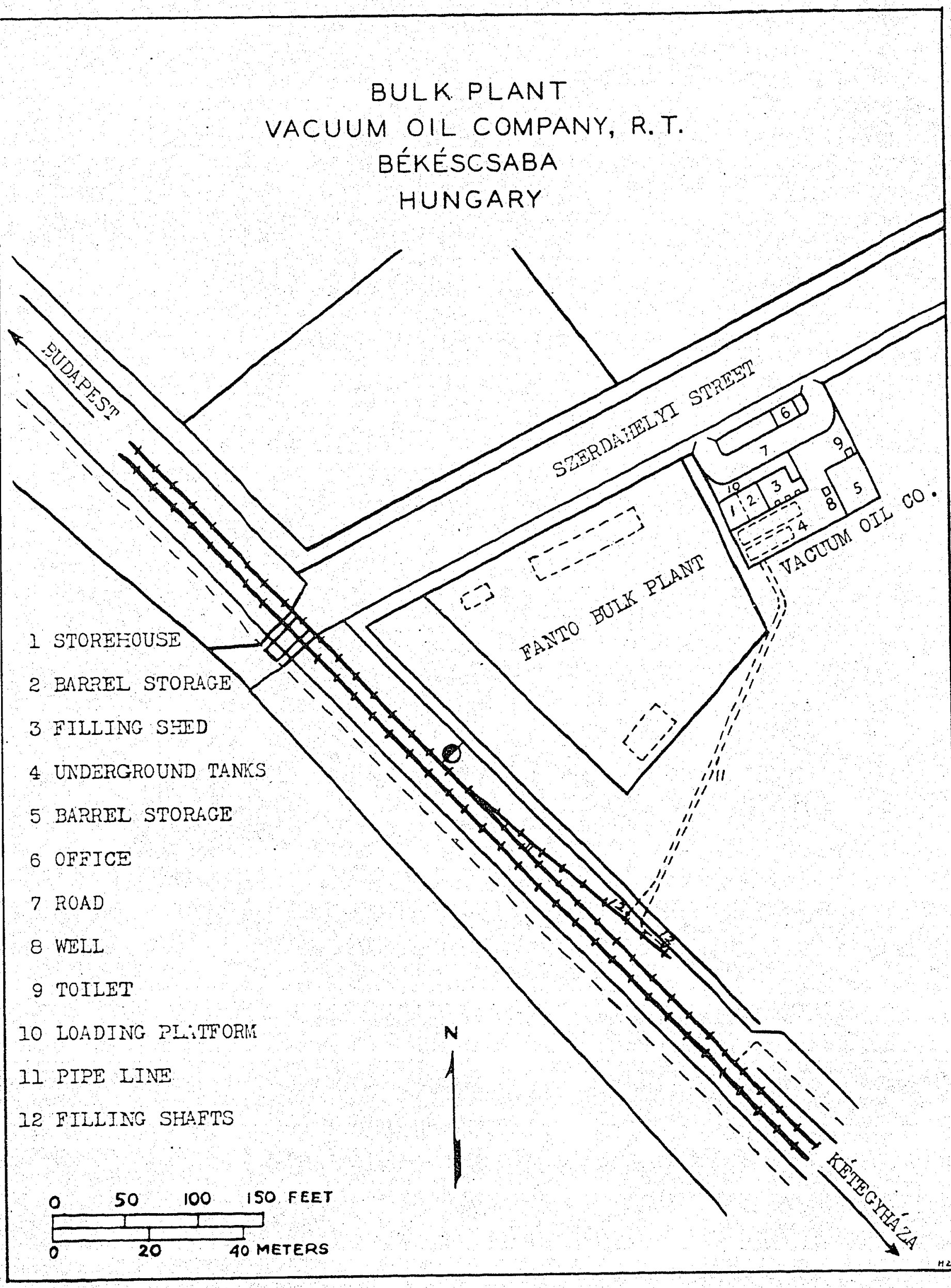


1 FILLING SHED
2 TOILET
3 TOOL HOUSE
4 LOADING PLATFORM
5 OFFICE
6 OPEN SHED FOR BARRELS
7 UNDERGROUND TANKS
8 PIPE LINE

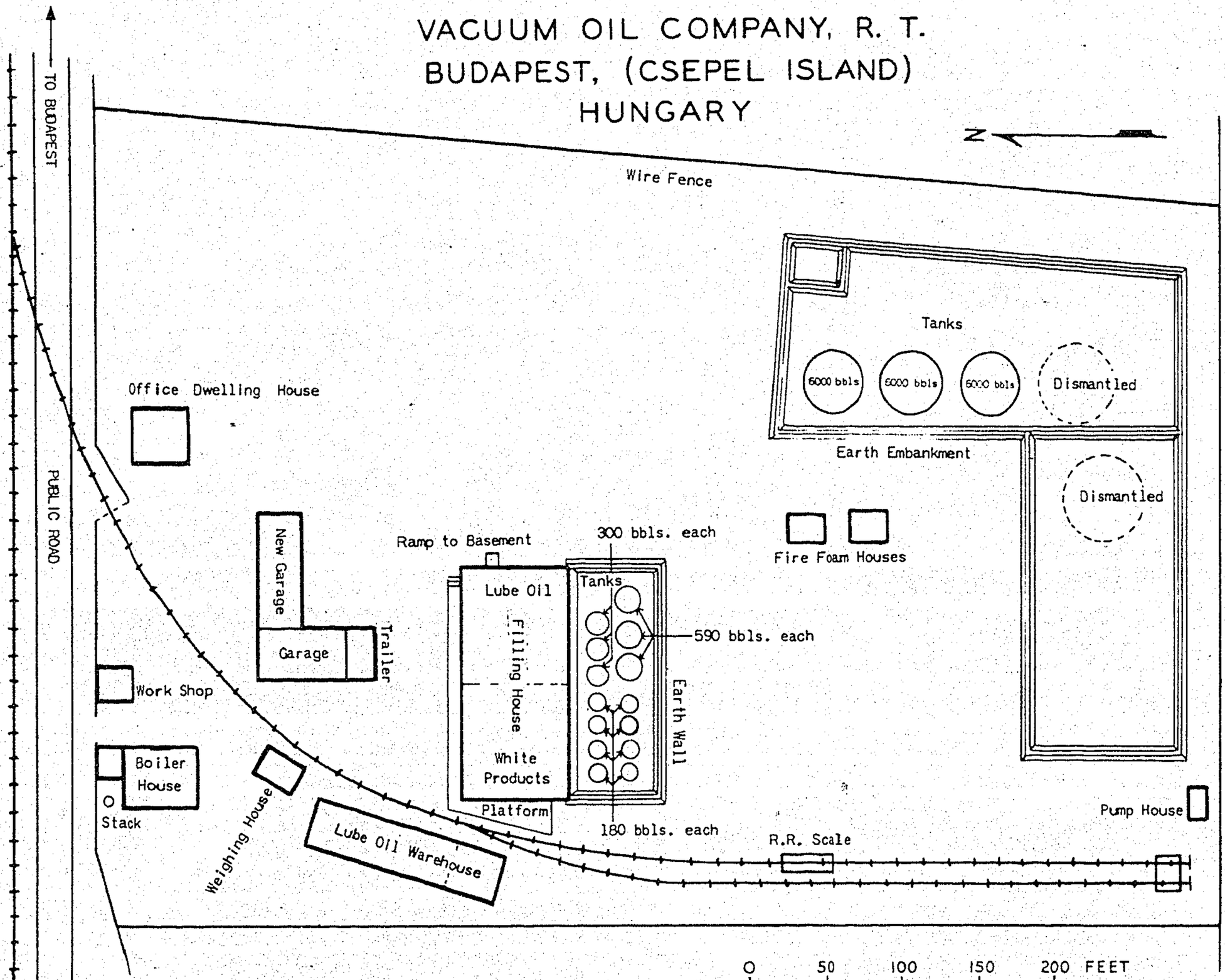


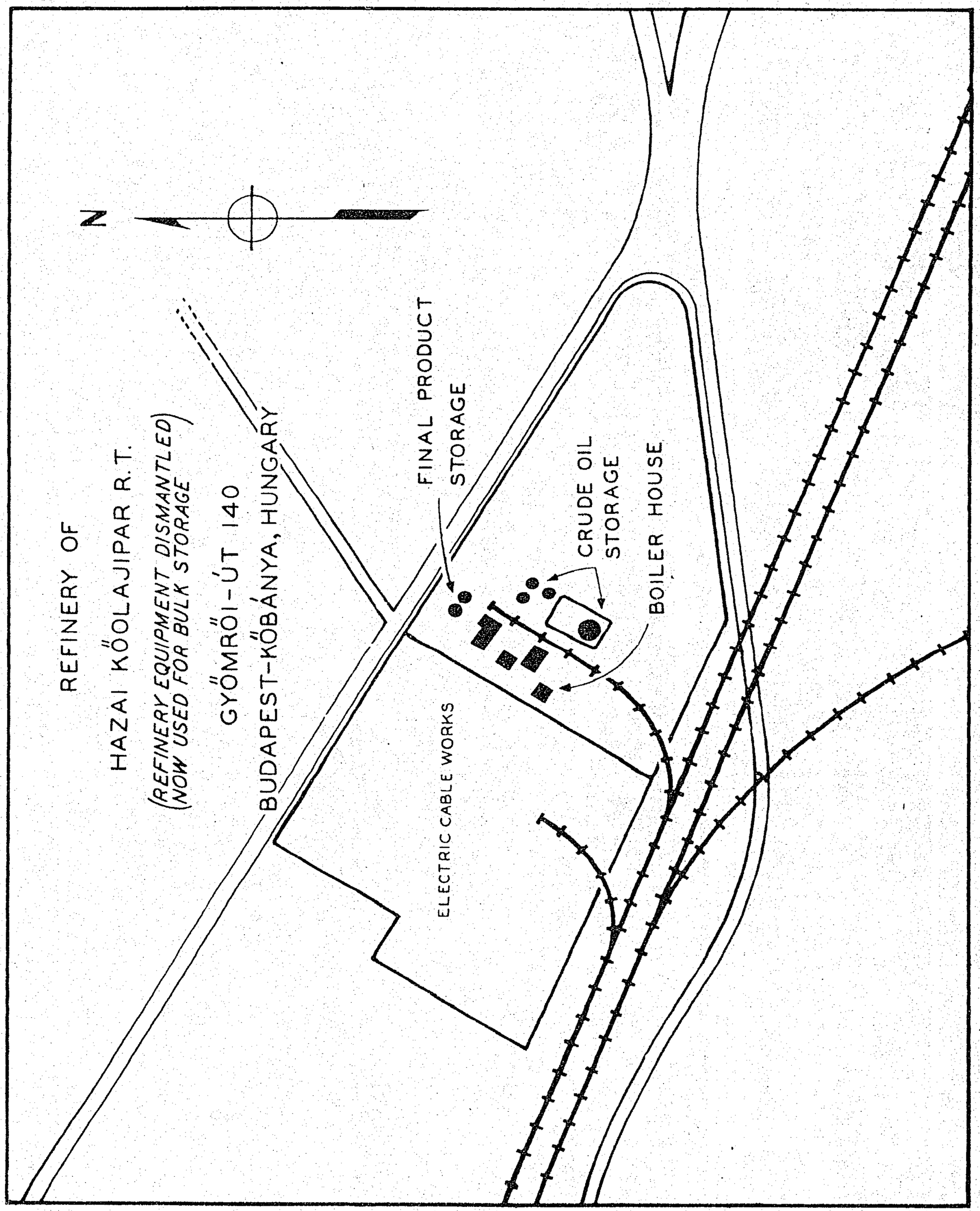
H9

BULK PLANT
VACUUM OIL COMPANY, R.T.
BÉKÉSCSABA
HUNGARY

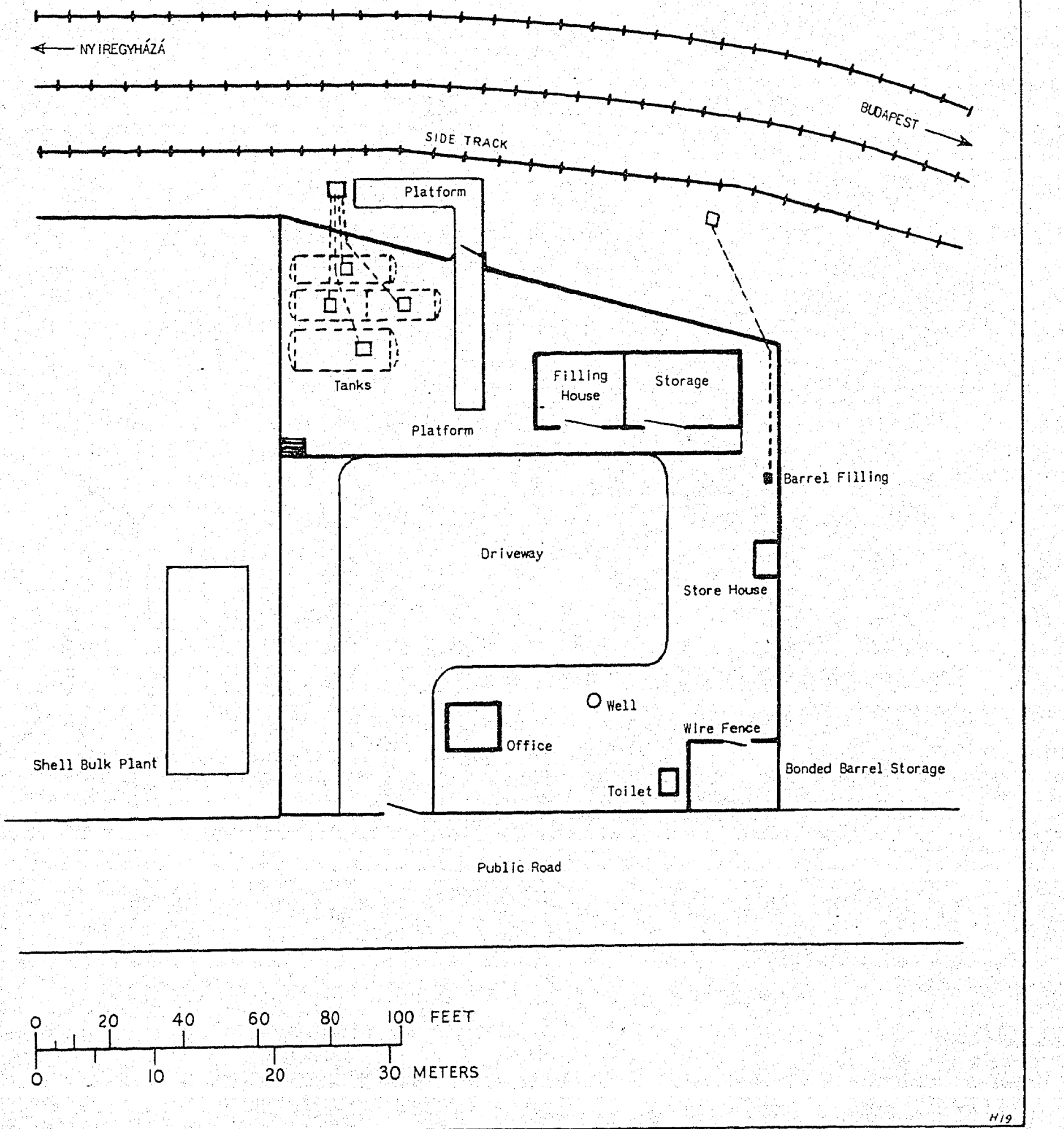


RIVER TERMINAL
VACUUM OIL COMPANY, R. T.
BUDAPEST, (CSEPEL ISLAND)
HUNGARY

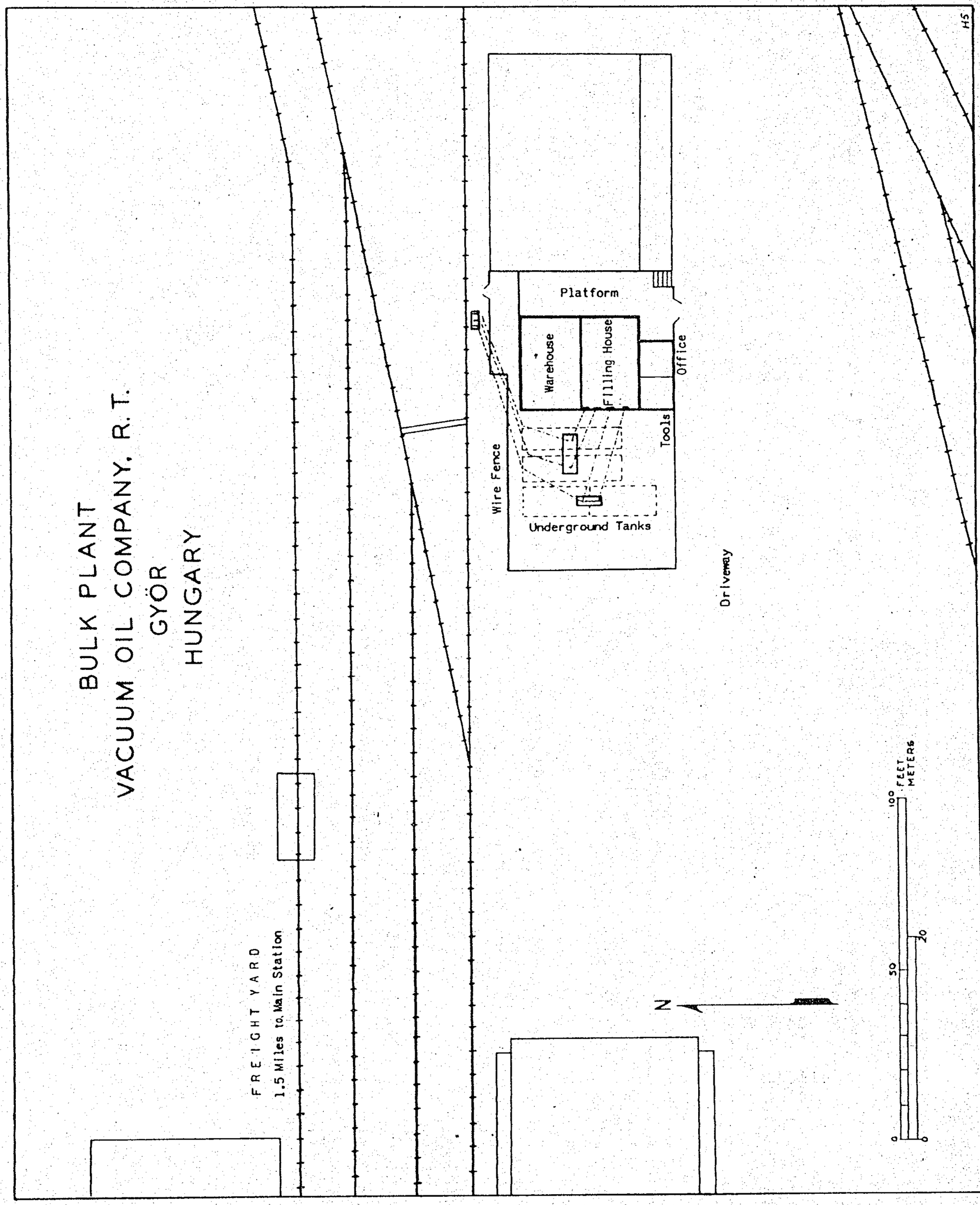



N
REFINERY OF
HAZAI KŐOLAJIPAR R.T.
(REFINERY EQUIPMENT DISMANTLED
