

FILM STUDY GROUP
SUBJECT INDEX AND REPORT

T.O.M. REEL NO. 37

Prepared by
CALIFORNIA RESEARCH CORPORATION

CALIFORNIA RESEARCH CORPORATION

RICHMOND, CALIFORNIA

INDEX OF TECHNICAL OIL MISSION

MICROFILM

REEL NO. 37

Prepared by California Research Corporation

INDEX OF REEL #37

	<u>Frame No.</u>
<u>ALCOHOLS</u>	
Synthesis, miscellaneous Ruhrchemie patents and applications	438P to 749P
<u>AROMATIZATION</u>	
Miscellaneous Ruhrchemie patents and applications	438P to 567P
<u>CATALYSTS</u>	
Miscellaneous Ruhrchemie patents and applications	438P to 749P
<u>CHEMICAL APPARATUS</u>	
Miscellaneous Ruhrchemie patents and applications	568P to 749P
<u>CHEMICAL PROCESSES</u>	
Miscellaneous Ruhrchemie patents	568P to 749P
<u>CRACKING</u>	
Catalytic, for upgrading Fischer synthesis products	750 to 1021
Experiments on Kogasin middle oil	750 to 1021
Thermal, for upgrading Fischer synthesis products	750 to 1021
<u>FATTY ACIDS</u>	
Miscellaneous Ruhrchemie patents and applications	568P to 749P
<u>FISCHER SYNTHESIS</u>	
Analysis of exit gas, calculating course of reaction by	376
Analysis of oven paraffin for Co	17
Construction of reactor	384
Effect of changing direction of gas flow	3
Effect of inert content of synthesis gas on conversion and yield	22
Exit gas analysis to calculate conversion	13
Experiments with Fe and Co catalysts	1155 to 1217
Of gasoline with Fe catalyst	1064
With iron catalyst, review by Fichler	1139
Iron catalysts, preparation and use of	1087
Kieselguhr and catalyst, quality and delivery of	1077
Loss of Co catalyst in paraffin formed	10
Methane formation and CO ₂ content of synthesis gas	19
Methanol synthesis experiments	418
Middle pressure synthesis,	
with CO ₂ -poor synthesis gas	1
with Co catalyst, summaries and reports on	187
with Co catalyst from 1937-1941	53
compared with normal pressure	53
effect of varying H ₂ :CO ₂ ratio	35
of gasoline, preparation of Fe catalysts for	367
with Fe catalyst, data, graphs, etc., of developments	
in 1941	367
with Fe catalyst, development of	252 to 363
With Fe catalyst, laboratory and pilot plant data	367
recycle gasoline from	1065
Ruhrchemie patents and patent applications, misc.	438P to 749P

INDEX OF REEL #37, Cont'd.

FISCHER SYNTHESIS, Cont'd.

	<u>Frame No.</u>
Monthly reports on processing olefinic gasolines	420
Nickel catalysts	380
Normal pressure, compared with middle pressure synthesis	53
Normal pressure, effect of recycling	42
Olefins from hydrogenation of CO	1134P
Operations of plant	1073
Oxygenated products from Oxo type reaction in Plant at Ruhrchemie	380
Present state at Ruhrchemie plant	1068
Production of higher alcohols in	1111
Production of wax for fatty acid synthesis	389
Proposed plant changes	408
Ruhrchemie patents and patent applications, misc.	383
Upgrading products to motor and aviation fuels	438P to 749P

FISCHER-TROPSCH PROCESS

Ruhrchemie synthesis plant present state	1111
--	------

GASOLINE

Aviation, from upgrading Fischer synthesis products	750 to 1021
Blending, for upgrading Fischer synthesis products	750 to 1021
Correlation of octane number with aniline point	750 to 1021
From Fischer synthesis, lead susceptibility	750 to 1021
From Fischer synthesis, octane number determinations and improvement	750 to 1021
Motor, from upgrading Fischer synthesis products	750 to 1021
From polymerization of C ₃ and C ₄ olefins	1022
Quality change upon removal of C ₇ fraction	1051
Synthesis, miscellaneous Ruhrchemie patents and applications	438P to 567P

HYDROCARBON SYNTHESIS

See Fischer synthesis, Fischer-Tropsch process

HYDROGENATION

Of carbon monoxide with Fe catalyst, review	1139
---	------

ISOMERIZATION

For upgrading Fischer synthesis products	750 to 1021
--	-------------

LUBRICATING OILS

Miscellaneous Ruhrchemie patents and applications	438P to 749P
From polymerization of olefinic gasolines	420

OLEFINS

From hydrogenation of CO by addition of organic acids	1134P
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INDEX OF REEL #37, Cont'd.

