```
The technic of hydrogenation of coal and its products (Pressure of 200 to 250 atm; temperature of 400 to 480; hydrogen concentration of at least 80 percent in spent
                                                                                         400 to 480;
Thermal efficiency of ccal hydrogenation, 6291
Thermal reaction and hydrogenation of coal. IV.
    Investigations on the course of reaction at lo
temperature (short reaction period) (Up to 4000 for 29 min using SnCl_2 as catalyst), 2549 Thermal reaction and the hydrogenation of coal. I. The
    thermal reaction of Fushum coal at high pressure in a nitrogen atmosphere, 2245
 Thermal reaction and hydrogenation of coal. VI. Effects
of preheating, 5902
Thermal reaction and hydrogenation of coal. VII. Effects
    of the ratic of hydrogen to coal, 5903
 Thermal reaction and hydrogenation of coal. VII. Effects
    of liquid media (ZnCl_2 or Cu_2Cl_2 catalyzed reaction),
Thermal reactions and high-pressure hydrogenation of
    coal. XIV. Correlation between the coal rank and the
    actions of catalysts and vehicles (Effects of fuel
ratio on products), 6011
Thermal reactions and high-pressure hydrogenation of
coal. XV- Hydrogenation of oxidized anthracite (Product is inferior to that of young coal), 6012
Thermal reaction and the hydrogenation of coal. III.
    Berginization of Fushum coal at an initial hydrogen
pressure of 100 kg./sq. cm, 2269
Thermal synthesis and hydrogasification of aromatic
    compounds (Initial hydrogenation converts coal to
                                                                                                                        CCAL/MINING
    liquids which are then hydrogasified to methane, ethane, and arcmatic liquid products), 7007
Thermal treatment of carbonaceous materials (Using
phosphates or sulfates of Mn, Fe, Cu, or Zn and one or more of the metals Mc, Sn, W, Re, U, V, Cr, Ni, or Co or compounds thereof), 2591

Transformation of carbonyl compounds during destructive hydrogenation (Data on hydrogenation of benzophenone, heartfolder of carbonyl compounds)
                                                                                                                               73-94€)
                                                                                                                        COAL/MIXING
benzaldehyde, cyclchexancne, semi-coked tars, and coals in presence of industrial ferric catalysts), 2936

Transforming coal into synthetic gas or cil (Flow diagrams of gasification (underground), enrichment
    process, Lurgi process, and hydrogenation and fluidization process), 3620
 Treating hydrogenation products (Removal of O-containing
aliphatic compounds, then subjection of residue to heat
treatment), 2629
Treatment of coal for the production of power materials
(28 references), 2540
Two-stage gasification of pretreated coal (Process for
production of methane-rich gas), 5633
Two-stage countercurrennt catalytic hydrogenation of ccal
(Partially spent catalyst from 1st stage helps prevent
rapid contamination or deactivation of fresh catalyst used in 2nd stage), 3092
U. S. Bureau of Mines experimental plant (Design and
    operation of plant for continuous hydrogenation of
                                                                                                                                7191
    coal), 2496
 Uncatalyzed hydrogenation of coal (Reaction investigated
in batch reactor with tetralin as solvent), 3 Uncatalyzed coal hydrogenolysis (At 400°), 2858
                                                                                         3102
 Uncatalyzed hydrogenation of coal, 3108
 Unconventional methods of hydrogenating coal (Usual
    methods regarded as uneconomical; propose use of monatomic H, electrical discharges, ultrasonic effects, etc.; review of research and patents), 2154
Unconventional methods of hydrogenating coal (Report briefly abstracts 78 patents and papers with general discussion on advantages and disadvantages), 2985
 Underground liquefaction of coal (Hydrogenation of coal
    at 288-454^{\circ} and 1000 p.s.i. underground; catalyst may be I, HI, or organic I compound, e.g., CH<sub>3</sub>I or CHI<sub>3</sub>),
     6557
Use of a refinery LP model to determine value of coal derived liquid. Paper No. 2 (Economics of using coalderived synthetic feedstock in a refinery), 3071
Use of emulsifying agent such as Na isopropylnaphthelenesulfonate to reduce surface tension
    in production of hydrocarbons, 5641
Use of hydrogen and carbon in the destructive hydrogenation of fuels (Review of effects of various
catalysts and operating conditions on yields in hydrogenation of coal, tars, and oil residues), 2869
Use of low grade coal for the production of cil, gas, fertilizers, and chemicals, 6976
Use of melted salts of metals as catalysts for
                                                                                                                               7395
Use of melted saits of metals as catalysts for hydrogenation and cracking of coal peptizates. II. Catalytic properties of melted tin(II) chloride (Coal peptizate hydrogenated and cracked at 450° and initial pressure (20°) of 85 atm; activity of Sn chloride twice that of Zn chloride), 3048
Utilization of coal with particular reference to the production of oil (Review), 7250
Vapor-phase destructive hydrogenation of middle oil using Co-Sn, Ni-Sn, Ni-Fe--Sn, Ni-Co--Sn, or Fe--Co--Sn allow catalysts. 2200
alloy catalysts, 2200
Variety and number of research projects stimulated by the
                                                                                                                               Germany with conversion almost entirely to low-boiling
                                                                                                                               products, 2499
```

```
war, 6050
Waverly Association of Gas Managers. Presidential
address, 2362
  Work in the past ten years in the laboratory of chemical engineering of Delft University (Eibliography of 70
     journal references and 5 theses), 2277
COAL/IRRADIATION
  Hydrogenation of irradiated coal (Irradiation with \gamma and
     x rays prior to hydrogenation; hydrogenation at 6000 p.s.i. at 400°), 29£1
CCAL/LIQUID FUELS
  Coal and oil-shale processing and combustion. Subpanel report V used in preparing the AEC Chairman's report to
the President, 2064 (WASH-1281-5) COAL/METHANATION
  Coal gasification warms up (Review on combined
  hydrogasification-methanation process), 5209
Coal technology: key to clean energy. Annual report,
     1973-74 (Production of synthetic fuels from coal), 5567
     (NP-20078)
  Direct methanation of coal, 5216
  High-Etu gas from coal via gasification and catalytic methanation (40-atm fluidized-bed gasifier used at 9500
  to produce high yields of methane; Raney Ni used as catalyst), 5155
Methanation for coal hydrogasification (Substantial
     fraction of product gas is CO, CO2, and H, which are catalytically converted to CH3; Ni-cn-alumina catalyst
  used), 5139
Synthetic pipeline gas from coal by the HyGas process
(Production of all-methane gas), 5158
COAL/METHANOL
  Best substitute for petrol may be petrol, 7028
  Development of torbanite in South Africa, 24
   Fracture of coal and oil shale for in-situ processing or
     remote removal: a proposal support document, 5522 (SLA-
   Method of coal-paste preparation, 7433
CHAL/NATURAL GAS
  Coal and the present energy situation, 2126
COAL/EXIDATION
  Action of chemical reagents on bituminous coals (Review with 86 references), 2685
Coal gasification (Oxidation of coal particles in molten
  Na sulfate; S compounds removed by Na carbonate), 5548 Coalification process (Effects of degree of
     polymerization upon reactivity of ccal), 7300
  Formation of CD_2 and water in the oxidation of coal, 6051 Fuel and chemical products from coal (Review: 46
     references), 5072
  Fuel processing fluidized beds (Review of literature; 68 references), 5070
  New prospects for the chemical treatment of bituminous
  coals, 2937
Oxidation of coal (Review with 315 references), 7426
  Oxidation processes of solid fuels, 7415
   Problems in the chemistry of coal (Extended review of
     physical and chemical nature of constituents of coals).
  Products from hydrocarbon synthesis, 6534
Review of alkaline oxidation of coal, 5708
   Some coal researches-their significance to the coal
  industry (Review of action of solvents, oxidizing agents, and Cl on coal and coal carbonization), 87
Treatment of coal to prevent agglomeration (Liquid slurry
     of coal treated with oxygen-containing gas at high
temperature and pressure to produce surface oxidation
     of coal. Feed in high-pressure hydrogasification
     process). 5281
COAL/PETROLOGY
  Hydrogenation of the banded constituents of coal--
     attrital matter and anthraxylon (Frediction of residue yields on basis of petrographic properties), 2604
COAL/PLASMA HEATING
  Recent trends in some aspects of coal processing. Non-
     fuel uses of coal (Review of research work in USA on
     nonfuel uses of coal; projects aimed at coal conversion into gasoline, liquid fuel, and gas of high calorific value; plasma processing of coal and irradiation with
     flash of high intensity light included), 5050
COAL/PLASTICITY
  Apparatus for determining plastic range of bituminous
  coal, 7401
Comparative measurement of the plastic state of coal,
  Plasticity of coal and the theory of coking, 7407
Plasticity of Berginized coal, 2180 CUAL/POLLUTION
  Detroit Edison has confidence in SD2 scrubber, 2112
COAL/POROSITY
  Vapor pressure isotherws and porosity curves of coals, 7416
COAL/PROCESSING
  Developmental and rate studies in processing of coal minerals, 50
COAL/PRODUCTION
  Catalytic destructive hydrogenation of coals and tars in
```

```
Coal can also yield liquid fuels (Laboratory
```

experiments), 6888
Fuel and power (Review of coal, as related to economy of

the UK), 4982 Highlights of a busy year for coal, 5594

CCAL/PURIFICATION

Bureau of Mines research and technologic work on coal, 1964, 4939

Chemical removal of nitrogen and organic sulfur from coal $(C_6H_\pi NC_2$ appears to be most efficient solvent for removal of organic S; particle size has no discernible effect), 1676

Economic evaluation of a process to produce ashless, low-sulfur fuel from coal, 1487 (EN-286)

Evaluation of the fluidized bed combustion process. Evaluation of the fluidized bed combustion process.

Volume I. Summary report. Report for 15 Nov 1969--15.

Nov 1971 (Reduction of SC₂ and nitrogen oxide contents of flue gases by fluidized bed coal gasification process), 5243 (PP-211 494)

Fixed fertilizers from a gas-desulfurizing process. I.

The wet desulfurizing method of the Gesellschaft fuer Kohlentechnik, with simultaneous absorption of ammonia, 300

Purification of coal or coke-oven gas (Removal of $\rm H_2S$ and $\rm HCN$ by washing with a neutral or acidic aqueous

solution of Cu₂SO₄), 1118

Recovery of ammonia and hydrogen sulfide from coaldistillation gases, 554

Solvent extraction of organic sulfur and nitrogen compounds from coal (40% reduction of organic S with no change in 5tu value), 1600 CCAL/PYRCLYSIS

Advances in the study of the thermal decomposition of coals (Review), 7156
Advances in research on coal pyrolysis (Coal pyrolysis at extremely high temperatures reviewed; ethylene formation; 63 references), 7150

Formation; 63 references; 7,7130

Binding sulfur in the process of energy generation
(Gasification of coal in the presence of dolomite
reduces sulfur content of gas; coal pyrolysis in the
presence of hydrogen and calcined dolomite is discussed also), 1639

also), 1639
Char cil energy development (CGED process for pyrolysis of bituminous coal), 7165 (EN-1995)
Char cil energy development, period of operation July 1971-June 1972 (Production of cil, gas, and char from coel by pyrolysis (CGED process)), 7179 (EN-2349)
Chemical treatment of bituminous coal (Brief review of

pyrolysis, extraction, and hydrogenation), 7097

pyrdights, extraction, and hydrogeneticity, 7057 Chemistry and technology of solid fuels, 7053 Clean energy from coal - a national priority (Status of

coel gasification, liquefaction, and solvent extraction programs), 5372 (EN-2281)
Clear fuels from coal. Technical and historical background (Review of coal solvation, pyrolysis, hydrogenation, and production of synthesis gas; no references), 5351

Clean fuels from coal. Catalysts for coal conversion (Review with 79 references), 3103 Coal--assonia--cxygen reaction: route to coal-based

nitrogenous fertilizers, 7142

nitrogenous fertilizers, 7142
Coal gasification. CGED process plus char gasification
(Plant utilizes CGED coal pyrolysis process along with
molten selt process to gasify CGED char), 5330
Coal gasification. TOSCCAL process for low temperature
coal pyrolysis (Shale or coal heated and conveyed
uplift pipe by concurrent flow with hot flue gas from
ball heater), 5332

Coal investigations using laser irradiation (Effects of coal rank on nature of gaseous products yielded), 7160 (BM-RI-7328)

Coal pyrolysis using laser irradiation (Froduct high in methane but very low in acetylene when done at coking temperatures but high in acetylene with lasers), 7148

temperatures but high in acetylene with lasers), 7148 Coal-to-gas system makes two fuels from one lump of coal (Garrett pyrolysis process), 7188 COED [Char Cil Energy Development] plant for coal conversion (Fyrolysis of coal with heating value 12.800 Btu/lb), 7166 COED coal-to-crude process moves into pilot-plant stage (Process development unit yielded following products (wt X of dry coal): char 54.3, oil 23.6, gas 15.0, water 7.0 with the gas consisting of (vol. X) CO 22.1, hydrogen 51.0, methane 20.9, and ethane 6.0), 6842 Combined determination of the thermal characteristics of solid fuel during high-temperature pyrolysis, 7139

solid fuel during high-temperature pyrolysis, 7139 (SLA-74-6007)

(SLA-74-007)
Composition of gases of thermal decomposition of coal
dust from Keragende Basin coal beds (Heating coal dust
to 700° leads to repid evolution of volatile compounds;
combustible gas constitutes more than 94% of total
volume of scuple, portion of methane and H exceeds 80%), 7174

Development of a method for the study of the thermal decomposition of coals during rapid heating (Rapid heating of coals using high-frequency electromagnetic field; apparatus was thick-walled quartz tube charged with crushed coal mixed with small steel spheres), 7122 Direct methanation of coal, 5216

Economic evaluation of CGED process plus char gasification, period of performance April 1971--April

1972 (Coal pyrolysis process producin char which is subsequently gasifid to produce 921 Etu gas), 7180 (EN-2348)

Economical new coal-to-gas process claimed by Garrett Co. (Garrett pyrolysis process), 7189

(Garrett pyrolysis process), 7189
Elimination of oxygen in the pyrolysis of coal, 7106
Evolution of gases from subbituminous coal (Coal heated at 2.80/min from 150 to ca. 1000°; gases studied were 0, N, CC, C dioxide, H, methane, ethane, propane, and ethylene; preheating to 600° would produce useful gas and some tar products and leave char that is useful for reduction), 7143
Flash heating and plasma pyrolysis of coal (Product yields are a function of energy input and gas composition), 7137

composition), 7137
Flash pyrolysis of coal. Effect of nitrogen, argon, other atmospheres in increasing olefin concentration and its significance on the mechanism of coal pyrolysis (Pyrolysis at about 1150° for 30 sec in vacuo and in N, Ar, NH4, and C₆H₆), 7178

Flash pyrolysis of coal: effect of nitrogen, argon, and

atmospheres in increasing olefin concentration

and its significance on the mechanism of coal pyrolysis (Flash pyrolysis at 1150°C for 30 sec in vacuuo), 7183 Fluidized-bed pyrolysis of coal, 7130 Fluidized-bed pyrolysis of Western bitumincus coals (Multistage pyrolysis at 600-650, 850, 1000, and 1600°F), 7138

Formation of hydrocarbons during the thermal degradation of Kuznetsk coals (Dependence of total yield of hydrocarbons and their components on heating conditions), 7171

Fuel and chemical products from coal (Review; 46 references), 5072

Future trends in the utilisation of coal energy

conversion, 5590

Garrett's coal pyrolysis process (Pyrolysis at 1075°F for short time; yields of 35% of liquid products; tar hydrogenated to give low-S fuel cil), 7024 Gas and cil from coal. Viable alternative (Review of

Gas and oil from coal. Viable alternative (heview of production of hydrocarbons by pyrolysis and hydrogenation of coal; 5 references), 3125
High-pressure liquid-phase hydrogenolysis of coal in continuous-type experimental apparatus. II, 2972

High-pressure liquid-phase hydrogenolysis of coal in continuous-type experimental apparatus. I, 2973 High-speed pyrolysis of brown coal in a stream [of

steam], 7164

Hydrocarbon fuels by pyrolysis of coal (First portion of char passed to fuel cell or MHD device to produce d.c.

char passed to fuel cell or MHD device to produce d.c. and second portion to apparatus where char with steam forms producer gas), 7153

Hydrogen processing of coal and the kinetics of desulfurization. Paper No. 36 (Pyrolysis and gasication of bituminous coal), 1486

Hydrogen processing of coal and the kinetics of desulfurization (Conditions for efficient and economic desulfurization of coal; quipment design), 1497

Hydrogenation of CGED coal cils (Hydrogenation at 3000 psig over fixed bed of Ni-Mo catalyst; H consumption and O, N, and S removal correlated with operation conditions). 6904 conditions), 6904 Hydrogenated COED oil (Conversion of coal by fluidized

bed pyrolysis into gas, oil, and char; catalytic hydrogenation plant constructed to hydrogenate oil;

hydrogenation plant constructed to hydrogenate oil; desulfurization; production of gasoline, middle distillate, gas oil, and bottoms), 5254
Hydrogenation of CGED process coal-derived oils (Gver fixed bed nickel-molybdenum catalysts), 7170
Hydrogenolysis and structure of Hokkaido coals (Concluded that hydrogenolysis of coal begins with liberation of both tar acids and saturated hydrogenous) 2000

both tar acids and saturated hydrocarbons), 2989
Hydrogenolysis of coal (Hydrogenation of coal paste;
reaction should be carried out at highest temperature and pressure; minimum density oils recommended for

paste formulation), 2941
Investigations in chemical technology (Major trends in studies of coal processing including pyrolysis, hydrogenation without a solvent, tar analysis, and tar processing), 3009

Kinetic relation of coal hydrogenation, pyrolysis, and

Kinetic relation of coal hydrogenation, pyrolysis, and dissolution (Catalytic hydrogenation gave 30% gasoline, 5% diesel oil, 35% high Btu gas, and 30% char), 3063 Kinetic study of the pyrolysis of a high-volatile bituminous coal (19 references), 7135 Kinetic studies on the pyrolysis, desulfurization, and the gasification of coals with emphasis on the nonisothermal kinetic method (Objective was to nonisothermal kinetic method (Objective was to determine kinetics of desulfurization as aid to design, operation, and evaluation of new process systems for practical desulfurization), 7146
Kinetics of the thermal decomposition of coal (Review with 41 references on experimental methods used in investigation of coal decomposition kinetics and theories of pyrolysis), 7132
Kinetics of pyrolysis of high volatile bituminous coal, 7136

Liquid fuels from coal, 1972 (Collection of 101 patents

```
in U.S.), 182
  Mechanisms of coal pyrolysis. VI. Reaction patterns in
the range 650-850°, 7128
Multistage pyrolysis of coal (High-volatile bituminous
  coal pyrolyzed steps at 600, 850, 1000, and 1600°F with N as fluidizing medium), 7133

New investigations relative to the chemical constitution and the chemical characteristics of bituminous coal; decomposition of bituminous coal by heat, 7095

New prospects for the chemical treatment of bituminous coals.
  coals, 2937
New systems for clean power (Coal gasification and methods for clean combustion), 5248
Occidental develops low-cost SNG route, 7185
  Office of Ccal Research continues liquid extraction
  projects (Review of projects for coal conversion into
city gas and gasoline), 6828
Perspectives of utilization of pulverized fuel for
production of technical and heating gas (Pyrolysis
carried out in tubular reactors with exterior heating;
        flow of steam used to carry fuel dust through reactor; fuels are good raw materials for gas production; calorific value of raw gas from bituminous shale was >2500 Kcal/m³; achieved complete decomposition of tar
  and increased yield of light gasoline), 7117
Pilot-scale development of the CSF process (Operational problems), 7169 (EN-2309)
   Plant for coal hydrocracking, 2999
  Possible new uses for coal (Review of pyrolysis and
       solvent action hydrogenolysis and oxidation as methods of degrading the complex coal structure into products of greater commercial value), 6061
 of greater commercial value), outliers (Reaction rates of subbituminous ccal heated in steam and steam-h mixture investigated up to 725°; at ca. 500° pyrolysis produces CH<sub>2</sub>, CD<sub>2</sub>, and char; mimimum temperature for rapid reaction of coal or char is ca. 625° giving
 rapid reaction of coal or char is ca. 625° giving mostly H and CC<sub>2</sub>; CH, production increased by addition of H to steam), 5377

Production of pipeline gas by hydrogasification of coal (Pressures up to 3800 psig and temperatures to 21000F with H, steam, and steam—H feed gases used), 5275

Production of electricity via coal and coal-char gasification. R and D report No. 65, interim report No. 3 (First phase of study of notactial excess)
       3 (First phase of study of potential process alternatives for converting coal or coal char into
        electricity via the production of low Btu gas for
 combustion in an advanced combined gas-and-steam turbine power cycle), 5480 (NP-20076)
Progresses made in the research of pyrolysis of
       bituminous coal (Reaction kinetics of gas formation),
 Project COED: coal pyrolysis pilot plant. Paper No. 8
(Recovery and processing of oil, gas, and char), 7155
Pyrolysis of coal. Thermal decomposition and distillation
  of a coal in a high vacuum, 7065
Pyrolytic conversion and coking of finely divided solid
 Pyrolytic conversion and coking of finely divided solid bituminous material and hydrocarbon oil (Fractionation of products; design of apparatus), 7077

Pyrolyzing and desulfurizing sulfur-bearing agglomerative bituminous coal (Continuous process; volatiles removed at 900-10000F; desulfurization during pyrolysis by enriching gas with H which reacts to form hydrogen sulfide which is removed by scrubbing or use of Fe coxide), 71E2

Rapid thermal decomposition of hituminous coals. Paper
  Rapid thermal decomposition of bituminous coals. Paper
       No. 49 (Devoltilization of vitrains in vacuo by rapid
 No. 49 (Devoltilization of vitrains in vacuo by rapid heatin), 7154
Reaction kinetics in coal pyrolysis. Paper No. 11, 7162
Reduced coals. I. Mechanism of coal pyrolysis (Pyrolysis at 600°), 7129
Slow thermal decomposition of Chukurovo coal at
 atmospheric pressure and in vacuo in the 200-800° range
(In vacuuπ, yield of tar and gas increased), 7168
Solid and gasecus products from laser pyrolysis of coal,
       7159
7159
Solid and gaseous products from laser pyrolysis of coal
(Use of pulsed ruby laser to produce gas with high
concentration of H and CH<sub>2</sub> and solid with approximately
same elemental composition as original coal), 7172
Study of the pyrolysis of mixtures of coal and iron
oxides at different isothermal levels (Mixtures contain
30% Fe<sub>2</sub>O<sub>3</sub> or Fe<sub>3</sub>O<sub>4</sub>), 7177
Survey of numerical data on the thermal decomposition of
coal (Review with 88 references), 7131
Synthetic crude oil: is if feasible yet, 5596
Systematic exploration of the pyrolysis of a coal between
Systematic exploration of the pyrolysis of a coal between 340° and 900°, 7098
 Systematic study of the pyrolysis of coal between 3400
Systematic study of the pyrolysis of coal between 3400 and 9000. IV. Graduated and comparative pyrolysis of coal. Evidence of the relation of coals, 7099
Systematic exploration of the pyrolysis of a coal between 3400 and 9000, 7096
Thermal decomposition of coals of the Irkutsk Basin at low temperatures (Coal heated in Al retort to 200-5000 at intervals of 500. effect on violet of sources.
      at intervals of 50°; effect on yield of gas, liquid
      products, and nonvolatile residue studied), 7123
Thermal decomposition of Siberian coals during slow
```

```
heating (Laboratory-scale distillation on coals of different ranks; calorific values of gases obtained ranged from 2830 to 5680 kcal/m³), 7119

Thermal decomposition of coal (Best at 400-50° (sic) for semicoking operations under N<sub>2</sub> atmosphere), 6570

Thermal decomposition of solid fuels with the aid of metallic heat carriers (Laboratory apparatus with peat or coal mixed with metal spheres heated to 500-700° by induction furnace), 7120

Thermal treatment of certain Kirgizia and Kazekhstan coals in retorts (Ccals heated to 460-850° in bronze or steel tubular retorts in resistance furnace), 7118

Thermal treatment of brown coal for its use for power
         heating (Laboratory-scale distillation on coals of
     Thermal treatment of brown coal for its use for power production (Use of electrically heated retort), 7121 Thermodynamic analysis of the formation process of
          aromatic hydrocarbons during coal pyrolysis, 7104
COAL/REDUCTION
      Catalytic dehydrogenation of coal. II. Reversibility of
         the dehydrogenation and reduction of coal (Coal reduced
          at 110°C with Li ethlenediamine and dehydrogenated at 347°C with Pd on Ca carbonate as catalyst and
          phenanthridine as vehicle; H removed from coal by
          dehydrogenation can be only partly restored by reduction although H added to coal by reduction can be
          completely removed by dehydrogenation), 2991
Process and equipment for the production of fuel gas or fuels (Reduction of coal by CO<sub>2</sub>), 3554
Similarity between the electrochemical elimination of sulfur from coal and from dibenzothiophehe, 1429
CCAL/REFINING
     Utilization of brown-coal gases in the energetic and
         material grid system (Lecture on aspects of industrial gases, in particular generator gases and gases from low-temperature carbonization), 4473
COAL/RESEARCH PROGRAMS
     Advances in coal research and technology (Review), 2564
Advances in research on coal pyrolysis (Coal pyrolysis at
         extremely high temperatures reviewed; ethylene formation; 63 references), 7150
     Bibliography of Bureau of Mines investigations of coal
     and its products, 4
Bureau of Mines research and technologic work on coal,
    1961 (Review with 131 references), 5
Bureau of Mines research and technologic work on coal,
         1962 (Discussion with 113 references), 7
     Bureau of Mines research and technologic work on coal,
         1963, 9
    1963, 9
Bureau of Mines Energy Program, 1972. Information circular, prepared in cooperation with Morgantown Energy Research Center, WV, and Bartlesville Energy Research Center, OK. See also Energy Program 1971, PB-211 456 (Review of 20 research areas by Bureau of Mines), 5488 (PB-224 399/6)
Bureau of Mines energy program, 1972 (Review of research in 20 major areas. 185 refereces), 17 (BM-IC--8612)
Bureau of Mines research and technologic work on coal.
                           Mines research and technologic work on coal,
     Bureau of
         1964, 4939
     Bureau of Mines research and technologic work on coal,
         1959, 2
     Bureau of Mines research and technologic work on coal,
    1960 (Report with 153 references), 3
Coal research in 1970 (Review of mining, preparation,
   Coal research in 1970 (Review of wining, preparation, liquefaction, gasification, combustion, and environment control), 6942

Coal research organizations - worldwide activities and publications (Revision of CA 55:18067-d), 11

Coal research (Review with 17 references), 18

Dffice of Coal Research history and activities, 5339 (CONF-731027-1)
     Office of Coal Research annual report 1972, 46 (EN-1541)
    Recent advances in coal research (Review with 18 references), 2702
    Recent coal research and coal chemistry in the future (Review with no references), 53
Report of the Fuel Research Board for the year ended 31st March 1935 with report of the Director of Fuel Research (Studies on chemistry, preparation for market, carbonization, treatment of tar, lubricating cils, budrogenation of coal, and outperiod fould and
    hydrogenation of coal, and pulverized fuels), 86
Report of the Fuel Research Board for the year ended 31st
March 1936 with report of the Director of Fuel Research
   (Studies on chemistry, preparation for market, carbonization, treatment of tar, lubricating oil, hydrogenation of coal, and steam raising), 90
Report on coal research in Western Europe, 5398 (CONF-
        731027-3)
    Report on coal research in the United States, 5397 (CCNF-
         731027-2)
    Report on status of federally supported coal research in Canada, 5399 (CONF-731027-4)
    Research and technologic work on Alabama coals: An anotated bibliography (458 references), 8
Research and development work in USA in refining and
   utilization of coal (NONE), 6840
Research and development needs for enhancing US coal
       utilization (Surmary of results of Advanced Coal
Technollogy Workshop at Carnegie-Mellon University).
       5575
   Research and technologic work on coal and related
```