NOW USED FOR BULK STORAGE
GYŐMRŐI-ÚT 140
BUDAPEST-KŐBÁNYA, HUNGARY
FINAL PRODUCT
STORAGE
CRUDE OIL
STORAGE
BOILER HOUSE
ELECTRIC CABLE WORKS

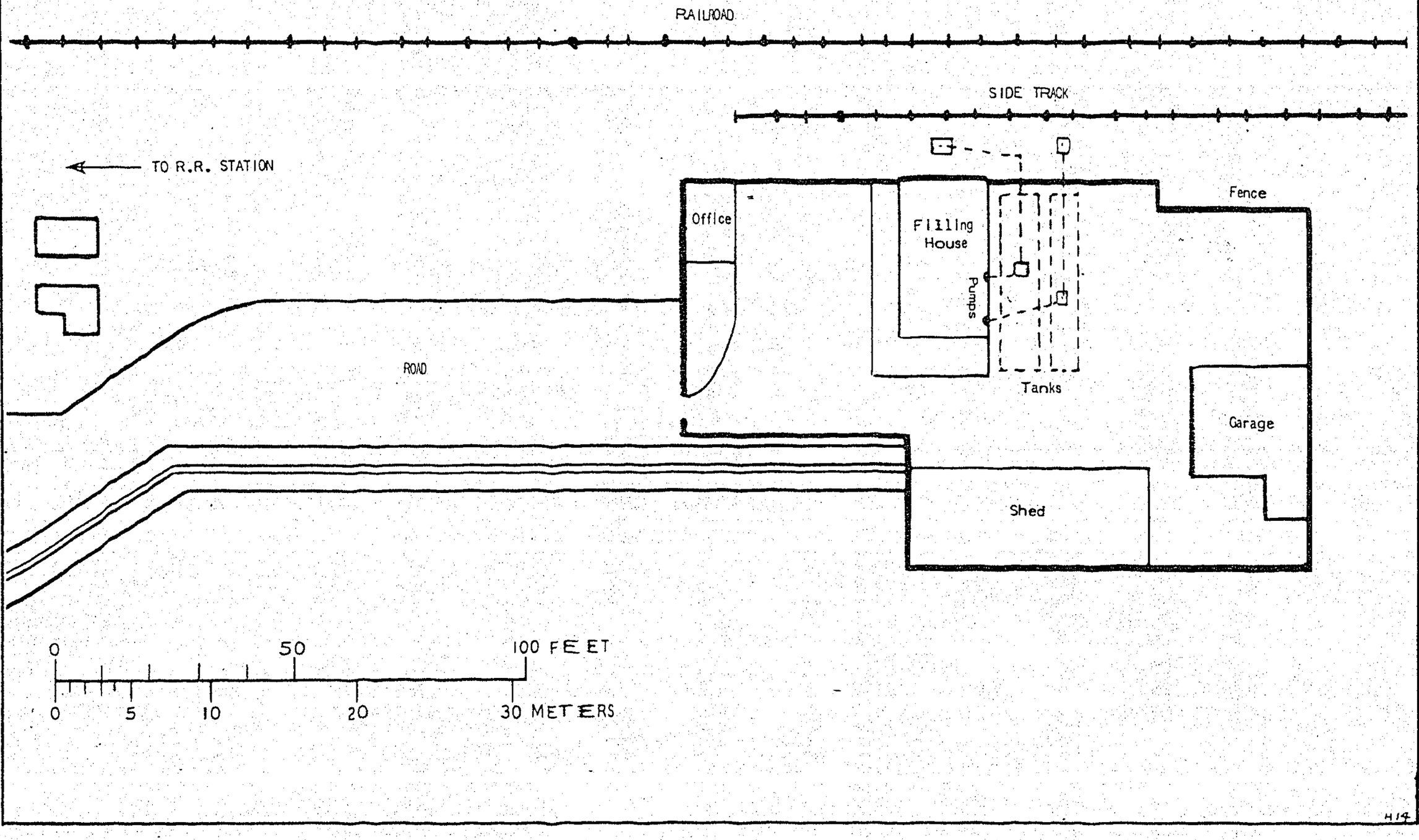
BULK PLANT
VACUUM OIL COMPANY, R. T.
DEBRECEN
HUNGARY



H19


BULK PLANT
VACUUM OIL COMPANY, R. T.
GYÖR
HUNGARY
Platform
Warehouse
Filling House
Office
Tools
Wire Fence
Underground Tanks
Driveway
FREIGHT YARD
1.5 Miles to Main Station
N
100 FEET
METERS
50
20
0
0

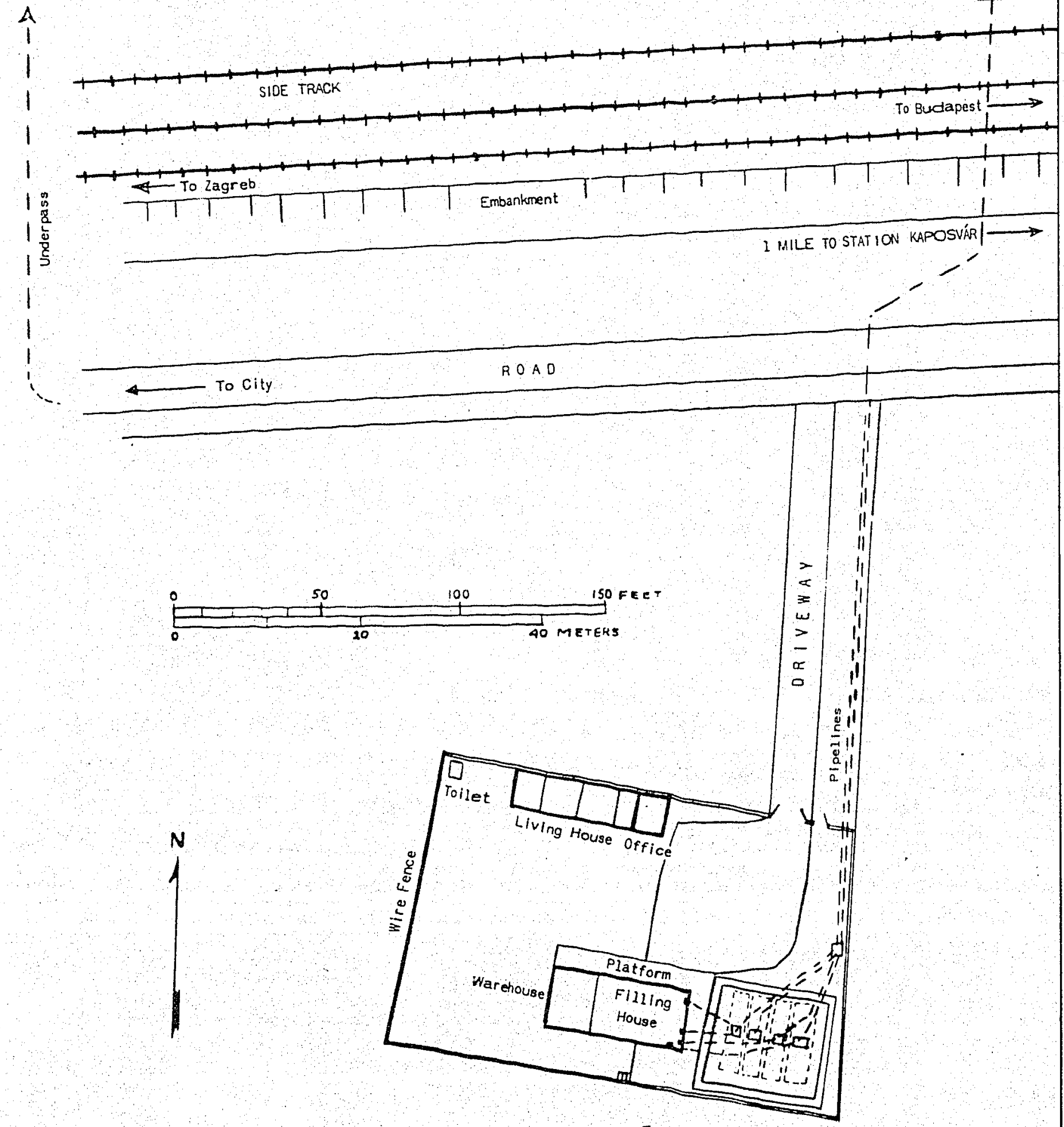
BULK PLANT
VACUUM OIL COMPANY, R. T.
HÓDMEZÖVÁSÁRHELY
HUNGARY