	<u>Frame No.</u>
<u>OXO REACTION</u>	
In Fischer synthesis, oxygenated products from	380
<u>POLYMERIZATION</u>	
Miscellaneous Ruhrchemie patents and applications	438P to 749P
Of olefinic gasolines to lubricating oils	420
Of olefins (C ₃ and C ₄) to gasoline	1022
For upgrading Fischer synthesis products	750 to 1021
<u>REFORMING</u>	
For upgrading Fischer synthesis products	750 to 1021
<u>RUHRCHEMIE, A. G.</u>	
Miscellaneous patents and patent applications	438P to 749P
Sterkrade-Holter, personnel to be evacuated	1091
<u>SOAPS</u>	
Miscellaneous Ruhrchemie patents and applications	568P to 749P

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ABSTRACT OF TECHNICAL OIL MISSION

MICROFILM

REEL NO. 37

Prepared by California Research Corporation

SUMMARY OF MICROFILM REEL TAC NO. 37

Rushchemie AG Sterkrade-Holten
Bag No. 3451, Target No. 30/5.01

Item No. 13 - (2 pages, frames 1-2)

A letter dated November 25, 1938, stating that in the middle pressure synthesis the use of a synthesis gas initially poor in CO₂ (0.6%) resulted in a much higher conversion to CO₂ during the synthesis than when the original feed contained a large quantity of CO₂ (14.1%).

Item No. 14 - (7 pages, frames 3-9)

A letter dated January 14, 1939, and a report dated December 26, 1941, in which the effect of changing the direction of flow of gas from down-flow to up-flow in the Fischer synthesis is discussed. It was concluded that the change to up-flow: (1) lowered the conversion, (2) decreased the amount of liquid products, (3) resulted in a liquid product which was lighter than that from down-flow operation.

Item No. 15 - (3 pages, frames 10-12)

A letter dated November 14, 1939, concerning the loss of cobalt catalyst in the paraffin formed during the Fischer synthesis.

Item No. 16 - (4 pages, frames 13-16)

A memorandum dated May 9, 1939, giving an example of how to use an exit gas analysis to calculate conversion, etc.

Item No. 17 - (2 pages, frames 17-18)

A memorandum dated December 7, 1939, containing an analysis of oven paraffin for cobalt showing a cobalt content of 2%.

Item No. 18 - (3 pages, frames 19-21)

A memorandum dated April 1, 1939, discussing experimental work to determine the relationship between methane formation and CO₂ content of the synthesis gas. No correlation between the two was found.

Item No. 19 - (13 pages, frames 22-34)

Memoranda dated October 2, 1941, and November, 1941, discussing the effect of the inert content in the synthesis gas on conversion and yield. It was concluded: (1) that at constant temperature and space rate, as inert content drops, conversion rises and liquefaction drops; (2) at constant inert concentration as space rate is increased, conversion drops and liquefaction is unchanged; (3) as inert content and through-put are both lowered simultaneously the conversion increases while the degree of liquefaction remains the same.

Item No. 20 - (7 pages, frames 35-41)

A memorandum dated March, 1942, discussing the effect of changing the ratio of hydrogen to CO in the synthesis gas in the middle pressure synthesis. There is some indication that by varying the H₂:CO ratio from 1.75 to 2.25 frequently, the conversion and yield are unchanged but the catalyst life is increased.

Item No. 21 - (11 pages, frames 42-52)

A memorandum dated February 5, 1941, discussing the effect of recycling in the normal pressure Fischer synthesis. It was concluded that increasing recycle increases conversion and catalyst life and increases the olefin content of the product.

Item No. 22 - (134 pages, frames 53-186)

This section consists of minutes of meetings, memoranda, etc. covering the development of the middle pressure synthesis with a cobalt catalyst during the period 1937 to 1941. In general there is very little interesting technical information in this section.

It contains, rather, more research programs, discussions of planned work, etc. Summaries of three memoranda of some technical interest are given below:

A memorandum dated December 19, 1939, announcing the development of a high cobalt catalyst (100 parts cobalt to 10-20 parts of kieselguhr) promoted by manganese which is capable of causing 100% conversion at 5-20 atmospheres and 160-170°C. with the production of a product containing 70-80% wax.

A memorandum dated January 11, 1939, on wax synthesis. It states that wax production in CO-hydrogenation is increased by: (1) low temperature; (2) high CO content of synthesis gas; (3) long contact time; (4) high pressure; (5) high cobalt content of catalyst.