investigations, 1954, 1 Review of Bureau of Mines Energy Program, 1970.

```
Information circular, 13 (FE--204 139)
Review of Burezu of Mines energy program, 1970, B.
Linville (Bertlesville Energy Fes. Cent, OK) (Includes
     bibliography), 14 (BM-IC--6526)
Hole of coal in the supply of power, 6871
Second specialist conference on fuel research, London,
     July 1956 (Review of progress in many areas including underground gasification), 4438
Some observations on German coal research and
     developments, 6192
Some trends of new research methods of coal processing in the US and their prospects for Foland, 6857
Storch Award address. Fundamental research on coal processes. Paper No. 10, 42
COAL/RETORTING
     Apparatus (with groups of spaced retorts) for heating coal, shale, etc. (Design), 7076
Development of torbanite in South Africa, 24
     Relations between the composition of retortable carbonaceous minerals and their yield of crude oil,
          5689
COAL/REVIEWS
      Bituminous coal. Source of gaseous and liquid fuels
     (Review), 3238
Chemicals from coal (Review (to 1962); no references), 41
Coal [conversion to synthetic crude oil] (Review with 14
     references), 6945
Constitution of coal (Review; 307 references), 7422
Gasoline and other fuels from coal and oil shale
(Review), 5729
Liquid fuels and chemicals from coal (Review with 24
          references), 6881
     Recent trends in some aspects of coal processing. Non-
          fuel uses of coal (Review of research work in USA on
          nonfuel uses of coal; projects aimed at coal conversion into gascline, liquid fuel, and gas of high calorific value; plasma processing of coal and irradiation with flash of high intensity light included), 5050
CCAL/SQLUEILITY
     Disintegration and complete solution of coal in
     anthracene oil, 7209
Dispersion of coal in a liquid medium at temperatures up
                  3500 (Anthracene oil), 7211
COAL/SOLVATION
     Clean fuels from coal. Technical and historical
     background (Review of coal solvation, pyrolysis, hydrogenation, and production of synthesis gas; no references), 5351
Solvation and hydrogenation of coal in partially
          hydrogenated hydrocarbon solvents (Removal of organic and inorganic S compounds), 1601
Solvation of coals, 7280 COAL/SOLVENT EXTRACTION
     μ-coal. I. The behavior of finely pulverized bituminous coals and their structural constituents in extraction and in low-temperature carbonization (Trichloroethylene
           and benzene), 7210
     [Solvent] extraction as a method for determining the chemical composition of black coal (Review with 40
           references), 7319
      Action of organic solvents upon coal during extraction
     under pressure (Pyridine, phenol, anthracene, and naphthalene as solvents), 7245
Action of organic solvents on coal, 7246
Action of solvents on Italian coals and lignites and
          hydrogenation of the extracts (Extraction with tetralin), 7248
      Action of pyridine bases on coals, 7205
     Action of solvents on coals at lower temperatures. IV.

Characteristics of extracts and residues from the
     treatment of coal with amine solvents, 7298
Action of organic solvents on Wattenbach bright pitchmoal, with especial reference to tar yield (Aniline, benzene, and tetralin extractants), 7200
     benzene, and tetralin extractants), 7200
Action of chemical reagents on bituminous coals (Review with 86 references), 2685
Action of solvents on coals at lower temperatures. I.
Qualitative survey of the effects of liquids upon bright coals of low rank (100 liquids tested, 54 evaluated), 7290
Action of solvents on coals at lower temperatures. III.
Behavior of a typical range of British coals towards specific solvents (Extraction with ethylenediamine).
           specific solvents (Extraction with ethylenediamine),
    7292
Action of sclvents on coals at lower temperatures. II.
Mechanism of extraction of coals by specific solvents
and the significance of quantitative measurements, 7294
Action of organic solvents on coal (Biphenyl, pyridine,
PhOH, sublimed and crude naphthelene, crude anthracene,
and anthracene oil), 7257
Action of solvents on coal. Extraction of Edentorn coal
by benzene at elevated temperatures (Effects of
extraction time, temperature, and particle size on
properties of products obtained), 7228
Action of selvents on coal. Extraction of a Pittsburgh
seem coal with aniline. tetralin and phenol at elevated
           7293
     seem coal with aniline, tetralin and phenol at elevated temperatures, 7240
Action of various solvents on coal, 7203
Action of solvents on some Indian coals (Results of pyridine and chloroform extractions), 7219
Activated extraction of coal using a hydrogen-donor
```

```
solvent (Kinetics of tetralin extraction under
solvent (Kinetics of tetralin extraction under influence of ultrascnic energy), 7358
Activated extraction of coal using a hydrogen-donor solvent (47 to 87°C), 7359
Behavior of bituminous coals towards solvents (Review with 177 references), 7289
Behavior of bituminous coals toward solvents (Review; 136 references), 7283
Bituminous coal (Extraction with C<sub>2</sub>H<sub>2</sub>Cl<sub>2</sub>), 7282
Chemical nature of extracts from a bituminous coal (Hydrogenetion of solvent extract from coal followed by nitration; dehydrogenation), 7288
       nitration; dehydrogenation), 7238
Chemical processing of brown coal (Relative merits of various methods), 3654
Chemical treatment of bituminous coal (Brief review of pyrolysis, extraction, and hydrogenation), 7097
Chemical utilization of the subbituminous coals of
      Washington (Review of solvent extraction and
 gasification processes), 7286
Clean energy from coal - a national priority (Status of
coal gasification, liquefaction, and solvent extraction programs), 5372 (EN-2281)
Clean fuels from coal. Catalysts for coal conversion (Review with 79 references), 3103
Coal. II. Extraction of coal with organic solvents (Extraction with pyridine, dioxane, and ethylene chloride), 276
 chloride), 7276

Coal and coal bitumens. A theory comprising the present
 knowledge on this subject, 7218

Coal bitumens. IV. Determination of the bitumen content of various coal types and content of the bitumen in the
 micelle phase contained in the extract of these coals obtained by xylene under pressure, 7224
Coal bitumens. III. Extraction of various types of coal
 with dioxane at ordinary pressures (Effect of age of coal on yield of extract), 7225
Coal bitumens. II. Method for determining the true
bitumen content of coal. Extraction with benzene, xylene, and dioxane, 7226

Coal bitumens. I. Prolonged extraction with organic solvents of the micelle phase flocculated by ether of the tetralin pressure extract of a gas coal, 7227

Coal converted to liquid products utilizing a two-stage
      solvent extraction process (Solvents such as tetralin
under H pressure in first stage; light monocyclic
aromatic or ketone used in 2nd stage), 6956
 Coal extracts (Hydrogenation using compounds of elements of the 6th group of the periodic table as catalysts),
      7254
7254
Coal extraction (Using tetrahydronaphthalene mixed with phenols, cresols, etc.), 7262
Coal extracts (Solvent extraction using tar extracts, phenols, anthracene oil, tetrahydronaphthalene), 7242
Coal extracts (Extraction of coal, lignite, peat, etc.,
      with hydrogenated oils or tetralene mixed with phenolic oils), 7243
 Coal liquefaction by three-stage solvent extraction (Crushed bituminous coal mixed with
       tetrahydronaphthalene; extraction with C7H16;
 extraction with benzene), 6950
Coal liquefaction using dual solvent extraction (Coal
Coal liquefaction using dual solvent extraction (Coal treated with polycyclic aromatic solvent and secondary solvent such as dichloronaphthalene), 7339

Coal liquefaction (Coal liquefied by solvent extraction using H-donor selective solvent), 6900

Coal liquefaction (Liquid hydrocarbons prepared from coal by solvent extraction, hydrogenation, and coking), 6918

Coal liquid extraction from coal solids (Solvent introduced into hottom of numery stringer zone and
      introduced into bottom of primary stripper zone and forced up countercurrently through mixture of coal and
       sand to remove coal liquids; enriched solvent taken off
 at top, heated, and introduced at top of secondary
extractor zone), 7345
Coal solvation with non-hydrogenated solvent in the
      absence of added hydrogen (Methods described for obtaining solutions of practically ash-free cerbonaceous metter from coals and brown coals; coal mixed with aromatized solvent; mixture heated for complete decomposition), 7331
 Coal technology: key to clean energy. Annual report,
1973-74 (Production of synthetic fuels from coal), 5567
(NP-20078)
 Coalification process (Effects of degree of
 polymerization upon reactivity of coal), 7300
Colloidal solution of coal, 2326
Colloidal structure of bituminous coal (Review; solvent
       extraction; 16 organic solvents), 7233
 Colloidal solution of coal (Pyridine, aniline, and quinoline), 7207
Complex utilization of Ukrainian brown coals. XII. Low-
      temperature carbonization of the preliminary extracted coals (Carbonization in Al retort before and after
      extraction by organic sclvents; most effective solvents were alcohol-benzene and dichloroethane-alcohol), 142
 were alconor-benzene and dichloroethene-alconor), 142
Constitution of coal and its carbonization (Review of solvent extraction), 76
Constitution of coal (Review of solvent extraction with benzene and pyridine), 7206
```

```
Contribution to the study of the constitution of coal
   (Pyridine and chloroform as extractants), 7197
Controlling emissions from fossil-fueled power plants
(Gasification, solvent extraction, and flue gas
desulfurization processes are described), 2033
Conversion of coal by solvent extraction, 7355
Destructive hydrogenation of solid fuels (Increase in
hydrocarbon yield by extraction with acids (HC1, acetic
    acid, or sulfonic acids)), 2355
Determination of S in coal. III. Extraction of a S-rich coal with organic solvents, 7275
Development of a process for producing an ashless, low-
   sulfur fuel from coal. Volume I. Engineering studies. Part 4. Impact of the solvent refined coal process. R and D report No. 53, interim report No. 5 (Approach to marketing and environmental problems), 7356 (NP-20133) Dissolution of bituminous coal in tetrahydroquinoline.
          Part 2 (Extraction of coal by solvent in autoclave),
  Effect of ferric oxide on the hydrogenation of Gyubari coal in Tetralin as the reaction medium (Coals (<100 mesh) extracted at 50^{\circ} with pyrodine and deashed, we hydrogenated for 168 hr. at 300-400^{\circ} and 50 \text{ kg/cm}^2),
          3061
    Emission controls -
                                                             status at coal burning power plants
         (Various methods for reduction of SO2 emissions in
   stack gas), 1982
Engineering evaluation and review of consol synthetic
          fuel process. R and D report No. 70 (Includes economic
   evaluation and description of plant), 3088 (NP-20086) Estimated cost of producing heavy fuel oil by hydrogenation of coal (Direct hydrogenation and combination of hydrogenation with extraction), 5236 Evolution of coal extraction (Review with 80 references),
         7259
   Extracting ccal (Use of \rm H_2SD_* to neutralize basic constituents of coal; use of wetting agent, e.g., dibutylnaphthalene-sulfonic acid), 7247
  dibutyinaphthalene-sulfonic acid), 7247

Extracting sulfur compounds from coal (Organic S content in coal decreased by extraction with solvents, e.g., c-chlorophenol, H<sub>3</sub>PO<sub>4</sub>, or HPF<sub>6</sub>), 1973

Extracting coal or oil shale (Digestion in NaOH followed by extraction of oily constituents), 7279

Extracting and hydrogenating coal, etc. (Solvent extraction at 200 to 400°C and 1 to 200 atm using catalysts of Sn(OH)<sub>2</sub>, Sn catalysts, MoC<sub>3</sub>, (NH<sub>4</sub>)<sub>2</sub>MoC<sub>4</sub>, or Ni under 20 to 300 atm), 7253

Extraction and hydrogenation of coal (Introduction of
  or Ni under 20 to 300 atm), 7253

Extraction and hydrogenation of coal (Introduction of low-boiling substances (benzine)), 2622

Extraction of brown coals (At 400°C and 180 atm using tetralin--cresol), 7260

Extraction of a bituminous coal--influence of the nature of solvents (Evaluation of 56 solvents), 7261

Extraction tests of Milke coal (Tetralin and phenol as
   Extraction tests of Milke coal (Tetralin and phenol as extractants), 7198
   Extraction of coal, peat, bituminous shale, etc. (Using
  oxides of groups 4-8 of the periodic table or heavy-
metal sulfides as catalysts. Volatile sulfur compounds
are used as promoters), 7270
Extraction of coal, etc. (Using Mo, V, or W halides as
catalysts), 7271
Extraction of coal (Using salts of metals of the Fe group
  as catalysts), 7273
Extractions from preheated coal with solvent (Extraction
        yields using chloroform and pyridine), 7335
 Extraction of liquid hydrocarbons from coal (Use of aromatic scivent under hydrocracking conditions), 7336 Extraction of a tertiary coal by tetralin, 7212 Extraction of brown coal with organic solvents (Review of
        patents), 7288
  Extraction of bitumens from brown coal (Using butanol),
  Extraction of plastic materials and binders from coals
        (Moderate-temperature hydrogenation process for
  preparation of products having valuable plastic and
binding properties), 2971
Extraction of coal with high-boiling organic compounds
        (Aniline, naphthalene, and phenol), 7192
  Extraction of coal under pressure (Czechoslovakia; heating with anthracene oil under pressure; H
        atmosphere increased yield), 7314
 Extraction of lignite with organic solvents (33 References), 7251
 Extraction with pyridine, 7194
Extraction studies (Benzene, alcohols, and mixture of CCl, and ethanol as solvents), 7195
Extraction of energy fuels. Open file report (Technical assessment of stimulation of petroleum and natural gas production; production of oil from tar sands;
production; production of oil from tar sands; development of oil shale; underground gasification of coal; oil and gas production from organic wastes; primary extraction of coal), 5311 (PB--220 328/9) Extraction of coal, peat, etc. (Use of organometallic compounds as catalysts), 7268 Extraction of coal (Use of benzene), 7307 Extraction (peptization) of Polish hard coal (Solvents used were tetralin, anthracene oil, and heavy oil obtained from the extract; coal was fed into reactor as
```

```
paste at 100 atm and 450°C; yields of extract and gas
were 61.2% and 9.6%, resp.), 7334
Extraction of bright coals by anhydrous ethylenediamine
(Effects of coal rank on extracts; ethylenediamine as
        solvent), 7281
   Extraction of Hungarian [brown] coal, 7318
Extraction of bituminous coal and its constituents
(Tetralin as extractant), 7220
   Extractive disintegration of bituminous coals (Using diphenylamine and 9,10-dihydroanthracene), 7295
  Extracts of coal, etc. (Solvent extraction using hydrogenated oils, acid oils, or mixture of tetralin and cresol under pressure), 7244
Finding fresh uses for coal (Flow charts, brief
        descriptions, and economic calculations for new coal-
   processing methods developed by US companies), 5053
Fuel for coal-dust motors (Extraction of coal with
       tetralin, tar fractions, cils or other high-boiling
       hydrocarbons), 7274
   General law expressing the process of extraction of coals
  (Equation relating amount of bitumen in original coal and time of extraction for various coals), 7234
High-boiling stable fuel cils or motor-fuel cils (Derived
        from pressure extraction or pressure hydrogenation of
       coal), \epsilon09
   High-pressure hydrogenation of carbonaceous matter. II.
      gn-pressure hydrogenation of carochaceous matter. 11 Primary hydrogenation in the liquid phase (Review of coal solvents, suitability of raw materials, requirements on catalysts, effect of pretreatment of coal on hydrogenation characteristics), 2743
   Hydrocarbons by extraction of carbonaceous materials.
       7297
   Hydrogenation-solvent extraction of coal (Double
       selective solvent system with nonconverted coal and ash separated without filtration), 3064
   Hydrogenation of coal distillation and extraction
       products (Hydrogenation of products from distillation
       and extraction of ccal at pressures above 100 atm),
   Hydrogenation of coal paste. VIII. Hydrogenation of the
       paste of coal extract under high pressure (At 4500 and
       200 to 700 atm pressure using McO3 catalyst), 2677
  Hydrogenating coal, etc (Extraction by tetralin and hydrogenated at pressure above 20 atm and 300°), 2224
  Hydrogenation of coal (Hydrogenation in two steps; 550-850°F and 750-850°F and 100-10000 p.s.i.), 2820 Hydrogenating coal extracts (Under pressure at 20°C in presence of Sn oxalate and NH, Cl), 2593 Hydrogenation and liquefaction of coal, 6056
  Increase in extractability of bituminous coals caused by Friedel-Crafts acylation, 7354
Influence of composition of mixture of benzene and ethyl
 Influence of composition of mixture of benzene and ethyl alcohol and influence of drying of brown coal on [extracted] bitumen yield, 7306

Influence of the ash content of brown coal upon yields of extraction and low-temperature carbonization (Effects of HCl pretreatment), 7252

Internal pressure of liquids used as coal solvents (Equations for dissolving power of coal solvents), 7265

Investigation of coal by means of solvents (Xylene, decalin, pyridine, cresol, phenol), 7213
  decalin, pyridine, cresol, phenol), 7213
Investigation of coals by extraction with organic
  solvents (Review with numerous references), 7322 Lignite bitumen and its production by means of the extraction of bituminous brown coal (Mixture of C_2H_5OH
 and C<sub>6</sub>H<sub>a</sub>, especially with dichloroethane, was most effective; equipment; 19 references), 7317 Liquid fuels from coal, 6898 Liquid fuels from coal (Boiling point of liquid fuels less than 2000), 7323
Liquid fuels from coal, 1972 (Collection of 101 patents in U.S.), 182
Liquid fuel obtained by thermal solution of solids (Use of tetralin as solvent), 7267
Making liquid fuels from coal by solvent extraction, 7338
Mechanism of the hydrogen-transfer process to coal and coal extract (Study of solvent extraction of coal using tetralin in an autoclave), 7327
Mechanism of solvent extraction from coal and its chars with chloroform f Extraction of raw and preheated coal
  Liquid fuels from coal, 1972 (Collection of 101 patents
      with chloroform (Extraction of raw and preheated coal
      at various temperatures), 7341
 Method for producing hydrogen-enriched liquid fuels from
coal (Coal extracted by decelin; extract was 23% of coal weight solid residue was 75% of coal weight; solid residue carbonized at 470°C; hydrogenation of liquid fractions yielded distillate boiling below 360°C), 7324 Motor fuel, etc., from coal, etc., by solvent and heat treatments (Ammonia and carbon tetrachloride as solvents), 5814
 New coal-utilization methods, 2541
New developments in coal dressing and coal by-products
(Review of extraction processes and coal gasification),
      7201
Obtaining fuel from coal (Review), 110
Office of Coal Research continues liquid extraction
projects (Review of projects for coal conversion into city gas and gasoline), 6828
On the role of hydrogen in the process of coal extraction (Role in free-radical reactions), 7353
Origin of coal (Critical reviews with many references),
```

```
Petrographic types of ccal. I. Study of glossy and semidull coals by means of their solution in organic solvents (Phenol and tetralin), 7266
Physiochemical characteristics of ccal on the basis of its absorption of pyridine vapor (Includes a review of literature on extraction of coal with pyridine), 7404
Pilot plant for gasoline production from coal in the U.S. (After solvent extraction, coal extract is hydrogenated on fixed bed of Co-Ho-Al oxide catalyst at 425°C and
on fixed ted of Lo-mo-hi dxide catalyst at 4250 and 210 atm; pilot plant is testing new catalyst based on Zn chloride that may be capable of direct conversion of coal into gasoline), 6846 Filot plant for solvent refining of coal (Flowsheet for extraction of S from coal; coal dissolved in coal-based solvent at 1000 psi and 4270 in presence of H; solution of Silvent and filtrate evacuated for recycling). 7351
filtered and filtrate evaporated for recycling), 7351
Pittsburgh and Midway Coal Mining Company solvent refined
coal process (Discussion of process and costs), 7349
Pollution-free fuels (From solvent extracted coals), 7352
Possibilities for utilization of Sulcis coal (Partial
     liquefaction, hydrogenation, extraction with tetralin),
     6796
 Possible new uses for ccal (Review of pyrolysis and
     solvent action hydrogenolysis and exidation as methods of degrading the complex coal structure into products of greater commercial value), 6061
 Pott-Broche coal-extraction process and plant of Ruhrol
     GmbH, Bottrop-Welheim, Germany (Froduction of liquid hydrocarbons), 7278
 Pressure extraction and hydrogenation of coal (Use of
 coke-oven gas in hydrogenation), 2386
Pressure extraction of vitrain-rich coal with anthracene
      cil, 7321
 Pressure extraction of bituminous coal (Fott--Broche and
 Unde process, 7236
Pressure extraction of brown coals (Effects of pressure
 on CH, production), 7258
Pressure extraction of coal, peat, bituminous shale, etc.
     (Using finely divided heavy metals or their oxides or sulfides of elements of groups 4-8 of the periodic
```

table together with mineral acids, carboxylic acids, or helogens), 7269
Pressure extraction of bituminous coal (Benzene or tetralin as extractants), 7221

Pressure extraction of bituminous coal, 7223

Pressure extraction of bituminous coal, 7223
Problems of the production of liquid fuels from coal
(Discussion of most important processes), 6149
Process for producing hydragen-enriched hydracarbonaceous
products from coal (Solvent extraction at 300 to 500°C;
catalytic hydrogenation of extract; use of Co oxide--Mo
oxide--Al oxide catalyst at 440°C, 245 atm, and
residence time of 2.8 hr), 4965
Production of benzine from coal (Review on methods
proposed and developed for production of synthetic
substitutes for petroleum cils), 5787
Production of hydrogen-enriched fuels from coal
(Suggested method of coal conversion into gasoline-type

(Suggested method of coal conversion into gasoline-type liquid fuel), 2994

Progress in the technique of liquefaction of coal (Review of hydrogenetion, carbonization, and extraction of coal and the Fischer-Tropsch synthesis), 5818

Project Gasoline. Paper No. 5 (Extraction of coal and hydrocracking of extract to produce gasoline), 7353

Project Western coal. Conversion of coal into liquids, 6923

ey2:
Prospects of some coal-based chemical industries in the
eastern region of India (Scivent extraction —
hydrogenation processes are described), 3096
Reappearance of coal as a chemical raw material (Review
of nonfuel uses of coal in the USA; hydrogenation,

gesification, and solvent extraction of coal), 5051
Recent ideas and work on the extraction, distillation, and hydrogenation of coal (Review), 7232

Relation of extract to residue in a bituminous coal

(Benzene extraction), 7241
Resins of brown coal. I. Sterols of resin bitumens

(Benzene--elcohol extraction), 7208

Results of the process of extracting coal and of coal extract hydrogenation on a laboratory scale, 7345

Results of the technical-chemical investigation of

Barzass sapromyxites, 7217
Saleable products from solvent extraction of coal (Review

Saleable products from solvent extraction of coal (Review covering 1955-56), 7328
Solid coal extracts (Extraction with benzene, tetrahydronaphthalene, tar oils, hydrogenated tar oils, phenols, bases, or a mixture of tetrahydronaphthalene or hydrogenated oils and phenol), 7272
Solid fuel research (Review of solid fuel research as well as fundamental research on combustion in fluidized bed, extraction of chemicals from coal tar and production of metallurgical coke, nonfuel uses of coal, e.g., solvent extraction and hydrogesification at high temperatures and pressures), 39

temperatures and pressures), 39
Soluble constituents of coal, 7222
Solution of coal by pressure extraction and hydrogenation of the extracts (Tetralin, phenol, and naphthalene as

solvents), 7214
Solution of coals in heavy solvents as a method for their characterization and study (Comparison of retene and anthracene oil), 7264
Solution of bituminous coal in heavy oils (Bibliography),

7237 Solvation process for carbonaceous fuels (Use of solvent extraction to obtain low-ash and low-sulfur fuel from fossil solid fuel), 7329

Solvation and hydrogenation of coal, 6217

Solvent extraction of oil-bearing shales, coals, and lignites, 7302

Solvent extraction of Fakistan coals (Extraction using benzene or benzene-ethanol mixture in Soxhlet

benzene or benzene-ethanol mixture in Soxhlet apparatus; extraction using pyridine), 7303 Solvent extraction of South Arcot lignite (Solvent extraction using benzene, xylene, tetralin, Cl₂C = CCl₂, Cdl₅Cl, C₅H₅N, and C₂H₅UH-C₆H₆), 7312 Solvent extraction of bituminous coal. I. Sulcis coal extraction with various types of solvents and quality of extract (Tetrahydrofuran, pyridine, morpholine, benzylamine, ethylenediamine, and mcnoethanolamine), 7305 7305

Solvent extraction of some Australian coals (Thermal dissolution of coals of various ranks in anthracene oil studied to produce ashless coal extract, called Coalex), 7330

Solvent extraction of bituminous coal. III. Influence of extraction temperature on extract composition (Extraction with tetrahydrofuran, morpholine, and tetralin in the temperature range of 65° to 350°), 7516

Solvent extraction of hydrocarbons from coal, 7837 Solvent extraction of lignites and bituminous coals (Comparison of dioxane, propanol, and pyridine followed

(Comparison of aloxane, property, and parameters)
by CHCl₃), 7296
Solvent extraction of organic sulfur and nitrogen
compounds from coal (40% reduction of organic S with no
change in Etu value), 1600
Solvent extraction of coals. Perspective (Review with 84

references; mechanisms of solvent extraction of coal; physicochemical aspect of solvents and catalysts), 7347 Solvent extraction of coal by a heavy oil (Coal converted

to liquid products by solvent extraction with heavy carbonaceous liquid containing C,H, inscluble material; solvent and solid heated to 55-935° at 500-1000 psig in presence of H to liquefy fraction of solid), 7348 Solvent extraction liquefaction of coal (Solvents such as tetralin, decalin, biphenyl, methylnaphthalene, or dimethinaphthalene), 6922 Solvent extraction of bituminous coal. II. Composition of extracts of Sulcis coal (Infrared and chromatographic studies of extracts), 7309 Solvent extraction of coal (Coalene is obtained by extracting coal with tar oil at 450-750 p.s.i. in an inert atmosphere), 7310 to liquid products by solvent extraction with heavy

extracting cost with tar oil at 450-750 p.s.i. in an inert atmosphere), 7310
Solvent extraction of coal utilizing a heteropoly acid catalyst (Patent), 7360
Solvent extraction of coal by aromatic compounds at atmospheric pressure, 7285
Solvent extraction method for liquefying coal (Two-stage method), 6955

method), 6955 Solvent power for coals at room temperature. Chemical and

physical factors, 7301

Solvent refined coal - a potential low sulfur utility fuel (removes fly ash and sulfur), 7344 (EN-1872)

Solvent-refined coal process for clean utility fuel (Discussion of production of solvent-refined coal and as de-ashed, low-S fuel for electric utilities), 7350 Solvent refining of coal (Pilot plant studies), 7357 Solvent treatment of coal (M. and B. Monographs: Chemical

Engineering), 7340 Engineering), 7340

Some coal researches—their significance to the coal industry (Review of action of solvents, oxidizing agents, and Cl on coal and coal carbonization), 87

Some observations on the chemical constitution of coal.