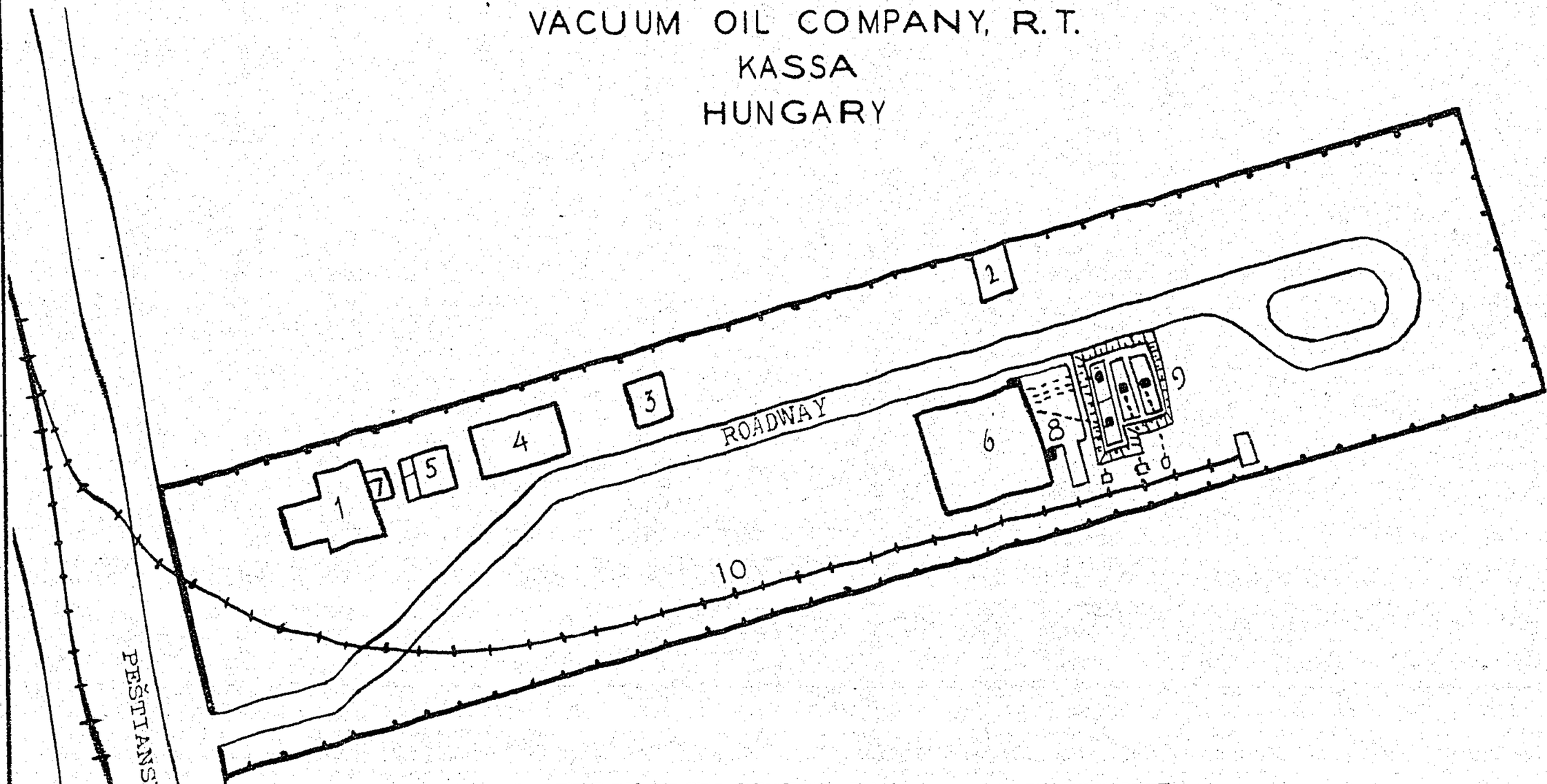
H14

DISTRIBUTING
Hódmezövásárhely

BULK PLANT
VACUUM OIL COMPANY, R. T.
KAPOSVÁR
HUNGARY



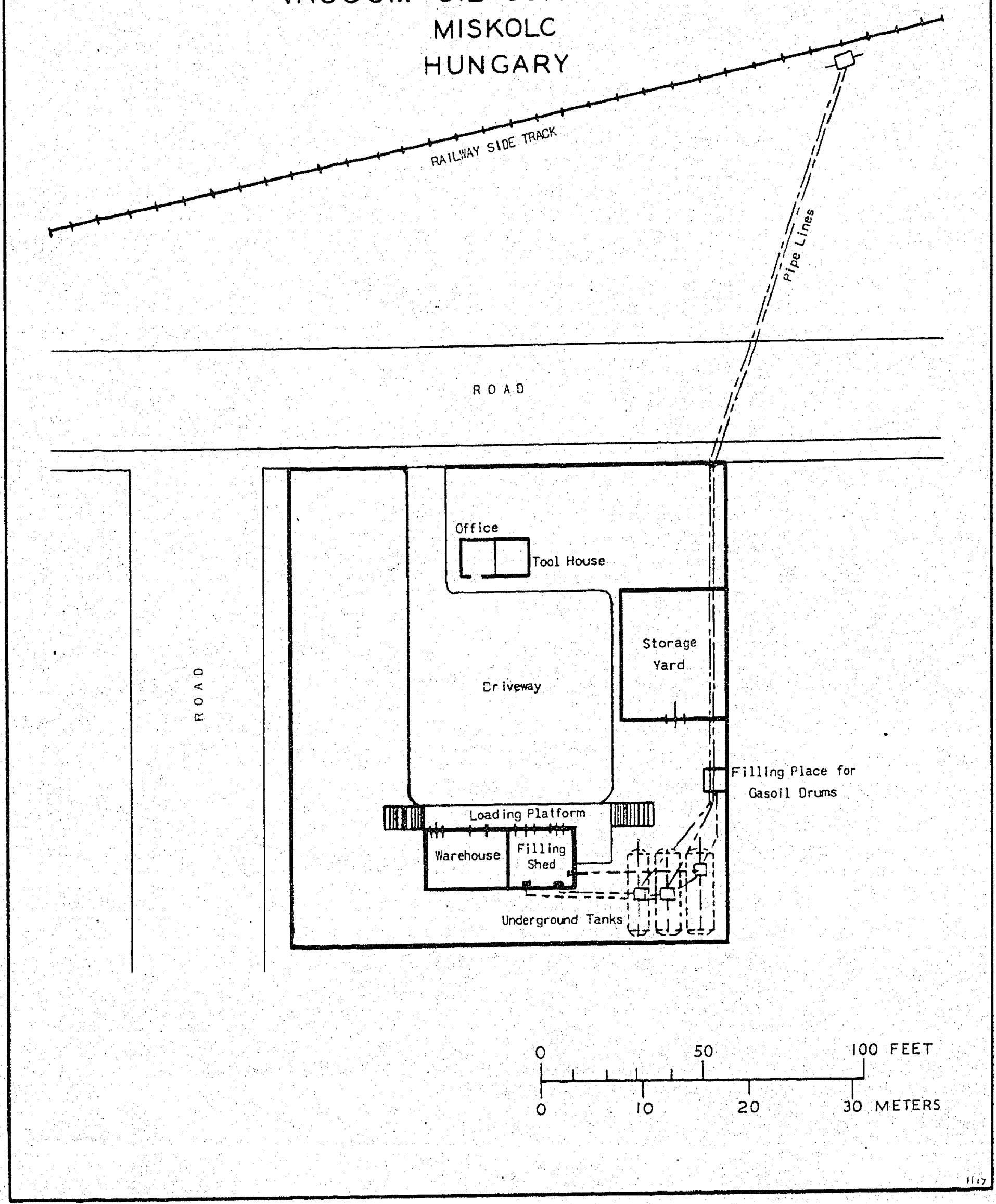
BULK PLANT
VACUUM OIL COMPANY, R.T.
KASSA
HUNGARY



1 OFFICE WITH LIVING ROOM
2 SHED FOR TANK WAGON
3 SHED FOR TOOLS
4 STABLE AND COACHMAN'S ROOM
5 TOILET
6 WAREHOUSE
7 COAL SHED
8 LOADING PLATFORM
9 UNDERGROUND TANKS
10 RAILROAD SIDING