A memorandum of May 9, 1938, discussing the effect of pressure in CO hydrogenation. When compared with the normal pressure synthesis, the middle pressure synthesis (5-20 atmospheres): (1) increases catalyst life; (2) increases yield; (3) results in more complete conversion; (4) results in higher boiling products; (5) is capable of greater selectivity.

Item No. 23 (65 pages, frames 187-251)

This section consists of a series of summaries and reports on the cobalt middle pressure synthesis. Below is a brief summary of those items of technical interest.

A statement by Dr. Pichler about the middle pressure synthesis containing qualitative discussion of catalysts, space rate, catalyst regeneration, etc., and including curves correlating pressure with yield, catalyst life with quality of product, etc.

A memorandum dated October 12, 1937, containing results of work on the middle pressure synthesis with a normal cobalt catalyst. It states that addition of nickel reduces wax formation and that high hydrogen concentration reduces the amount of wax and heavy material.

A memorandum dated February 17, 1938, on the effect of a high concentration of carbon monoxide in the synthesis gas. It was stated that with a normal cobalt catalyst higher temperatures were required for a given conversion. The amount of liquefaction remained the same but CO₂ formation rose sharply. The boiling point of the liquid product was not greatly changed except that wax formation was suppressed. The advantage of high CO concentration is the unsaturated character of the product. Tables are included giving data on the run.

A compilation of results from the operation of a pilot plant from October to December, 1937, in the middle pressure synthesis. The addition of ammonia during the run to neutralize acids formed had an undesirable effect on catalyst activity.

A memorandum dated April 7, 1938, discussing an investigation of the water soluble products of the middle pressure synthesis. About one gram per cu. ft. of synthesis gas was formed and it was found to consist principally of organic acids.

A memorandum dated July 12, 1938, on a method of increasing the gasoline content of the product of the middle pressure synthesis. This can be accomplished by (1) recycling, (2) use of higher temperature, (3) use of a catalyst of low cobalt concentration, and (4) use of a cobalt-nickel catalyst.

A memorandum dated September 16, 1938 in which it is stated that a normal cobalt catalyst was operated for 107 days in the middle pressure synthesis without any decline in activity.

In addition to the above items, there is some data on pilot plant runs, inspections of products, etc.

Item 24 - (112 pages, frames 252-363)

This section contains minutes of meetings, etc., covering the development of the middle pressure synthesis with an iron catalyst. In general it contains little technical information. Brief abstracts of those memoranda containing information of interest are given below.

A memorandum dated January 28, 1943 discussing iron catalysts. It is stated that there is no iron catalyst comparable to cobalt catalysts since all iron catalysts require pressure (10-20 atmosphere) and operate at higher temperatures (above 200°C.). However, under these conditions there are a variety of active catalysts which can give products of highly different characteristics. The compositions of the various iron catalysts lie in the following range:

100	Fe
2-5	Cu
10-30	CaO
30-150	Kieselguhr

The catalyst activity is very sensitive to the method of preparation and the products are in general more unsaturated than those from a cobalt catalyst.

A memorandum dated December 22, 1941 reporting a high conversion and high wax production (75% of the liquid product) with an iron catalyst at low temperature (220°C.). This is attributed to the fact that the synthesis gas contained no inerts.

Minutes of a conference dated April 19, 1940 discussing the middle pressure synthesis in which it is stated that increasing the CO:H₂ ratio increases olefins but not wax.

A memorandum dated February 13, 1940 on the olefin synthesis. All iron catalysts give high yields of olefins, the Lurgi catalyst yielding a gasoline containing 77% olefins. A high CO concentration favors olefins and by using a ratio of CO to hydrogen of 1.5, the concentration of olefins in the final product is as high as 75 to 90%. Recycle also causes a small increase in the olefin concentration.

A letter dated January 30, 1940 discussing a sample of wax from the iron middle pressure synthesis stating that it is suitable for fatty acid production. The wax consisted of 55% normal paraffins 15% normal olefins, 10% iso-olefins, 10-15% oxygenated products, and the balance isoparaffins.

A memorandum dated December 20, 1939 discussing the iron synthesis. The catalyst was activated with water gas rather than being reduced with pure hydrogen. After activation operating conditions were 225-245°C., 10-20 atmospheres pressure, 0.1 cubic meters per litre per hour space rate, conversion of 75-90%, catalyst life of at least 1000 hours, and methane formation of 2-12%. The yield of liquid product was 145 grams per inert free cubic meter of synthesis gas. During the first 100 hours the product was principally gasoline with only 10% wax, after 200 hours the product contained 40% wax, and after 260 hours 50%.