The action of chlorine on coal. III. The action of

The action of chlorine on coal. III. The action of solvents, 7204

Studies in the composition of coals. The action of solvents (Catalytic effects of coal on solvents), 7215

Studies of the extraction and coking of coal and their significance in relation to its structure, 7292

Study of coal by means of extraction with solvents, 7193

Synthetic fuels process (Description of coal liquefaction process; recycle of natural solvent), 6946

The action of solvents on coal (Literature survey), 7216

The action of solvents on coal (Literature survey), 7216 The action of organic solvents on hard coals (Including heterocyclic nitrogen compounds, amines, and phenols), 7231

Thermal liquefaction of a sub-bitumincus coal (Coal

Thermal liquefaction of a sub-bitumincus coal (Coal dissolved in hydrogenated polycyclic compound solvent under H pressure (2000-3000 psig) at 440-4500 for 5-20 min), 6953

Thermal solution of solid fuels. V. Role of the fractional composition of the solvent on the solubility of humus and sapropelite coals (Solubility in benzene, toluene, xylene, naphthalene, and 5 fractions of anthracene), 7308

Treatment of coal with solvents. I. Extraction of coal by solvents at comparatively high temperature (Effects of temperature on extractability), 7277

Ultimate yield of solvent extraction of coal; calculation from rate of extraction (Improved method for estimating yield; benzene, aniline, and tetralin as solvents),

yield; benzene, aniline, and tetralin as solvents),

```
Use of low grade coal for the production of oil, gas,
      fertilizers, and chemicals, 6976
Utilizing solvent-refined coal in power plants (Emission
         of S oxides reduced), 7326
 of S oxides reduced), 7326
Variation in extraction yields from coal caused by preheating (Chloroform and pyridine extraction), 7342
Working up liquefaction products of coals, shales, or peat (Using solvent of tetrahydronaphthalene and naphthalene at >370°C prior to chilling and mechanical separation), 7263
COAL/SPECIFIC HEAT
      Determination of the specific heat of tar and tar oils,
         coke, and coal, 7403
  COAL/STATISTICS
  Bituminous coal data, 1970 edition (Industrial statistics), 15 (EN-121)
COAL/SYNTHETIC FUELS
     Synthetic fuels: will government lend the oil industry a hand, 5601
  COAL/THERMODYNAMIC PROPERTIES
      Combined determination of the thermal characteristics of solid fuel during high-temperature pyrolysis, 7139 (SLA-74-6007)
  COAL/VAPOR PRESSURE
      Vapor pressure isotherms and porosity curves of coals, 7416
  COAL/VOLATILITY
      Dilute phase hydrogenation of high-volatile bituminous
         coal, 3024
      Synthetic oil from coal (Catalytic hydrogenation in autoclave at 140-210 atm up to 475° in presence of
         ammonium molybdate and Sn chloride or Zn chloride gave
crude cil, gas, coke, and water; hydrorefining with CoO
and Mo oxide on Al oxide followed by cracking), 6877
 CCAL/WASHING
     Evaluation of coal cleaning processes and techniques for
removing pyritic sulfur from fine coal, 1583 (BCR-L-
         404)
    High sulfur combustor. Study of systems for coal refuse processing. Volume I. Narrative summary (Extraction of energy and sulfur products from coal washing reject fractions), 1579 (PB-203958)
     Preparation characteristics and desulfurization potential
        of Iowa coals (High S content (4.2-10.4%); organic S was 0.8-3.8%; pyritic S content reduced by crushing and
    washing), 1894
Study on design and cost analysis of a prototype coal cleaning plant. Part 1-6, 1481 (FB-196631)
Sulfur reduction of Illinois coals. Washability studies.
        II, 1679
     Sulfur reduction of Illinois coals. Washability studies.
     1, 1564
Sulfur reduction through improved coal washing practices
        (S content reduced by crushing coal, washing in
hydraulic classifier table circuit, and using
    hydroclone/heavy-medium unit combination), 1573
Sulfur reduction of Illinois coals. Washability tests
 (Pyrite S removed by washing), 1490 COAL DEPOSITS/DRILLING
    Drilling of long boreholes in coal (For underground
gasification), 4705
Feasibility of using rapid turbodrills for boring
    Feasibility of using rapid turbodrilis for boring inclined directional holes in the coal seam (For underground gasification), 4621
Making an actual shaft layout in boring inclined-level holes (In underground gasification of coal), 4622
Preliminary results of trials of directional boreholes (Large-scale testing of linkage possibilities of inclined horeholes), 4557
inclined boreholes), 4557 CCAL DEFOSITS/FRACTURING
    Experiments on hydraulic fracturing of bituminous coal
    seams (For underground gasification), 4554
Gas as agent reducing the mechanical strength of the coal
    seam during its hydraulic fracturing (For underground gasification of coal), 4617
Use of torpedo perforators in construction of underground
gas generators, 4555
COAL DEPOSITS/GEOLOGY
Directional properties of coal and their utilization in
underground gasification experiments, 5545
CGAL DEPOSITS/USA
   Synthetic fuels industry based on Rocky Mountain coals,
       €930
CUAL EXTRACTS
Bitumens from coal (Review with 48 references), 7313 CGAL EXTRACTS/CARBONIZATION
   Solvent extraction of lignite and carbonization of lignite extracts (Solvents were tetrallin, cresol, naphthalene, octahydroanthracene, phenanthrene, octahydrophenanthrene, octahydrochrysene, decalin, and
        some mixtures), 7315
COAL EXTRACTS/CHEMICAL RADIATION EFFECTS
   Evaluation of beta radiation as a hydrogenation catalyst. Interim technical status report No. 3, September 1--
December 31, 1962 (Hydrocracking of coal derivatives),
       2980 (NYO-10186)
```

Evaluation of beta radiation as a hydrogenation catalyst.

```
Interim technical status report, March 1, 1962-Oct 31, 1963 (Effects on hydrorefining, removal of N and S from
                    distillate oils derived from hydrogenated coal extract), 2997 (NYO-2978-34)
           Evaluation of beta radiation as a hydrogenation catalyst.

Quarterly technical status report No. 1, March 1--May
31, 1962 (Hydrocracking of coal derivatives), 2964
  (NYO-10184)
COAL EXTRACTS/CRACKING
          Hydrocarbon oils from bituminous coal (Cracking of extracts from coal using Al or Mg silicates as catalysts), 6690
Liquid fuels from coal (Process described for minimizing
                    deleterious effect of ash on hydrocracking catalyst
during production of distillable liquid hydrocarbons
 during production of distillable liquid hydrocarbons from ash-containing coal extract), 6810

Three-stage processing of coal extract dijuted by anthracene oil to obtain liquid fuels (Laboratory experiments; best catalyst Al oxide--Mo oxide--CeO which removed almost all cf S; hydrocracking with W sulfide gave liquid fraction suitable as fuel), 6941

COAL EXTRACTS/DISTILLATION

Production of hydrocraceness total fuels for the formation of hydrocracking with M coal extractory of hydrocracking with M coal extractory of hydrocracking with M coal extractory of hydrocracking of hydroc
           Production of hydrogen-enriched fuels from coal
                   (Suggested method of coal conversion into gasoline-type
           liquid fuel), 2994
Pyridine extracts of coals and carbonized coals, 7116
  COAL EXTRACTS/FILTRATION
         Coal solvation with non-hydrogenated solvent in the absence of added hydrogen (Methods described for obtaining solutions of practically ash-free carbonaccous matter from coals and brown coals; coal mixed with aromatized solvent; mixture heated for
  complete decomposition), 7331
COAL EXTRACTS/HYDROCRACKING
         Extracts/HTDRUCKRANING
Evaluation of beta radiation as a hydrogenation catalyst.
Interim technical status report, March 1, 1962--Oct 31, 1963 (Effects on hydrorefining, removal of N and S from distillate oils derived from hydrogenated coal
                  extract), 2997 (NYO-2978-34)
        Evaluation of beta radiation as a hydrogenation catalyst.

Quarterly technical status report No. 1, March 1--May
31, 1962 (Hydrocracking of coal derivatives), 2964
(NYD-10184)

Final report, development of CSF coal liquefaction
                 process (Liuefaction followed by hydrocracking of extract produces acceptable utility fuel), 7005 (EN-
        2364)
Project Gasoline. Paper No. 5 (Extraction of coal and hydrocracking of extract to produce gasoline), 7333
Technical developments in the USAEC process radiation
development program (Use of fission-product β radiation for hydrogenation of coal and coal products to produce liquid hydrocarbon fuels), 2967
COAL EXTRACTS/HYDROGENATION
       DAL EXTRACTS/HYDROGENATION

Catalysts for hydrogenation of coal extract (Comparison of activaties of catalysts), 3075

Catalytic hydrogenation of coal extract (Determination of effects of temperature (370-450°), H pressure (50-190 atm), and space velocity of raw materials (0.5-3.2 hr-1); catalyst contained CoO 1.55, MoO<sub>3</sub> 15.50, WO<sub>3</sub> 13.9, and Al<sub>2</sub>O<sub>3</sub> 69.05 parts; best results in 2-stage process with hydrogenation at 370-400°), 3073

Coal refinery. Jengible concept (Review with 21 references), 3084

Coal technology: key to clean energy. Appeal pages
        Coal technology: key to clean energy. Annual report.
                 1973-74 (Production of synthetic fuels from coal), 5567
                 (NP-20078)
        Engineering evaluation and review of consol synthetic fuel process. R and D report No. 70 (Includes economic evaluation and description of plant), 3088 (NP-20086) Evaluation of beta radiation as a hydrogenation catalyst.
                Interim technical status report No. 3, September 1—December 31, 1962 (Hydrocracking of coal derivatives), 2980 (NYO-10186)
        Extraction (peptization) of Polish hard coal (Solvents
      Extraction (peptization) of Polish hard coal (Solvents used were tetralin, anthracene oil, and heavy oil obtained from the extract; coal was fed into reactor as paste at 100 atm and 450°C; yields of extract and gas were 61.2% and 9.6%, resp.), 7334

Hydrogenation of coal extracts (Operation may be noncatalytic or in presence of H halide or its ammonium eait). 2003
       salt), 2993

Hydrogenation of coal and its distillation and extraction products (Evaulation of catalysts of HCl with Al,
      products (Evaluation of Cotalysts of Hot with Al, magnalium, or Al bronze), 2646

Hydrogenation of coal and its products (Using catalysts of Fe, Co, Ni, Mn, or HCl), 2647

Hydrogenation of coal extracts (Extraction for 30 min at 400° and 100° atm; hydrogenation over 20% WS; catalyst
              on aluminosilicate carrier; apparatus permits operation at less than or equal to 500^\circ and less than or equal to 300 atm), 3058
     Hydrogenation of coal-extraction and -hydrogenation products (Pre-hydrogenation steam distillation in vacuo for removal of asphalt and resins), 2651 Liquid products from pressure extracts of solid carbonaceous materials, 5924 Mechanism of the hydrogen-transfer process to coal and coal extract (Study of solvent extraction of coal using tetralin in an autoclave), 7327 Method for producing hydrogen-enriched liquid fuels from
       Hydrogenation of coal-extraction and -hydrogenation
```

coal (Coal extracted by decalin; extract was 23% of coal weight solid residue was 75% of coal weight; solid residue carbonized at 470°C; hydrogenation of liquid fractions yielded distillate boiling below 360°C), 7324

McIten zinc halide catalyst for hydrocracking coal extract and coal (Zn chioride and tetralin extract of coal used; hydrogenation at 385°C, 140 atm, for 1 hr), 3015

Pilot plant for gasoline production from coal in the U.S. (After solvent extraction, coal extract is hydrogenated on fixed bed of Co-Mo-Al oxide catalyst at 425°C and 210 etm; pilot plant is testing new catalyst at 420 c and 210 etm; pilot plant is testing new catalyst based on 2n chloride that may be capable of direct conversion of coal into gascline), 6846

Process for producing hydrogen-enriched hydrocarbonaceous products from coal (Solvent extraction at 300 to 500°C; catalytic hydrogenation of extract; use of Co oxide—Mo oxide—Al oxide catalyst at 440°C, 245 atm, and residence time of 2.8 hr), 4965
Production of hydrogen-enriched fuels from coal

(Suggested method of coal conversion into gasoline-type liquid fuel), 2994
Results of the process of extracting coal and of coal

extract hydrogenation on a laboratory scale, 7346
Synthetic fuels from coal (Discussion of potential
processes for production of synthetic crude oil and
refined "petroleum products" from coal), 6883
Three-stage processing of coal extract diluted by
anthrecene oil to obtain liquid fuels (Laboratory

experiments; best catalyst Al axide—Mo oxide—Call which removed almost all of S; hydrocracking with W sulfide gave liquid fraction suitable as fuel), 6941

Use of spherical catalyst in coal extract hydrogenation (Coal extracts hydrogenated ir fixed bed downflow reactor; Co-molybdate catalyst; hydrogenation at 650-900°F and 1000-4000 psig), 3065
COAL EXTRACTS/PRODUCTION

Extraction (peptization) of Polish bard coal (Solvents used were tetralin, anthracene oil, and heavy oil obtained from the extract; coal was fed into reactor as paste at 100 atm and 450°C; yields of extract and gas were 61.2% and 9.6%, resp.), 7334
Solvent extraction of some Australian coals (Thermal

dissolution of coals of various ranks in anthracene oil studied to produce ashless coal extract, called Coalex), 7330

COAL EXTRACTS/WASHING

Coal liquid extraction from coal solids (Solvent introduced into bottom of primary stripper zone and forced up countercurrently through mixture of coal and sand to remove coal liquids; enriched solvent taken off at top, heated, and introduced at top of secondary extractor zone), 7345 CGAL FINES/DISPERSIONS

Fluidized solid particle fuel (Goal fines dispersed in H_2O and wetted by carbonaceous liquid, such as oil or pitch), 57

FINES/FLUIDIZATION

Fluidized solid particle fuel (Coal fines dispersed in H₂D and wetted by carbonaceous liquid, such as oil or pitch), 57

COAL FINES/GASIFICATION

Casification of coal fines in a laboratory plasma-chemical reactor with a spouted bed (Ar plasma), 5212 Gasification of the dust of Moscow region brown coal and its coke in media ballasted by carbon dioxide, 5211 Gasification of solid fuel (Fuel mixed with volatile liquid hydrocarbon in ratic to produce semisolid,

pumpable mass), 5056
Gasification of solid fuels with a high content of coal fines (Process inhibited wing to poor aerodynamics of fuel bed when coal fines fraction of 0-5 mm exceeds 5%), 4942

Theoretical computer study of the gasification of powdered fuel in a flow with frequent circulation, 5114 COAL FINES/HYDROGENATION

Thermal decomposition and hydrogenation of coal dust in a shock tube (Additions of I promoted reaction), 3104
COAL FINES/PYROLYSIS

Thermal decomposition and hydrogenation of coal dust in a shock tube (Additions of I promoted reaction), 3104 COAL GAS

Recovery of components of coke-oven gas, 1459 Recovery of components of coke-oven gas, 1459
Technology and use of lignite. Information circular, pubin proceedings: Bureau of Mines--University of North
Dakote Symposium, Bismarck, ND, 12-13 May 1971
(Liquefaction of lignite and removal of nitrogen oxides
and sulfur oxides from flue gases), 6985 (PB--211 826)
Utilization of brown-coal gases in the energetic and
material grid system (Lecture on aspects of industrial
gases, in particular generator gases and gases from
low-temperature carbonization), 4473
DAL GAS/CHEMICAL REACTIONS

COAL GAS/CHEMICAL REACTIONS Coal gas as a substitute for synthesis gas in Fischer—Tropsch reactions. III (Coal gas (CO₂ 5.38, H 25.9, O 2.7, CH, 19.05, unsaturated hydrocarbons 3.10, C₂ and higher saturated hydrocarbons 0.41, CO 7.25, N 36.23%) reacted over catalyst (MgO--ThO₂--kieselguhr)), 6744

COAL GAS/CLEANING Performance of a Wellman-Galusha producer installation with a Whessoe gas-cleaning plant, 4202

COAL GAS/COMBUSTION HEAT Analysis of separate stages of underground gasification of brown coal (Effects of seam thickness, quantity and degree of preheating of air blown into gasification

zone on heat of combustion of gas produced were

evaluated), 5194
British trials in underground gasification (If coal is British trials in underground gasification (If coal is heated in absence of air, volatiles representing 15-40% of bituminous coals are driven off as coal gas), 4288 Calculation of indexes of the gasification process of solid fuels under pressure (Method for calculating indexes of gasification process at 10-20 atm; results agree well with operational data), 4752

Dependence of gas quality on the moisture content of gasified coal (Laboratory procedure; decrease in moisture (35 to 1%) caused increase in heat of combustion of gas), 4749

Determination of the heating value of PGU (underground coal gasification) gases by measuring the heat

Determination of the heating value of PGU (underground coal gasification) gases by measuring the heat conductivity of the gas mixture, 4582

Determination of chemical efficiency of underground gas generators (Equation for chemical efficiency of underground gasification of coal), 4562

Effect of various factors on the heat of combustion of gas produced by underground gasification of coal (Discussion of effects of various factors on amount and quality of gas produced), 4909

Enriched coke-oven gas suitable as a natural gas substitute (Coke-oven gas methanated with suitable catalysts at 180-500°; H removed, and residual gas enriched with liquid gas to calorific value of natural gas), 5062

gas), 5062
Experimental investigation of the influence of pressure on coal carbonization with the goal of an increase in

on coal carbonization with the goal of all increase in yield, 116
Increase in the heat of combustion of gas in underground gasification of coals (Addition of steam to air produced increase in H content of gas by 8% after first steam blowing and by 7% after repeated steam blowing), 5030

Influence of the thickness of the coal layer on the heat of combustion during underground gasification of coal (Experimntal and matematical study; empirical formulas fiving dependence of heat of combustion of gas on water

content and spcific water flow in gas), 4999
Low-temperature thermal treatment in fluidized beds of typical coals of western Siberia (Preparation and typical coals of western Siberia (Preparation and thermal treatment of typical coals; partial decomposition in fluidized bed at 200-600° in stream of inert gas (N or CO2) to drive off most of C compounds as CO2 and H2O; purpose was to develop methods for preparing low-rank coals for use in making liquid chemicals and gases of high calorific value), 4768 Natural gas substitute from coke-oven gas (Three-stage

Matural gas substitute from coke-oven gas (infee-stage methanation process using Ni catalyst to increase calorific value of coke-oven gas to near that of natural gas), 5064

Preparation of an energy-producing gas from sulfur coals of the western Donets Basin by their pressurized fluidized-bed gasification (Gasification at 900-1000 and 10 atm yielding gas of 1100-1220 Kcal/m³), 5195

Pressure gasification of solid fuels (Calorific value of solid fuels)

Pressure gastification of solid rue is (calorific value of gases produced by pressure gasification of solid fuels with 0 or 0-enriched air and steam is increased by catalytic cracking of tar produced), 4348

Production of generator gas from Chukurovski coal by oxygen enrichment (Addition of 3.5% 0 to air and steam resulted in 150 kcal/m³ increase in heat content of gas

produced), 4802

Pyrolysis of heavy tars from the semicoking of Cheremkhovskii coals (Pyrolysis at 650-10000; proportion of unsaturated compounds in gas decreased with increasing temperature from 40% at 650-7000 to 5%

at 1000°), 7124
Relation of calorific value and of composition of gas
from the underground gasification of coal to humidity of the gas, 4832

Thermal decomposition of Siberian coals during slow

heating (Laboratory-scale distillation on coals of different ranks; calorific values of gases obtained ranged from 2830 to 5680 kcal/m³), 7119
Thermal treatment of brown coal for its use for power production (Use of electrically heated retort), 7121
Underground gasification of coal. Operation of multiple path system (Eight bereholes for air injection or mutthle path system (Eight bereholes for air injection arranged in circle 50ft from central product gas cutlet; only 3 1/2% of energy in coal in 100-ft-diam circle recovered as combustible gas), 4805
Underground gasification of coal by oxygen (By use of Coal of the co

instead of air, calorific value of >1000 Kcal/m3

resulted), 4808 Underground gasification of fuels. Products obtained in the continuous heating of coal with an electric current (Elaborate laboratory apparatus shown in schematic drawings; composition and thermal values of gas as functions of time of heating are plotted), 4772 Underground gasification of fuels. Effect of preliminary

thermal treatment on the composition of the gas from

the gasification of Moscow brown coal in a permeable channel (Laboratory scale O gasification experiments on Moscow brown coal that had been preheated to 150, 250, 350, and 5500), 4761

COAL GAS/COST

Engineering study and technical evaluation of the ngineering study and technical evaluation of the bituminous coal research, Inc., two-stage super pressure gasification process (Concept has been reviewed and is judged to be theoretically sound and to offer genuine practical advantages in coal gasification although it has not yet been demonstrated), 3130 (DCR-

COAL GAS/CRACKING

Cracking of low-temperature gas and tar from brown coal (Use of CaCl₂, Fe, brass, pumice, Cu, and chalk), 7051 Synthesis gas (Two-stage precess preceded by removal of S compounds), 5063

COAL GAS/DESULFURIZATION

- 45th report of the Joint Research Committee of the Gas Research Board and the University of Leeds. Removal of sulfur compounds from coal gas and synthesis gas at atmospheric pressure (Effective catalysts for removal of organic S compounds from water gas and coal gas), 668
- Absorption of hydrogen sulfide from coal gas (Review),
- Absorption of hydrogen sulfide by arsenic-soda solutions under turbulent (fcaming) conditions (To purify cokeoven gas of residual H sulfide concentrations of 1.5-2.0 g/cu. m., 13-14 stages are required whereas 38 are needed for purification to tolerable environmental levels), 1384
- Absorption of hydrogen sulfide from coke-oven gas by ammonium phenolate solutions (Addition of phenol and cresols to reduce loss of NH₃ during desulfurization),
- 575
 Advanced coal gasification system for electric power generation. Annual technical report, August 9, 1972-June 30, 1973. Research and development report No. 81, interim report No. 1 (Development of economic, efficient, nonpolluting power plants), 5411 (NP-20074)
 Ammonia-circulation method (in desulfurizing das) and it

- efficient, nonpolluting power plants), 5411 (NP-20074)
 Ammonia-circulation method (in desulfurizing gas) and its
 conditions (Removal of H₂S from coal gas), 1138
 Ammonia-hydrogen sulfide cyclic washing process for cokeoven gas (95% of H₂S removed from gas compared with 85%
 in usual processes), 2001
 Ammonia method for removing hydrogen sulfide from coke-
- oven gas under laboratory conditions (Use of ammonia oven gas under laboratory conditions (use of ammonia absorbent solution to remove S from gas; high degree of absorption possible only up to 25°), 1367

 Ammonium sulfate from coal gases containing hydrogen sulfide and ammonia (High absorbed in washer by highly concentrated NH₄OH at high pressure), 877
- Analysis of a dynamic model for the two-stage monoethanolamine purification of coke oven gas by theory-of-graphs methods (Analysis of dynamic model of
- 2-stage extraction of CO₂ and H₂S), 1892
 Apparatus and method for purifying gases containing ammonia and hydrogen sulfide (Coke-oven gas passed through spray of FeSO, solution; H_2S reduced from $\theta q/\pi^3$ to 1 ppN and NH₃ from 10q to 20 mg/m³), 1613 Apparatus and method or purifying gases containing
- ammonia and hydrogen sulfide (Washing in a spray of dilute, aqueous ferrous sulfate), 1610
- Application of the foaming column in Thylox-type desulfurization plants, 1321
 Application of fluidized-solids technique to coal-gas purification (Removal of H₂S using Fe oxide catalyst), 705
- Application of fluidized bed techniques in gas purification (Use of Fe oxide catalyst to remove H₂S from coke-oven gas; catalyst prepared by mixing FeSO, (ground), Ca(OH)₂, and H₂O in rotary mixer; Fe(OH)₂ oxidizes in air to Fe₂O₃, and CaSO, acts as binder and carrier; description of apparatus), 1324
 Appraisal of the operation of a gas pressure purification plant in the coking works ''Zdzieszowice'', 1494
 Aspects of iron oxide purification of gases, 736
 Bacterial removal of hydrogen sulfide from water gas and coal gas by pest and peat-oxide mixtures, 596
 Bases of dry removal of hydrogen sulfide from coal gas (Effects of H₂O content, reaction temperature, and structure of the hydrate on efficiency of Fe₂O₃·xH₂O), 534 purification (Use of Fe oxide catalyst to remove H₂S

- Benfield process (Removal of C dioxide, H sulfide, and COS from sour natural gas and raw gases produced during manufacture of substitute natural gas by partial
- oxidation of coal or oil or by naphtha reforming), 1957 Burning of ammonia in coke-oven gases with simultaneous burning of the hydrogen sulfide (Conversion of ammonia to N and water and of hydrogen sulfide to S), 1394 Caol gas (Removal of S by bog Fe ore or a mixture of
- Caoi gas (Removal of S by bog re ore or a mixture of Fe₂O₃ and Ne₂CO₃), 420
 Catalysts for coke oven-gas purification (Oxides of Ni or Cu, especialy Ni, with addition of carries, ground, moistened with H₂O, agglomerated, screened), 892
 Catalytic removal of organic sulfur compounds from coal
- gas (Most suitable industrial catalyst is Ni subsulfide

- on a china-clay support), 698
 Catalytic oxidation of organic sulfur compounds in coal
 gas (Ni subsulfide catalyst), 795
 Catalytic removal of organic sulfur compounds from coal
 gas by metallic thicmolybdates (Use of Ccros, supported on bauxite granules as catalyst; absorption of H2S by
- Fe oxide or $Cu_3(P0_{\bullet})_2$), 670 Catalytic removal of organic sulfur compounds from coal gas. 720
- Catalytic removal of organic S compounds from coal ga (Ni subsulfide as catalyst on china clay pellets), 650 Choice of highly economical methods for the hydrogen sulfide purification of coke oven gas (Relative costs of vacuum-potash and As--soda methods), 1084
- Clean fuels from coal (Production of liquid and gaseous products recommendations for research programs), 1806
- (PB--224 530/6)
- (PP-224 330/0)

 Coal. Black magic (Technologies of coal desulfurization, coal gasification, and sulfur dioxide emission control are described), 1765 (PB-213 032/6)

 Coal gas (Removal of H₂S by passing gas through activated C through which volatile hydrocarbons lighter than C₂H₆
- c through which volatile hydrocarbons lighter than C₂H_a or C₂H_a have been led), 485

 Coal gas (Removal of H₂S from coal gas using solutions of As--O compounds), 418

 Coal gas as a substitute for synthesis gas in the Fischer--Tropsch synthesis (Removal of O from coal gas by passage over Cu turnings at 320-500; gas freed of S by passage over alkalized Fe₂O₃ at 2500; catalyst of 100 Co, 5 ThO₂, 8 MgG, 80 kieselguhr), 6671

 Coal gas purification in the Leopoldau gas works (Gas scrubbed with solution containing free amonts
- scrubbed with solution containing free ammonia,
- scrubbed with solution containing area amounta, combined ammonia, thiosulfate, sulfate, thiocyanate, hydrogen sulfide, and hydroquinone), 1385
 Coal gasification. Low BTU for power station emission control (Efficiency of gasification plant is 80%), 5382 Coal gasification. Two-stage coal combustion process
 (Two-stage coal combustion process consists of
 dissolving coal in molten Fe where coal-fixed C and S

are required, and coal volatiles cracked emitted as CO

- and H), 5335

 Coal gasification (Gas containing 94.8% CH, and solid fuel containing 0.72% S of high calorific value manufactured by 2-step process; final product of methane 94.8, carbon dioxide 1.14, CO 0.06, H 2.0, and N 2.0%), 5456
- Coke oven gas free from acidic gases, 2075 Coke oven gas (NH₃, H₂S, and HCN removed by scrubbing with waste liquor from steel pickling), 1272
- Coke-oven gas desulphurization process (Sodium carbonate
- solution is absorbent), 2018 Cold-warm tube principle applied to the dry purification and desulfurization of coal gas (Removal of $\rm H_2S$ using Fe₂O₃), 351
- Comparison of the dry purification of coal gas in a modern installation with wet scrubbing (Removal of H₂S), 1140
- Complete removal of organic sulfur compcunds by the Desorex process (Use of series of absorption stages), 1316
- Continental practice in the treatment of coal gas (Tar decantation under pressure, horizontal-tube primary coolers, centrifugal exhausters, and H₂S removal; dry purification usually used), 3835