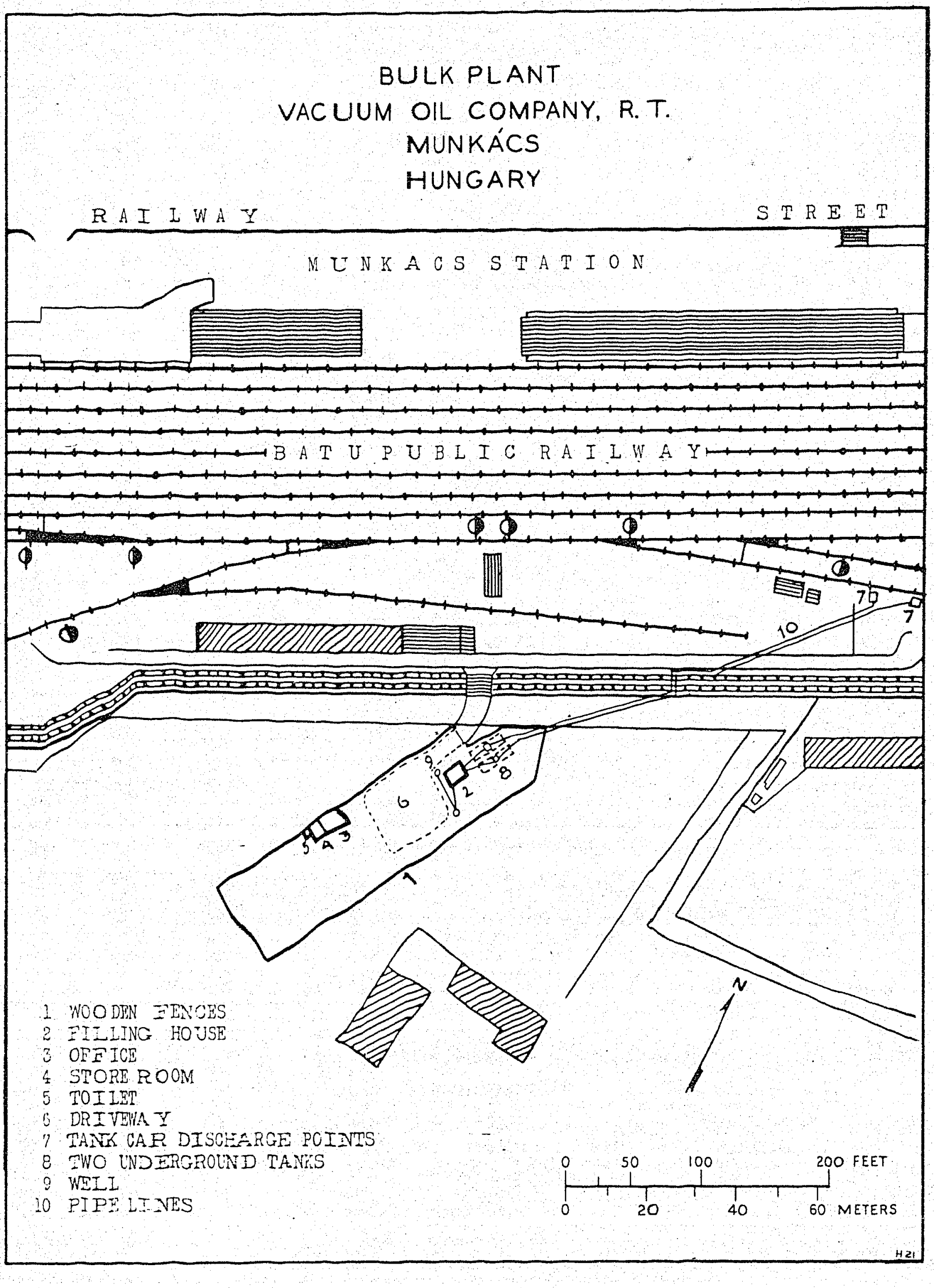
H13

BULK PLANT
VACUUM OIL COMPANY, R.T.
MISKOLC
HUNGARY



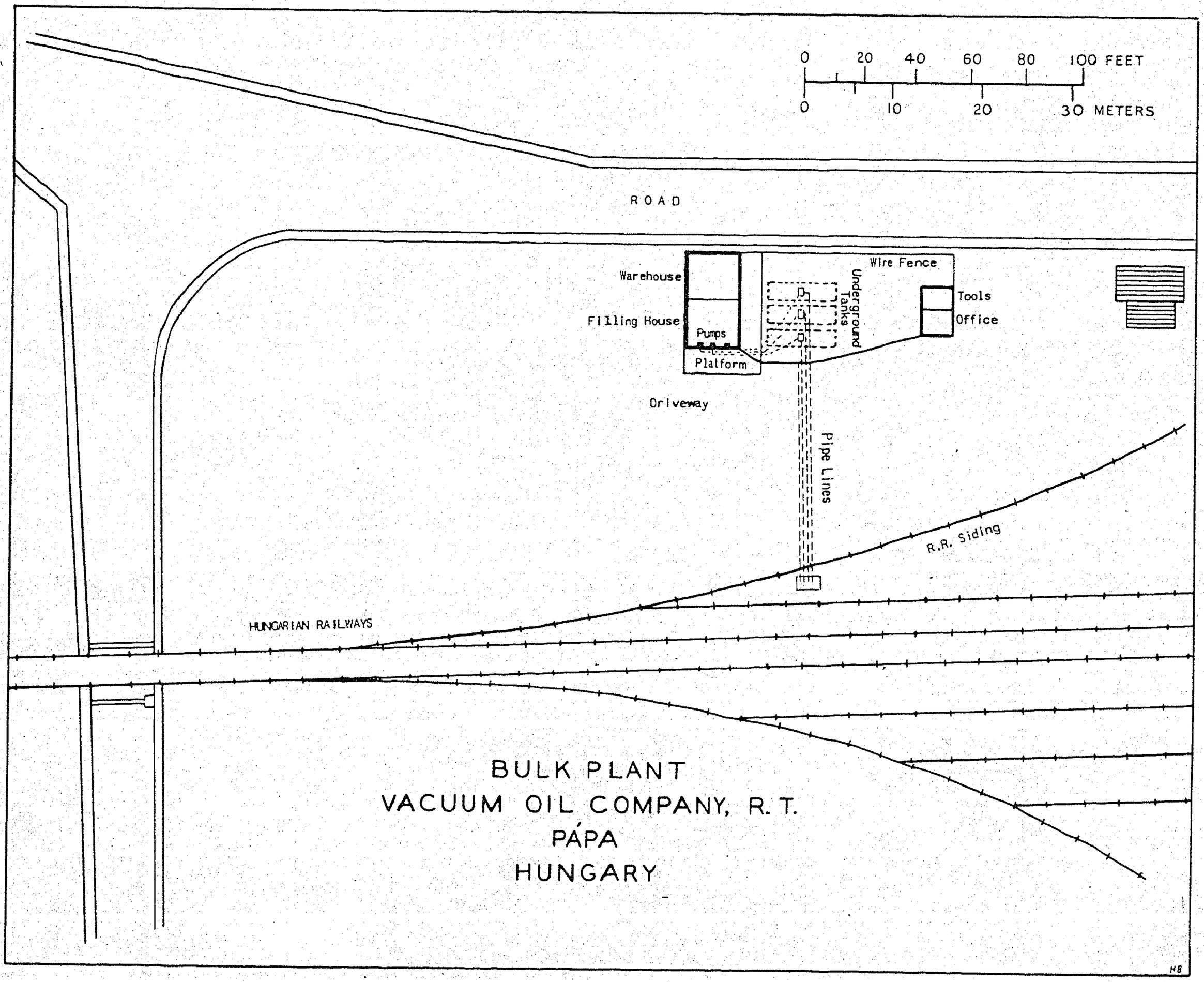
1117

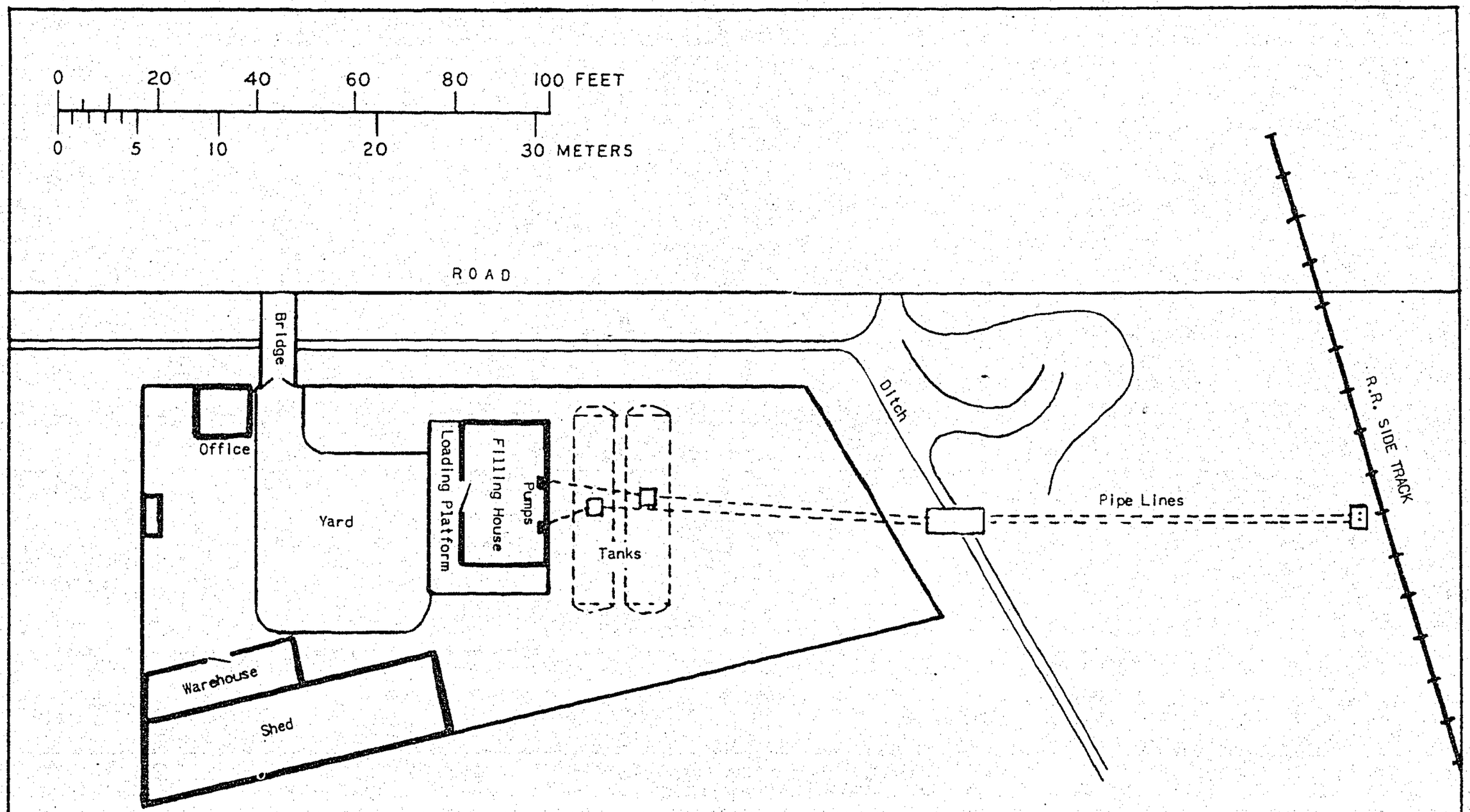
BULK PLANT
VACUUM OIL COMPANY, R. T.
MUNKÁCS
HUNGARY



1 WOODEN FENCES
2 FILLING HOUSE
3 OFFICE
4 STORE ROOM
5 TOILET
6 DRIVEWAY
7 TANK CAR DISCHARGE POINTS
8 TWO UNDERGROUND TANKS
9 WELL
10 PIPE LINES

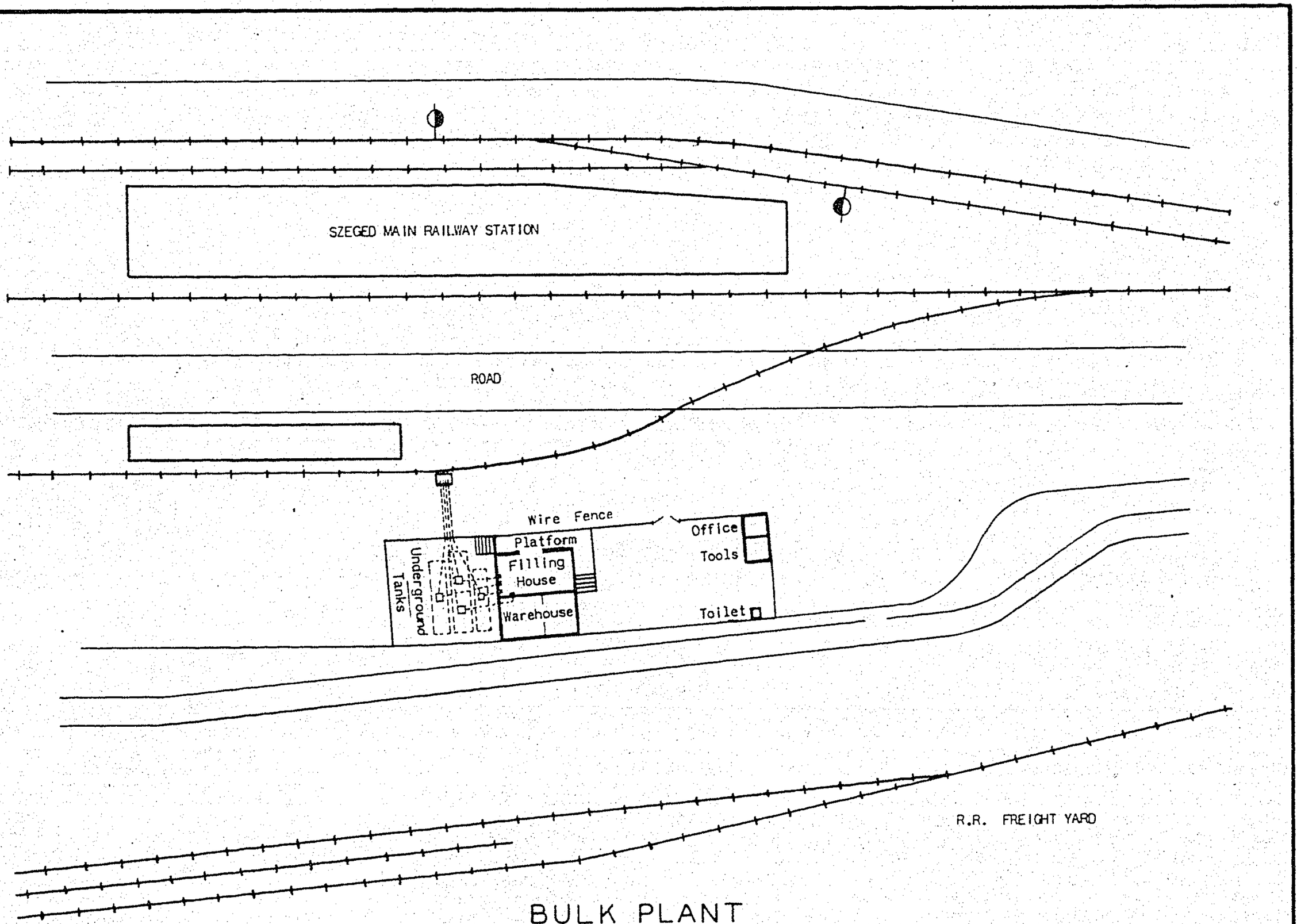
H21


0 20 40 60 80 100 FEET
0 10 20 30 METERS
ROAD
Warehouse
Filling House
Pumps
Platform
Underground Tanks
Wire Fence
Tools
Office
Driveway
Pipe Lines
R.R. Siding
HUNGARIAN RAILWAYS
BULK PLANT
VACUUM OIL COMPANY, R. T.
PÁPA
HUNGARY
HB



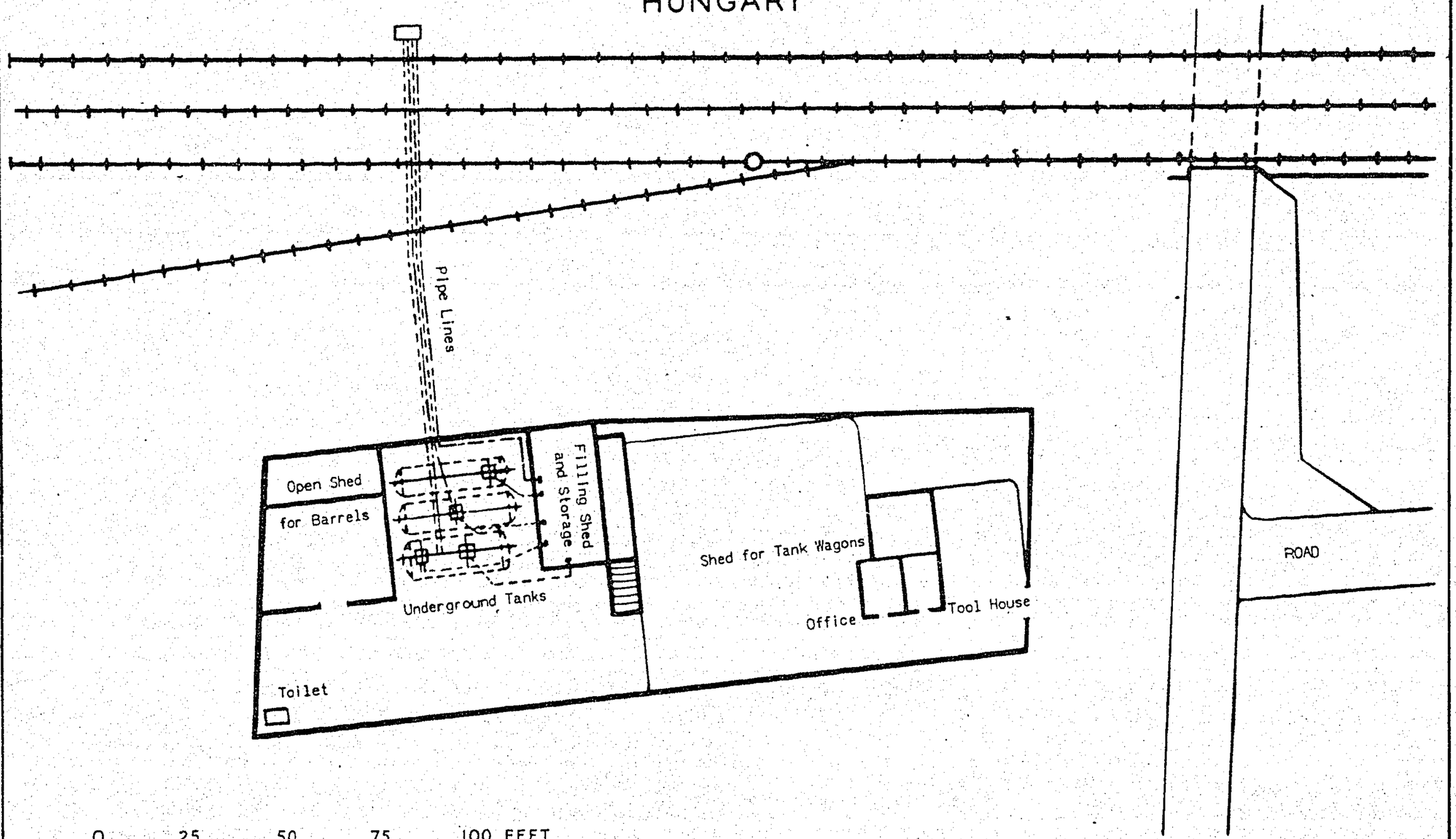
BULK PLANT
VACUUM OIL COMPANY, R.T.
PÉCS
HUNGARY

H7



BULK PLANT
VACUUM OIL COMPANY, R.T.
SZEGED
HUNGARY

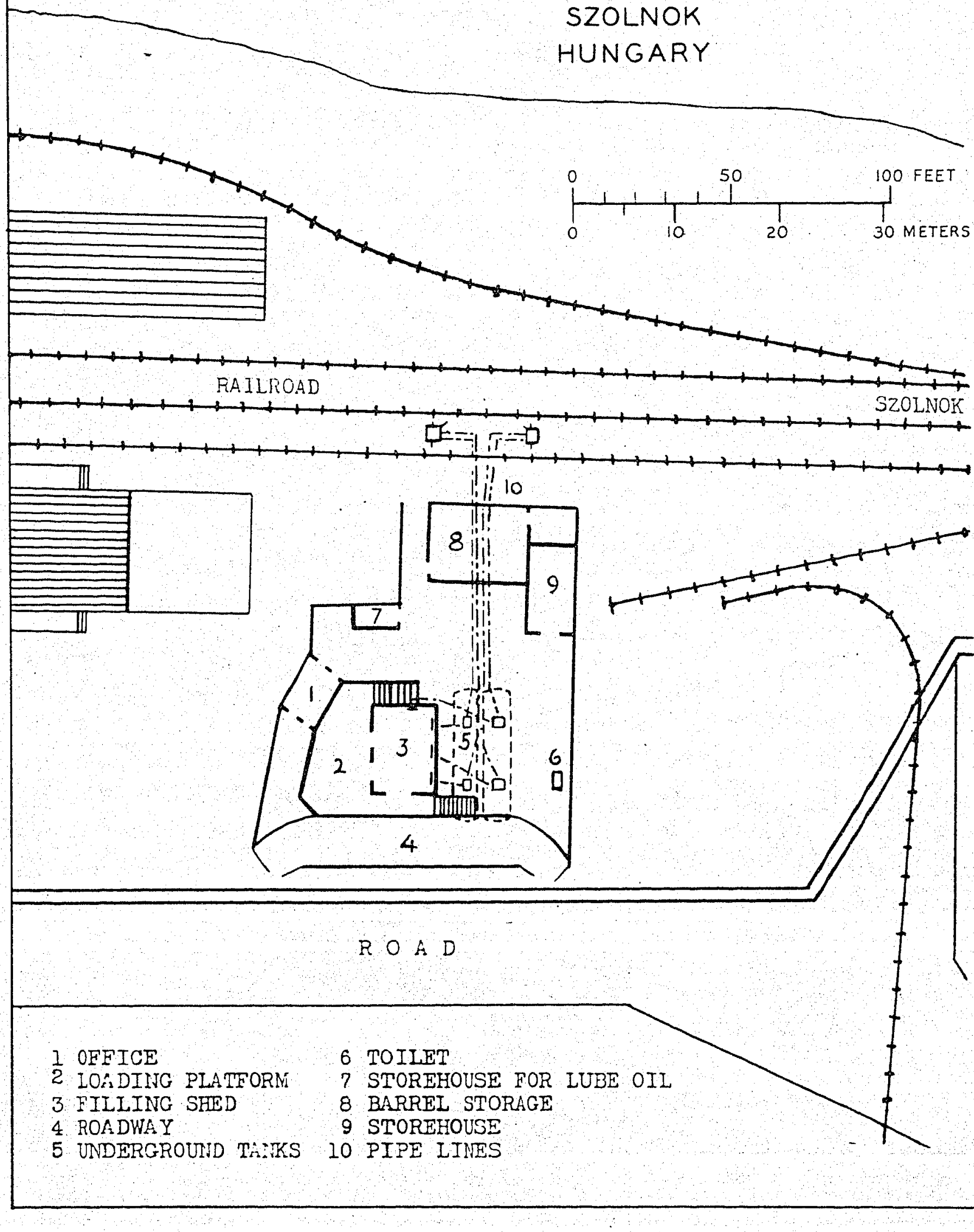
BULK PLANT
VACUUM OIL COMPANY, R.T.
SZÉKESFEHÉRVÁR
HUNGARY