Item 25 - (9 pages, frames 367-375)

A memorandum dated September 19, 1941 giving comparative laboratory and pilot plant data on the middle pressure synthesis with an iron catalyst. It contains no unusual technical information.

Item 26 - (9 pages, frames 367-375)

This is a summary dated January 19, 1942 of developments in 1941 on the iron middle pressure synthesis. These papers contain a considerable amount of interesting technical information including tables of data, graphs, etc., illustrating the qualitative conclusions given below.

It states that wax formation is a function of the catalyst precipitant used with KOH, NaOH, and Na₂CO₃ being effective in that order. The effect is very great, with the wax content varying from 66% to 18% of the total product, and vice versa for gasoline ingoing from KOH to Na₂CO₃. Also gasification is reduced when the catalyst is precipitated with KOH. Variation of the pH of precipitation of the catalyst has a great influence on the consistency of the

wax formed, on the reaction temperature, on conversion, and particularly on the consumption ratio of CO:H₂. As the pH of precipitation increases operating temperature decreases. The consumption ratio of CO:H₂ decreases as pH of precipitation increases. There is also a very large increase in the amount of oxygenated compounds as the pH of precipitation increases. For example, the OH number of the gasoline rises from 17 to 113 as the pH increases from 6.8 to 9.4; and carbonyl, neutralization and saponification numbers also increase. The olefin content is also perhaps slightly increased.

Since it is desirable to have a catalyst which gives the right consumption ratio of CO to hydrogen (for water gas about 1:1.25) a catalyst was developed which gave at 245°C. a yield of 140-145 grams of liquid product per cubic meter of synthesis gas. This product contained 60% by weight of wax and the consumption ratio was the desired 1:1.25. The catalyst consisted of 100 Fe, 5 Cu, 10 CaO, 100-150 kieselguhr precipitated with KOH with a pH of 6.8-7.0. This catalyst was selected as the standard catalyst.

With the standard catalyst it was noted that wax production dropped over a period of 1000 hours from approximately 65% to 40%. Attempts to bring up wax formation again by removing adhering wax from the catalyst by extraction and by hydrogenation had no favorable effect. It was found that by increasing the alkalinity considerably (impregnating the catalyst with 20% potassium aluminate) that the catalyst was fairly well stabilized so far as wax formation was concerned but that the consumption ratio of CO:H₂ was 1:0.7. The addition of only 5% potassium is helpful but not sufficient.

As temperature of reaction is lowered wax formation increases. For example, wax formation increases from 12% at 300°C. to 75% at 225°C. The use of a hydrogen rich gas has no effect on the temperature of reaction or on the wax content.

Luxmasse, a cheap source of iron from bauxite refining, can be substituted for pure iron without bad effect. The substitution of silver for copper in the catalyst gives a product of high wax, olefin, and oxygen content. The activity of the catalyst is also very dependent on copper concentration. As copper concentration decreases the amount of wax and Diesel oil decreases greatly and the gasoline increases. Small traces of the copper have a very large effect on increasing the wax content of the product.

The temperature of reduction affects only the consumption ratio of CO:H₂, changing it from 1:1.2 at 275°C. to 1:1.08 at 325°C.

There is also attached a 6 page report in handwriting on the preparation of iron catalysts for the middle pressure synthesis of gasoline.

Item 27 - (4 pages, frames 376-379)

A memorandum dated November 17, 1943 on the method of calculating the course of a reaction by analysis of exit gas. No interesting technical information is included.

Item 28 - (3 pages, frames 380-382)

A memorandum dated May 14, 1943 suggesting that oxygenated products result from an OKO type reaction.

Minutes of a meeting dated October 18, 1938 discussing nickel catalysts in which it was stated that nickel catalysts are unsatisfactory because of the high methane formation.

Item 29 - (5 pages, frames 383-387)

Minutes of a meeting dated July 9, 1940 discussing proposed plant changes. It contains no technical information of interest.

Item 30 - (1 page, frame 388)

A memorandum dated May 21, 1940 concerning the construction of a reactor. Of no interest.

Item 31 - (19 pages, frames 389-407)

Minutes of a meeting dated June 8, 1943 discussing the production of high alcohols (in the Fischer synthesis). It contains no interesting technical information.

A memorandum dated January 27, 1942 discussing direct production of alcohol in the Fischer synthesis. It is stated that high pressure (100 atmospheres) is desirable. Iron catalysts are superior to cobalt and increasing the alkalinity of precipitation increases the amount of oxygenated products. Increasing temperature decreases the concentration of oxygenated products. The presence of acetylene in a synthesis gas favors the formation of alcohols.