 Continuous desulfurizing of coal gas (Removal of H₂S
- using fluidized Fe₂0₃ catalyst), 711
 Conversion of organic compounds of sulfur on a cobalt--
- molybdenum catalyst in the scrubbing of gases, 1156
 Conversion of coke oven gas to a gas interchangeable with
 natural gas (Conversion of coke-oven--water gas mixture
 to gas equivalent to natural gas requires 2 steps),
- Conversion of carbon monoxide (Removal of CO and Scontaining compounds from coke-oven gas; gas washed with solution of soda and anthraquinonesulfonic acid as catalyst; diagram of apparatus), 1356 Converting coke oven ammonia and hydrogen sulfide
- (Scrubbing coke-oven gas with water to remove ammonia and H sulfide), 1400
 Cooling and desulfurizing of coal-distillation gases, 1168
- Cooling and washing of coke oven gases, and simultaneous removal of ammonia, hydrogen sulfide, and other acid components (Gas cooled to ca. 45° in 1st indirect cooling stage and then to ca. 20° in 2nd direct stage), 1536
- Corrosion protection of sulfur removal regenerators (Use
- of epoxide resin to protect regenerator used in removal of H₂S from coke-oven gas), 1670

 Cyclic process for removal of hydrogen sulfide and ammonia from coke-oven gas (H₂S scrubbed selectively with NH₂OH; NH₃ bound by aqueous solution of (NH₄)H₂PO₄--(NH₄)₂HPG₄), 1726

 [Recomposite aution of the composite selection of the c
- Decomposing sulfur compounds in gases and in byproducts therefrom (Removal of fixed or organic S by treatment with H₂ internally generated), 417
- Dedication of the Dorsten pressure gasification plant for bituminous coal (Lurgi gas producer modified so coals of Ruhr region could be gasified with 0 and steam at 20-30 atm), 4301

 Desulfurizing water gas (Organic sulfur removed by

activated C impregnated with oxidizing agent), 593 Desulfurizing ccal-distillation products (Predesulfurization cracking using catalysts of oxides and selts of Ca, Al, Pb, Zn, Cu, Ho, and metallic selenides), 579

Desulfurization of gas (Removal of organic sulfur compounds using either the oxide, hydroxide, or carbonate (or mixture of them) of an alkali or alkaline earth metal), 718 Desulfurized fuel from coal by implant gasification (Two-

Desulfurized fuel from coal by implant gasification (To stage, superpressure, C-blown coal gasifier for production of pipeline gas is described), 5263

Desulfurization of generator gas by treatment of coal with milk of lime (Using hydrogen from coal distillation), 374

Desulfurizing coal-distillation gases, etc. (Treatment with aqueous suspension of Mn(OH)3), 219

Desulfurizing gases (Gas purification by washing using solution of SO₂ aliphatic or aromatic hydrocarbon to which an organic base and a phenol or naphthol have been added), 455

Desulfurization during coking (By passing H, desulfurized coke-oven gas, or gaseous hydrocarbons through coke during coking, up to 54% of initial S can be removed), 1311

Desulfurization of [town] gas and sulfur-recovery processes (Review), 568

processes (neview), soo Desulfurization of coal gas (Removal of $\rm H_2S$), 1052 Desulfurization of coal gas (Removal of $\rm H_2S$ by scrubbing with NH₃ in gaseous form), 1053 Desulfurization of gases with diphenolates (Equipment and

procedure), 1242

Desulfurizing coke-oven gas by activated carbon (17 references), 4852 Desulfurization of coke (Treatment with gaseous

unsaturated hydrocarbons, H₂U vapor, CH₄, CO, and H₂ at 800 to 1200°C), 301

Desulfurizing gas containing hydrogen sulfide (H₂S and HCN removed from coke-oven gas by scrubbing with aqueous Na₂CO₃), 1986

Desulfurization of coke-oven gas at Appleby--Frodingham (Hea of fluidized stream of Fe ovide at Apple 350°C. Has

(Use of fluidized stream of Fe oxide at about 350°; $\rm H_2S$ and organic S compounds removed to about same extent), 1082

Desulfurizing industrial gases (Gas purified by passage through fluidized bed of Fe axide catalyst), 1333 Desulfurizing gases (Catalytic axidation of $\rm H_2S$, absorption of products in ammoniacal solution or

water), 252

Desulfurization of coke-oven gases (Washing with NH,OH to

Desulfurization of coke-oven gases (Washing with NH, DH to remove H₂S), 1177

Desulfurization of coke-oven gas with arsenic-soda solution (Coke-oven gas containing H₂S washed countercurrently with solution containing Na thiosulfate, Na thiocyanate, and As oxide), 1360

Desulfurization of coke-oven gas (H₂S and NH₃ scrubbed from coke-oven gas in several stages), 1215

Desulfurizing coal-distillation gases (By passage through Fe-containing purifying materials), 390

Desulfurizing coal gas (Removal of H₂S by washing with ammonical liquor), 818

Desulfurizing reducing gases (Removal of H₂S from coke-

Desulfurizing reducing gases (Removal of H₂S from coke-oven gas, producer gas, water gas, and hydrocarbon gases; fluidized solid bed of Cu-SiG₂ gel used to remove H₂S by decomposition), 1331 Desulfurization of coke-oven gas (Combination of Collin NH₃ process of desulfurization of coke-oven gas and

recovery of H2S with Chemiebau wet contact H2SO.

recovery of H₂S with Chemiebau wet contact H₂SU, process), 873

Desulfurization of coke-oven gas (Coke-oven gas scrubbed to remove hydrogen sulfide with NH, OH containing (NH,)₂SU,, (NH,)₂S₂O₃, and NH, SCN), 1989

Desulfurizing gases (Catalysts comprising sulfides of elements of groups 2 to 7 and metals of group 8 or heavy metals of group 1), 255

Determination, conversion and removal of organically combined sulfur from gas (Tron catalyst), 313

combined sulfur from gas (Iron catalyst), 313
Developments in the complete removal of sulfur from coaldistillation gases. The autopurification process and

unstitution gases. The autopurification process and the Steatsmijnen-Otto process (Economics), 721

Dry desulfurization of coal gas with slimes from metal etching (Slimes from metal etching are not inferior to Laut mass and better than bog iron ore), 1088

Dry gas desulfurization technique (Use of Fe oxide beds), 1202

Dry-process adsorption of hydrogen sulfide from coke-oven gases (Description of process), 1262
Dry purification of illuminating gas (Decreased afficiency of S removal with Fa₂O₃), 864
Dry purification of gas (Removal of H₂S and tar droplets by passage through finely divided coke at 18 to 33°), 537

Dry purification of blue gas (Blue gas: using iron oxide with Na, $\rm GO_{2}$, or NH $_{3}$ additions), 506 Effect of temperature on iron oxide purification

(relative) humidity being held constant, 309 Effect of coal gas on the removal of sulfur from Assam coal (Use of SiO₂ and Al_2O_3), 642 Effectiveness of the work of regenerators in plants purifying coal gas by removing H_2O gas by the vacuum-alkeline method (Comparison of effectiveness of soda

and potash solutions), 1001

and potash solutions), 1001

Efficiency of operation of regenerators in works for cleaning hydrogen sulfide from coke gas by the vacuum—aikali process (Na₂CG₃ and K₂CO₃ solutions), 1000

Efficient removal of ammonia and hydrogen sulfide from gases (Washing and then scrubbing using aqueous solution of ammonia; three-stage process), 1460

Elimating hydrogen sulfide from gases (Washing with suspension of a ferrocyanide of Fe in aqueous NH₃ containing NH₄ salt), 484

Elimination of H₂S and other impurities from gases, particularly coal gas (Using a solution of alkali carbonate and bicarbonate), 629

Elimination of sulfur compounds from boiler-furnace gases (Catalyzed oxidation of dissolved gas (in H₂O) using Fe

(Catalyzed oxidation of dissolved gas (in H20) using Fe

and Mn ions), 324
EPA alkali scrubbing test facility: scdium carbonate and limestone test results. Final rept (Initial results of testing prototype wet lime-limestone scrubbing facility for removing SO_2 particulates from flue gas), 2017

(PE--225 041/3)
Ethylene and coal gas from the carbonization of bituminous coals or lignite by injection of liquid and gaseous hydrocarbons into coke ovens, 157
Evaluation of the fluidized bed combustion process.
Volume III. Appendices, see also Volume 2, PB--212 960

(Evaluation of fluidized bed combustion for steam-power generation), 1614 (PE--213 152/2)
Evaluation of the fluidized bed combustion process.

Volume II, technical evaluation, see also Volume 1, PB--211 494 (Removal of SO₂ from flue gases by limestone scrubbing), 1612 (PB--212 960/9)
Experiences with calcined material in the pressure desulfurization of coke-oven gas (Tests made to determine effectiveness of roasting as means of regenerating materials used to remove H2S. from coke-

regenerating materials used to remove H₂S. from coke-oven gas), 1348

Experimental SO₂ removal system and waste disposal pond, Widows Creek Steam Plant, Alabama. Final environmental impact statement. Supersedes report dated 3 Jul 1972, EIS-AL--72-4819-D (Removal of SO₂ and fly ash from flue gases), 1905 (EIS-AL--73-0101)

Experimental investigation of the "Ferrox" process for gas purification, 464

Extraction of sulfur from coke-oven gas and the

gas purification, 464
Extraction of sulfur from coke-oven gas and the manufacture of sulfuric acid (Removal of S by Collin NH₃ process; H₂SO₄ produced by Chemiebau wet contact process from recovered H₂S; equipment), 1076
Extraction of hydrogen sulfide from coke-oven gas by means of sodium carbonate solutions, 576
Extraction of sulfur from the hydrogen sulfide of coke-oven and other gases by means of activated charcoal, 323

323

Facility of scrubbing hydrogen sulfide from coal gas in the gas works at Ceske Budejovice (Tower scrubber

the gas works at Ceske Budejovice (lower scruover filled with Raschig rings), 1425
Ferro-ammonium method for recovery of sulfur from cokeoven gas (Method for desulfurization using NH₃ and Fe(OH)₃), 326
Field washers for removal of hydrogen sulfide by addition of ammonia water (Regulation of temperature and NH₃

concentration), 638

concentration), 638
Formation and present status of the Ruhrgas A.G. of Essen (Desulfurization of gas with bog Fe or Luxmass), 681
Freeing coal gas from hydrogen sulfide (By washing with Na₂CO₃ solution and boiling under vacuum), 281
Gas desulfurization (Review of industrial processes), 465
Gas mixtures such as coal gases for catalytic processes (Removal of organic sulfur compounds from coal gas by treatment wih active carbon at room temperature then strongly alkalinized Fe oxide mass at above 100°), 578
Gas purification (Removal of sulfurous impurities by addition of C₂H_{*} or CH_{*}), 221
Gas purification (Flowing gas treated with sodium thioarsenate solution), 250
Gas-purification process (Removal of H₂S from coke-oven gas), 663

gas), 663

Gas purification (Desulfurization using Ni, Se, Te, or heavy metal oxide catalyst at 300 to 400°C), 261 Gas purification (Regeneration of liquid absorbent by

Gas purification to remove H₂S), 714

Gas purification tower with continuous revivification (For removal of S from coke-oven gas), 829

Gas purification (Use of alkaline solution containing nickel sulfide), 203

Gas purification (Using a liquid absorbent to remove

H₂S), 715
Gas purification (Removal of H₂S from coal gas by washing

with NH, phosphate and NH, thionate), 330

Gas purification (Desulfurization of coal gas by use of tannin-bearing material mixed with Fe oxide), 693

Gas-purifying materials (Dry removal of H₂S from gases; formation of insoluble sulfides by addition of Cu, Hg,

formation of insoluble sulfides by addition of Cu, ng and Pb), 454
Gases from the distillation of coal (Coke-oven gas purified by catalytic treatment, desulfurization by scrubbing, and removal of lighter hydrocarbons; scrubbing with alkaline liquids for desulfurization),

COAL GAS/DESULFURIZATION 1229 Gasification of fuels. Purification of coke oven gas at transmission pressure in the Ruhr region (Gas is passed through tar precipitator and HCN washer at normal pressure and then compressed to 10 atm; $\rm H_2S$ and $\rm NH_3$ are later removed), 4318
Gesellschaft fur Kohlentechnik process for desulfurization of [coke-oven] gas with recovery of ammonia (Ammoniacal suspension of Fe(CH) $_3$ used to remove H $_2$ S as FeS), 503 H $_2$ S removal from gases using reagent containing 2nCC $_3$ and $(NH_{\bullet})_2CO_3$, $(NH_{\bullet})_2SO_{\bullet}$, or $NH_{\bullet}C1$, 297 High-BTU gas from coal, 5313 High efficiency removal of H_2S from fuel gases and process gas streams (Description of Stretford process), 2034 High-pressure dry purification of gas (Removal of H₂S

from coke-oven gas), 775 Hydrated ferric oxide for use in gas purification (Highly reactive Fe(III) oxide for removal of $\rm H_2S$ prepared by precipitating Fe(II) hydroxide from solution of Fe(II)

precipitating re(11) hydroxide from solution of re(11) salt and inert salt and separating, washing, shaping, and drying precipitate), 1343
Hydrogen sulfide removal from coal gas with fluidized iron oxide (Raw gas saturated with H₂O at 50-100° sent to fluidized bed of Fe oxide at 50-70°), 1289
Hydrogen sulfide removal [from coal gas] by the Stretford liquid purification process (H₂S absorbed by alkaline

solutions of anthraquinonedisulfonic acids; dissolved 0 oxidizes H₂S to S; Na vanadate increases capacity of solution for H₂S and rate of production of S), 1258 Hydrogen sulfide removal from coal-distillation gases

drogen sulfide from coke-oven gas (H₂S, HCN, and CO₂ Hydrogen sulfide from coke-oven gas (H2S, HCN, and

drogen suitide from coke-oven gas (H_2 S, HCN, and UU_2 recovered from coke-oven gas by absorption in Na_2CO_3 solution; equipment), 1290 drogenation of solid fuels at Lieven according to the processes of the Societe Nationale de Recherches (At 300 kg pressure and 450°C in liquid phase, then 500 to $\frac{1}{1000}$ Hydrogenation

550°C using catalysts in vapor phase), 5796
Improvement in the arsenate method for purification of coke gas from hydrogen sulfide (Fost important factors:(1) As203:H₂S ratic; when greater than or equal to 15, approx. 90% of H₂S extracted; (2) enrichment in 0 (30-5%) of air or of sclution by addition of 0-containing additives, i.e. quinone (0.01% or less) during regeneration process; (3) continuity of neutralization of regeneration solution), 968

Improvement of the arsenic-soda purification process for removing sulfur (Concentration of $\rm As_2O_3$ of 33.5 g/l

recommended), 1368
Impurity removal of coke plant gas at a low temperature
(Desulfurization by passage over CaO catalyst at high temperature or through tubes containing Pt-alumina and ZnO). 1443

Industrial tests of the met desulfurization of coke oven gas using hydroquinone as an organic oxygen carrier

Inhibiting the formation of sulfur-containing oxy salts in the Takahax process for desulfurization of hydrogen sulfide-containing gas (H sulfide absorbed in alkali solution and oxidized to S over naphthaquinone derivative catalyst in liquid phase), 2076 Intensification of scrubbing hydrogen sulfide from coke

Intensification of scrubbing hydrogen sulfide from coke oven gas in a rapidly revolving absorber (Absorber solution of As₂O₃ at pH 7.9-8.1), 1078
Koppers coke or H₂S extraction from coal gas mixtures (Effects of particle size of coke), 1066
Liquid purification of high-sulfur gas at the Indiana By-Product Gas Company, East Chicago, Indiana (Operating figures using Seaboard process), 311
Liquid purification of coal gas (Review of liquid purification process for removing H₂S), 844
Liquid purification [of coal gas] (Detailed discussion of principles and processes for H₂S removal), 722

principles and processes for H_2S removal), 722 Liquid reagents for the final removal of hydrogen sulfide

from gases (Alkaline 2n slurry reagents are effective for final purification of coal gas or mixed gas), 1059 Manufacture of motor fuels by the Fischer-Tropsch process (Desulfurization; catalysts-description of a plant),

6085

Mathematical description of the monoethanolamine

purification of coke oven gas, 1496 Metallic ions as catalysts for the removal of sulfur dioxide from boiler-furnace gases (Fe³⁺ and Mn ions), 303

Method to purify and to remove sulfur from the raw gases produced from lignite, 730
Methods of hydrogen sulfide removal from coal gas with the aid of ammonia water (Indirect and semi-direct

the aid of ammonia water (indirect and semi-direct processes of ammonia recovery and production of SO_2 from H_2S are described in detail; 47 references), 1089 Methods of hydrogen sulfide removal from coal gas with the aid of ammonia water (Review of earlier methods),

1079

Modern practices in gas purification and hydrocarbon recovery, 917

Modern processes for the desulfurization of gases (Review

of patents), 459
Modern systems for gas purification (Review of processes for H₂S and organic S removal), 757
New processes. 5. Desulfurization of coal gas. Claus-type desulfurization (Japanese petroleum refinery plant),

Nickel and cobalt sub-sulfide catalysts for decomposing organic sulfur compounds in water gas or coal gas, 612 Notes on purification [of coal gas from hydroger

sulfide], 214
Obtaining sulfur from carbonization gases by thioarsenate

solution (Removal of $\rm H_2S$ by Thylox process), 863 Operation of the Thylox process with coal gas containing hydrogen cyanide (Reaction of $\rm H_2S$ with thioarsenates), 911

Operation of the ''Manchester'' liquid purification plant at Linacre, Liverpool (Removal of H2S and HCN by

Manchester process), 836

Operation of the Frodingham desulfurizing plant at Exeter (Removal of 99% of H sulfide and 90% of other organic compounds common to coal gas; sulfuric acid produced), 1405

Organic sulfur and its elimination (Organic S compounds eliminated by physical absorption by solvents, chemical reaction with solutions, adsorption by solids, catalytic hydrogenation or oxidation, or reaction with solid metallic oxide; review of principal methods), 1408

Perox plant for removal of hydrogen sulfide from cokeoven gas (NH_3 and H_2S re aremoved by washing after removal of naphthalene; operating details of plant and

costs are discussed), 951
Pilot-plant studies of the hot-carbonate process for removing carbon dioxide and hydrogen sulfide (Removal

removing carbon dioxide and hydrogen sulfide (Removal of CO₂ and H₂S from gas mixtures necessary in synthesizing liquid fuels from coal), 1280
Pilot scale investigation of a Venturi-type contractor for removal of SO₂ by the limestone wet-scrubbing process. Final report, 1606 (PB-209 023)
Plant experiments on the purification of coke gas from hydrogen sulfide (Using the As-soda method), 949
Plate-nozzle regenerators of a plant for removing hydrogen sulfide from coke oven gas, 1493
Preparation of sulfur from coke gas by a method analogous to the Thylox process on a semifactory scale in Enakievo (Desulfurization of coke gas using As₂C₂ and

Enakievo (Desulfurization of coke gas using As2C3 and

NaOH), 380
Present status of desulfurization of coke-oven gas (Critical review of 10 methods including Petit, Koppers, and Rostin processes), 271

Producing sulfur-free gas from high-sulfur-content coke for use in an energy-generating plant (Co₃O₄ used to remove S from gases by forming Co₃S₄), 5238

Production of gas containing high percentages of hydrogen and carbon monoxide (H sulfide removed by passing gas over FeC or ZnO), 175
Production of ammonium sulfide from the hydrogen sulfide

gas of vacuum-carbonate desulfurization [of coke gas] (Pilot plant constructed to obtain hydrogen sulfide from coke gas and combine it with ammonium hydroxide to form ammonium sulfide), 1365

Purification of coke-oven gases and production of a combustible gas rich in hydrogen and carbon monoxide (Crude coke-oven gas purified and most of ar, aromatics, naphthalene, nitrogen compounds, and S compounds removed using steam and oxide or sulfide

catalyst), 1371 Purification of gases containing H_2S (Treatment of coal gas with dilute solution of NH_e(H), 643 Purification of coke-oven gas under high pressure (5.5 to

8 atm. with a maximum of 14), 495

Purification of gases from hydrogen sulfide by organic absorbents (PhONa solution), 496

Purification of combustible gases from sulfur compounds (Removal of $\rm H_2S$ by As--soda method), 1064 Purification of coal gas with simultaneous regeneration

of the purification mass (Lux or Lauta), 463
Purification of fuel gases (Coal gas containing HCN, H₂S, and NH₃ washed with aqueous suspension containing NH₄ polysulfide and fine S particles), 1820
Purification of high-sulfur gas (Description of Seaboard

process), 310

Purification of coke-oven gas from hydrogen sulfide by a solution of monoethanolamine under pilot-plant conditions (Absorption of $\rm H_2S$ and $\rm CO_2$ by technical monoethanolamine), 1199
Purification of coal gas from hydrogen sulfide (Review of

process development and design and layout of plant for removal of $\rm H_2S$ using $\rm Fe_2O_3$ box purifiers), 240

Purification of compressed coke-oven gas (Oxidizer unit for removal of NO, coolers and bubble cap benzene washers, dry S remover, coolers, naphthalene washers, and low-temperature coolers to keep low point at 50), 1313

Purification of coal gases (H₂S removed from coal gases with NH₃-containing gases using washing tower with deacidifier connected in cycle), 1129 Purification of a coke-oven gas (Purification under

pressure for removal of naphthalene, absorption of benzene hydrocarbons and hydrogen sulfide, removal of H oxides, and drying), 1775

```
Purification of industrial gases (Removal of H2S and CO2
   from coal distillation gas by scrubbing with aqueous
NH<sub>2</sub> solution), 986
Purification of gases such as coke-oven gas (Removal of \rm H_2S by cyclic process), 581
Furification of coke oven and other fuel gases from
```

sulfur, 1200 Purification of gases (Removal of ${\rm H_{2}S}$ from technical

Purification of gases (Removel of H₂S from technical gases, e.g., coke-oven gases), 857
Purification of coal gas, etc. (Desulfurization by means of Fe oxide slurry), 636
Purification of compressed coke-oven gas (Ammonia condensation, S removal, benzene scrubbing, and separation of nephthalene and light hydrocarbons in gas 10 to 12 atm compared with atm-pressure process), 1314

Purification of coking gas from HaS by the ammonia method

(Description of equipment), 1387
Purification of coal gas (Removal of organic sulfur compounds by passing gas over a mixture of an active Fe₂O₃ and a reduced alkali carbonate at 300° or above),

Purification of coke oven gas (Gas containing HCN, NH₃, and H₂S purified by weshing with aqueous S suspension to give NH₅SN, (NH₆)₂S₂O₃, and solid S), 2013
Purification of coke-oven gas for high-pressure underground storage (Aromatic hydrocarbons and

butadiene removed by activated carbon following removal

butadiene removed by activated carbon following removal of H sulfide, HCN, and NO by suitable absorbers), 1406 Purification of gases containing hydrogen cyanide and hydrogen sulfide (HCN and $\rm H_2S$ fixed in water in form of N-containing S compounds and removed by burning with excess air at 1100-1200° to $\rm SO_2$ to be recovered as $\rm H_2SC_a$, sulfate, or sulfite), 2048 Purification of commercial gases at elevated temperatures. II. Simultaneous removal of hydrogen sulfide and organic sulfur (Use of Cu-V-clay and Cu-Cr-clay). 429

sulfide and organic sulfur (Use of Cu-V-clay and Cu-Cr-clay), 429
Purification of lignite coke gas by the Girbotol process without pressure (Absorption of CC₂ and H₂S by NH₂CH₂OH, NH(CH₂CH₂OH)₂, N(CH₂CH₂OH)₃, and an alkaline solution of sulfosolvan B (C₈H₈O₂NK) was studied in especially designed apparatus), 1257
Purification of coke-cven gas by removal of CO₂ and H₂S with ethylamine (Gas treated with Na arsenate solution and bog iron one to remove most of H₂S: cvcle gas then

with ethylamine (Gas treated with Na arsenate solution and bog iron ore to remove most of H₂S; cycle gas then compresses and scrubs in series of towers with H₂G, C₂H₃NH₂, caustic, and H₂G again), 1006
Purification of coal-distillation gases (Multistep compression and coaling operation), 1179
Purifying a fuel gas containing hydrogen cyanide, hydrogen sulfide, and ammonia (Gas scrubbed in aqueous alkali solution containing small particles of S to remove 95% of HCN, 90% of H₂S, and 30% of NH₃), 2056
Purifying coal distillation gases (Washing with solution of complex compound of NH₄ thiosulfate and SU₂, then thionate of metal of Fe group), 286
Purifying gases (Conversion of organic sulfur compounds to H₂S using contact agents containing Au and Ag), 207
Purifying gases (Wash with suspension of Fe(GH)₂ in H₂G), 299

Purifying gases from the combustion of sulfur-containing

fuels (Use of lime in gas-scrubbing zone), 452 Purifying gases such as those from coal distillation (Removal of H₂S by washing with aqueous ammoniacal solution containing iron ferrocyanide in suspension),

Purifying coal or similar gases (), 215 Purifying coke-cven gas from sulfur (Using $Fe_2\Omega_3$, sorption in $Na_2C\Omega_3$, and Thylox process), 569 Purifying gases containing hydrogen sulfide (Treatment with alkaline suspension of iron hydroxide and nickel carbonate), 249

Purifying gases containing carbon monoxide and hydrogen (Removal of organic S compounds using $\mathrm{Fe_2O_3}$ or $\mathrm{Fe(OH)_3}$ catalyst at 150 to 300°C), 488 Reactions involved and the reaction velocities for the

Reactions involved and the reaction velocities for the regeneration of the scrubbing solutions in the metal thionate processes for purifying coal gas from ammonia and hydrogen sulfide. Manganese sulfate process, 860 Recent imprevements at the Cornillon [Paris] coke plant in the domains of gas scrubbing and the recovery of hydrogen sulfide (Scrubbing with NH₃ liquor), 918 Recent wet processes for removing sulfur from coke—oven gas (Oxidation of H₂S to S; Fe+++ or MnSU₄ as catalysts), 602

gas (Oxidation of H₂S to S; Fe*+* or MnSO, as catalysts), 602

Recovery of by-product nitrogen and sulfur in the cokeoven and gas industries (Review of Koppers, Seaboard, Ferrox, Thylox, and Nickel, Kohlentechnik, Bahr, and Petit processes), 235

Recovery of sulfur from coal-distillation gases (Scrubbing with NH, OH at pH 8 in presence of air to oxidize H₂S to S), 1183

Recovery of, sulfur from coal gas by the vacuum carbonate process of liquid purification (Removal and utilization of H₂S), 834

of H.S), 834

Recovery of pure sulfur from coal gas (Fluidization process for recovering pure sulfur from spent oxide), 779

Recovery of sulfur from synthesis gas (Cost estimates), 755

Recovery of sulfur from coke oven gas (Ammonia interfered in H sulfide recovery and in debenzenization process; optimal S recovery obtained when pH was kept at 7.8-8.2 and when HCN elimination was reduced), 1386
Recovery of sulfur from coke oven gas. Critical review of

methods (Dry and wet processes of S recovery from coke-oven gas with schematic flow diagrams), 1424 Recovery of sulfur from hydrogen sulfide-containing gases