0 25 50 75 100 FEET
0 5 10 20 30 METERS

H 16

BULK PLANT
VACUUM OIL COMPANY, R.T.
SZOLNOK
HUNGARY

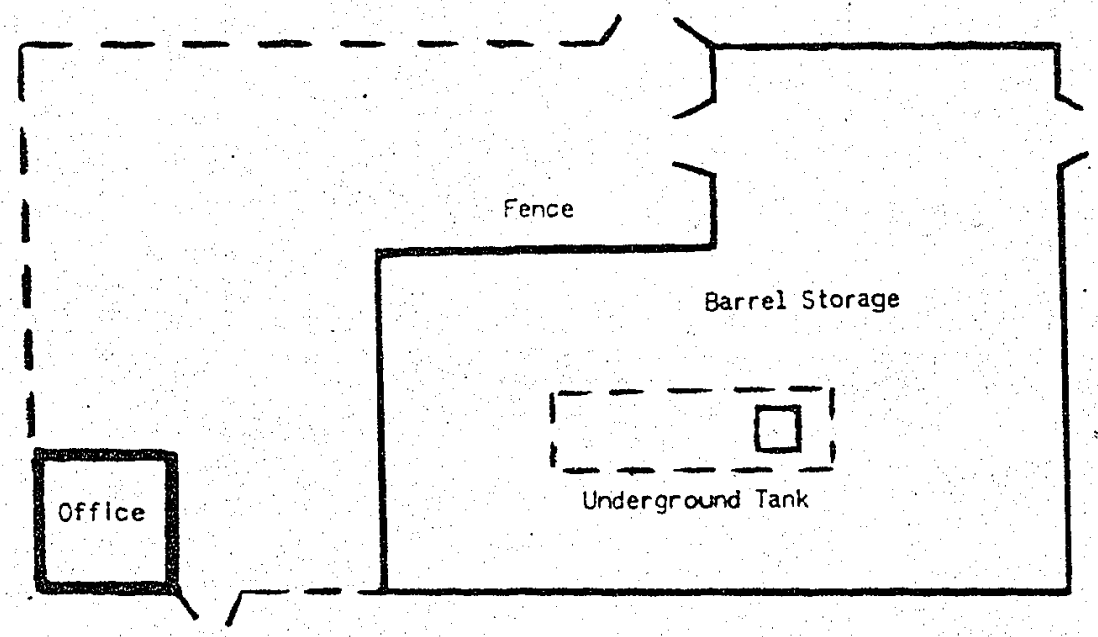


1 OFFICE
2 LOADING PLATFORM
3 FILLING SHED
4 ROADWAY
5 UNDERGROUND TANKS
6 TOILET
7 STOREHOUSE FOR LUBE OIL
8 BARREL STORAGE
9 STOREHOUSE
10 PIPE LINES

H16

BULK PLANT
VACUUM OIL COMPANY, R.T.
SZOMBATHELY
HUNGARY

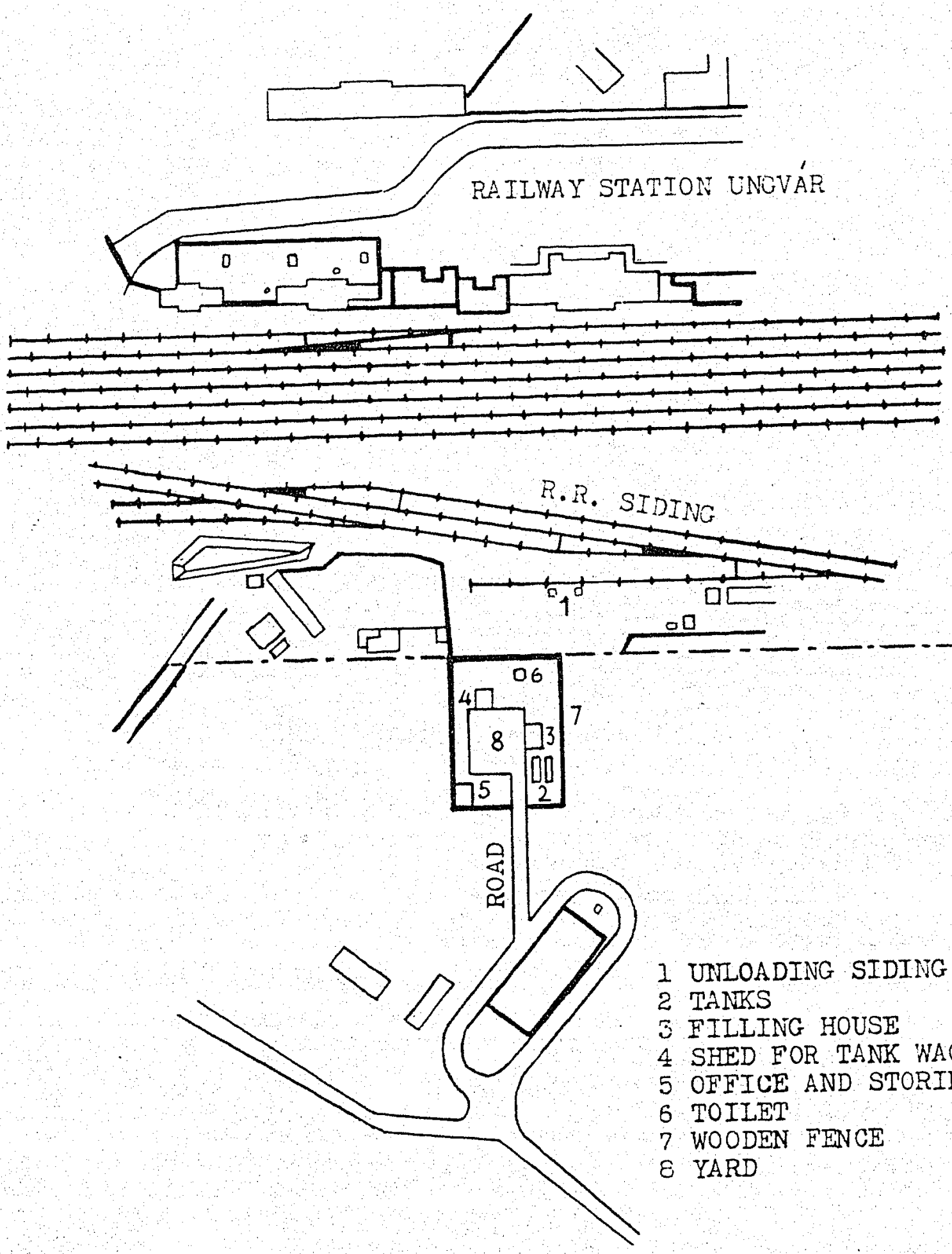
RAILWAY



ROAD

H6

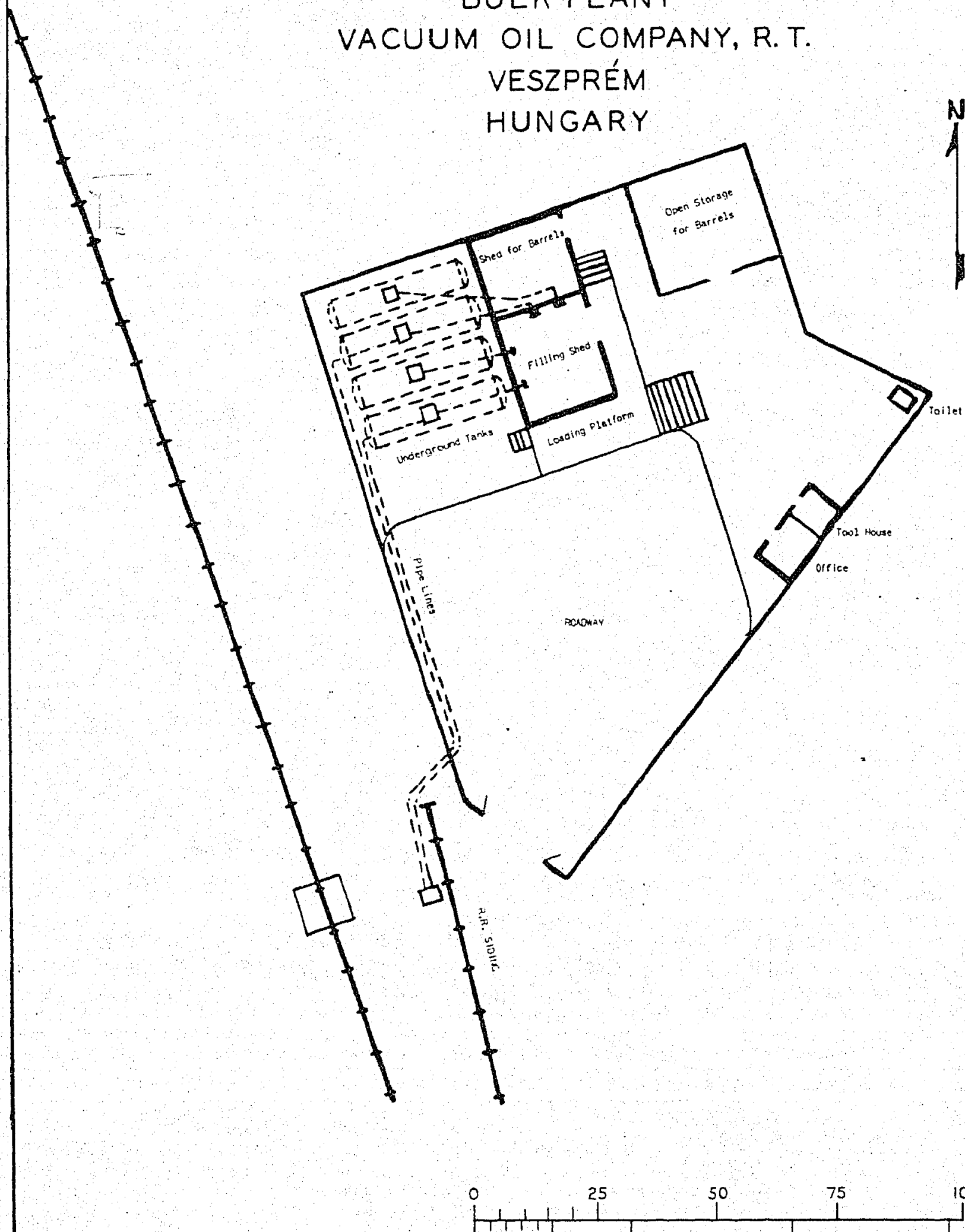
BULK PLANT
VACUUM OIL COMPANY, R.T.
UNGVÁR
HUNGARY



1 UNLOADING SIDING
2 TANKS
3 FILLING HOUSE
4 SHED FOR TANK WAGON
5 OFFICE AND STORING SHED
6 TOILET
7 WOODEN FENCE
8 YARD

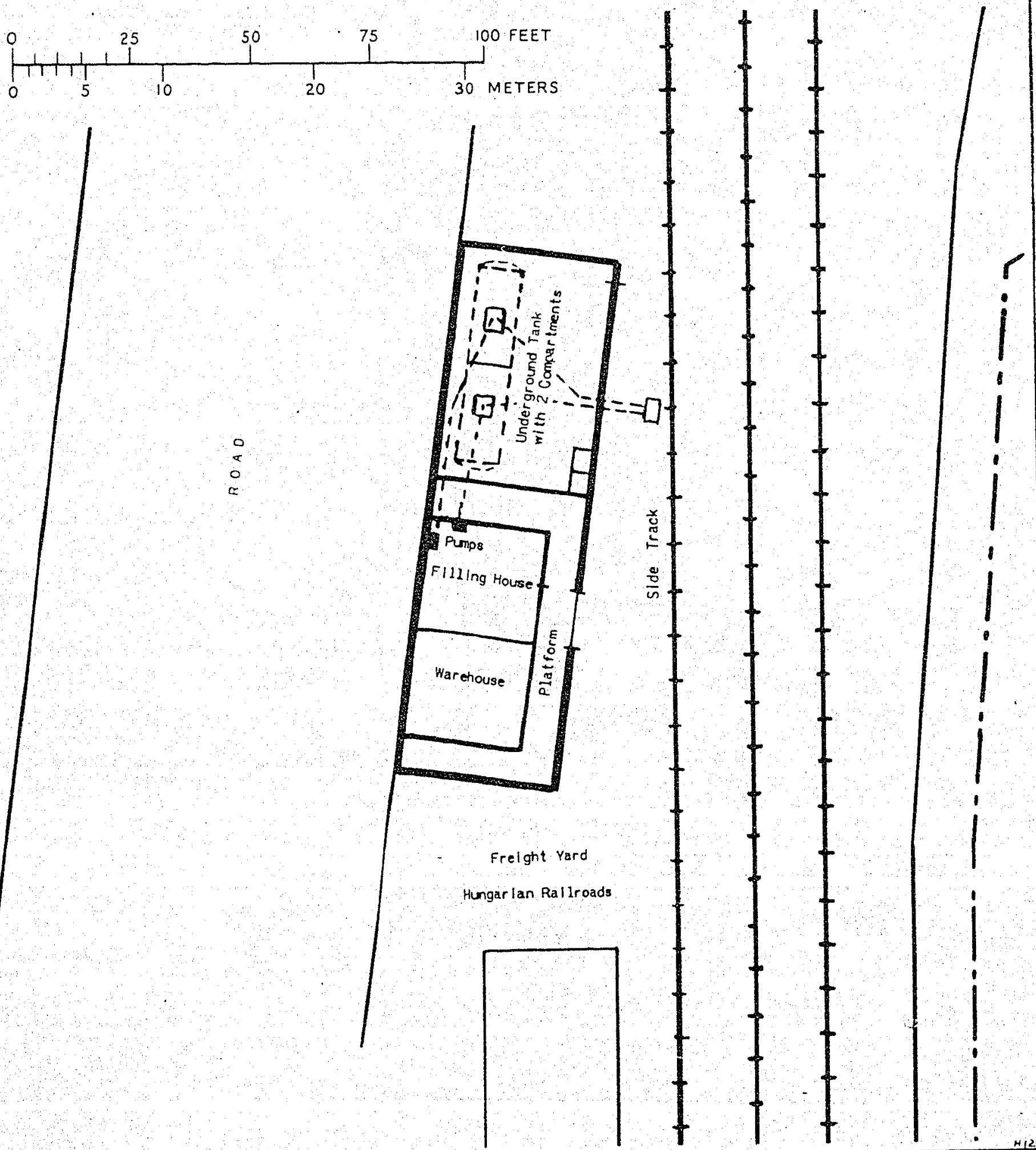
H20

BULK PLANT
VACUUM OIL COMPANY, R.T.
VESZPRÉM
HUNGARY



H 15

BULK PLANT
VACUUM OIL COMPANY, R. T.
ZALAEGERSZEG
HUNGARY



A P P E N D I X 1

CONVERSION FACTORS USED IN THIS REPORT

The conversion factors used in this report are as follows:

Basis.- One metric ton of 1,000 kilograms is divided by the volume of one barrel (159 liters) multiplied by the density of the oil at 60° F. (15.5° C.). this reduces to the factor of 6.3 divided by the density of the oil.