Item 32 - (Frames 408-417)

Minutes of a meeting dated July 21, 1943 discusses the production of wax for use in the fatty acid synthesis. Contains no technical information.

Item 33 - (2 pages, frames 418-419)

Two memoranda dated August 17 and May 3, 1943, on the status of methanol experiments and describing a good synthesis for methanol at 45-50 atmospheres pressure.

Item 34 - (18 pages, frames 420-437)

This contains a series of monthly reports from February to September 1944 on experimental work on the processing of olefinic gasolines including their polymerization to lubricating oils. Some data was given but it is sketchy and incomplete.

Item 35 - Miscellaneous Ruhrchemie Patents - (130 pages, frames 438-567)

Patent No. 701846 issued January 24, 1941 on the solvent removal of wax from a Fischer catalyst.

Patent application dated February 25, 1936 concerning the removal of acetylene from hydrocarbon gases by a two-step extraction with water at normal temperature and 10-15 atmospheres pressure.

Patent No. 736976 issued July 2, 1943 on a process for the preparation of oxides of alkaline earth metals free from iron and silica.

Application dated March 31, 1936 on the hydrogenation of CO with a cobalt catalyst activated by thorium and magnesium.

Patent No. 703225 issued March 4, 1941 describing a plant for the catalytic synthesis of hydrocarbons from CO and hydrogen.

An application dated June 23, 1936 on a process for the conversion of CO and steam into CO₂ and H₂ with an iron catalyst containing at least 20% alkali.

Patent No. 722707 issued July 27, 1942 on a process for the preparation of aldehydes by the oxidation of ethylene and its homologues with an active carbon catalyst.

Application dated February 19, 1937 on a process for the recovery of acetylene from hydrocarbon gases.

An addition to a patent on the use of propylene polymers as an additive for lubricating oils.

An application dated April 29, 1937 on the removal of CO₂ from technical gases with lime.

An application dated July 20, 1937 on a process for the preparation of catalysts for gasoline synthesis by the simultaneous precipitation of the active components with the carrier.

An application dated September 24, 1937 on a process for the preparation of a cobalt magnesium catalyst for CO hydrogenation.

An application dated September 24, 1937 on a process for extruding a thick paste through a perforated plate.

An application dated January 5, 1938 on a process for regeneration of a catalyst for gasoline synthesis by pretreatment with steam before redissolving in acid.

Patent No. 694152 issued July 26, 1940 on a process for the separation of thorium from sludges containing iron and thorium.

Patent application dated May 6, 1938 on a process for the preparation of alcohols by the absorption of olefins in a strong acid such as sulfuric acid followed by saponification of the ester formed.

Patent application dated June 30, 1938 on a process for the separation of thorium in an iron free-form from iron-thorium sludges.

An application dated July 1, 1938 on a process for increasing the anti-knock value of gasoline from CO hydrogenation by contacting at 150-250°C.

with acid treated clay containing aluminum chloride. There is also 6 pages of correspondence with the Patent Office on this patent.

An application dated July 1, 1938 on a slight modification of the above process.

An application dated August 29, 1938 on a process for the aromatization of straight chain paraffins with MgO activated with 10-50% Cr₂O₃.

An application dated September 16, 1938 on a process for the preparation of oxygenated hydrocarbons from CO and olefins (the OXO process).

Application dated September 19, 1938 on a process for removing lime from cobalt solutions by precipitating it as CaF₂.

An application dated September 19, 1938 on a process for improving lubricating oils made by polymerization of olefins by treatment with bleaching clay, treatment at high temperature with elementary sulfur followed by an after-treatment with alkaline agents.

An application dated September 19, 1938 on a process for sulfurizing lubricating oils by treatment with sulfur at increased temperature in the presence of vulcanization accelerators.

An application dated September 30, 1938 on a process for the reduction of Fischer type catalysts with gas containing very low concentrations of CO, CO₂ and H₂O.

An application dated October 7, 1938 on a process for the recovery of thorium by the decomposition of potassium thorium sulfate.

An application dated October 22, 1938 on a process for the recovery of thorium from iron-thorium sludges by the above method.

An application dated October 31, 1938 on a process for the determination of the stability of lube oils.

An application dated October 31, 1938 on a process for improving lube oils made by the polymerization of olefins by treatment with selenium or tellurium.

An application dated November 5, 1938 on a process for the regeneration of CO hydrogenation catalysts by continued hydrogen treatment after dewaxing is completed.

An application dated November 5, 1938 on a slight improvement of the above process.