(Recovery from coal gas, oil gas, or producer gas in 3-step process; dilute Na_2CG_3 used as absorbent for H_2S ; H_2S stripped from absorbent by Seaboard process; gas

H₂S stripped from absorbent by Seaboard process; gas then scrubbed with solution of picric acid and Na₂CU₃ to oxidized H₂S to S), 1263
Recovery of sulfur from coking gas (Description of the Bahr, Petit, Seaboard, Girdler-Girbotol, Ferrox, and Thylox processes), 671
Rectisol processes), 671
Rectisol processes (Purification of crude gas produced by coal gasification), 1965
Reduction of hydrogen sulfide content in generator gas by adding lime to coal (Addition of up to 2% CaO to gasified fuel containing more than 1.5% S), 1196
Reduction of organic sulfur compounds by oil washing (Removal of CS₂ from coal gas by oil washing), 551
Regenerating alkaline solutions used for desulfurization of coke oven gas (H₂S is absorbed by alkaline solution of coke oven gas (H_2S is absorbed by alkaline solution containing catalyst), 2057 Regeneration of alkali metal carbonate solutions used to

remove hydrogen sulfide from coal-distillation gases (Solutions treated with air in 2 steps; first with air at 5 atm to exidize H₂S almost to S, and then with air and solution countercurrently to remove up to 99.82% original H₂S), 1162
Regeneration of desulfurizing solutions for gases (NaOH or NaCOL) 928

or Na₂CO₃), 928

Regenerator process for the separation of coke-oven gas

Regenerator process for the separation of coke-oven gas (Coke-oven gas after removal of tar and ammonia, is cooled to eliminate impurities such as benzene, S compounds, carbon dioxide, water, nd methane), 1351 Removal and recovery of sulfur from gases (Nonoxidizing gases freed of S by treatment with V derivatives such as acids, oxides, previously oxidized sulfides, and vanadates of Cu, Ni, or Cr; best results from V₂C₅ with NiO, CuO, and Cr₂O₃; regeneration of reagents), 4246 Removal and recovery of hydrogen sulfide from coal gas (Scrubbing and distillation process using NH₃-fortified ammoniacal liquor), 444 Removal of hydrogen sulfide from gas by the arsenic--soda method (Difficulty in use of As-soda method on gas from

method (Difficulty in use of As-sode method on ges from underground gesification because of high ${\rm CO}_2$ and ${\rm H}_2{\rm S}$

contents), 1075 contents), 10/3
Removal of organic sulfur from coke oven gas. I. Furpose of the experiments, procedure (One-stage process involves converting S compounds catalytically and binding converted S for removal; 2-stage process converts S compounds, by hydrogenation to H₂S to first stage and absorbs H₂S for removal in second stage), 1572

Removal of H2S using alkaline absorbent liquid such as Na2CO3 solution containing catalyst such as Co, Ni, or

Fe compound, 209 Removal of hydrogen sulfide from coal gas by means of

iron oxide, 697
Removal of hydrogen sulfide from coal gas by the Ferrox process (Using an Fe(OH)₃ suspension), 869
Removal of hydrocyanic acid, ammonia, and hydrogen sulfide from coke-oven gas (Scrubbing with ammoniacal S

suspension containing polysulfides to remove HCN; treatment with NH₃ solution to remove H₂S), 887 Removal of hydrogen sulfide from coke-oven gas, generator gas, pressure gaswork gas, expansion gas, and air (Fe (III) complex of tris (carboxymethyl) amine reacts with H sulfide; H sulfide converted to nonvolatile S

H sulfide; H sulfide converted to nonvolatile S compound), 1392
Removal of hydrogen sulfide from industrial gases, especially coal-distillation gases (Dry process for removal of H₂S from industrial gases by tower purifying plants arranged in series), 1171
Removal of H₂S from coke-oven gas by a pressure-

Removal of H₂S from coke-oven gas by a pressure-recirculating method, 934 Removal of hydrogen sulfide from coke-oven gas by the Stretford process (Solutions of Na anthraquinonedisulfonate absorbed H₂S and convert it to S; vanadate improves rate of exidation to S), 1312 Removal of hydrogen sulfide and other acid impurities from gases (Use of aqueous solution of alkali metal

carbonate and bicarbonate containing substituted

unsubstituted hydroxy- or polyhydroxybenzenes), 1206 Removal of sulfur compounds from gases (By passage Removal of sulfur compounds from gases (By passage through a catalyst tower containing kieselguhr V₂C₅, K₂C₁, and P), 983

Removal of hydrogen sulfide in low concentrations from gases (Gas washed with aqueous suspension of Zn(CH)₂ or

basic Zn carbonated in presence of alkali or alkali metal carbonate; H₂S is converted to ZnS), 1268 Removal of sulfur and nitrogen from coal-tar and coal-gas

hydrocarbon fractions (Compounds of S and N from aromatic hydrocarbon fractions produced in destructive distillation of coal removed by hydrogenation; S and N

carbonate process, 1563

S compounds), 1391

1047

converted to $\rm H_2S$ and $\rm NH_3$, resp.), 1269 Removal of sulfur from gases (Use of cxidized and sulfurated Ni catalysts for hydrogenation of organic S compounds with formation of $\rm H_2S$), 1224 Removal of hydrogen sulfide from coke-oven gas by the

Removal of organic sulfur from coke oven gas. II. Test results with single step processes (Results of experiments with 1-stage process; CaC, Zn, and Fe tried as catalysts and final binding materials), 1574 Removal of hydrogen sulfide and ammonia from coke oven

gas (H₂S and NH₃ removed by scrubbing gas with solvent containing As compound catalyst), 1776 Removal of hydrogen sulfide from coke-oven gas, generator

gas, cil refining gas, expansion gas, and air (Solutions of Fe (III) complexes of aminocarboxylic acids absorb H sulfide which is oxidized to nonvolatile

Removal of inorganic sulfur compounds from industrial gases (Gas passed over catalyst of Fe $_2$ C $_3$ and CaSO $_4$),

solution containing As and hydroquinone or naphthoquinone), 2028 Removal of sulfur from gases (Removal of $\rm H_2S$ by

Removal of hydrocyanic acid and organic sulfur compounds from coke-oven gas (Gas purified by scrubbing with

```
ammoniacal liquor in a deacidifying pressure
       apparatus), 1108
  Removal of sulfur-containing organic compounds from coke
       oven gas (Coke-oven gas washed with higher-boiling fraction of crude benzene), 1412
  Removal of organic sulfur from coke oven gas. I. Purpose
       of the experiments. Procedure (Organic S compounds converted to H sulfide that is then absorbed), 1561
 Removal of H<sub>2</sub>S from coal gas by alkaline washing using solutions containing S-As-O compounds and a small
 amount of Mn or Cu compounds as catalysts, 425
Removal of hydrogen sulfide from coke-oven gas and
       generator gas (Tris (carboxymethyl) amine and
generator gas (Tris (carboxymethyl) amine and
substituted aminocarboxylic acids give mixed Fe (III)
complex showing high purification effect in wide pH
range), 1393
                        of organic sulfur compounds from coal-
  distillation gases, 1286
Removal of sulfuretted hydrogen from coal gas (Review of
processes with 32 references), 802
 Removal of organic sulfur from coal gas (Coal gas containing 15-20% CO; S compounds onverted to H<sub>2</sub>S over Nimox (Ni-+Mc) enversion catalyst; H<sub>2</sub>S removed by
  Luxmasse (a prepared Fe oxide)), 1569
Removal of organic S compounds from gases (Removal of CS<sub>2</sub>
 Removal of organic S compounds from gases (Removal of C: and COS by washing with water under pressure), 637
Removal of sulfur compounds from coke gas with sludge from production of potassium permanganate (Removal of COS, CS<sub>2</sub>, RSH, C<sub>4</sub>H<sub>4</sub>S, and its homologs by means of sludge obtained by ancdic dissolution of carbonaceous ferromanganese in KOH), 1279
Removal of hydrogen sulfide from coal gas, particularly by liquid purification (Review), 377
Removal of hydrogen sulfide from coke-oven gas with potash solutions in scrubbers with forced-jet atomics.
       potash solutions in scrubbers with forced-jet atomizing
 potash solutions in scrubbers with forced-jet atomizing plates (Use of KOH solutions to remove H<sub>2</sub>S; spray-jet plates more effective than packed columns), 1243
Removal of hydrogen sulfide from coke oven gas and recovery of alkali, 1831
Removal of organic sulfur-containing compounds from the ethylene fraction of coke-oven gas with the aid of poly(alkylbenzenes) (Removal of thiophene and carbon dismifide), 1344
       disulfide), 1344
  Removal of organically bound sulfur from crude coke oven
       gas (Light oil obtained during coking used to remove S
 by washing), 1438
Removal of hydrogen sulfide from coal gas (Using iron ore, dust-catcher dust from the blast furnace, and Oliver filter sludge from the blast furnace), 977
Removal of hydrogen sulfide in coal gas by lime
 suspension in highly efficient sieve-plate tower, 1154
Removal of hydrogen sulfide from gas mixtures
(Desulfurization of coke-oven gas with triethanolamine solution containing As<sub>2</sub>S<sub>3</sub>), 945
Removal of organic sulfur from gas (Using oxides or sulfides of Cr, Cu, Mo, or Ni as catalysts), 716
Removal of organic sulfur from coke oven gas. III. Test results with two step processes (Freerigents with
       results with two step processes (Experiments with
       different hydrogenation catalysts (Pt--Al<sub>2</sub>O<sub>3</sub>, Co--Mo, Ni--Mo, Ni), 1575
 Removal of hydrogen sulfide from distillation gases
 (Washing with acid-free NH<sub>3</sub> water), 646
Removal of organic sulfur compounds from hydrocarbon
 Removal of organic sulfur compounds from hydrocarbon gases (By passage through SiO<sub>2</sub> gel), 991
Removal of acidic constituents from gases (Removal of HCN, H<sub>2</sub>S, and NO from coke-oven gas using hydrated FeO), 932
Removal of organic sulfur from coke oven gas. III. Test
results with two-step processes (S compounds hydrogenated over Pt/Al oxide and H sulfide absorbed by Zn- or Fe-based material), 1566
Removal of sulfur from coal gases (Use of iron hydroxide
```

```
or activated carbon sorbent), 732
Removal of hydrogen sulfide from gas mixtures (Coke-oven gas (6.8g H<sub>2</sub>S/m<sup>3</sup>) washed with solution of alkaline salts equivalent to 12 kg Na<sub>3</sub>PO<sub>8</sub>/m<sup>3</sup>; 56 kg Na<sub>2</sub>HPO<sub>8</sub>, and 50 kg As<sub>2</sub>O<sub>3</sub>; purification is complete; precipitated
50 kg As<sub>2</sub>U<sub>3</sub>; purification is complete; precipitated As<sub>2</sub>S<sub>3</sub> roasted to produce SU<sub>2</sub> and recover As<sub>2</sub>U<sub>3</sub>), 1034 Removal of the hydrogen sulfide content from soft coal distillation gas by absorption in sodium biphenolate solution (Gas contained approximately 25% CC<sub>2</sub>, 14% H<sub>2</sub>S, and 1.52 g organic S/m³, continuous method for lowering H<sub>2</sub>S content; gas washed with NaCH and then pyrocatechol), 1204
 Removal of organic sulfur from gas by catalytic cracking
     (Addition of molybdic acid on clay and use of Fe cxide carrier results in 75% removal of S), 1275
 Removal of hydrogen sulfide from gases (Absorption-
      description process), 1267
Removal of sulfur from coal gas by the Thylox process
(Economics of desulfurization by Thylox process), 357
Removal of sulfur from coal gas (Review), 400
Removal of hydrogen sulfide from coke-oven gas (Hydrogen
sulfide removed by soda scrubbing), 1352
Removal of organic sulfur from coke oven gas. II. Test
      results with single-step processes (Use of Ca
carbonate, Ba carbonate, 2n0, or Fe oxide as
      absorbent), 1562
Removal of organic sulfur compounds from gases by conversion into hydrogen sulfide (In presence of Ni
      catalyst), 1031
catalyst), 1031
Removal of hydrogen sulfide from gases (By oxidation to S by scrubbing with Fe(OAc)<sub>2</sub> solution and oxygen), 1032
Removal of hydrogen sulfide from coke-oven gas in unpacked towers equipped with a centrifugal atomizer (Highly effective method), 1327
Removal of ammonia and hydrogen sulfide from coke oven
     gas (Two-step washing process; catalytic oxidation gives sulfuric acid), 1528
Removal of sulfur compounds from coke-oven gas by
      absorption in an infiltrative manganese ore (Absorption
      at 800-50°), 1686
Removal of hydrogen sulfide and carbon dioxide from gases (Gases, such as those from carbonization of coal, freed from H<sub>2</sub>S and CO<sub>2</sub> scrubbing with alkaline liquid containing D carrier), 1174
Removal of hydrogen sulfide from illuminating gas (Use of
pellets of hydrated Mn oxides), 706
Removal of hydrogen sulfide from gases, especially from coal-distillation gases (Preliminary washing with dilute NH,OH; Fe(OH)3 used to convert H,S into FeS),
Removal of H_2S from coal gas by washing with Fe
polythionate solutions containing H<sub>2</sub>SC., 229 Removal of hydrogen sulfide from coke-oven gas by the phenolate method, 574
 Removal of hydrocyanic acid, hydrogen sulfide, and
nemoval of hydrocyanic acid, hydrogen sulfide, and ammonia from coal-distillation gases, 1104
Removing and recovering sulfur dioxide from gases such as boiler furnace or smelter gases, 594
Removing ammonia and hydrogen sulfide from gases such as
cold coke-oven gas (Scrubbing with H<sub>2</sub>SO<sub>a</sub> and aqueous solution of monoethanolamine), 443
Removing cyanides from coal gas by scrubbing and thermal decomposition (Gas scrubbed with ammoniacal alkaline
       solution containing suspended S to capture cyanides as
      NH,SCN), 2061
 Removing hydrogen sulfide from gases (Washing with
soluton of polythionate, bisulfite, or bisulfite—
sulfite mixture of NH,, alkali metal, Zn, or Mg), 208
Removing hydrogen sulfide from gases, 628
Removing hydrogen sulfide from gas (Treatment with
solution of alkali metal compound and metal of Sn group
such as Na<sub>2</sub>CO<sub>3</sub> and Na arsenite), 276
Removing hydrogen sulfide from coal gas or water gas (Use
of iron oxide), 289
Removing hydrogen sulfide from gases, etc. (Treatment with nitrosylsulfuric acid), 291
Removing H_2S and other impurities from coal-distillation gases, etc. (Using a solution of K_2CO_3--KHCO_2), 645 Removing hydrogen sulfide from coke-oven gas (Use of K
      and Na double salt carbonate solutions as absorbers),
Removing hydrogen sulfide from gases, especially coal gas (Washing of coal gas with elkaline solution), 1264
Removing hydrogen sulfide and other impurities from coal-
distillation gases (Multi-stage cleaning and
compression process), 587
Removing hydrogen sulfide, etc., from gaseous mixtures (Scrubbing with concentrated aqueous solution of alkali metal sait of phenol), 384

Removing hydrogen sulfide from coal gas (Using an alkali
carbonate solution), 368
Removing hydrogen sulfide from gases (Washing with
polythionate solution containing fron), 204
Removing H<sub>2</sub>S and other acid impurities from cost-
distillation gases (Washing of gases with alkali
phenolates), 615
Removing hydrogen sulfide from fuel gases (Treatment with
solution of NH<sub>6</sub>HSO<sub>6</sub> in H<sub>2</sub>SO<sub>6</sub> bath), 396
Removing hydrogen sulfide from gases (Use of colloidal suspension in nonaqueous liquid of sait of higher
     organic acid or metallic coordination compound; e.g.,
```

compounds of Zn. Cu. Fe, Cc. Ni), 457
Removing hydrogen sulfide from gas (Stage washing using

strong NH₃ solution), 257 Removing organic sulfur compounds from gases (Use of Cr, CrO, and CrS as catalyst), 653

Removing organic sulfur compounds from ocal gas or similar gas (By passing gas over a metallic thiomolybdate catalyst at temperatures of 300 to 600°, the HaS formed being absorbed by hydrated Fe oxide), 52€

Removing organically bound sulfur from water gas (Gas mixed with exidents before passing through activated C; other variations), 604

Removing sulfur compounds from gases such as coal, water, or producer gases (Oxidation of sulfur compounds in presence of catalyst such as Fe--P--Si), 298 Femoving sulfur compounds from gases (Oxidation $\rm H_2S$ to $\rm SO_2$ and weshing with thiosulfates), 246 Removing sulfurous impurities from combustible gases such

as coal gas (Removal of organic sulfur compounds from $\rm H_2S$ -free gases by contact with a catalyst of the subsulfide of Ni or Co at temperatures between 200° and 3500), 557

Removing sulfur compounds from gases such as coal gas,

air, or hydrogen (Treatment with piperidine), 294
Removing sulfur compounds from coel ges, etc. (Removal of H₂S from distillation gases by washing with alkaline

solutions of compounds of As, elkali, S, or 0), 483
Report of Organic Sulfur Committee (Use of piperidine and morpholine for removal of organic sulfur compounds from gases), 690

pases), 690
Postin processes for desulfurizing gas and for refining coal gas and benzene (Removal of H₂S by bubbling through NH₂OH which is circulated over CuO), 411
Scrubbing of coal-distillation gas (Removal of naphthalene, H₂S, H₂O, and benzene from coal

distillation gas as high pressure), 990 Scrubbing of hydrogen sulfide from coke-oven gas (Using NH, liquor at 5 etmospheres pressure at temperatures as iow as 50), 1216 Selective absorption of hydrogen sulfide from synthesis

gas (Effectiveness of K_3FG_w and glycine solutions), 843 Selective absorption of hydrogen sulfide (From coke-oven ges using carbonates and sulfides of alkali metals), 635

Selexol process (Gas purification and removal of ${\bf H}$ Selexol process (Gas purification and removal of H sulfide, C dioxide, CCS, mercaptans, etc., from gas streams by physical absorption), 1964
Separation of sulfur and asmonia from hot gases (Cokecven gas; gas cooled and washed with ammoniacal

solution to absorb H₂S and HCN; gas scrubbed to remove

Separation of carbon diaxide, hydrogen sulfide, and organic sulfur compounds from coke-oven gases, 1036 Separation and recovery of hydrogen sulfide from gases (H₂S recovered from coal-carbonization gases by

continuous absorption-descrption process), 1288 Separation of hydrogen cyanide and sulfide and nitrogen oxides from coal distillation gases (Gases are free from tar), 995 Separation of tar, naphthalene, ammonia, hydrogen

sulfide, hydrogen cyanide, and pyridine from coke-oven gas (Gas scrubbed with ammoniacel liquor), 1175

Separation of sulfur from Lurgi generator gas (Removal of

Separation of sulfur from Lurgi generator gas (Removal of H₂S by adsorption on active coal), 975
SO₂ free two-stage coal combustion process (Coal is dissolved by injection into molten Fe and simultaneously dissolved coal C is oxidized with injected air to CO; coal S is not oxidized but is transferred from Fe to slag consisting of coal ash and added limestone; process economics), 1750 (PB-211888)
Sode-potash method for absorbing hydrogen sulfide from coke-goven gas. 1276

coke-oven gas, 1278
Sodium thiosulfate recovery from coke-oven gas (During removal of H₂S by the Thylox process), 1121
Solid chemical absorbents for gases. Part A: removal of hydrogen sulphide from coal gas. (Chap. 8) (Catalytic removal of organic sulfur compounds from fuel gas), 1648 1648

Some experiences in the purification of coke-oven gas

(H₂S removal in oxide boxes), 403

Start and operation of a sulfur-containing gaspurification department by using the arsenic-soda
method (H₂S is absorbed by Na₂As₃S₃O₂, which can be
regenerated; schematic diagrams), 963

Steam-cxygen gasification of various U.S. coals (Process for making supplemental natural gas from coal; removal of S compounds from product), 5270
Studies of the fluidized lime-bed coal combustion

desulfurization system. Part 1. Design of the high pressure fluidized bed combustion lime regeneration pilot unit - The FBCR Miniplant. Fart 2. Factors affecting nox formation and control in fluidized bed combustion. Final report 1 Jan-31 Dec 1971, 1617 (PE-

combustion. Final report 1 Sec. 220 246)
Study of characterization and control of air pollutants from a fluidized-bad combustion unit. Carbon-burnup cell (Resoval of SO₂ from flue gas by injection of limestone into combustion chamber), 1699 (PB-210 828)
Sulfur dioxide control. Selected bibliography. Rept. for 1964-Oct 1973, Supersedes NTIS-PK--109 (Contains 150

selected abstracts; experimental combustors; coal desulfurization), 2068 (CGM--73-11804/4) Sulfur dioxide (Removal from effluent gases and recovery

of useful products), 635 Sulfur from coke-oven gas (Review), 474

Sulfur losses in sulfur-removing apparatus (S balances for vacuum-carbonate and As-soda methods), 1565 Sulfur oxides pollution control. Federal research and

development planning and programming, 1968-1972 (Coal desulfurization and removal of sulfur oxides from flue gas), 1434 (PB-180769)

Sulfur recovery from hydrogen sulfide of coke-oven gas and other gases by means of activated carbon (Using activated carbon as a catalyst only), 327

Sulfur recovery from the gas from coal distillation, 274 Sulfur removal from coke-oven gas by the Thylox process (Review), 1315

(Heview), 1515 Sulfur removal (Use of iron oxide mass to remove organic S compounds from gases), 921 Sulfur removal from gases (Grganic S compounds converted to $\rm H_2S$ by Ni catalyst; S removed by passage over limestone purifier or Ca(GH)₂ catalyst to remove S), 1228

Sulfuric acid from coke-oven gas (Description of the hotactivation S-recovery process, a modification of the Seaboard process, for removal of ${\rm H}_2{\rm S}$ and production of

H₂SO₄), 667
Synthetic crude oil from coal (Carbonization of coal and hydrotreating of coal tar products), 6919
Synthetic gas (Processes or converting coal to synthetic

gas), 5122

gas), 5122
Technological problems in the production of sulfuric acid from hydrogen sulfide by catalytic wet method in the Zdzieszowice coking plant (Conversion of H sulfide to sulfuric acid was 97%), 1501
Technological improvement of the process for removal of hydrogen sulfide from coke oven gas, 1505
Ten years of experience at the pressure-gasification plant at Most (Czechoslowkia) (Gasification ratio of

plant at Most (Czechoslovakia) (Gasification ratio of

steam to oxygen), 4188
Total sulfur below 10 grains/100 cu. ft., 542
Treatment of gases with solids and especially a continuous purification of coal gas and continuous revivification of spent oxide (Use of Fe oxide to remove H₂S), 644

Treatment of gases containing hydrogen cyanide and hydrogen sulfide (HCN and H₂S removed with alkaline

solution), 2027
Treatment of sulfur-containing gases such as water gas
(Mixture with water vapor at 400 to 500°C passed over a

mixture of ferric and Zn oxides), 580

Treatment of gases produced by the carbonization of coal (Removal of organic S by hydrogenation using sulfide of Mo or Ni and subsequent removal of H₂S), 654

Treatment of coal-distillation gases (A method for

removing NH3, $\rm H_2S$, and HCN in which the products of each step are recycled for use in preceeding steps of

the cycle), 556
Treatment of sulfur compound-containing waste gases from the Claus process in coke oven plants (Waste gas from Claus process in coke over plants (waste gas from Claus process, by which H₂S from coke-oven gas is converted to S, mixed with crude coke-oven gas before tar separator to remove S compounds), 2015
Two-stage 'Thylox'' process for hydrogen sulfide

removal, 435
Two-stage removal of hydrogen sulfide from coke oven gas

by arsenious oxide-soda ash method, 955
Use of sulfur-rich lignite (Removal of sulfur compounds
from coal, lignite, coal gas, flue gas, and coke-oven gas), 976

Washing of hydrogen sulfide from coke oven gas (Washing

with ammonia-containing water), 1521
Washing of hydrogen sulfide from coal-distillation gases
with ammoniacal solutions (Washing with NH₃ solution), 935

Washing out hydrogen sulfide from coke-oven gas (H sulfide washed from coke-oven gas with Na carbonate-

containing solution of Na arsenate), 1413 Wet process of sulfur removal at the Hamburg gas works (Using potassium ferricyanide and potassium carbonate), 314

Wet processes for sulfur removal from coal gas (Review of 4 oxidation processes, 5 neutralization processes, and 1 physical process for removal of H₂S), 973
Wet purification for the removal of sulfur from gas (Oxidation of absorbed H₂S to S by alkaline solution of KER(N)), 320

(Uxidation of absorbed H₂S to S by alkaline solution K₃Fe(CN)₆), 320
Wet purification of gas (Desulfurization of coal gas by washing with alkaline solution), 890
Work of the Gas Research Board. Report of the Director

(Review of complete gasification; synthesis of CH, using Ni catalyst; removal of organic sulfur from coal gas), 3400 gas), 3400 COAL GAS/DRYING