Product	Bbls/Metric Ton
Propane	12.4
Butane	11.0
Natural Gasoline	9.16
Aviation Gasoline	8.5
Motor Gasoline	8.5
Light Aromatics (Benzol, Toluol, and Zylenes)	7.2
Ethyl Alcohol	8.0
Methyl Alcohol	8.0
Kerosine	7.9
Diesel Oil) Gas Oil)	7.2
Lubricants	7.0
Residual Fuel Oil	6.5
Paraffin Wax	7.5
Asphalts	6.0
Synthetics (average)	8.0
All Products (average)	7.5
Crude Oils	
Albania	6.6
Austria	6.8
Czechoslovakia	6.8
Estonia (Shale Oil)	7.0
France	7.0
Germany	7.0
Hungary	7.7
Italy	7.7
Poland	7.4
Rumania	7.5
Russia	7.28
Crude Oils (Locality unspecified)	7.0
Shale Oils (Locality unspecified)	7.0

Conversion factors are of necessity subject to variations from time to time and from place to place. If meticulous accuracy is necessary, conversion factors must be derived from actual specifications.

ESTIMATE OF ADDITIONAL CRUDE OIL PRODUCTION

Possibly Resulting From Interspaced Drilling Of Lovaszi Field, 13.5 Acre Producing Pattern

All drilling beginning January 1. 1943

	Well	March 1943	April 1943	May 1943	June 1943	July 1943	August 1943	Sept. 1943	October 1943	November 1943	December 1943	Jan. 1944	Feb. 1944	March 1944	April 1944	May 1944	June 1944	July 1944
1 Rig	1.	300	300	290	280	270	260	250	240	230	220	210	* 200	197.5	195	192.5	190	187.5
	2.			300	300	290	280	270	260	250	240	230	220	210	* 200	197.5	195	192.5
	3.					300	300	290	280	270	260	250	240	230	220	210	* 200	197.5
	4.							300	300	290	280	270	260	250	240	230	220	210
	5.									300	300	290	280	270	260	250	240	230
	TOTAL DAILY PRODUCTION	300	300	590	580	860	840	1,110	1,080	1,340	1,300	1,250	1,200	1,157	1,115	1,080	1,045	1,017
1 Rig	TOTAL MONTHLY PRODUCTION	9,300	9,000	18,290	17,400	26,660	26,040	33,300	33,480	40,200	40,300	38,750	33,600	35,867	33,450	33,480	31,350	31,527
1 Rig	CUMULATIVE PRODUCTION	9,300	18,300	36,590	53,990	80,650	106,690	139,990	173,470	213,670	253,970	292,720	326,320	362,187	395,637	429,117	460,467	491,994
3 Rigs	TOTAL MONTHLY PRODUCTION	27,900	27,000	54,870	52,200	79,980	78,120	99,900	100,440	120,600	120,900	116,250	100,800	107,601	100,350	100,440	94,050	94,581
3 Rigs	CUMULATIVE PRODUCTION	27,900	54,900	109,700	161,970	241,950	320,070	419,970	520,410	641,010	761,910	878,160	978,960	1,086,561	1,186,911	1,287,351	1,381,401	1,475,982
6 Rigs	TOTAL MONTHLY PRODUCTION	55,800	54,000	109,740	104,400	159,960	156,240	199,800	200,880	241,200	241,800	232,500	201,600	215,202	200,700	200,800	188,100	189,162
6 Rigs	CUMULATIVE PRODUCTION	55,800	109,800	219,540	323,940	483,900	640,140	839,940	1,040,820	1,282,020	1,523,820	1,756,320	1,957,920	2,173,122	2,373,822	2,574,720	2,762,802	2,951,964

ESTIMATE OF ADDITIONAL CRUDE OIL PRODUCTION (Continued)

	Well	Aug. 1944	Sept. 1944	Oct. 1944	Nov. 1944	Dec. 1944	Jan. 1945	Feb. 1945	March 1945	April 1945	May 1945	June 1945	July 1945	Aug. 1945	Sept. 1945	Oct. 1945	Nov. 1945	Dec. 1945
	1.	185	182.5	180	177.5	175	172.5	** 170	167.8	165.8	164.2	161.5	159.3	157.2	155.1	153	150.8	148.7
	2.	190	187.5	185	182.5	180	177.5	175	172.5	** 170	167.8	165.8	163.6	161.5	159.3	157.2	155.1	153
	3.	195	192.5	190	187.5	185	182.5	180	177.5	175	172.5	* 170	167.8	165.8	163.6	161.5	159.3	157.2
	4.	200	197.5	195	192.5	190	187.5	185	182.5	180	177.5	175	172.5	** 170	167.8	165.8	163.6	161.5
	5.	220	210	* 200	197.5	195	192.5	190	187.5	185	182.5	180	177.5	175	172.5	** 170	167.8	165.8
	TOTAL DAILY PRODUCTION	990	970	950	937	925	912	900	888	875	864	852	841	829	818	807	796	786
1 Rig	TOTAL MONTHLY PRODUCTION	30,690	29,100	29,450	28,100	28,675	28,272	25,200	27,528	26,250	26,784	25,560	26,121	25,699	24,540	25,017	23,880	24,366
1 Rig	CUMULATIVE PRODUCTION	522,684	551,784	581,234	609,344	638,019	666,291	691,491	719,019	745,269	772,053	797,613	823,734	849,433	873,973	898,990	922,870	947,236
3 Rigs	TOTAL MONTHLY PRODUCTION	92,070	87,300	88,350	84,300	86,025	84,816	75,600	82,584	78,750	80,352	76,680	78,363	77,097	73,620	75,051	71,640	73,098
3 Rigs	CUMULATIVE PRODUCTION	1,568,052	1,655,352	1,743,702	1,828,032	1,914,057	1,998,873	2,074,473	2,157,057	2,235,807	2,316,159	2,392,839	2,471,202	2,548,299	2,621,919	2,696,970	2,768,610	2,841,708
6 Rigs	TOTAL MONTHLY PRODUCTION	184,140	174,600	176,700	168,600	172,050	169,632	151,200	165,168	157,500	160,704	153,360	156,726	154,194	147,240	150,102	143,280	146,196
6 Rigs	CUMULATIVE PRODUCTION	3,136,104	3,310,704	3,487,404	3,656,004	3,828,114	3,997,746	4,148,946	4,314,114	4,471,614	4,632,318	4,785,678	4,942,404	5,096,598	5,243,838	5,393,940	5,537,220	5,683,416

* Thenceforth declined at rate of 15% per year, or 30 barrels for the first year (2½ barrels a month)

** and 25½ barrels during the second year (2.125 barrels a month)

A P P E N D I X 2

ESTIMATES OF HUNGARIAN CRUDE OIL PRODUCTION

The Budafapuszta and Lovászi Fields

The best and latest available information indicates that, although the productive capacity may be about 10,000,000 barrels a year (1,300,000 metric tons per year), the actual Hungarian production and exports of oil have been about as follows:

Hungarian Crude Oil

	1942		1943	
	Barrels	Metric Tons	Barrels	Metric Tons
Total production	5,236,000	680,000	6,160,000	800,000
Exports	2,210,000	325,000	3,465,000	450,000

If Germany has been able to compel aggressive development and production in the Lovászi field during the years 1942 and 1943, the productive capacity of the Budafapuszta and Lovászi fields may have reached a peak of more than 38,000 barrels a day (1,800,000 metric tons per year) about the end of 1943. Germany would probably have been able to accomplish the necessary drilling and the results of such a program would have been of great value to Germany. However, it is believed that such a program would have been resisted strongly by the Hungarian Government, while in control of the country, as it had in the past consistently favored the conservative production program contemplated by M.A.O.R.T.

In order to furnish data on production rates possible of achievement in the Budafapuszta and Lovászi fields under sufficient compulsion, the production tables which follow were computed using the basic assumptions that:

1. All new drilling would be in the Lovászi field where maximum return could be obtained.

2. Each rig employed would complete a well every two months.

3. On the average, each new well would produce initially 300 barrels per day. After the first two months the production rate of each well would decrease ten barrels per day each month for ten months and 15 per cent per year thereafter.

4. During 1942 the four rigs known to be in the field would be employed continuously in drilling wells on a 20 acre spacing, and perhaps 6 additional German rigs might be likewise employed.

5. During 1943 the same rigs used in 1942 would continue drilling and perhaps 6 additional rigs might be employed to drill interspaced wells on a 13.5 acre spacing.

6. By the end of 1943 drilling would cease.

Estimate, 1942

ESTIMATE OF CRUDE OIL PRODUCTION

Budafapuszta and Lovászi Fields, 20 Acre Producing Pattern

Year 1942

	January	February	March	April	May	June	July	August	September	October	November	December
Production of Oil Wells (Budafapuszta & Lovászi fields)	11,500 b/d	11,500 b/d	11,500 b/d	11,000 b/d	11,000 b/d	11,000 b/d	10,500 b/d	10,500 b/d	10,500 b/d	10,000 b/d	10,000 b/d	10,000 b/d
New Wells (Lovászi field, 4 M.A.O.R.T. rigs, 101 locations. Drilling time 2 months per well; initial production 300 bbls./day for 2 months, then decrease 10 b/d per month for remainder of first year; thereafter 15% decline during second year).			1,200 b/d	1,200 b/d	1,160 b/d 1,200	1,120 b/d 1,200	1,080 b/d 1,160 1,200	1,040 b/d 1,120 1,200	1,000 b/d 1,080 1,160 1,200	960 b/d 1,040 1,120 1,200	920 b/d 1,000 1,080 1,160 1,200	880 b/d 960 1,040 1,120 1,200
			1,200 b/d	1,200 b/d	2,360 b/d	2,320 b/d	3,440 b/d	3,360 b/d	4,440 b/d	4,320 b/d	5,360 b/d	5,200 b/d
5th Rig (Drilling and production as above).				300 b/d	300 b/d	290 b/d 300	280 b/d 300	270 b/d 290 300	260 b/d 280 300	250 b/d 270 290 300	240 b/d 260 280 300	230 b/d 250 270 290 300
				300 b/d	300 b/d	590 b/d	580 b/d	860 b/d	840 b/d	1,110 b/d	1,080 b/d	1,340 b/d
6th Rig " " 7th Rig " " 8th Rig " " 9th Rig " " 10th Rig " "					300 b/d	300 b/d 300	590 b/d 300 300	580 b/d 590 300 300	860 b/d 580 590 300 300	840 b/d 860 580 590 300	1,110 b/d 840 860 580 590	1,080 b/d 1,110 840 860 580
					300 b/d	600 b/d	1,190 b/d	1,770 b/d	2,630 b/d	3,170 b/d	3,980 b/d	4,470 b/d
Total Daily Average	11,500 b/d	11,500 b/d	12,700 b/d	12,500 b/d	13,960 b/d	14,510 b/d	15,710 b/d	16,490 b/d	18,410 b/d	18,600 b/d	20,430 b/d	21,010 b/d
Total Monthly Production	356,500 b/m	322,000 b/m	393,700 b/m	375,000 b/m	432,760 b/m	435,300 b/m	487,010 b/m	511,190 b/m	552,300 b/m	576,600 b/m	612,600 b/m	651,310 b/m

Total Production for Year 5,706,270 barrels

ESTIMATE OF CRUDE OIL PRODUCTION

Budafapuszta and Lovászi Fields, 20 Acre Producing Pattern

Year 1943

	January	February	March	April	May	June	July	August	September	October	November	December
Production of Old Wells (Budafapuszta & Lovászi fields)	9,500 b/d	9,500 b/d	9,500 b/d	9,500 b/d	9,000 b/d	9,000 b/d	9,000 b/d	9,000 b/d	8,500 b/d	8,500 b/d	8,000 b/d	8,000 b/d
New Wells (4 M.A.O.R.T. rigs. Drilling time 2 months per well. Initial production 300 bbls./day for 2 months, then decrease 10 b/d per month. Forty-four wells completed by end of year)	840 b/d 920 1,000 1,080 1,160 1,200	800 b/d 880 960 1,040 1,120 1,200	800 b/d 840 920 1,000 1,080 1,160 1,200	800 b/d 800 880 960 1,040 1,120 1,200	800 b/d 800 840 920 1,000 1,080 1,160 1,200	760 b/d 800 800 880 960 1,040 1,120 1,200	760 b/d 800 800 840 920 1,000 1,080 1,160 1,200	760 b/d 760 800 800 880 960 1,040 1,120 1,200	760 b/d 760 800 800 840 920 1,000 1,080 1,160 1,200	740 b/d 760 760 800 800 880 960 1,040 1,120 1,200	740 b/d 760 760 800 840 920 1,000 1,080 1,160 1,200	740 b/d 740 760 760 800 800 880 960 1,040 1,120 1,200
	6,200 b/d	6,000 b/d	7,000 b/d	6,800 b/d	7,800 b/d	7,560 b/d	8,560 b/d	8,320 b/d	9,320 b/d	9,060 b/d	10,060 b/d	9,800 b/d
5th Rig (Drilling time 2 months per well. Eleven wells completed by end of year.)	220 b/d 240 260 280 300	210 b/d 230 250 270 290 300	200 b/d 220 240 260 280 300	200 b/d 210 230 250 270 290 300	200 b/d 200 220 240 260 280 300	200 b/d 200 210 230 250 270 290 300	190 b/d 200 200 220 240 260 280 300	190 b/d 200 200 210 230 250 270 290 300	190 b/d 190 200 200 220 240 260 280 300	190 b/d 190 200 200 210 230 250 270 290 300	180 b/d 190 190 200 200 220 240 260 280 300	180 b/d 190 190 200 200 210 230 250 270 290 300
	1,300 b/d	1,550 b/d	1,500 b/d	1,750 b/d	1,700 b/d	1,950 b/d	1,890 b/d	2,140 b/d	2,080 b/d	2,330 b/d	2,260 b/d	2,510 b/d
6th Rig. 10 wells completed. 7th Rig. 10 wells completed. 8th Rig. 9 wells completed. 9th Rig. 9 wells completed. 10th Rig. 8 wells completed.	1,340 b/d 1,080 1,110 840 860	1,300 b/d 1,340 1,080 1,110 840	1,550 b/d 1,300 1,340 1,080 1,110	1,500 b/d 1,550 1,300 1,340 1,080	1,750 b/d 1,500 1,550 1,300 1,340	1,700 b/d 1,750 1,500 1,550 1,300	1,950 b/d 1,700 1,750 1,500 1,550	1,890 b/d 1,950 1,700 1,750 1,500	2,140 b/d 1,890 1,950 1,700 1,750	2,080 b/d 2,140 1,890 1,950 1,700	2,330 b/d 2,080 2,140 1,890 1,950	2,260 b/d 2,330 2,080 2,140 1,890
	5,230 b/d	5,670 b/d	6,380 b/d	6,770 b/d	7,440 b/d	7,600 b/d	8,450 b/d	8,790 b/d	9,430 b/d	9,760 b/d	10,390 b/d	10,700 b/d
Total Daily Average	22,230 b/d	22,720 b/d	24,380 b/d	24,820 b/d	25,940 b/d	26,310 b/d	27,900 b/d	28,250 b/d	29,330 b/d	29,650 b/d	30,710 b/d	31,010 b/d
Total Monthly Production	689,130 b/m	636,160 b/m	755,780 b/m	744,600 b/m	804,140 b/m	789,300 b/m	864,900 b/m	875,750 b/m	879,900 b/m	919,150 b/m	921,300 b/m	961,310 b/m