Patent No. 725000 issued September 12, 1942 on a process for the preparation of high octane gasoline from the products of CO hydrogenation by thermal cracking of the middle and heavy oils and conversion of the resulting olefins into alcohols.

A patent application dated January 9, 1939 on a process for the catalytic cracking of hydrocarbons in which some of the cracked products are recycled.

A patent application dated February 10, 1939 on a process for the conversion of straight chain paraffins of 6 to 12 carbon atoms into aromatics with a chromia alumina catalyst.

A patent application dated February 11, 1939 on a process for the improvement of lube oils made by olefin polymerization by heating with lower boiling products in the presence of fresh aluminum chloride.

A patent application dated February 9, 1939 on a process for the preparation of lubricating oils stable to oxidation by polymerization of high boiling olefins followed by treatment with aluminum chloride.

A patent application dated February 10, 1939 on a process for improving lubricating oils by treatment with aluminum chloride followed by the addition of anti-oxidants.

Item 36 - Miscellaneous Ruhrchemie Patents (182 pages, frames 568-749)

An application dated June 21, 1943 on a process for removing chromium from technical products by extraction with sulfuric acid.

An application dated June 29, 1943 on a process for removing alcohols from hydrocarbons by extraction with sulfonates or fatty acids.

A patent application dated July 9, 1943 on a process for the separation of sulfuric acid esters of high boiling alcohols from hydrocarbons by neutralization followed by extraction with low boiling paraffins.

A patent application dated July 10, 1943 on an automatic apparatus for pumping small amounts of liquids in an electrolysis apparatus by displacement with the gas generated in the reaction.

An application dated July 12, 1943 on a process for removing chlorine from hydrocarbons by treatment with zinc.

An application dated July 14, 1943 on a process for the recovery of fatty esters from soap concentrates.

An application dated July 15, 1943 on an improvement of the above process.

An application dated July 19, 1943 on a process for the polymerization of olefins with a metal halide addition complex.

An application dated July 21, 1943 on a method of processing aluminum chloride tar oils.

An application dated July 23, 1943 on a process for the preparation of fatty acid salts from esters by caustic fusion.

An application dated July 30, 1943 on a process for the activation of CO hydrogenation catalysts by washing with solutions of alkali or alkali carbonate.

An application dated August 20, 1943 on a dehydrogenation catalyst consisting of chromia alumina promoted by an alkali metal.

An application dated August 25, 1943 on a process for the separation of mixtures of sulfuric acid esters of high molecular weight alcohols from hydrocarbons by neutralization and extraction.

An application dated September 9, 1943 on a process for the removal of oxygenated compounds from hydrocarbons by adsorption on silica gel or aluminum silicate.

An application dated September 9, 1943 on increasing the stability of lubricating oils by passing a dilute solution through an adsorbent, such as silica gel.

An application dated September 15, 1943 on a process for the preparation of organic acids by the oxidation of coal with nitrogen oxides and air.

An application dated September 15, 1943 on a process for the preparation of condensation products of formaldehyde, urea and nitroparaffins.

An application dated October 30, 1943 on an automatic gas sampling apparatus.

An application dated December 20, 1943 on a process for preparing aviation gasoline from straight run gasoline by fractionation and recombination of the desirable fractions.

An application dated December 31, 1943 on a process for the polymerization of oxygen-containing CO hydrogenation products by dehydration over $MgO-Al_2O_3$ followed by polymerization.

An application dated January 6, 1944 on a process for the preparation of alkali free water-oil emulsions.

An application dated January 8, 1944 on a process for the preparation of water-oil emulsions with the aid of aluminum soaps.

An application dated January 13, 1944 on a process for the preparation of chlorinated wax.

An application dated January 15, 1944 on a process for the preparation of active dehydrogenation catalysts by spraying the active component on the carrier.

An application dated January 25, 1944 on a process for removing chlorine from high molecular weight hydrocarbons by treatment at high temperature with silica or alumina catalysts.

An application dated January 27, 1944 on a process for the removal of chlorine from high molecular weight compounds by treatment with copper and/or iron at high temperature.

An application dated February 4, 1944 on a method for preparation of low molecular weight fatty acids by alkali fusion of the corresponding aldehydes.

An application dated February 8, 1944 on a process for the preparation of synthetic soaps by caustic fusion of alcohols from CO hydrogenation.

An application dated February 9, 1944 on a process for the preparation of lubricating oils from wax by chlorination followed by dehydrochlorination and polymerization.

An application dated March 9, 1944 on a method of removing ash from water-gas generators.