Purification of a coke-oven gas (Purification under pressure for removal of naphthalene, absorption of benzene hydrocarbons and hydrogen sulfide, removal of H oxides, and drying), 1775

```
COAL GAS/ENRICHMENT
COAL GAS/ENRICHMENT
     Coal gasification and enrichment of coal gas, 4051
    through porous walls, 20
COAL GAS/HUMIDITY
    Relation of calorific value and of composition of gas
from the underground gasification of coal to humidity
of the gas, 4832
COAL GAS/HYDROGENATION
    Catalytic hydrogenation of carbonized coal gases
(Particulate coal mixed with H preheated to 400° at 400
   psi and passed to carbonization zone to be heated 500-5500; catalyst containing Ni 0.5, Co 1.0, and Mo 8.3 parts by weight on aluminium oxide), 3016
Continuous distillation of condensable volatiles (Lowtemperature carbonization, hydrogenation of volatiles, and gasification of char; equipment), 161
Hydrogenation of coke-oven gas (Thermal hydrogenation on catalysts at atmospheric pressure; unsaturated hydrogarbons removed by Al-Co-Mo or Ni-Cr
         hydrocarbons removed by Al--Co--Mo or Ni--Cr
         hydrogenation catalysts separately or together to
    5500), 3020
Thermal treatment of carbonaceous materials (Using
        phosphates or sulfates of Mn, Fe, Cu, or Zn and one or
more of the metals Mo, Sn, W, Re, U, V, Cr, Ni, or Co
or compounds thereof), 2591
COAL GAS/METHANATION
    Enriched coke-cven gas suitable as a natural gas
        substitute (Coke-over gas methanated with suitable catalysts at 180-500°; H removed, and residual gas enriched with liquid gas to calorific value of natural
        gas), 5062
    gas), cools
cas interchangeable with natural gas (Gas with high
calorific value (8600 Kcal/cu m) and exchangeable with
natural gas obtained by methanation of coke oven gas at
180-2500 and addition of liquefied gas), 5061
    Methanation of coal gas for SNG (Coal gas produced by Lurgi gasification process), 5620
Natural gas substitute from coke-oven gas (Three-stage
        methanation process using Ni catalyst to increase
calcrific value of coke-oven gas to near that of
   natural gas), 5064
Process to make high-BTU gas from coal (Fluidized-bed gasification of coal), 5161
AL GAS/PRODUCTION
    Acrodynamic gasification of a coal bed, 5014
Aerodynamic gasification of a coal bed, 5014
Analysis of separate stages of underground gasification
        of brown coal (Effects of seam thickness, quantity and degree of preheating of air blown into gasification zone on heat of combustion of gas produced were
        evaluated), 5194
    Approaches to new coal chemical industry (Treatments of powdered coal), 4191
    Autogenous carbonization for the continuous production of
   coke and gas (Description of equipment), 4870

British trials in underground gasification (If coal is heated in absence of air, volatiles representing 15-40% of bituminous coals are driven off as coal gas), 4288

Carbonization of coal and simultaneous production of
        combustible gas (Description of electric-resistance
   type furnace described), 132
Chemical conversion of the gas formed in the underground gasification of coal (Review of uses of gas from underground gasification), 4944
   Chemical products of the commercial carbonization of gas coal, 173
Clean fuels from coal, 5324 (PB-224530-6-GA)
    Coal carbonization and gasification (Production of coal
   gas and water gas), 135
Coal gasification process and apparatus (Calorific value of gas produced is ca. 60% of that of criginal coal), 5455
   Coal gasification. Two-stage coal combustion process (Two-stage coal combustion process consists of dissolving coal in molten Fe where coal-fixed C and S
   are required, and coal volatiles cracked emitted as CO and H), 5335

Coal gasification. COED process plus char gasification
  (Plant utilizes COED coal pyrolysis process along with molten salt process to gasify COED char), 5330 COED research aims at oil, gas and char from coal (Yield from one ton Illinois No. 6 coal is 610 kg char, 210 liters crude oil, and 136 cu m gas, or, alternatively, 560 kg char, 260 liters oil, and 280 cu m hydrogen), 6845
        6845
   Combustion of coal in subterranean deposits (Injection
       pressure of combustion-supporting gas, usually air
       controls amount of flammable gas and coal tar liquids),
  Combustion of coal by gasification, 4910
Composition of gases of thermal decomposition of coal dust from Karaganda Basin coal beds (Heating coal dust to 700° leads to rapid evolution of volatile compounds; combustible gas constitutes more than 94% of total
```

volume of sample, portion of methane and H exceeds 80%), 7174

carbonization of coal (Description of equipment), 154

Continuous process for low-temperature fluidized

```
Dedication of the Dorsten pressure gasification plant for bituminous coal (Lurgi gas producer modified so coals
        of Ruhr region could be gasified with D and steam at
   20-30 atm), 4301
Determination of chemical efficiency of underground gas
  Determination of chemical efficiency of underground gas generators (Equation for chemical efficiency of underground gasification of coal), 4562

Development of a method for the study of the thermal decomposition of coals during rapid heating (Rapid heating of coals using high-frequency electromagnetic field; apparatus was thick-walled quartz tube charged with crushed coal mixed with small steel spheres), 7122

Ethylene and coal gas from the carbonization of bituminous coals or lignit by intection of highly and
  bituminous coals or lignite by injection of liquid and
gaseous hydrocarbons into coke ovens, 157
Extraction (peptization) of Polish hard coal (Solvents
       used were tetralin, anthracene oil, and heavy oil obtained from the extract; coal was fed into reactor as paste at 100 atm and 450°C; yields of extract and gas
  were 61.2% and 9.6%, resp.), 7334

flow-type coal gasifier (Improved cylindrical generator; steam fed at 600°F; air preheated to 800°F; operating pressure of 400 p.s.i.g.), 4824

Gas from coal. Fuel of the future (Survey with 6
       references; oal gasification seen as primary substitute
       for natural gas; discussion of chemistry and types of processes under serious consideration; suggestion of
       CH, as automotive fuel), 5197
  Gas from coals of Sao Jeronimo (NONE), 4738
  Gas-producer plants (Gas-producer theory is reviewed and
  practical operation of producers discussed), 3415
Gas yield during cabonization of Tisco coals (Gas
       produced decreases with increasing particle size of
       coal charge; moisture content of coal does not affect
 gas yielld), 4981
Gasification of fuels. Manufacture of gas from Styrian brown coal (Equipment), 4323
Gasification of earthy brown coal under pressure in a
 paid to plant, 4630

Gasification of pulverized coal (Final product contains CO<sub>2</sub> 22.0, CO 29.5, H 38.0, and CH, 0.5%), 4175

Gasification of Dimitrovo coal in generators for mixed gas (Efficiency of gasification (as regards coal gas) is about 69%), 4459
  Gasification of caking coal in a free-fall, fluid-bed
       reactor (Gas produced to methanator for production of
       high Btu gas), 5033
 High-speed pyrolysis of brown coal in a stream [of steam], 7164
  Hydrogenation of coal to give methane-containing gases.
       5126
  Intensifying the gasification process under pressure
      (Possibility of increasing gas production to 3000 m<sup>3</sup>/m<sup>2</sup>/hr at 20-25 atm is cutlined; coals with high ash content less suitable for gas production), 4739
  Liquefaction and gasification of coal (Review with
  references to patents), 7020
Liquid-phase coal hydrogenation in an experimental flow
       plant (Hydrogenation at 6 atm: plant capacity of
plant (Hydrogenetion at 6 atm: plant capacity of 50kg/day), 2939
Low-temperature thermal treatment in fluidized beds of typical coals of western Siberia (Preparation and thermal treatment of typical coals; partial decomposition in fluidized bed at 200-600° in stream of inert gas (N or CO<sub>2</sub>) to drive off most of 0 compounds as CO<sub>2</sub> and H<sub>2</sub>O; purpose was to develop methods for preparing low-rank coals for use in making liquid chemicals and gases of high calorific value), 4768
Manufacture of coal gas. 4229
 Chemicals and gases of high calorific value), 4768
Manufacture of coal gas, 4229
Naphtha and gas from coal, 4892
New developments in anthracite gasification (Gas
concentration ranges of CC<sub>2</sub> 24-7, CC 24-7, and H 40-1;
tests using Pennsylvania anthracite in Lurgi
generators), 4635
 Oxygen gasification of coal. Some unsolved processing
 problems, 4286
Preparation of an energy-producing gas from sulfur coals
Preparation of an energy-producing gas from sulfur coals of the western Donets Basin by their pressurized fluidized-bed gasification (Gasification at 900-10000 and 10 atm yielding gas of 1100-1220 Kcal/m³), 5193

Pressure gasification of solid fuels with steam and oxygen (Testing of Russian coals of low calorific value and peat; use of air, air + steam, and D), 4558

Process to make high-BTU gas from coal (Fluidized-bed gasification of coal), 5161

Processes for the gasification of solid fuels (Review of 180 processes), 4118

Production of generator gas from brown coal and lignite
Production of generator gas from brown coal and lignite (Effects of moisture and ash content), 3849
oxygen enrichment (Addition of 3.5% O to air and steam resulted in 150 kcal/m³ increase in heat content of gas
produced), 4802
Production of illuminating gas from Gusinoozerskii coals,
     4971
Pyrolysis of heavy tars from the semicoking of Cheremkhovskii coals (Pyrolysis at 650-1000s;
```

proportion of unsaturated compounds in gas decreased with increasing temperature from 40% at 650-700° to 5% at 1000°), 7124
Rapid City - step three for coal gas (Pilot plant for

```
testing Carbon Dioxide Acceptor Process), 5319
Regenerative method of underground dasification process
  of coal (Heating value of 900-1000 Kcal/m³ increased to 1300-1400 Kcal/m³ by increasing \Box content to 23%; with \Box and steam it was 2500 Kcal/m³; gas composition of \Box
   13.58, O 0.22, CO 6.32, H 58.5, CH, 4.28, N 17.1%),
  4573
Research on brown coal at University of Melbourne (Coal
```

Research on brown coal at University of Melbourne (Coal gas production), 3868
Slagging fixed-bed gasification of North Dakota lignite at pressures to 400 psig (Pilot plant for production of coal gas), 5176 (BM-RI-7408)
Slow thermal decomposition of Chukurovo coal at atmospheric pressure and in vacuo in the 200-800° range (In vacuum, yield of tar and gas increased), 7168
SO₂ free two-stage coal combustion process (Coal S is not oxidized under reducing conditions existing during combustion), 1745 (PB-211888) combustion), 1745 (PB-211888)
Status and design characteristics of the BCR/DCR bi-gas

pilot plant (5 ton/hr BI-GAS pilot plant), 5203
Synthetic gas (Processes or converting coal to synthetic gas), 5122
Synthetic oil from coal (Catalytic hydrogenation in autoclave at 140-210 atm up to 475° in presence of ammonium molybdate and Sn chloride or Zn chloride gave crude oil, gas, coke, and water; hydrorefining with CoU and Mo oxide on Al oxide followed by cracking), 6877

and No Oxide on Al Oxide iclidwed by cracking 19, 6077

Far, gas, and char from coking and noncoking coal or

lignite (Preparaton of clean coal gas), 174

Technological process analysis of the gasification of raw

coal using nuclear energy (Manufacture of gases from

coal and lignite reviewed; 9 references), 5157

Thermal decomposition of Siberian coals during slow

Thermal decomposition of Siberian coals during slow heating (Laboratory-scale distillation on coals of different ranks; calorific values of gases obtained ranged from 2830 to 5680 kcal/m³), 7119

Thermal decomposition of solid fuels with the aid of matallic heat carriers (Laboratory apparatus with peat or coal wixed with metal spheres heated to 500-700° by industing furnace), 7120 induction furnace), 7120

Thermal treatment of certain Kirgizia and Kazakhstan coals in retorts (Coals heated to 460-850° in bronze or

coals in retorts (Goals heated to 460-850° in bronze of stee) tubular retorts in resistance furnace), 7118

Thermal treatment of brown coal for its use for power production (Use of electrically heated retort), 7121

Underground gasification of fuels. Underground gasification of Lisichansk coal (Use of D-enriched steem-air blast (66-74% C) resulted in gas containing 15% N, 40% CO₂, and 45% CO + H), 4765

Underground gasification of coal in a steem-oxygen-air blast (Eyen-iments with blast rate of 900 and 1400

blest (Experiments with blast rate of 900 and 1400 normal cu. m./hr at 0 concentration in the blast of 55-70%), 4795

Zonal characteristics of the gasification process of a coal seam in a channel and the scheme of gas production (Average composition of gas produced in 90-m-long channel: CH₂ Z, CO 4, H 16, CO₂ 17%), 4575
COAL GAS/PURIFICATION

35 equations for reactions occurring in gas purification

with iron exide, 305 Absorption of hydrogen sulfide and ammonia from gases (Using ammonia polythionate and ammonium thiosulfate), 206

Adsorption purification of coke gas from organic sulfur compounds and heavy hydrocarbons. II. Investigation of adsorption methods of purification by using industrial coke gas (Use of activated carbon as absorbing agent), 948

Analysis of a dynamic model for the two-stage monoethanolamine purification of coke oven gas by theory-of-graphs methods (Analysis of dynamic model of

theory-of-graphs methods (Analysis of dynamic model of 2-stage extraction of CO₂ and H₂S), 1892
Apparatus and method or purifying gases containing ammonia and hydrogen sulfide (Washing in a spray of dilute, aqueous ferrous sulfate), 1610
Apparatus and method for purifying gases containing ammonia and hydrogen sulfide (Coke-oven gas passed through spray of FeSO₆ sclution; H₂S reduced from 8q/m³ to 1 ppN and NH₃ from 10q to 20 mg/m³), 1613
Application of fluidized-solids technique to coal gas purification (Use of Fe cxide as purification material; comparison of two methods), 728
Application, 723
Appraisal of the operation of a gas pressure purification

Appraisal of the operation of a gas pressure purification plant in the coking works "Zdzieszowice", 1494
Benfield process (Removal of C dioxide, H sulfide, and

Benfield process (Removal of C dioxide, H suilide, and COS from sour natural ges and raw gases produced during menufacture of substitute natural gas by partial oxidation of coal or cil or by naphtha reforming), 1957 Burning of ammonia in coke-oven gases with simultaneous burning of the hydrogen sulfide (Conversion of ammonia to N and water and of hydrogen sulfide to S), 1394

to N and water and of hydrogen suffice to 3), 1034 Catalytic purification of coke oven gases (Two reactors with Pd catalyst; gas first passed through hydrogenation equipment), 1375 Cleaning and purification of gas by ethanolamines (Removal of CG₂ and H₂S; review with 29 references),

Cleaning coke-oven gas by the Stretford process, 1325 Coal gas (Washing with ammoniacal liquer, cuproammoniacal

solution, and kerosene), 224 Coal gas (Extraction of $\rm NH_3$ and $\rm H_2S$ from coal gases to

coal gas (Extraction of NH₃ and H₂S from coal gases to form (NH₄)₂SO₄ and S), 225

Coal gas as a substitute for synthesis gas In the Fischer--Tropsch synthesis (Removal of G from coal gas by passage over Cu turnings at 320-50°; gas freed of S by passage over alkalized Fe₂O₃ at 250°; catalyst of 100 Co, 5 ThO₂, 8 MgO, 80 kieselguhr), 6671

Coal-gas purification (Removal of NH₃, H₂S, and (CN)₂ by washing with lyes containing ammonium polythionate and (NH₄)₂S₂O₃), 230

Coal gas purification in the Leopoldau gas works (Gas scrubbed with solution containing free ammonia, combined ammonia, thiosulfate, sulfate, thiocyanate, hydrogen sulfide, and hydroquinone), 1385

Coke oven gas free from acidic gases, 2075

Coke oven gas (NH₃, H₂S, and HCN removed by scrubbing with waste liquor from steel pickling), 1272

Collection of ammonia, benzene, and hydrogen sulfide [from coke-oven gas] (S used to manufacture (NH₄)₂SO₄; benzene collected with wash oil and activated carbon), 461

Conversion of carbon monoxide (Removal of CO and S-containing compounds from coke-oven gas; gas washed with solution of soda and anthraquinonesulfcnic acid as

catalyst; diagram of apparatus), 1356 Converting coke oven ammonia and hydrogen sulfide

(Scrubbing coke-oven gas with water to remove ammonia and H sulfide), 1400
Cooling and washing of coke oven gases, and simultaneous removal of ammonia, hydrogen sulffide, and other acid components (Gas cooled to ca. 45° in 1st indirect cooling stage and then to ca. 20° in 2nd direct stage), 1536

Cyclic process for removal of hydrogen sulfide and ammonia from coke-oven gas (H₂S scrubbed selectively with NH₄DH; NH₃ bound by aqueous solution of (NH₄)H₂PO₄--(NH₄)₂HPO₄-); 1726
Dedication of the Dorsten pressure gasification plant for bituminous coal (Lurgi gas producer modified so coals of Ruhr region could be gasified with 0 and steam at 20-30 atm), 4301

Desulfurizing gas containing hydrogen sulfide (H_2S and HCN removed from coke-oven gas by scrubbing with aqueous Na₂CO₃), 1986
Desulfurization of coke-oven gas (H₂S and NH₃ scrubbed

resulturization of coke-oven gas (H₂S and NH₃ scrubbed from coke-oven gas in several stages), 1215
Dry purification of gas (Removal of H₂S and tar droplets by passage through finely divided coke at 18 to 33°), 537

Efficient removal of ammonia and hydrogen sulfide from gases (Washing and then scrubbing using aqueous

solution of ammonia; three-stage process), 1460
Electrostatic gas purification at the Stuttgart—Gaisburg coke oven plant (Efficiency for removal of tar, naphthalene, NC, light oil, HCN, and H₂S), 910
Elimination of sulfur and carbon dioxide from coke-oven

gases by means of ammonia water under pressure (13 atm

pressure), 321
Experimental installation for coal-gas purification under atmospheric pressure in plate and beli-jar washers, 700
Extraction of hydrogen sulfide and hydrogen cyanide from

gas mixtures containing carbon dioxide (By scrubbing under pressure with benzene or xylene), 1098
Feld processes for the extraction of ammonia and hydrogen

sulfide from coal gas (NUNE), 263 Gas purification (Removal of $\rm H_2S$ and other impurities using Fe, Ni, and Sn group and their compounds as

using Fe, Ni, and Sn group and their compounds as catalysts), 319
Gas purification (Removal of NH₃ and S using wash liquor containing an Fe compound in suspension), 290
Gas purification (Tar and moisture condensed by spraying gas with NH₃; use of alkaline solution, such as Na₂ClG₃ to remove H₂S, HCN, and NH₃), 886
Gas purification (Removal of H₂S and HCN), 664
Gas-purifying materials (Removal of S or HCN from coal gas or producer gas using porous nodules of Fe oxides Gas-purifying materials (Hemoval of S of Hon from Goal
gas or producer gas using porous nodules of Fe oxides
and sawdust to which is added resin-containing
agglomerant that forms gel in the mass), 480
Gasification of fuels. Purification of coke oven gas at
transmission pressure in the Ruhr region (Gas is passed

through tar precipitator and HCN washer at normal pressure and then compressed to 10 atm; H₂S and NH₃ are

pressure and then compressed to 10 atm; H₂S and NH₃ are later removed), 4318 Girdler process for gas purification (Ethanolamines as absorbers of CO₂ and H₂S), 307 High-BTU gas from coal, 5313 Hydrogen sulfide removal from coal-distillation gases (Use of ammoniacal liquor; equipment description), 1214 Hydrogen sulfide from coke-oven gas (H₂S, HCN, and CO₂ recovered from coke-oven gas by absorption in Na₂CO₃ solution; equipment), 1290 Modern practices in gas purification and hydrocarbon recovery, 917 New commercial application of the Walter Feld polythionate process, 265

polythionate process, 265 New process washes coke-oven gas with waste pickle liquor (Removal of NH $_3$, H $_2$ S, and HCN), 901

CCAL GAS/FURIFICATION Operation of the "Manchester" liquid purification plant at Lineare, Liverpool (Removal of H₂S and HCN by Manchester process), 836 Perox plant for removal of hydrogen sulfide from coke-oven gas (NH₃ and H₂S re aremoved by washing after removal of naphthalene; operating details of plant and costs are discussed), 951 Pilot-plant studies of the hot-carbonate process for removing carbon dioxide and hydrogen sulfide (Removal of CO_2 and $\mathrm{H}_2\mathrm{S}$ from gas mixtures necessary in synthesizing liquid fuels from coal), 1280 Principles of coal-gas purification (Review of various physical-chemical methods), 704 Progress in the utilization of nitrogen and sulfur in coal (Review of processes and equipment for purifying coal gas and recovering by-products), 431 Purification of coal or coke-oven gas (Removal of $\rm H_2S$ and HCN by washing with a neutral or acidic aqueous solution of Cu2SO,), 1118 Purification of coke-oven gases and production of a combustible gas rich in hydrogen and carbon monoxide (Crude cake-cven gas purified and most of ar, aromatics, naphthalene, nitrogen compounds, and S compounds removed using steam and oxide or sulfide catalyst), 1371 Purification of fuel gases (Coal gas containing HCN, H₂S, and NH₃ washed with aqueous suspension containing NH₄ polysulfide and fine S porticles), 1820

Purification of coke-oven gas from hydrogen sulfide by a solution of monoethanolamine under pilot-plant conditions (Absorption of $\rm H_2S$ and $\rm C\tilde{u}_2$ by technical monoethanclamine), 1199monoethanclamine), 1199
Purification of gases containing hydrocarbons and hydrogen sulfide (By low-temperature absorption with toluene or xylene), 1049
Purification of distillation gases (Removal of NH₃, H₂S, and HCN by washing), 616 Purification of a coke-oven gas (Purification under pressure for removal of naphthalene, absorption of benzene hydrocarbons and hydrogen sulfide, removal of ${\rm H}\,$ exides, and drying), 1775 cxides, and drying), 1775
Purification of coke oven gas (Gas containing HCN, NH₃, and H₂S purified by washing with aqueous S suspension to give NH₈SON, (NH₄)₂S₂O₃, and solid S), 2013
Furification of carbon monoxide-containing gases (CC-containing gases, especially those produced by dry distillation or gasification of fuels), 883
Purification of coke-oven gas (Recovery of hydrocarbons from coke-oven gas by activated charcoal increased when charcoal already used once for this purpose is connected in series before adsorption columns; NH₃, $C_{10}H_8$, and H_2S separated first), 989 Clothected in series before adsorption columns; NH₃, CloH_a, and H₂S separated first), 989
Purification of coke-oven gas for high-pressure underground storage (Aromatic hydrocarbons and butadiene removed by activated carbon following removal of H sulfide, HCN, and NO by suitable absorbers), 1406 Purification of gases containing hydrogen cyanide and hydrogen sulfide (HCN and H₂S fixed in water in form of N-containing S compounds and removed by burning with excess air at 1100-1200° to SO $_2$ to be recovered as H₂SG₄, sulfate, or sulfite), 2048 Purification of coal gas (Residues, dust, etc., removed hydraulically; then gas is cooled and heavy tar and medium oil are condensed fractionally), 1125 medium oil are condensed fractionally), 1125
Purification of lignite coke gas by the Girbotol process
without pressure (Absorption of CG2 and H2S by
NH2CH2CH2OH, NH(CH2CH2OH)2, N(CH2CH2OH)3, and an
alkaline solution of sulfosolvan B (CaH4O2NK) was
studied in especially designed apparatus), 1257
Purification of industrial gases (Removal of H2S and CO2
from coal distillation gas by scrubbing with aqueous $\rm NH_3$ solution), 986 Purification of coke-oven gas by removal of CO $_2$ and $\rm H_2S$ with ethylamine (Gas treated with Na arsenate solution and bog iron ore to remove most of H_2S ; cycle gas then compresses and scrubs in series of towers with $H_2\mathbb{Q}$, C2H5NH2, caustic, and H2O again), 1006 Purifying a fuel gas containing hydrogen cyanide, hydrogen sulfide, and ammonia (Gas scrubbed in aqueous alkali solution containing small particles of S to remove 95% of HCN, 90% of $\rm H_2S$, and 30% of $\rm NH_3$), 2056 Purifying coal gas, etc., 210 Purifying gases (Wet purification of such gases as coal gas), 481 Purifying coal or similar gases (), 215 Purifying coke-oven, etc., gases (Removal of S compounds and CC₂ by washing with high boiling hydrocarbons or and CO₂ by washing with night occurring phenols), 253

Purifying coke-oven gas (Removal of NH₃, HCN, and S), 482

Purifying gases such as those from coal distillation (Scrubbing with liquor containing iron or manganese compounds), 216

Purifying fuel gases (Desulfurization by passing over nickel, cobalt, or copper compounds), 218

Purifying coal gas, etc. (Use of Fe₂O₃, Fe(OH), or Ni ealts in suspension for gas purification in the form of salts in suspension for gas purification in the form of freely falling liquid film), 248 Reactions involved and reaction velocities for the

regeneration of the scrubbing solutions in the metal thionate processes for purifying coal gas from ammonia and hydrogen sulfide, 865
Reactions involved and the reaction velocities for the regeneration of the scrubbing solutions in the metal thionate processes for purifying coal gas from ammonia and hydrogen sulfide. Manganese sulfate process, 860 Recovery and utilization of nitrogen and sulfur produced in coal carbonization (Recovery as useful products), Recovery of the by-products nitrogen and sulfur in the coke and gas industry (Description of liquid purification with recovery of S and description of Bahr process), 239
Recovery of chemicals from underground coal gasification gas in a large-scale laboratory apparatus (Pilot-scale laboratory apparatus), 5035 Rectisol process (Purification of crude gas produced by coal gasification), 1965 Reduction of atmospheric pollution. Volume 1. Main report. Final report June 1970-June 1971. See also Volume 2, PE-210 674 (Reduction of SC_2 , nitrogen oxide, and particulate emissions in flue gas by use of oxide, and particulate emissions in flue gas by use of fluidized bed coal combustion process with added limestone or dolomite), 1597 (PB--210 673)
Reduction of atmospheric pollution. Volume 2. Appendices 1-3. Final report Jun 1970--Jun 1971. See also Volume 1, PB--210 673 and Volume 3, PB--210 675 (Reduction of SG₂, nitrogen oxide, and particulate contents of flue gas by fluidized bed combustion of coal), 1595 (PB--210 674) Reduction of atmospheric pollution. Volume 3. Appendices 4-9. Final report Jun 1970-Jun 1971. See also Volume 2, PB--210 674 (Reduction of SO_2 content of flue gas by fluidized bed combustion of coal), 1598 (PB--210 675) Regenerator process for the separation of coke-oven gas (Coke-oven gas after removel of tar and ammonle, is cooled to eliminate impurities such as benzene, S compounds, carbon dioxide, water, nd methane), 1351
Removal and recovery of ammonia and sulfur from coal-Removal and recovery of ammonia and sulfur from coaldistillation gas (Removal and recovery of H₂S and NH₃ without addition of any reagents), 760

Removal of hydrocyanic acid, ammonia, and hydrogen sulfide from coke-oven gas (Scrubbing with ammoniacal Suspension containing polysulfides to remove HCN; treatment with NH₃ solution to remove H₂S), 887

Removal of sulfur and nitrogen from coal-tar and coal-gas light-oil fractions (Compounds of S and N from aromatic hydrocarbon fractions produced in destructive distillation of coal removed by hydrogenation; S and N converted to H₂S and NH₃, resp.), 1269

Removal of HCN, H₂S, and NH₃ by washing with (NH₄)₂S₂O₃ and (NH₄)₂S₄O₆, 362

Removal of hydrogen sulfide and ammonia from coke oven gas (H₂S and NH₃ removed by scrubbing gas with solvent gas (${\rm H_2S}$ and ${\rm NH_3}$ removed by scrubbing gas with solvent containing As compound catalyst), 1776 Removal of hydrocyanic acid and organic sulfur compounds from coke-oven gas (Gas purified by scrubbing with solution containing As and hydroquinone or naphthoquinone), 2028 Removal of ammonia and hydrogen sulfide from gas by means of thionate solutions, 348 of thionate solutions, 340 Removal of acidic constituents from gases (Removal of HCN, H₂S, and NO from coke-oven gas using hydrated FeO), 932 Removal of hydrogen sulfide from gases (Absorption— Removal of hydrogen sulfide from gases (Absorption-desorption process), 1267

Removal of H₂S, CO₂, and HCN from coal gases by absorption with alkali metal compound and boric acid mixture, 317

Removal of ammonia and hydrogen sulfide from coke oven gas (Two-step washing process; catalytic oxidation gives sulfuric acid), 1828 Removal of hydrogen sulfide and carbon dioxide from gases (Gases, such as those from carbonization of coal, freed from H_2S and CO_2 scrubbing with alkaline liquid containing O carrier), 1174 Removing ammonia and hydrogen sulfide from coal-distillation gases, etc. (Treatment with solution of thionate or thiosulfate of heavy metal such as Fa, Mn, or Zn), 241

Removing ammonia and hydrogen sulfide from gas mixtures (Catalytic oxidation of H₂S to SO₂ then washing with (NH₄)S₂O₃, (NH₄)₂SO₃, or NH₄HSO₂), 360

Removing ammonia and hydrogen sulfide from coke-oven gas by means of sulfurous anhydride, 577

Removing ammonia and hydrogen sulfide from gases such as cold coke-oven gas (Scrubbing with H₂SO₄ and aqueous solution of monoethanolamine), 443

Removing ammonia and hydrogen sulfide from coal gas (Washing with FeS₂O₄ and Fe(OH)₃), 217

Removing carbon dioxide, hydrogen sulfide, atc., from gaseous mixtures such as coal gas, natural gas (Using a solution of a compound of an alkeli-forming metal and a phenol in properties to form an immiscible phase in the absorbent liquid), 389