Total Production for Year 9,841,420 barrels

APPENDIX 2
Estimate, 1943

ESTIMATE OF CRUDE OIL PRODUCTION

Budafapuszta and Lovászi Fields, 20 Acre Producing Pattern

Year 1944

	January	February	March	April	May	June	July	August	September	October	November	December
Production of Oil Wells (Budafapuszta and Lovászi Fields)	7,900 b/d	7,800 b/d	7,700 b/d	7,600 b/d	7,500 b/d	7,400 b/d	7,300 b/d	7,200 b/d	7,100 b/d	7,000 b/d	6,900 b/d	6,800 b/d
(a) New Wells (4 M.A.O.R.T. rigs. Drilling time 2 months per well. Initial Production 300 b/d for 2 months then decreased 10 b/d per month. Forty-four wells completed by end of year)	730 730 750 750 790 790 840 920 1,000 1,080 1,160	720 720 740 740 780 780 800 880 960 1,040 1,120	710 710 730 730 770 770 790 840 920 1,000 1,080	700 700 720 720 760 760 780 800 880 960 1,040	690 690 710 710 750 750 770 790 840 920 1,000	680 680 700 700 740 740 760 780 800 880 960	670 670 690 690 730 730 750 770 790 840 920	660 660 680 680 720 720 740 760 780 800 880	650 650 670 670 710 710 730 750 770 790 840	640 640 660 660 700 700 720 740 760 780 800	630 630 650 650 690 690 710 730 750 770 790	620 620 640 640 680 680 700 720 740 760 780
Totals	9,540 b/d	9,280 b/d	9,050 b/d	8,820 b/d	8,620 b/d	8,420 b/d	8,250 b/d	8,080 b/d	7,940 b/d	7,800 b/d	7,690 b/d	7,580 b/d
5th Rig (Drilling time 2 months per well. Eleven wells completed by end of year.)	177.5 b/d 187.5 187.5 197.5 197.5 200 220 240 260 280 280	175 b/d 185 185 195 195 197.5 210 230 250 270 280	172.5 b/d 182.5 182.5 192.5 192.5 195 200 220 240 260 270	170 b/d 180 180 190 190 192.5 197.5 210 230 250 270	167.5 b/d 177.5 177.5 187.5 187.5 190 195 200 220 240 250	165 b/d 175 175 185 185 187.5 192.5 197.5 210 230 240	162.5 b/d 172.5 172.5 182.5 182.5 185 190 195 200 220 230	160 b/d 170 170 180 180 182.5 187.5 192.5 197.5 210 220	157.5 b/d 167.5 167.5 177.5 177.5 180 185 190 195 200 210	155 b/d 165 165 175 175 177.5 182.5 187.5 192.5 197.5 200	152.5 b/d 162.5 162.5 172.5 172.5 175 180 185 190 195 197.5	150 b/d 160 160 170 170 172.5 177.5 182.5 187.5 192.5 195
Totals	2,437.5 b/d	2,372.5 b/d	2,307.5 b/d	2,250 b/d	2,192.5 b/d	2,142.5 b/d	2,092.5 b/d	2,050 b/d	2,007.5 b/d	1,972.5 b/d	1,945 b/d	1,917.5 b/d
6th Rig 10 wells completed	2,200 b/d	2,150 b/d	2,100 b/d	2,060 b/d	2,060 b/d	2,030	2,030 b/d	2,010 b/d	2,010 b/d	1,985 b/d	1,960 b/d	1,935 b/d
7th Rig 10 wells completed	2,260	2,200	2,150	2,100	2,060	2,060	2,030	2,030	2,000	1,975	1,950	1,925
8th Rig 9 wells completed	2,020	1,970	1,920	1,880	1,880	1,850	1,850	1,820	1,820	1,797.5	1,775	1,752.5
9th Rig 9 wells completed	2,090	2,040	2,000	2,000	1,970	1,970	1,940	1,940	1,917.5	1,895	1,872.5	1,850
10th Rig 8 wells completed	1,850	1,810	1,780	1,780	1,760	1,740	1,720	1,700	1,680	1,660	1,640	1,620
Totals	10,420 b/d	10,170 b/d	9,950 b/d	9,820 b/d	9,730 b/d	9,650 b/d	9,570 b/d	9,500 b/d	9,427.5 b/d	9,312.5 b/d	9,197.5 b/d	9,082.5 b/d
Total Daily Average (each month)	30,297.5	29,622.5	29,007.5	28,490	28,042.5	27,612.5	27,212.5	26,830	26,475	26,085	25,732.5	25,380
Total Monthly Production	909,925 b/m	888,675 b/m	870,225 b/m	854,700 b/m	841,275 b/m	828,375 b/m	816,375 b/m	804,900 b/m	794,250 b/m	782,550 b/m	771,975 b/m	761,400 b/m

Total Production for year 9,923,625 barrels

(a) All completed in the Lovaszi Field.

Summary of Oil Production Possibly Developed in Budafapuszta and Lovaszi Including Interspaced Wells at Lovaszi

1942		1943	
Month	Barrels per Day	Month	Barrels per Day
January	11,500	January	22,230
February	11,500	February	22,720
March	12,700	March	26,180
April	12,500	April	26,620
May	13,960	May	29,480
June	14,510	June	29,790
July	15,710	July	33,060
August	16,490	August	33,290
September	18,410	September	35,990
October	18,600	October	36,130
November	20,420	November	38,750
December	21,010	December	38,810
Total 1942:	5,706,270	Total 1943:	11,365,240

Other Possibly Productive Areas

It is estimated that at Hahót or on the MANAT concession, east of the Danube, additional production of perhaps 7,500 barrels per day may have been developed by the end of 1943.

A P P E N D I X 3

EVALUATION OF BUDAFAPUSZTA CRUDE

Hungarian (Budafapuszta) Crude, True-Boiling Analyses

Sp. Gr. @ 60°F.	0.8155
A.P.I.	42.0°
Water (D&S)	0.025%
Water & B.S. (Centrifuge)	0.1%
Flash (Abel Closed)	below 73°F.
Sulphur (Bomb)	0.157%
Calorific Value (Bomb)	19,300 BTU/lb.
Conradson Carbon	0.92%
Pour Point	45°F.
Ash	0.003%
Paraffin Wax (I.P.T.)	5.32% (M.P. 103°F.)
Odour	Sweet
Colour	Dark Green

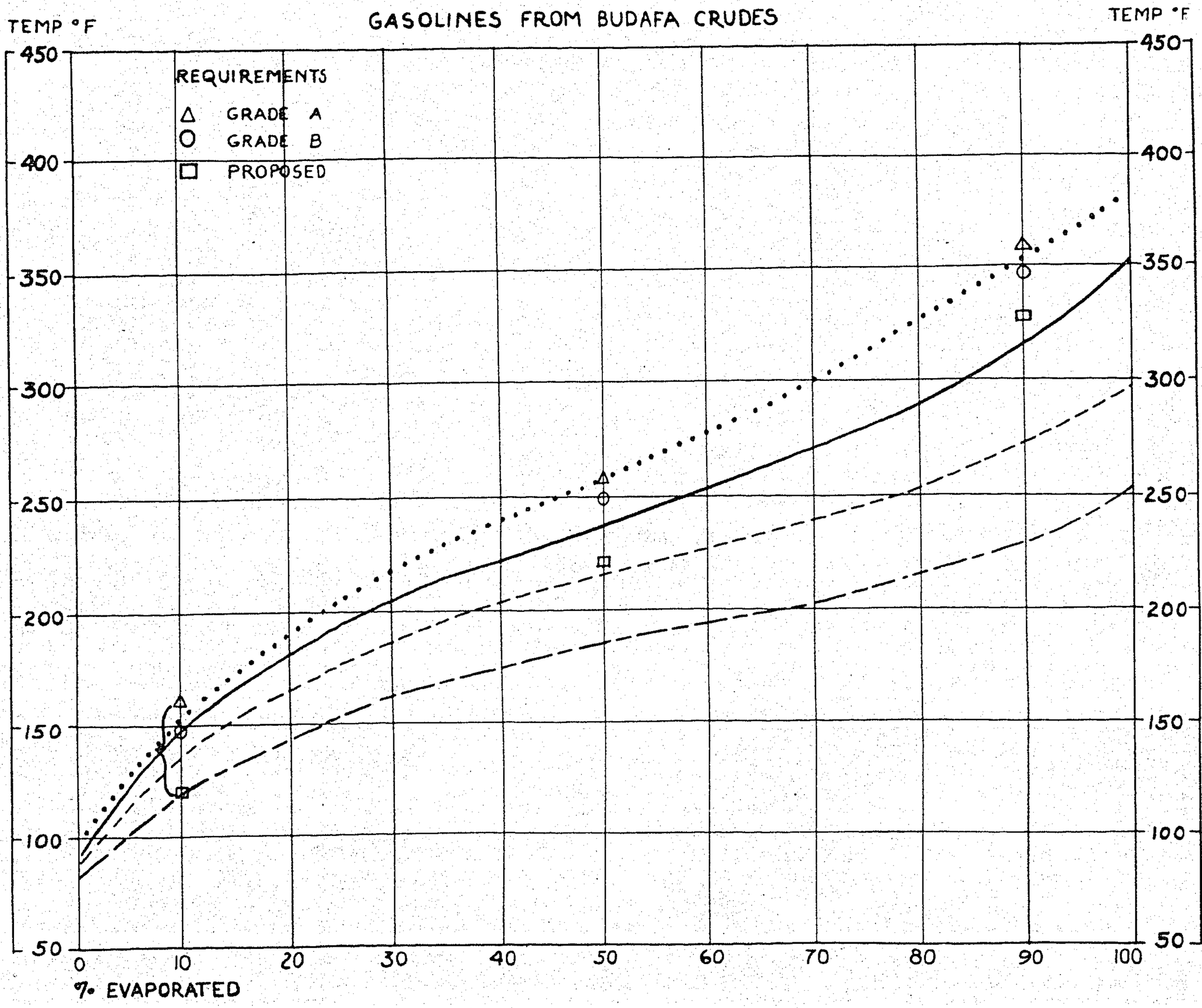
Viscosities									
Red.	No.1	@ 50°F.	equals	209"	Say.Univ.		@ 50 °F.	equals	330"
"	"	@ 70°F.	"	35"	"	"	@ 70 °F.	"	38"
"	"	@ 90°F.	"	31"	"	"	@ 90 °F.	"	36"
"	"	@100°F.	"	26"	"	"	@100 °F.	"	33"

Distillation Range (ASTM)			
I.B.P.	39°C.	160°C.	32-1/2%
50°C	1-1/2%	180°C.	38%
60°C	2-1/2%	200°C	41-1/2%
70°C	4-1/2%	220°C	47%
80°C	8%	240°C	51%
90°C	11%	250°C	53%
100°C	13%	260°C	55%
120°C	18%	280°C	59-1/2%
140°C	27%	300°C	65%
150°C	29%		

Gasoline Blends					
V. T. Range °F.	0-250°F.	0-300°F.	0-350°F.	0-400°F.	0-430°F.
Yield	24.01%	32.38%	40.15%	45.11%	50.26%
Sp. Gr. @ 60°F.	0.7035	0.7205	0.7347	0.7435	0.7505
A.P.I.	69.6°	64.9°	61.1°	58.8°	57.1°
Colour Saybolt	+30	+30	+30	+30	+28
Doctor Test	Sweet	Sweet	Sweet	Sweet	Sweet
Octane No. CFRMM	72	66-1/2	-	59-1/2	54-1/2
R. V.P. - lbs.	12.3	-	9.6	-	7.9
Sulphur	-	0.01%	0.01%	0.11%	-
Dist. Range Astm					
I.B.P.	28°C	31°C	33°C	36°C	37°C
50°C D+L	12%	7%	5%	4-1/2%	4%
70°C D+L	28-1/2%	17-1/2%	13%	12%	10%
100°C	78%	47%	34%	28%	24%
140°C	-	95%	78-1/2%	64-1/2%	57%
F. B. P.	124°C	148°C	177°C	195°C	215°C

DISTILLATION CURVES

GASOLINES FROM BUDAFA CRUDES



WHITE SPIRIT BLENDING

V.T. Range°F.	300-400°F.		
Cut Range	33.54-47.27%		
Yield	13.73%		
Sp. Gr. @ 60°F.	0.796		
A.P.I.	46/3°		
Flash (Abel Closed)	105°F.	Corrosion	
Color Saybolt	+30	@ 212°F.	Passes
Sulphur	0.012%	@ 122°F.	Passes
Doctor Test	Sweet		
Kauri-Butanol Value	39		
Dist. Range ASTM			
I.B.P.	157°C.		
160°C.	2%		
170°C.	47-1/2%		
180°C.	80-1/2%		
190°C.	94-1/2%		
F. B. P.	198°C.		