An application dated March 13, 1944 on a process for the preparation of nitroparaffins by treatment with concentrated nitric acid.

An application dated March 10, 1944 on a process for the separation of high molecular weight sulfuric acid esters from hydrocarbons by neutralization and extraction.

An application dated March 29, 1944 on a process for the dehydrogenation of hydrocarbons to aromatics in an adiabatic process.

An application dated April 4, 1944 on equipment for the automatic addition of exactly measured amounts of liquids at low pressures.

An application dated April 24, 1944 on an apparatus for the automatic sampling of gases at low pressure.

An application dated April 28, 1944 on a process for the preparation of high molecular weight compounds from low molecular weight olefins by the addition of CO followed by caustic fusion.

An application dated May 15, 1944 on a process for the preparation of resins by reaction of water gas and cyclopentadiene.

An application dated May 15, 1944 on a process for the improvement of the efficiency of cracking units.

An application dated May 18, 1944 on a process for the determination of oxidation stability of lubricants.

An application dated June 8, 1944 on a process for the improvement of synthetic lubricants by treatment with aluminum chloride and elementary sulfur.

An application dated July 20, 1944 on a process for the catalytic cracking of kogasin to obtain low boiling olefins with a silica alumina catalyst in the presence of steam as a diluent.

A memorandum dated August 1, 1944 on the preparation of high molecular weight hydrocarbons by polymerization of olefins with aluminum chloride after pre-treatment with alumina and alkali.

An application dated August 3, 1944 on a process for the removal of chlorine from polymers of Fischer olefins with zinc oxide or zinc.

An application dated August 31, 1944 on a reaction oven for the continuous combustion of H_2S to sulfur.

An application dated September 15, 1944 on a process for the regeneration of thorium from iron-thorium sludges.

Item 37 - (272 pages, frames 750-1021)

This section contains reports, memoranda, etc. on the up-grading of Fischer synthesis products to motor and aviation fuels. The methods used were those well-known in this country, i.e. thermal and catalytic cracking, reforming, polymerization, etc., and while there appear to be no particularly unusual results the various memoranda are listed below with a brief description of their contents in order to facilitate reference should the details be desired:

Minutes of a meeting dated October 19, 1943 concerning methods of determining octane number of synthesis gasoline (3 pages).

Minutes of a meeting dated August 23, 1943 discussing discrepancies in octane number determinations on Fischer gasoline and discussing possible solutions to the problem (4 pages).

A memorandum dated April 29, 1942 on the determination of "Abreiss-temperature" of gasolines (17 pages).

A memorandum dated July 4, 1940 giving a comparison of aromatization, catalytic cracking and thermal cracking for the preparation of aviation gasoline from synthesis products. It was concluded that catalytic cracking was the most economical process (3 pages).

A memorandum dated February 1, 1940 discussing the octane number of gasolines made by blending polymers and cracked gasoline (5 pages).

A letter dated May 25, 1939 concerning the composition of blended gasoline (1 page).

A memorandum dated May 5, 1939 on the refining of cracked gasoline with clay at 200-300°C. to increase octane number. Increases of as much as 6.3 octane numbers by this method were reported. Tables of results and correlations of the various variables are given (20 pages).

A memorandum dated March 21, 1939 on the lead susceptibility of cracked gasolines (2 pages).

A memorandum dated March 8, 1938 on the preparation high octane aviation gasoline from Fischer products. The methods include aromatization, catalytic cracking and polymerization (2 pages).

A memorandum dated February 18, 1939 on the octane number of Fischer gasoline fractions (3 pages).

A letter dated February 13, 1939 giving results of octane number determinations on Fischer gasolines (4 pages).

A memorandum dated January 31, 1939 on the preparation of aviation gasoline from Fischer products by aromatization, catalytic cracking, polymerization, etc. (2 pages).

A memorandum dated January 26, 1939 on the preparation of aviation gasoline from Fischer Products by the above method. A flow diagram is included.

A memorandum dated January 16, 1939 concerning the lead susceptibility of Fischer gasolines (6 pages).

A memorandum dated December 23, 1938 on the octane number improvement of Fischer gasolines by the addition of tetraethyl lead and by the addition of alcohols. It includes 50 pages of tables and graphs (55 pages).

A letter dated November 23, 1938 giving the results of octane number determinations, etc., on a Fischer gasoline (5 pages).

A letter dated October 31, 1938 concerning the production of motor gasoline from Fischer synthesis products by the usual methods of aromatization, cracking, etc. A cost estimate is included (5 pages).

A letter dated June 10, 1938 concerning the preparation of aviation gasoline from Fischer products (3 pages).