Removing cyanides from coal gas by scrubbing and thermal decomposition (Gas scrubbed with ammoniacel alkeline solution containing suspended S to capture cyanides as or Zn), 241

solution containing suspended S to capture cyanides as

Removing gaseous weak acids such as H,S and CO, from

NH.SCN), 2061

```
gases such as coal hydrogenation waste gases (By scrubbing with a solution of Na
             diethylenetriaminediacetate or other salt of an alkali,
    alkaline earth, or strong organic base with an aminocarboxylic acid containing at least 2N atoms and derived from ethylenediamine or a polymer), 528
Removing impurities from distillation gas (Removal of S and HCN using bog iron ore or alkali-containing Fe<sub>2</sub>O<sub>3</sub>
              hydrate), 296
     Review on primary processes of purification of coal gas,
    Scrubbing of coal-distillation gas (Removal of nephthalene, H<sub>2</sub>S, H<sub>2</sub>G, and benzene from coal distillation gas as high pressure), 990
Scrubbing ammonie, hydrogen sulfide, and carbon dioxide from coal-distillation gases (Using H<sub>2</sub>C or aqueous
              NH<sub>3</sub>), 600
     Selective absorption of hydrogen sulfide (From coke-oven gas using carbonates and sulfides of alkali metals),
   Selexcl process (Gas purification and removal of H sulfide, C dioxide, COS, mercaptans, etc., from gas streams by physical absorption), 1964
Separating ammonia and hydrogen sulfide from gases (Ammonium thicsulfate, ammonium polythionates, and ammonium sulfite—bisulfite), 276
Separating ammonia and hydrogen sulfide from coke—oven gas (Removal as NH, HS), 562
Separating H<sub>2</sub>S and NH<sub>3</sub> from coke—oven gas (Cooling at approximately atm pressure to 0° to separate naphthalene and water then further cooling to -40 to -50 to separate NH<sub>3</sub> and H<sub>2</sub>S), 588
Separation of carbon dioxide, hydrogen sulfide, and organic sulfur compounds from coke—oven gases, 1036
Separation of sulfur and ammonia from hot gases (Coke—oven gas; gas cooled and washed with ammoniacal solution to absorb H<sub>2</sub>S and HCN; gas scrubbed to remove NH<sub>3</sub>), 1027
       NH<sub>3</sub>), 1027
Seperation of hydrogen cyanide and sulfide and nitrogen
      Separation of hydrogen cyanide and suitide and nitrogen oxides from coal distillation gases (Gases are free from tar), 995
Separation of ter, naphthalene, ammonia, hydrogen sulfide, hydrogen cyanide, and pyridine from coke-oven gas (Gas scrubbed with ammoniacal liquor), 1175
Synthetic crude oil from coal (Carbonization of coal and hydrogenteenting of coal ter products), 6919
      hydrotreating of coal tar products), 6919

Ter, gas, and char from coking and noncoking coal or lignite (Preparaton of clean coal gas), 174

Ten years of experience at the pressure-gasification plant at Most (Czechoslovakia) (Gasification ratio of
                steam to axygen), 4188
       Treatment of gases containing hydrogen cyanide and hydrogen sulfide (HCN and H<sub>2</sub>S removed with alkaline
       nyarogen suittoe (now and n<sub>2</sub>s removed with electric solution), 2027

Treatment of coal-distillation gases (A method for removing NH<sub>3</sub>, H<sub>2</sub>S, and HCN in which the products of each step are recycled for use in preceeding steps of the cycle), 556

Herbicological associated with liquor comprising symposium
       Washing of coal gas with liquor comprising ammonium
        polythionate and ammonium thiosulfate, 222
Wet process for the removal of hydrogen sulfide from coke-oven gas (Scrubbing with a suspension of
       coke-oven gas (Scrubbing with a suspension of (NH<sub>A</sub>),FeCN<sub>E</sub>), 381
Wet purification of coal gas, 232
Wet purification of gases such as those from coal
distillation (Removel of NH<sub>3</sub>, H<sub>2</sub>S, and a benzene
hydrocarbon by scrubbing with an acid solution of NH<sub>6</sub>,
thionate, sulfite, or bisulfate followed by oxidation
(heat and catalyst) then washing oil treatment to
remove hydrocarbons), 518
Wet purification of coke-oven gas (Use of Na ferrocyanide
(NH<sub>A</sub>)<sub>2</sub>SO<sub>4</sub>, NH<sub>3</sub>, and FeSO<sub>6</sub> in purification of coke-oven
gas), 437
Zinc process for extraction of ammonia and hydrogen
         gual, and Cinc process for extraction of ammonia and hydrogen sulfide from [coal] gas, 238
COAL GAS/PYROLYSIS
Influence of the coking temperature on certain raw cokegas chemical products (Increase of coking temperature from 1350-60 to 1370-800 affected products; yield of Haulfide, HCN, and assonia increased with temperature),
 CGAL GAS/REDUCTION
CGAL GAS/REDUCTION

Coal gesification (Gas containing 94.8% CH, and solid fuel containing 0.72% S of high calorific value manufactured by 2-step process; final product of methane 94.8, carbon dioxide 1.14, CG 0.06, H 2.0, and N 2.0%), 5456

CUAL GAS/REFINING
Rostin processes for desulfurizing gas and for refining coal gas and benzene (Removal of H<sub>2</sub>S by bubbling through NH<sub>0</sub>OH which is circulated over CuO), 411
COAL GAS/REVIEWS
         Chemicals from coal (Review (to 1962); no references), 41
  COAL GAS/SCRUBBING
         Coal gas purification in the Leopoldau gas works (Gas scrubbed with solution containing free ammonia,
         scruosed with sciution containing free ammonia, combined asmonia, thiosulfate, sulfate, thiocyanate, hydrogen sulfide, and hydroquinone), 1385
Coke oven gas (NH<sub>3</sub>, H<sub>2</sub>S, and HCN removed by scrubbing with waste liquor from steel pickling), 1272
Converting coke oven asmonia and hydrogen sulfide
```

```
(Scrubbing coke-oven gas with water to remove ammonia and H sulfide), 1400
Desulfurizing gas containing hydrogen sulfide (H<sub>2</sub>S and HCN removed from coke-oven gas by scrubbing with
     HCN removed from coke-oven gas by scrubbing with aqueous Na<sub>2</sub>CO<sub>3</sub>), 1986

Desulfurization of coke-oven gas (H<sub>2</sub>S and NH<sub>3</sub> scrubbed from coke-oven gas in several stages), 1215

Desulfurization of coke-oven gas (Coke-oven gas scrubbed to remove hydrogen sulfide with NH<sub>6</sub>CH containing (NH<sub>6</sub>)<sub>2</sub>SO<sub>4</sub>, (NH<sub>6</sub>)<sub>2</sub>S<sub>2</sub>O<sub>3</sub>, and NH<sub>4</sub>SCN), 1989

EPA alkali scrubbing test facility: sodium carbonate and
               limestone test results. Final rept (Initial results of testing prototype wet lime-limestone scrubbing facility for removing SO_2 particulates from flue gas), 2017
              (PB--225 041/3)
      Facility of scrubbing hydrogen sulfide from ccal gas in
the gas works at Ceske Budejovice (Tower scrubber
      filled with Raschig rings), 1425
Modern oil-absorption plants for light-cil recovery (from manufactured gas) (Review of patents), 7361
Purification of industrial gases (Removal of H<sub>2</sub>S and CO<sub>2</sub> from coal distillation gas by scrubbing with aqueous
               NH3 solution), 986
      Removal of hydrogen sulfide from coke-oven gas with potash solutions in scrubbers with forced-jet atomizing plates (Use of KOH solutions to remove HgS; spray-jet plates more effective than packed columns), 1243
Removing cyanides from coal gas by scrubbing and thermal decomposition (Gas scrubbed with ammoniacal alkaline solutions countries against a supposed S to capture cyanides as
        solution containing suspended S to capture cyanides as NH<sub>4</sub>SCN), 2061
Scrubbing of coal-distillation gas (Removal of
               naphthalene, H_zS, H_zG, and benzene from coal distillation gas as high pressure), 990
        Separation of sulfur and ammonia from hot gases (Coke-
oven gas; gas cooled and washed with ammoniacal
solution to absorb H<sub>2</sub>S and HCN; gas scrubbed to remove
Solution to according and now, gas strated to lemote NH<sub>2</sub>), 1027
Separation of tar, naphthalene, ammonia, hydrogen sulfide, hydrogen cyanide, and pyridine from coke-oven gas (Gas scrubbed with ammoniacal liquor), 1175
CCIAL GAS/TRANSPORT
Long-distance transmission of gas from works making gas
by carbonization and high-pressure processes, 3516
COAL GAS/VAPOR CONDENSATION
Gas condensate from the underground gasification of
coals, 5102
COAL GAS/WASHING
       ARL GAS/WASHING
Ammonia-hydrogen sulfide cyclic washing process for coke-
oven gas (95% of H<sub>2</sub>S removed from gas compared with 85%
in usual processes), 2001
Conversion of carbon monoxide (Removal of CC and S-
containing compounds from coke-oven gas; gas washed
with solution of sode and anthrequinonesulfonic acid as
        catalyst; diagram of apparatus), 1356
Desulfurization of coke-oven gas with arsenic-soda
                 solution (Coke-oven gas containing H2S washed
        solution (Coke-oven gas containing no washed countercurrently with solution containing Na thiosulfate, Na thiocyanate, and As oxide), 1360 Liquid reagents for the final removal of hydrogen sulfide from gases (Alkaline Zn slurry reagents are effective for final purification of coal gas or mixed gas), 1059 Methods of hydrogen sulfide removal from coal gas with the aid of ammonia water (Review of earlier methods),
        1079
Purification of fuel gases (Coal gas containing HCN, H<sub>2</sub>S, and NH<sub>3</sub> washed with aqueous suspension containing NH<sub>4</sub> polysulfide and fine S particles), 1820
Purification of coke oven gas (Gas containing HCN, NH<sub>3</sub>, and H<sub>2</sub>S purified by washing with aqueous S suspension to give NH<sub>4</sub>SON, (NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>3</sub>, and solid S), 2013
Removal of sulfur-containing organic compounds from coke oven gas (Coke-oven gas washed with higher-boiling fraction of crude benzene), 1412
Removal of organically bound sulfur from crude coke oven gas (Light oil obtained during coking used to remove S
         gas (Light oil obtained during coking used to remove S by washing), 1438
Removal of ammonia and hydrogen sulfide from coke oven gas (Two-step washing process; catalytic oxidation gives sulfuric acid), 1528
          Separation of sulfur and ammonia from hot gases (Coke-
oven gas; gas cooled and washed with ammoniacal
sclution to absorb H<sub>2</sub>S and HCN; gas scrubbed to remove
                  NH<sub>3</sub>), 1027
         Nagly, 102/
Washing of hydrogen sulfide from coke oven gas (Washing with ammonia-containing water), 1521
Washing out hydrogen sulfide from coke-oven gas (H sulfide washed from coke-oven gas with Na carbonate-containing solution of Na arsenate), 1413
   COAL GASIFICATION

"Synthetic" natural gas from coal (Research on production of CH, directly from coal), 3442
           A.G.A. coal gasification research, 5349
Action of steam on brown coal from the view-point of gas
                   equilibrium (Steam in equilibrium with gases above
                   5000), 3640
           Additional gasification tests (Tests on gasification of coal and on fresh and partly rotten wood), 3429
```

COAL GASIFICATION 568 Advanced coal gasification system for electric power. Annual technical report for the period August 9, 1972-June 30, 1973. Research and development report No. 81, interim report No. 1 (Fluidized bed process using coal, sir, and steam for gasification and limestone/dolomite air, and steem for gasification and limestone/dolomite for desulfurization), 5412 (NP-20128) Advanced methods of oil and gas production from fossil fuels. Subpanel report VII used in preparing the AEC Chairman's report to the President, 5553 (WASH-1281-7) Advances in the technique of gasifying fine, high-ash coal under pressure (English translation), 4057 Aerodynamic gasification of a coal bed, 5014 Alkali carbonate and nickel catalysis of coal steam gasification (For production of methane and carbon dioxide), 5468 Alternative methods of high-temperature carbonization (Use of continuous vertical retorts for production of 525 B.t.u. gas), 102 Analysis of the phenomena of gasification of solid fuels for different types of gas producers, 3381 Annual report of research and technologic work on coal, fiscal year 1949 (Discussion of coal mining, preparation, storage, utilization, carbonization, gasification, liquefaction, and synthetic-fuel demonstration plants), 3709
Annual report of research and technologic work on coal, fiscal year 1945 (Includes studies on carbonization of American coals; gasification of subbituminous coal and lignite; and reaction mechanisms in hydrogenation of coal), 6142 Annual review of fuel technology in Japan (Review of coal mining, coal cleaning, synthetic gasoline, city gas, and gasification industry), 3180
Apparatus for the gasification of solid fuel powder under simultaneous liquefaction of the ash (Fuel injected at bottom of reactor), 4826

Apparatus for gasification of solid fuels (Unit for obtaining efficient gas-solid contact, especially for use in gasification of coals and cokes), 4864

Apparatus for synthesis-gas manufacture, 4480 Apparatus and method for desulfurizing and completely gasifying coal (Patent), 5625 Apparatus for gasifying lignite, 3445
Apparatus for gasification of caking-type coal, 4785
Applicability study. Coal gasification process. Final report, 5288 (PB-208 944) Application of oxygen in large quantities for the manufacture of illuminating and synthesis gases from coal (By complete gasification), 3598
Application of the Fischer-Tropsch process at the Lutzkendorf plants of the Wintershall Company (Comparison of merits and disadvantages of Schmalfeldt-Wintershall and Winkler processes for gasification of lignite to obtain gas suitable for Fischer-Tropsch process), 6160 Application of nuclear process heat for process techniques (Coal gasification and petroleum cracking), 5229 (AED-CONF-71-100-18) Appraisal of future United States power sources (Coal gasification as a means of supplementary energy sources), 3145
Approaches to new coal chemical industry (Treatments of powdered coal), 4191 Ash problems in pressure gasification (Formation of sintered lumps and coked layers of ash lead to disturbances in production of generator gas from brown coal). 4952 Assessing advanced methods of generation, 5403 Atomic Energy Commission-Bureau of Mines process heat reactor program. Quarterly progress report, May 1--July 31, 1962 (Construction of 250-psig pilot scale He recycle loop), 4833 (TID-19443)
Atomic Energy Commission-Bureau of Mines process heat reactor program. Quarterly progress report, November 1, 1962-January 31, 1963 (Tests on Induction-Heated Simulated Nuclear Reactor (ISR) for producing superheated steam, heat from high-temperature He to reform natural gas, and He--graphite and N--graphite suspension), 4882 (TID-19552) Atomic Energy Commission-Bureau of Mines process heat reactor program. Quarterly progress report, February 1--April 30, 1963 (Tests on fixed-bed coal gasifier in He-recycle system), 4883 (TID-19553)
Atomic Energy Commission--Eureau of Mines process heat reactor program. Quarterly progress report, February 1--April 30, 1962 (Fabrication and testing of Induction-Heated Simulated Nuclear Reactor (ISR) gasification system), 4835 (TID-19551)
Balanced-pressure pilot reactors (Direct gasification of coal at pressures up to 2000 psig and temperatures up to 22000F), 4975
Basic principles and applications of fixed-bed gasification, 4061

Basic principles and applications of lixed-ded gasification, 4061
Basic trends of research on application of oxygen in the gasification of low-grade fuels (Review), 3394
Basic trends in the gasification of solid fuels, 5570
Behavior of nickel methanation catalysts in coal-steam reactions. Paper No. 14 (Cne-step gasification and

coke in low-temperature carbonization and gasification in a current of steam, 101 Best substitute for petrol may be petrol, 7028
Bibliography of investment and operating costs for chemical and petroleum plants, January-December 1969, 5144 (BM-IC-8478) Binding sulfur in the process of energy generation (Gasification of coal in the presence of dolosite reduces sulfur content of gas; coal pyrolysis in the presence of hydrogen and calcined delomite is discussed also), 1639 British Coal Utilization Research Association research on coal gasification, 3763

British gas experience of high pressure gas-making processes (Review of British work), 5344

Brown coal as a raw material for gas works (Review of different methods), 4807 Brown coal semicoke for the production of generator gas, Bureau of Mines research and technologic work on coal, 1964, 4939 Bureau of Mines Energy Program 1971. Information circular (Environmental aspects of the extraction, processing, and utilization of coal), 45 (PB--211 456) Burnham Coal Gasification complex (Plant to produce 972 Burning of anthracite plates for the purpose of studying production of water gas (Use of oxygen-enriched air and steam; gas produced has heat value of 2460 cal/m³), 3224 Calculation of favorable conditions for the gasification of coal (Theoretical treatment of complete gasification reactions), 4469 reactions), 4469
Calculation of indexes of the gasification process of solid fuels under pressure (Method for calculating indexes of gasification process at 10-20 atm; results agree well with operational data), 4752
Calculation of gasification equilibria, 3382
Calculation of gas yields from coal gasification, 3645
Carbon monoxide and hydrogen from powdered coal (Gasification with C and steam at about 100 lb/in² pressure), 3815 Carbonization and gasification of carbonaceous solids (Carbonaceous materials carbonized in fluidized bed to remove part of volatiles), 168 Carbonization and gasification. Catalytic production of methane, 3534 Carbonization and gasification of coal (Production of 53,000 ft3 of 309 to 316 Btu gas/ton coal), 3336 Case for synthetic pipeline gas from coal and oil shale, 5086 Catalysis of coal gasification at elevated pressure Catalysis of coal gasification at elevated pressure (Research on catalysts), 5469
Catalyst for Fischer--Tropsch synthesis (3 to 15% Si incorporated in Fe catalyst), 6438
Catalytic action in the process of gasification in the fluidized bed (Effectiveness of 50% Fe₂O₃ plus 50% CuCl₂, K₂CO₃, and NaCl as catalyst), 4729
Catalyzed hydrogasification of coal chars (Analysis of the samples) 5467 char samples), 5467
Changes of combustion properties of gas produced by means of pressure gasification of coal after carbon dioxide removal and carbureticn, 5003
Chemical mining of coal to avoid stripping, 5410 Chemical processing of brown coal (Relative merits of various methods), 3654
Chemicals from coal: illusion or reality (Feasibility of economic production of petrochemical feedstocks), 5632 Chemistry of gasification with reference to small producers (34 references), 3342 Chemistry of the carbon-steam reaction, 5023 Chemistry and physics of combustion, gasification, and metallurgical processes (Reactions include MnC, FeC. Fe₂O₃, or Fe₃O₄ with CO), 3529 Chemistry and physics of entrained coal gasification, 5470 Clean conversion of coal to electric power: a dollar and cents approach, 2133 Clean energy from coal technology, 3099 Clean energy from coal: a national priority. 1973 annual report, calendar year 1972, 5429 (NP-19963)
Clean fuels from coal. Introduction to modern processes (Review with 39 references), 6995 Clean fuel gas from coal by gasification (Removal of Clean fuel gas from coal by gasification (Removal SO₂), 5346 Clean fuels from coal, 5324 (PB-224530-6-GA) Clean fuels from coal gasification, 5626 Clean fuels from coal - an alternative to SNG (Description of methyl-fuel process), 5503 Cleanup methanation for hydrogasification process (Conversion of coal hydrogastfication product gas to high Btu gas; catalytic activities of Ni, Fe, and Ru catalysts for methanation of CO measured; Ni on kieselguhr found to be most active), 5044

Coal: a past and future king (Describes H-coal liquefaction process and oxygen-enriched gasification process), 5569

Coal. Black magic (Technologies of coal desulfurization, coal gasification, and sulfur dioxide emission control

Behavior of activated bituminous coal and low-temperature

coal combuston processes), 5381

```
are described), 1765 (PB--213 032/6)
Coal and char transformation in hydrogasification, 5038
Coal and char transformation in hydrogasification, 4992
Coal and cil-shale processing and combustion. Subpanel report V used in preparing the AEC Chairman's report to the President (Higher-efficiency fluidized-bed systems), 2064 (WASH-1281-5)

Coal as a raw material (Lecture with 60 references), 2870
Coal as a chemical raw material (Forecast of chemical treatment of coal; coal hydrogenation; production of
     jet fuels: production of fuels of high calorific value), 6801
Cool as clean fuel -
                                                a challenge (Development of new
fuels by gasification and liquefaction), 5542
Coal carbonization, tar refining, and coal gasification
(Descriptive), 125
Coal carbonization and gasification (Production of coal
pas and water gas), 135
Coal conversion process (Coal converted to hydrocarbons
end O-conteining organic compounds), 5174

Coal feeding to a high-pressure gasification process

(Finely divided coal at atmospheric pressure mixed with carrier gas at pressure above that of gasification),
Coal gasification (Use of fluidized bed), 4122
Coal gasification and the coal mining industry (Various
gasification processes are reviewed), 5133
Coal gasification - an alternative in clean energy
     production (Technical, environmental, and economic
      espects of proposed plant), 5516
Coal gasification. Low BTU for power station emission control (Efficiency of gasification plant is 80%), 5382
 Coal gasification. Converting coal into nonpolluting fuel oil (Discussion of liquefaction over gasification; liquefaction requires less chemical transformation and
     hydrogenation; energy conversion efficiency of liquefaction is about 78% vs. 60% for gasification; liquefaction plants have much smaller water requirement
and water pollution problems than gasification plants;), 5333
Coal gasification (Production of high-methane-content
natural gas subtitute), 5566

Coal gasification (Water gas with increased H content produced continuously forming gas permeable bed of coal and spent coal particles; it is permeated with G-containing gas preheated to 1000-18000F to raise temperature in bed to 2200-25000F, cause orbonization
      and yield flue gas), 7027
and yield five gas), 7027
Coal gasification (Improved process for producing pipeline-quality gas), 5426
Coal gasification unit completed at Missouri gas synthesis plant (For production of synthesis gas), 3643
Coal gasification: low Bt.u. gas for power station
 emission control, 5439
Coal gasification: design of a coal-oil-gas refinery, 5440
 Coal gasification circulates molten salt (Molten sodium carbonate supplies heat and also catalyzes the basic reaction), 5239
 Coal gasification takes on a new look (Current
     gasification projects in the USA (1974)), 5616
 Coal gasification in a low-pressure, low-residence-time, entrained flow reactor, 5466
Coal gasification (Oxidation of coal particles in molten
  Na sulfate: S compounds removed by Na carbonate), 5548 Coal gasification: how best, how soon (Evaluation of
  processes), 5549

Coal gasification. A bibliography with abstracts, 5482

(NTIS-WIN-73-13)
 Coal gasification process (Coal particles are oxidized by molten sodium sulfate in an exothermic reaction), 5384
Coal gasification (Reaction of aqueous slurry of coal or coke with 0 above 1800°F and 100 psig to produce CO and
      Н), 5182
  Coal gasification for electric power generation - process conditions effecting contaminant (Design of plant),
       5501
  Coal gasification: can it stage a comeback (Problems in substituting gas produced for natural gas), 5294
Coal gasification: a technical description, 5404
Coal gasification. Two-stage coal combustion process (Two-stage coal combustion process of two-stage coal combustion process consists of dissolving coal in molten Fe where coal-fixed C and S
```

are required, and coal volatiles cracked emitted as CO

Coal gasification technology at center stage (State-ofart report), 5279

Coal gasification with oxygen and steam (Theoretical approach proposed for study of gasification of coal),

5249
Coal gasification for electric power generation, 5540
Coal gasification: the new energy source, 5326
Coal gasification takes on a new look (Basic techniques
are reviewed and a list of US coal gasification plants
as of March, 1974 is given), 5611
Coal gasification: two-stage coal combustion process,
5445

temperature combustion (Multiphase chemical equilibrium program used for calculating equilibrium compositions of slag, unconsumed C, condensed seed, and gas phase of

Coal gasification. Equilibrium problems in high

and H), 5335

5249

5445

```
coal combuston processes), 5381

Coal gasification for electrical power (Economics of use of fuel gas derived from coal), 5292

Coal gasification - an alternative in clean energy production (Description of gasification process and its effects on the environment), 5607

Coal gasification (Production of CO and H by reaction of carbonaceous fuel with steam and O; equipment), 4125

Coal gasification (In vortex chamber and slagging gasifier), 4259

Coal gasification (Patent: production of pipeline gas).
  Coal gasification (Patent; production of pipeline gas),
          5565
 Coal gasification (Gas containing 94.8% CH, and solid fuel containing 0.72% S of high calorific value manufactured by 2-step process; final product of methane 94.8, carbon dioxide 1.14, CO 0.06, H 2.0, and N 2.0%), 5456

Coal gasification (A cyclic process for the production of fuel gas), 4476
Coal gasification (A cyclic process for the production of fuel gas), 4476

Coal gasification (Use of water-gas generator), 3792

Coal gasification (Production of water gas with enhanced hydrogen content), 5576

Coal gasification: an old process comes of age (Environmental advantages), 5490

Coal gasification: equilibrium problems in hightemperature combustion, 5442

Coal gasification a partial solution to the energy crisis (Feasibility of three systems for producing SNG), 5318

Coal gasification in suspension, 3310

Coal gasification, 4887

Coal gasification: converting coal into non-polluting fuel oil, 5448
          fuel oil, 5448
fuel oil, 5448
Coal gasification: the TOSCOAL process for low temperature coal pyrolysis (800 to 970°F), 5449
Coal gasification: an alternative in clean energy production (Four Corners, NM), 5603
Coal hydrogasification (Production of high-Etu gas), 5170
Coal hydrogasification catalyzed by aluminium chloride (Batch reactor at 4000 psi and 450°; amenability of carbonaceous material to catalytic hydrogasification increases with increasing M content and decreasing M
          increases with increasing H content and decreasing C content), 5091
   Coal hydrogasification (Process for making high Btu gas
   from coal using 2-stage hydrogasification), 4998
Coal hydrogenation (Coal mixed with oil solvent and
           hydrogenated at 825°F in presence of bed of Co
  molybdate), 5302
Coal-oil-gas refinery offers SNG, refinery feed, low-sulfur fuel oil, 5474
Coal research and coal technology in respect to the conservation of American coal resources (Includes
   conservation of American coal resources (Includes carbonization, complete gasification, and hydrogenation studies), 3251
Coal science - state of the art, 5152
Coal technology: key to clean energy. Annual report 1973-1974, Office of Coal Research, U.S. Department of the Interior, 5573
  Interior, 55/3

Coal-to-gas system makes two fuels from one lump of coal
(Gasification process produces pipeline quality gas and
a char usable for boiler firing), 5610

Coal utilization under changing energy patterns and
social restraints. Conference paper (Methods for
converting coal to cleaner synthetic fuels are
described), 43
   Coal utilization in brown coal (lignite) countries in connection with deveopments in the fuel economy, 166 Coalification process (Effects of degree of
   polymerization upon reactivity of coal), 7500
Coke and gas production of gas works, with special attention to the use of noncaking or poorly caking
             coals, 3834
   coals, 3634
Coke-over gas (Effects of chemical composition of coal on
production), 3953
Cold flow mixing study of a vortex coal gasifier, 5394
Combined gas/steam turbine operated power plant using
pressure gasification of coal in the Kellermann power
station at Luenen, 5230
   station at Luenen, 5230
Combustible gases from powdered fuels (Suspension of powdered coal and 0 or 0-enriched air injected exially at apex of conical refractory reaction chamber; steam or CO<sub>2</sub> injected through whirling annular nozzle), 4127
Combustible gas (Gasification of solid fuels in fluidized bed at 1800-2000°F), 4144
Combustion- and gasification-reactions in the gas producer and blast furnace (Use of 0 and steam), 3384
Combustion and gasification of pulverized coal in a model cyclone generator. 4332
    cyclone generator, 4332
Combustion and gasification of pulverized fuel
(Mathematical equations are derived correlating extent
of combustion with amounts of fuel and of gas, reaction
     of combustion with amounts of fuel and of gas, reaction rate, etc.), 3524
Combustion of coal by gasification, 4810
Combustion of high-sulfur coal in a fluidized bed reactor (Combustion takes place in reactor comprising gasification, combustion, and heat-recovery zones; fluidized bed of cal and limestone; effluent within CG;
      CaS produced), 5246
Commercial production of synthesis gas from low-grade
```

coal. I. Gasification process (Commercial installation at Sasolburg, Orange Free State, South Africa), 4423
Commercial and industrial fuel gases from coal, 4911
Compendium of university forums of the National
Commission on Materials Policy, May-June 1972. A
background document. NCMP forum on technological
innovation in the production and utilization of
materials at Pennsylvania State University, on 19-21 June, 1972 (Technological innovations), 5493 (PB--223 679/2) Complete gasification of coal, 3410 Complete gasification (Tully Gasification plant--400 BTU gas is produced), 3385 Complete gasification (Method for reduction of steam consumption during gasification), 4311 Complete gasification of coal. Its development and future (Historical survey), 4228 Complete gasification of coal (Review; USA and UK work), Complete gasification of coal. VII. Effect of rate of Complete gasification of coal. VII. Effect of rate of heating of coal upon the reactivity of coke toward steam (816, 900, 1000, 1120, and 12000), 3219