REFINING OIL BLENDS

V.T. Range°F.	300-580°F.	300-560°F.	400-500°F.
Cut Range - %	33.54-68.17	33.54-66.56	47.37-57.56
Yield	33.63%	33.02%	10.29%
Sp.Gr. @ 60°F.	0.8124	0.8195	0.829
A.P.I.	40.8°	41.2°	39.2°
Colour Saybolt	+17	+18	+22
Doctor Test	Sweet	Sweet	Sweet
R.O. Visc. @ 60°F.	390	360	430
Ring Number	24	24	18
Smoke Point (I.P.T.)	21	20	20
Flash (Abel Closed)	130°F	130°F	172°F(PM Closed)
Sulphur	0.025%	0.023%	0.028%
Distillation Range			
I.B.P.	166°C	166°C	211°C
200°C	33%	33-1/2%	-
240°C	65-1/2%	68%	86%
F.B.P.	295°C	288°C	260°C

GAS OIL BLENDS

V.T. Range F.	300-700°F.	350-630°F
Cut Range - %	33.54-79.77	41.31-74.12
Yield	46.23 %	32.81%
Sp. Gr. @ 60°F.	0.8315	0.8347
A.P.I.	38.7°	38.1°
Flash (PM Closed)	150°F.	170°F.
Aniline Point	147.5°F	151°F.
Diesel Index	57.08	57.5
Sulphur	0.073%	0.08%
Pour Point	15°F	5°F
Colour Tag Robinson	24	24
Engler Visc./68°F	1.21°	1.34°
Conradson Carbon	Nil	Nil
Dist. Range ASTM		
I. B. P.	180°C	199°C
200°C	21%	-
250°C	50%	50%
300°C	76%	86%
350°C	97-1/2% (FBP)	324°C

BOTTOMS (Reduced Crude)		
Cut Range - %	85.97-100	79.77-100
Yield	14.03%	20.23%
Sp. Gr. @ 60°F.	0.9375	0.918
A.P.I.	19.4°	22.6°
Flash (PM Closed)	510°F	425°F
Pour Point	130°F	110°F
Visc.Say.Furol/175°F.	42"	17"
" " " /225°F.	18.5"	-
Conradson Carbon	6.6%	4.3%
Sulphur	0.35%	0.285%

DETAILS OF INDIVIDUAL REFINED OIL CUTS				
Cut Range - %	33.54-41.31	41.31-44.31	44.31-47.27	47.27-50.27
Yield - %	7.77%	3.0%	2.96%	3.0%
Sp.Gr. @ 60°F.	0.790	0.801	0.8095	0.815
A.P.I.	47.6°	45.2°	43.3°	42.1°
Colour Saybolt	+36	+30	+28	+27
R.O. Visc. @60°F.	190(Approx)	245	290	340
Ring Number	54	41	31	29
Smoke Point	24	24	24	23

Cut Range - %	50.27-51.42	51.42-54.51	54.51-57.56
Yield - %	1.15%	3.09%	3.05%
Sp. Gr. @ 60°F.	0.821	0.837	0.839
A.P.I.	40.9°	37.6°	37.2°
Colour Saybolt	+23	+22-1/2	+22
R.O. Visc. @ 60°F.	-	445	565
Ring Number	0	5	25
Smoke Point	22	19	19

DETAILS OF INDIVIDUAL CUTS ON GAS OIL ETC.					
Cut Range - %	57.56-60.56	60.56-63.56	63.56-66.56	66.58-68.17	68.17-71.17
Yield - %	3.0%	3.0%	3.0%	1.61%	3.0%
Sp.Gr. @ 60°F.	0.8415	0.846	0.8465	0.8485	0.852
A.P.I.	36.7°	35.8°	35.7°	35.3°	34.6°
Pour Point	-.5°F	-.5°F	15°F	30°F	40 °F
Flash (PM Closed)	225°F	-	255°F	-	290°F
Visc.Engler/68°F	1.22°	1.33°	1.45°	1.6°	1.7°
Colour Saybolt	+8	+5	-		-
Colour Tag Rob.	-	-	23	21	20-1/2
Aniline Point	147-1/2°F	149-1/2°F	159-1/2°F	166°F	169°F
Diesel Index	54.1	53.5	57.0	58.6	58.5
Sulphur	0.05%	-	-	0.105%	-
Con. Carbon	-	-	-	-	-

Cut Range - %	71.17-74.12	74.12-76.99	76.99-79.77	79.77-82.91	82.91-85.97
Yield - %	2.95%	2.87%	2.78%	3.14%	3.06%
Sp.Gr. @ 60°F.	0.8585	0.865	0.870	0.8737	0.8855
A.P.I.	33.3°	32.1°	31.1°	30.5°	28.3°
Pour Point	55°F	65°F	80°F	95°F	105°F
Flash (PM Closed)	-	-	350 °F	370°F	-
Visc.Engler/68°F.	2.0°	2.52°	-	-	-
Colour T.R.	18-1/2	14	13	9-1/2	3
Aniline Point	173-1/2°F	178-1/2	187°F	198-1/2°F	201-1/2°F
Diesel Index	57.7	57.3	58.15	59.9	57.0
Sulphur	-	-	0.13%	-	-
Con.Carbon	-	-	Nil	Nil	0.02%

SUMMARY OF CHARACTERISTICS

This is a mixed base crude yielding over 65% of White Oils. Between 45/50% of 205°C Index Gasoline with comparatively good octane number can be obtained.

The Kerosines are low in Ring Number and Smoke Point.

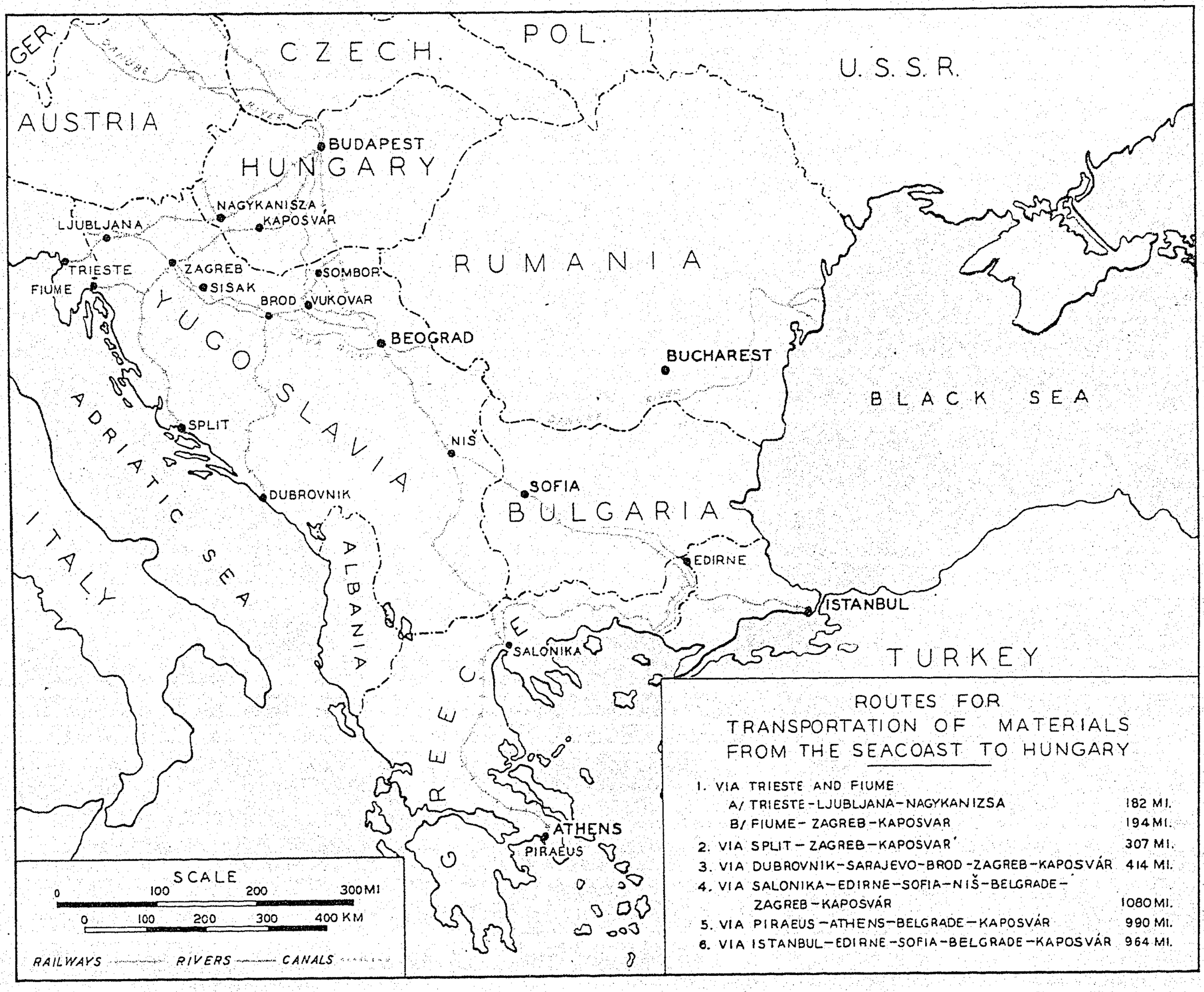
Gas Oil production will be governed by high wax content and specification pour point limits. Diesel Indices are only moderate.

Sulphur Contents are low throughout and the products are particularly sweet to odour.

A yield of 13.7% of White Spirit is shown which from its Kauir-Butanol Value and otner tests should be of excellent quality.

The possibilities of Lubricating Oil production has not been investigated, but heavy dewaxing would be necessary.

The Bottoms (14%) show a high paraffin content as evidenced by the pour of 130° F.



ROUTES FOR TRANSPORTATION OF MATERIALS FROM THE SEACOAST TO HUNGARY

1. VIA TRIESTE AND FIUME	
A/ TRIESTE - LJUBLJANA - NAGYKANIZSA	182 MI.
B/ FIUME - ZAGREB - KAPOSVAR	194 MI.
2. VIA SPLIT - ZAGREB - KAPOSVAR	307 MI.
3. VIA DUBROVNIK - SARAJEVO - BROD - ZAGREB - KAPOSVÁR	414 MI.
4. VIA SALONIKA - EDIRNE - SOFIA - NIŠ - BELGRADE - ZAGREB - KAPOSVÁR	1080 MI.
5. VIA PIRAEUS - ATHENS - BELGRADE - KAPOSVÁR	990 MI.
6. VIA ISTANBUL - EDIRNE - SOFIA - BELGRADE - KAPOSVÁR	964 MI.

APPENDIX 4

TRANSPORTATION OF MATERIALS FROM THE SEACOAST TO HUNGARY

Routes for transportation of materials from the seacoast to Hungary are shown in red on the map on page 106.

1. Via Trieste and Fiume

A. Trieste-Ljubljana-Nagykanizsa: 182 miles.- double-tracked between Trieste and Ljubljana and single-tracked from the latter city to Nagykanizsa. There are excellent siding facilities on this section.

B. Fiume-Zagreb-Kaposvár: 194 miles.- Single-tracked throughout but has good siding facilities.

Both of these railroad routes are standard (a) gauge and there are secondary paralleling routes, all single-tracked, which could be used to relieve congestion. These are the best routes to use for transportation of materials to Hungary, provided the ports of Trieste and Fiume are available. The Trieste-Nagykanizsa route is the better of the two.

2. Split-Zagreb-Kaposvár: 307 miles.- Next to the Trieste-Nagykanizsa and Fiume-Kaposvár routes, the Split-Zagreb-Kaposvár route would be the best for transportation of material from the seacoast to Hungary. The road bed of this line usually is in fair condition. It is single-tracked throughout.

3. Dubrovnik-Sarajevo-Brod-Zagreb-Kaposvár: 414 miles.- This is a branch line which passes through the mountainous Sarajevo country. The road bed from Dubrovnik to Brod is not well kept. The road is narrow gauge and single-tracked from Dubrovnik to Brod, and from the latter point to Kaposvár is standard gauge and single-tracked. The use of this line involving reloading to standard gauge cars at Brod would not be recommended if the ports of Trieste, Fiume or Split should be available. However, it might possibly be preferable to the long hauls via Piraeus or Salonika.

4. Salonika-Edirne(b)-Sofia-Niš-Beograd-Zagreb-Kaposvár: 1080 miles.- The Greek line from Salonika to Edirne is double-tracked and standard gauge but there are no parallel lines which could be used to relieve excess traffic or as alternative routes should the right of way be cut.

The route from Edirne, passing through Sofia, Niš, and Beograd is the trunk line from Europe to Turkey and the Middle East. It is single-tracked throughout.

5. Piraeus-Athens-Beograd-Kaposvár: 990 miles.- This is the main line of railway communication between Athens and the rest of Europe. It is single-tracked and standard gauge. This would be a long haul but could be used (c).

6. Istanbul-Edirne-Sofia-Beograd-Kaposvár: 964 miles.- This is the main trunk line which connects Turkey and the Middle East with Europe. It is single-tracked throughout and standard gauge. Excellent siding facilities are available.

7. The Danube River.- The channel of the Danube River is maintained at a depth of ten feet (d) by constant dredging. This river is closed to navigation

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(a) European
(b) Adrianople
(c) All railroads in Greece other than those described above are antiquated and narrow gauged.
(d) However, the minimum depth of the Danube Channel in Yugoslavia during the low water is as low as six feet.

in consequence of freezing for an average of two and one half months each year, usually from the middle of December to the end of February.

Aside from the winter freeze, the only volume restriction on Danube water traffic is the narrow gorge of the Iron Gate (Turnul-Severin), where the Danube River cuts through the Carpathian mountains. At this point the Sip Canal has been blasted through the rapids. Because of the force of the current, barges going upstream are towed on a paralleling railway. Traffic through the Sip Canal is alternately upstream and downstream, and it is estimated that not more than 600,000 metric tons a month of upstream shipping can be accommodated through these narrows (a). A barge of 700 metric tons capacity is about the largest that can pass through the Iron Gate.

Besides the straight Danube route to Budapest, there are a number of combinations of rail and the Danube River which might be used if the Danube River were not passable at certain points. Among these are:

A. Via the Danube to Beograd, with transfer to railway tank cars at Beograd.

B. Via the Danube to Beograd, thence via the Sava River to either Brod, Sisak, or Zagreb, depending on the barge draught, with transfer to railway at any of these points.

C. Via the Danube to Vukovar, with transfer to rail at the latter point.

D. Via the Danube and the Prince Alexander Canal, with transfer to rail at Sombor, thence to Budapest.

8. Internal Transportation Facilities in Hungary.- The city of Budapest and its environs contained nearly one-third of Hungary's pre-war population, and the greater part of Hungarian manufacturing facilities was centered there. A network of railroad lines radiates from Budapest over the whole country, and the Danube River furnishes an avenue for north-south water transport from Budapest. In the eastern part of the country the Tisza River is also navigable for barges throughout most of its length, and affords a second north-south waterway.

The entire country is well served with both trunk roads and secondary roads. While the roads throughout the fields are all-weather roads, numerous and macadamized, they are not sufficiently well built to stand heavy traffic in bad winter weather. They are also narrow. As an example of the difficulties which might be expected in bad winter weather, Mr. Paul Ruedemann (b) pointed to the unsatisfactory experience of the Germans while hauling propane gas in bottles from the fields, eight tons to the load. They had much trouble skidding into ditches during bad winter weather. Roads are sometimes blocked by snow in winter for several days in succession, but presumably snow plows would be in operation by the Allied Forces and the roads probably would be kept open in any case, hence this point probably is of minor importance.

(a) American Consulate, Istanbul, report dated 11/23/42, Doc. Sec. No. 417787, MEW report on German utilization of Caucasus oil, of April 25, 1942.
(b) Formerly Manager of M.A.O.R.T., Hungarian subsidiary of the Standard Oil Co. of New Jersey.

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