A memorandum dated May 6, 1938 concerning cracking experiments on a kogasin middle oil (6 pages).

A memorandum of April 29, 1938 concerning the composition of liquid products from a Fischer normal pressure synthesis with recycle. It stated that the effect of recycling was to increase yield of gasoline and olefins. Tables showing the effect of recycle under various conditions are given (15 pages).

A report dated March 29, 1938 on the improvement of the octane number of Fischer gasolines by treatment with phosphoric acid at high temperature and pressure (3 pages).

A memorandum dated March 25, 1938 on the attempted preparation of aviation gasoline from cracked gasolines by the addition of lead (1 page).

A report dated March 15, 1938 on the analytical distillation of a gasoline sample and on the attempted correlation of octane number with aniline point (21 pages).

A memorandum dated February 15, 1938 on the cracking of kogasin fractions and the production of lubricating oils by polymerization of the resulting olefins with aluminum chloride (8 pages).

A memorandum dated February 11, 1938 discussing the preparation of standard fuels for use in engine tests (20 pages).

A report dated February 11, 1938 on experiments on the effect of high temperature clay treating on the octane number of cracked gasoline in which it was stated that appreciable increases of octane number (from 3 to 20 octane numbers) were obtained, probably due to olefin isomerization occurring during the treatment (18 pages).

A memorandum dated July 14, 1938 contains experimental data on the storage stability of cracked gasolines (5 pages).

Minutes of a meeting dated October 1, 1940 concerning methods of evaluating aviation gasoline.

Minutes of a meeting dated April 15, 1940 discussing specifications for fuels, particularly with respect to "Abreisstemperature" (8 pages).

Minutes of a meeting dated September 16, 1938 concerning specifications for aviation gasoline (5 pages).

Minutes of a discussion dated February 14, 1938 concerning the proposed sale of information on an American reforming process to Ruhrchemie (3 pages).

Minutes of a meeting dated February 7, 1938 concerning production of aviation gasoline by cracking (4 pages).

Minutes of a meeting dated January 31, 1938 on the blending of gasolines (2 pages).

A memorandum dated January 20, 1938 on the evaluation of fuels (4 pages).

A table dated May 24, 1939 giving data on blended gasolines.

A memorandum dated May 31, 1938 concerning the olefin content of gasolines from a Th-Mg catalyst. It states that apparently thorium alone gave greater olefin yields (2 pages).

Item 38 - (29 pages, frames 1022-1050).

This section consists of reports, minutes of meetings, etc., on the polymerization of C₃ and C₄ olefins to produce gasoline. It contains no new or unusual information.

Item 39 - (13 pages, frames 1051-1063)

This consists of 3 memoranda on the change in the quality of a gasoline upon removal of the C7 fraction.

Item 40 - (1 page, frame 1064)

A description dated July 2, 1940 of a gasoline made with an iron catalyst.

Item 41 - (3 pages, frames 1065-1067)

A memorandum of March 3, 1941 concerning recycle gasoline from the middle pressure synthesis.

Item 42 - (5 pages, frames 1068-1072)

A memorandum of August 30, 1940 describing the Fischer synthesis plant at Ruhrchemie.

Item 43 - (4 pages, frames 1073-1076)

Two reports describing the operations of the Fischer synthesis plant.

Item 44 - (9 pages, frames 1077-1086)

Memoranda concerning the quality and delivery of kieselguhr and catalyst.

Item 45 - (4 pages, frames 1087-1090)

Memoranda on the preparation and use of iron catalysts.

Bag 2240, Target 30/5.01 Ruhrchemie, A. G., Sterkrade-Holten

Item 1 - (20 pages, frames 1091-1110)

A list of personnel to be evacuated.

Item 2 - (23 pages, frames 1111-1133)

A report in English on the present state of the synthesis of hydrocarbons at the Ruhrchemie synthesis plant (Fischer-Tropsch).

Bag 3450 - Target 30/5.01 Ruhrchemie, A. G., Sterkrade-Holten

An index of documents in Bag 3450.

Item 1 - (5 pages, frames 1134-1138)

A patent application dated November 30, 1944 on the production of olefins during CO hydrogenation by the addition of small quantities of organic acids.

Item 2 - (16 pages, frames 1139-1154)

Minutes of a meeting dated September 11, 1940 on CO hydrogenation with an iron catalyst. It contains a fairly good review of the whole subject by Dr. Pichler and includes tables of data.

Item 3 - (63 pages, frames 1155-1217)

This section contains 63 pages of experimental data (tables, graphs, etc.,) of experiments with iron and cobalt catalysts.