Complete gasification of coal (Effects of rate of heating to 550°C on product yield), 3256 Complete gasification of coal. VIII-IX. Effect of the rate of heating of coal upon the combustibility of coke (1 and 2) (Comparison of heating in 10% G-90% N mixture and in air), 3193
Complete gasification plant (Description of generator complete gasification plant (bescription of general operation), 3431
Complete gasification (For supplementing low B.t.u. output of city gas system), 3362
Complete gasification plant at the Vienna gas works (Comparison to coke water-gas generators (plant with 12,000 m³ and one with 72,000 m³ daily capacity)), 3363 Complete-gasification plant at Mill Hill (172.2 therms of gas per ton of coal), 3152 Complete gasification of ccal, and tests for suitable coals, 3154 Complete gasification of coal (Low-temperature carbonization), 4000 Complete gasification of coal. Progress Report No. 40 (Review, with 33 references, from 1950 to 1958), Complete gasification of coking coals (Review), 4076
Complete gasification of gas coal in shaft-furnaces with
intermediary conversion into ferro-coke. Its importance
for the gas and metallurgical industries (Review with 16 references), 4078
Complete gasification of coal and methane synthesis (Efficiency of ThO₂-promoted Cc catalyst), 3292
Complete gasification of coal (Report of lectures), 3373
Complete gasification in Scotland (Description of 1 million ft³/day Tully carburetted complete gasification plant at Kirkcaldy), 4098

Complete gasification of coal. I. Effect of heating rate of the carbonization. II. Reactivity of coke against carbon dioxide, 3171 Complex use of solid fuel for power and chemical purposes (Investigations on gasification under pressure in a steam-D atmosphere), 3460
Condensates from pressure gas-generators, 4990
Continuous steam gasification of coal char in an electrofluid reactor (1500 to 1900°F at atmospheric pressure), 5395 Continuous production of combustible gases (Combustible gases (fuel gas, synthesis gas, and H) produced by reformation or gasification of carbonaceous material), Continuous process for the low-temperature gasification of solid fuels with the use of superheated steam (Use of cokes and anthracite), 4327 Continuous gasification of pulverized coal with oxygen and steam by the vortex principle, 3712 Continuous pressure gasification of pulverized coal in suspension, 3880 Continuous gasification of solid fuels such as coal or coke (Apparatus and method), 3327 Controlling SO_2 emissions from coal-burning boilers: status report, 1751 Controlling emissions from fossil-fueled power plants. 2113 Controlling emissions from fossil-fueled power plants (Gasification, solvent extraction, and flue gas desulfurization processes are described), 2033 Conversion of solid fuels to low Btu gas, 5572 Conversion of coal to oil and gas, 6235 Conversion of solid fossil fuels to high-heating-value Conversion of solid fossil fuels to high-neating-value pipeline gas (Destructive hydrogenation at 500-2000 psig and 1400-1700°F), 4950

Conversion of coal for future energy needs (Production of liquid and gaseous fuels from Indian coals), 6909

Cost estimate of a 500 billion Btuyday pipeline gas plant via hydrogasification and electrothermal gasification of lignite, 5146 (PB-193928) Cracking of hydrocarbons combined with gasification of coal (Combustion of coal furnishes heat for cracking of hydrocarbons), 7110

Cyclic gasification of subbituminous coal (Effects of

coal reactivity, coal particle size, waste-heat recovery, fuel bed temperatures, and cyclic times), Dedication of the Dorsten pressure gasification plant for bituminous coal (Lurgi gas producer modified so coals of Ruhr region could be gasified with C and steam at 20-30 atm), 4301 Dedication of the Dorsten pressure gasification plant for bituminous coal (Complete gasification of coal necessory to meet gas demands of Ruhr gas system), 43C2 Degasification of coal seams (Review), 3412 Description, operation, and development results of the coal-gasification plant of the Cokerie Gaziere de Strasbourg, 3886 Design and initial operation of a slagging, fixed-bed, pressure-gasification pilot plant (Design for eventual operation at pressures from 400 to 600 psig to gasify lignite or other low-rank, noncaking coals; 25 references), 4828
Desulfurized fuel from coal by implant gasification (Twostage, superpressure, O-blown coal gasifier for production of pipeline gas is described), 5268 Desulfurization in the gasification of coal (By condensing Fe carbonyl on the coal prior to gasification), 893

Development of the gasification of solid fuels during the last two decades (Review), 3386

Development of the HYGAS process for converting coal to synthetic pipeline gas (Coal-oil slurry used; hydrogasfication in 2 steps-at 1300-1500°F to produce methane from volatile matter and then at 1700-1800°F to produce methane and to effect steam--coal reaction to generate H), 5325 Developments in solid fuels gasification processes (Review of literature from 1948 to 1958, with 70 references), 4569
Developments in coal research and technology in 1937 and 1938 (Review), 5884 Developmental and rate studies in processing of coal minerals, 50
Development of the primary energy consumption and future means of refining and application of hard coal
(Discussion of processes for treating hard coal), 5402 Development of an experimental slagging, fixed-bed gasifier for production of synthesis gas at pressures to 400 psig (Gasification of North Dakota lignite and bituminous coal char), 4880
Development of hydrogenation and Fischer--Tropsch processes in Germany, 6195 Development of the conversion of coal. III. Coal as a raw material for gaseous products (Review of 79 German material for gaseous products (Review of 79 German papers on coal gas production, processing and uses (1926-1941), 3364

Developments in the oxygen gasification of solid fuels on the American continent (40 references), 4077

Devolatilization of large coal particles as applied to SziklaRozinek gasifiers (Carbonizing of coal and capification of resultant cottal 178 gasification of resultant coke), 178
Devolatilization of coal by rapid heating (Pulse heating using electric currents), 5463
Direct gasification of coal fines (Pressure of American gasification methods in current use), 3705 Direct methanation of coal, 5216 Distilling carbonaceous material, 3680 Early operations of the hydrogenation demonstration plant, using Rock Springs, Wyoming, coal, 2808
Economic evaluation of a process to produce ashless, low-sulfur fuel from coal, 5163
Economic evaluation and process design of a coal-oil-gas (CGG) refinery (Process including coal preparation, solvent-refined coal process, hydrocracking and hydroconversion, Bi-Gas process, and cryogenic separation; economic evaluation), 5419
Economic evaluation of MHD-steam powerplants employing coal gasification, 5405 Economics of generating clean fuel gas from coal using an air-blown two-stage gasifier, 5235
Effect of adding steam to the gasification air and of the heat loss in the reaction zone on the solid-bed gasification of coal (Review with 12 references), 4470 Effect of sodium carbonate upon gasification of carbon and production of producer gas, 3165
Effect of moisture in coal on its pressure gasification (Effect of 13.5-37.7% by wt. water; effect on 0 (Firect of 15.5-57.7% by Wt. water; effect on U consumption), 4972

Effect of operating conditions on the formation of methane in pressure gasification, 5075

Effective use of coal through gasification (Produced gas of CO₂ 13.0, CO 12.0, CH₄ 1.5, H 9.0, O 0.5, and N 64% from coal wastes), 4741

Effects of elevated pressure on gasification of Effects of elevated pressure on gasification of carbonaceous material by steem, 3166
Electrolytic hydrogen and oxygen in industrial gas production-complete gasification of coal with oxygen, 3252 Emission controls — status at coal burning power plants (Various methods for reduction of SO_2 emissions in stack gas), 1982 Energy prognosis for the Federal Republic of Germany from the viewpoint of introduction of nuclear heat for

vaporization of fossil raw materials, 5224 (JUL-745-RG)

```
Enery-producing gas from fine-grained coal (Gasification
  of fine-grained coal in fluidized bed with inert
  substrate at more than 2 atm with steam--air blast),
  5454
```

Engineering study and technical evaluation of the Bitumineus Ceal Research, Inc. two-stage super pressure gasification process. Research and development report No. 60, 5147 (OCR-RDR-60)

Engineering study and technical evaluation of the Bituminous Coal Research, Inc. two-stage super-pressure gasification process (Production of synthetic natural aas). 5195

Engineering study and technical evaluation of the Bituminous Coel Research, Inc., two-stage super pressure gasification process (For production of SNG from coel), 5148 (EN-294)

EPA sponsors coal combustion process (Gasification of coal with air in molten Fe bath producin fuel gas),

Estimation of coal and gas properties for gasification design calculations (Book), 3146
European gas economy, 3718

Evaluation and assay of coal for gas manufacture (Factors for predicting yields of gas, cake, tar, (NH₄)₂SO₄, and

for predicting yields of gas, care, tar, (nn, 1200, and liquor), 3164

Evaluation of the production of hydrogen by gasification of coal using nuclear heat (Production of H of 99% purity; heat transferred from nuclear reactor by stream of 435-psig He heated to 2500°F maximum; no in-reactor processing), 4885

Evaluation of solid fuel as raw material for gasification

(Classification of coals into 3 groups and optimum gasification process for each of the groups), 4320 Fxothermic catalytic gas reactions (Hydrogenation of CO

in synthesis gas produced by gasification of brown coal), 3948

Experiences and impressions of thirty years in the gas industry (Comparative economic consideration of coal and coke), 3296

Faperiment on gasification of coarsely dispersed, aqueous fuel mixtures (Gasification of coal suspensions to produce synthesis gas), 5129 Experiments on gas manufacture (Efficiency of vertical

retorts for complete or partial gasification of coal),

Experimental investigation of coal gasification processes by testing models under conditions of various aqueous regimes (Effects of coal $H_2\mathbb{Q}$ on gasification), 4718 Experiments on gasification of coal from the Bolshevik

experiments on gasification of coal from the Bolshevik coal mine (Lignite contains C 20.90, H 2.10, Ω 15.40, N 0.60, S 0.70, ash 25.80, and H₂C 36.50%; ash contains SiG₂ 26.80, Al₂C₃ 7.41, Fe₂C₃ 2.69, CaC 47.35, MgC 1.81, and (Co₂ + SO₃ + loss) 13.94%; generator of Koler type), 4831

Experimental carbonization of blends of Yallourn brown experimental carbonization of diends of failure brown coal briquet and biturinous coking coal for town gas menufacture, 7108

Experiments on a Goffin gas plant, 3155

Exxon discloses advances in coal utilization

(Gasification and liquefaction processes to produce synthetic fuels), 5517

Feasibility study of a coal slurry feeding system for high pressure gasifiers, 5253 Findings about gas formation in the early stages of the

carbonization process based on pyrolytic experiments, 5237

First synthetic natural gas from coal plant starts up (Start up of Westfield coal gasification plant), 5532
Fischer--Tropsch hydrocarbon synthesis (Mechanism), 6372

Fixed-bed pressure-gasification pilot plant for operating under slagging conditions (Description of pressure gasifier, slagging technique, and comparison of Lurgi process), 4678 Flexibility and balance in the gas industry (Production

of gas, coke, and tar; gas purification, total gasification, and special products from gas), 3267 Fluidized gasification of brown coal and manufacture of

active carbon from cyclone dust (Steam and air used as fluidizing substances), 4862 Fluidized gasification of noncaking coals with steam in a

small pilot plant, 3902

For meeting energy requirements. Hydrogen energy carrier.

Volume 1: mussery (Production, technology,
transportation, and implementation of H into energy
systems; legal aspects and economics), 5507 (N74-

Formation of benzene hydrocarbons during the gasification

[of coel], 6004
Formation of water gas and the behavior of brown coal and

Formation of water gas and the behavior of brown coal and bituminous coal cokes and semicokes in water-gas generation (Study of reactions), 3186

Forming a low-sulfur residual fuel oil from a high-sulfur coal, 6983

Fossil fuel option. Chapter II, 5560 (TID-26528)

Fossil fuel yields power+pollution (Flue gas desulfurization is major pollution contrl method; coal gasification and liquefaction after alternatives), 1901

French experimental station for the manufacture of city gas and synthesis gas from Fuveau Basin lignites. I. Experimental station at Digoin (NUNE), 3609

Fuel. 5009

Fuel, 5009

Fuel and chemical products from coal (Review; 46

references), 5072
Fuel gas, especially synthesis gas, from gas generators with tapholes (Fluidized bed gasification of coal or dry lignite), 4524 Fuel gas (Preparation from bituminous fuel or coke at

pressure of about 30 atm by mixture of air and steam), 3248

Fuel gas (Gas of high calcrific value mede from solid Fuel gas (Gas of high calcrific value made from solid powdered or finely grained fuels by making starting materials react with air or 0, steam, and CO₂), 4338 Fuel gas from low-grade bituminous coal, 4008 Fuel gas from molten iron coal gasification (190-940 Btu/ft³) (Review with 3 refereneces), 5359 Fuel gas from a granulated solid fuel (Coal gasified with air in fluidized bed), 3800 Fuel gas of high calorific value and synthesis gas low in methane (From gasification of coal in a 2-zone generator), 4523 Fuel gas plants for the process industries burn coal cleanly, efficiently (Description of Gas Integral fuel

cleanly, efficiently (Description of Gas Integral fuel gas generator), 5627 Fuel gas production from granular and powdered fuels

(Fuel is brown coal dust; gasifying agent is mixture of steam, air, and 0; equipment), 4684 Fuel-gas production by the gasification of caking coal

dust, 4588
Fuel gases (Production in fluidized bed of finely divided coal or coke), 3802
Fuel gasification. Prediction of sulfur species

distribution by free energy minimization, 5629
Fuel revolution (A review of coal liquefaction and gasification and of the Fischer-Tropsch synthesis), 6201

Fundamental factors in the rational organization of the processes of burning and gasification of solid fuels in beds, 3417

Fundamentals of calculation of gasification processes (Methods for calculation of gasification equilibria), 3371

Fundamental principles of gasification [of coal] (How the conditions for production of a gas of high calorific value can be determined mathematically from its compound), 3380

Fundamental studies on coal gasification in the utilization of thermal energy from nuclear high-

temperature reactors, 5476
Future of synthetic pipeline-gas technology (Froduction of clean pipeline quality gas by gasification of coel and methenation and desulfurization of resultant gas), 1539

Future of low Btu gas in power generation, 5400 Future possibilities in methods of gas manufacture, 3507 Future trends in the utilisation of coal energy

conversion, 5590
Gas desulfurization (Gasification of fluidized bed of solid carbonaceous materials), 816

solid carbonaceous materials), 816
Gas from bituminous fuel (Continuous gasification of bituminous fuel with steam and 0), 3271
Gas from coal. Fuel of the future (Survey with 6 references; oal gasification seen as primary substitute for natural gas; discussion of chemistry and types of processes under serious consideration; suggestion of CH, as automotive fuel), 5197
Gas-from-coal. Update, 5617
Gas from low-temperature carbonization of bituminous

Gas from low-temperature carbonization of bituminous coal, its characteristics, use, and further treatment, 108

Gas from noncoking coals (Discussion of new process), 3876

Gas from solid carbonaceous fuels (Description of fuel and O movement in combustion zone of generator), 3325 Gas generator research and development. Phase II. Process Gas generator research and development. Flore I. Flores and equipment development. Period of performance, March 1965-September 1970. Final report, 5225 (GCR-20) Gas-generator theory (Gas-generator theory and treatment of chemical equilibrium), 3406
Gas manufacture by the complete gasification of bituminous coal at Freiberg (Breisgau), 4570

Gas manufacture (By reaction of a suspension of powdered carbonaceous material in steam), 3392
Gas of high calorific power (20 atm pressure 1 vol air to 1.6 vol steam), 3277
Gas of low heating value from the gasification of coal

preparation plant waste, 3848
Gas pipe line transmission of methane derived from

gas pipe fine transmission of methade derived from pressure gasification and synthesis (NONE), 3656 Gas producers (Advantages of using preheated air and steam), 3453 Gas producer (Equipment), 4585

Gas-producer plants (Gas-producer theory is reviewed and practical operation of producers discussed), 3415 Gas production from steam, air, and coal (Slag production minimized by passing through the hot fuel alternate streams of steam containing less than 10% C and more

than 25% O; process reduces steam consumption), 4933 Gas Research Board. Report of the Director for the year 1949, 3697

```
gasifying agent at 700-1000°; CaO mixed with fuel),
COAL GASIFICATION
                                                                                                                                                      4134
                                                                                                                                                  Gasification of pulverized coal, 4135
                                                                                                                                                 Casification of coal (In geration of CO, calcium carbonate is used to react with C according to equation CaCO<sub>3</sub> + C = CaO + 2CO), 4928
    Gas Research Board. Report of the Director for the year 1951 (Review of 1951 work; coal gasification in H, G, and steam), 3853
                                                                                                                                                  Gasification of lignite and subbituminous coal (Details
    Gas rich in carbon monoxide and hydrogen from coal or
                                                                                                                                                  of design, construction, and operation of 2 pilot plants for gasification of low rank fuels), 3512 Gasification of solid fuels (Solid fuels converted to CD
        coke, 4260
    Gas sources for the present and future supply of Germany (Brief review of gasification processes in Germany),
        3317
                                                                                                                                                      and H by dispersion of finely ground fuel particles in
    Gas-turbine fuel from a pressurized gas producer (Tests of 3 coals used in modified pressurized gas producer),
                                                                                                                                                      steam and reaction with 0-containing gas at >100
                                                                                                                                                       p.s.i.g.), 4681
                                                                                                                                                  Gasification by the moving-burden technique (Review of
        3991
                                                                                                                                                      German processes for production of water gas from low-
     Gases containing carbon monoxide and hydrogen (Production
    by 3-stage gasification process), 4367
Gases rich in hydrogen (Produced by gasification of
                                                                                                                                                      rank coals), 3829
                                                                                                                                                   Gasification of inferior coals from Chomutov (Gives
    coke), 3323
Gasification of brown coal, peat, lignite, and viscous
                                                                                                                                                       satisfactory product for rotating-gate gas generator),
                                                                                                                                                      4715
    Gasification of some anthracites by oxygen. Comparison of two methods, thermogravimetry and gasometry, 5255
                                                                                                                                                   Gasification of brown coal with hydrogen in a continuous
                                                                                                                                                       fluidized-bed reactor, 4716
                                                                                                                                                  Gasification of coal with predistillation at low
temperatures (Advantage of predistillation), 3704
    Gasification by the moving-burden technique. II, 3874
Gasification of South Wales coals, 3473
Gasification of bituminous coal with oxygen in a pilot
                                                                                                                                                   Gasification of solid fuels by oxygen under pressure
                                                                                                                                                  (City gas production), 3294
Gasification of fuels. Manufacture of gas from Styrian
        plant equipped for steam-pickup feeding, 4916
     Gasification of Nazarovsk coal under pressure, 4638
                                                                                                                                                       brown coal (Equipment), 4323
                                                                                                                                                  Gasification of coal in hydrogen under pressure
(Production of coal in hydrogen under pressure
(Production of manufactured gas and coke), 3459
Gasification of fuels by oxygen (Gasification is more
effective when enriched gas and steam-0 blowing were
used instead of steam-air blowing), 4751
Gasification of finely divided fuels, 4583
Gasification of powdered fuels by the "Panindco"
process, 3778
    Gasification of solid, carbonaceous fuels (Rate of partial oxidation of pulverized coal with 0 mixed with steam under pressure at temperatures above 2200°F
     increased by use of scric vibrations), 4793 Gasification methods (26 references), 3409
     Gasification conditions for use of high-ash fuels
     (Review), 3962
Gasification of water-containing fuels (Use of alkali
                                                                                                                                                      process, 3778
                                                                                                                                                   Gasification of solid fuels with recovery of the tar
products (Recovery of all oils produced during
gasification), 3377
         metal, alkaline earth metal, Fe aluminates and
    metal, alkaline earth metal, re aluminates and silicates, or Al slicates as catalysts), 4586 Gasification of char with sulfur dioxide (Production of carbon monoxide and sulfur), 5498 Gasification of lignite in a commercial-scale pilot plant: Progress report from July 1, 1950 to Dec. 31, 1951, and summary of work previous to July 1, 1950 (At 1600 to 19250f, mechanical performance of externally heated allow-steel retort). 4178
                                                                                                                                                  gasification of pulverized coal (Final product contains CO<sub>2</sub> 22.0, CO 29.5, H 38.0, and CH, 0.5%), 4175 Gasification of Dimitrovo coal in generators for mixed gas (Efficiency of gasification (as regards coal gas) is about 69%), 4459 Gasification of solid fuels (Apparatus is described to
          heated alloy-steel retort), 4178
     Gasification research with various brown coals and cokes
                                                                                                                                                   give high conversion of coal), 4897
Gasification with oxygen (200 atm commercial size plant
    in a rotating-grate generator, 4104
Gasification of the tailings of coal-beneficiation plants. I (Carbonization in N stream at 950°; quality of producer gas given as function of gasification rate), 4611
                                                                                                                                                  Gasification with oxygen (200 atm commercial size plant in Germany), 3173
Gasification of solid fuel (Solid fuel particles are gasified in a state of suspension), 4494
Gasification reactor, 5623
Gasification of solid fuel with superheated water vapor (Gasification of semicoke (brown coals and shales), anthracite, and charcoal; feed rate of steam was 20-200 g/min at 650-1000°), 4639
Gasification of solid fuels for the production of fuel gas of low carbon monoxide content (Ontimum conditions
     Gasification of solid fuels in a slagging producer (In
         gas producer in wich molten slag in sprayed into
furnace as principal heat source, use of C or highly
enriched air preheated to at least 1000° as
gasification agent allows use of low-grade coal or coke
                                                                                                                                                       gas of low carbon monoxide content (Optimum conditions for pressure gasification of coal and generation of gas low in CC similar to coke-oven gas to town gas; usual conversion catalysts of oxides of Fe and Cr can be
          as fuel), 5012
     Gasification of coal from west Germany (Review), 3354
Gasification of fuels (Use of less O and steam to produce
more synthetic gases and a solid residue that can be
         used as fuel; high volatile bituminous coal produced gas of: CG 46.1, H 44.0, CG<sub>2</sub> 8.6, CH<sub>4</sub> 0.6, N 0.5, and
                                                                                                                                                        used, also exides or sulfides from Groups VI and VIII),
                                                                                                                                                   Gasification of solid fuels, 3559
Gasification of solid fuels (At less than 20 atmospheres
     H<sub>2</sub>S 0.2%), 4356
Gasification of coal by hot recycled helium in a
         laboratory-scale exchanger-type gasifier (Study of feasibility of using He to transfer heat from nuclear
                                                                                                                                                       pressure), 4702
                                                                                                                                                  Gasification of coal with oxygen (Peralieo discussion of problems), 3281
Gasification of Kiselev-Afonin coal (Results in a Guth-Rettger generator equipped with a Chapman rake), 3309
Gasification process (By introduction of steam into mixture of carbonaceous solid fuel and CaO), 3924
Gasification (Of coal with oxygen and steam in 2-stage
                                                                                                                                                   Gasification of coal with oxygen (Detailed discussion of
     reactor to gasify coal; coal fed as \rm H_2O slurry), 4859 Gasification of powdered coal in a cyclone furnace
         (Operating data; combustion of coal with deficiency of
     Gasification of lignite from the Moscow region with
         carbon dioxide and nitrogen additives in the blast,
                                                                                                                                                       process to produce CH,-rich gas and synthesis gas),
    5105
Gasification of solid fuel (Production of synthesis gas from coal), 4478
Gasification of powdered coal in suspension, 4479
Gasification of Washington coal (Dissertation), 4112
Gasification (In gaseous medium), 4009
Gasification of solid fuel by O, water vapor, and heat to give mixture of Co, H, and CO<sub>2</sub> suitable for synthesis of alcohols, 3232
Gasification of low-quality fuels with a steam-oxygen
                                                                                                                                                        4157
                                                                                                                                                   Gasification of gas-flaming coals in retorts (Heating value of gas produced is lower than that from gas
                                                                                                                                                   coals), 4293
Gasification of coal in producers and water-gas
generators (8 references), 4073
                                                                                                                                                   Gasification of Rhine brown coal with Rhine water (Pilot experiements on gasification of crude lignite
                                                                                                                                                   containing 55% water), 5389
Gasification of fine anthracite (Extent of gasification
      Gasification of low-quality fuels with a steam-oxygen
      blast, 3234
Gasification of Muscovite coal with the steam-oxygen
                                                                                                                                                        is higher with steam than with carbon dioxide), 5250
      blast (Steam--O mixture blown in at pressure of 20-25 atm at 450-500^\circ; gases purified by HOCH_2CH_2NH_2), 4277 Gasification of solid carbonaceous materials (Two-stage
                                                                                                                                                    Gasification of lignite and subbituminous coal (NCNE).
                                                                                                                                                        3454
                                                                                                                                                    Gasification of combustible material (In molten slag),
    Gasification of solid carbonaceous materials (Two-stage process for coal, lignite, oil shale, etc.), 3947
Gasification of coal from the Moscow region by means of oxygen blast under pressure, 4561
Gasification as a new rational method of utilizing coal wastes obtained in coal preparation in washers (Using Lurgi-type generators), 3518
Gasification of coal (Production of water gas), 4167
Gasification of bituminous coal in producers with special reference to the production of cold clean gas for industrial purposes (Design, operation, and working
                                                                                                                                                        4013
                                                                                                                                                    Gasification of bituminous caking coal, 4239
Gasification of solid fuels (At 5-50 atm pressure using D
                                                                                                                                                    and water vapor containing CO_2), 3326
Gasification significance to the anthracite industry
                                                                                                                                                       (General discussion), 3899
                                                                                                                                                    Gasification-significance to the bituminous-coal industry
                                                                                                                                                   Gasification-significance to the bituminous-ccal indust:
(General discussion), 3901
Gasification of solid fuels in a cyclone (93% carbon conversion is claimed), 4779
Gasification of small-grained coal in a "bubbling" layer using an cxy-steam blow (Calorific value of gas is 2200 to 2300 kg cal/m³), 3398
Gasification or liquefaction: where we stand (In-depth
     industrial purposes (Design, operation, and working cost of plants), 3432
Gasification behavior of solid fuels in small gas producers. I. Coke (from low-temperature carbonization) in gas producers with increasing gasification, 3315
Gasification of coke or coal (Saturated steam is
```

status report on coal and coal conversion processes in

```
USA). 5580
Gasification of solid fuel, 4867
Gasification of pulverized coal (International developments in total gasification), 845
Gasification of fuel dusts under pressure (Review with 18
references), 4812
Gasification and liquefaction of coal (Book; symposium proceedings including 15 papers), 3986
Gasification of subbituminous coal and lignite in externelly heated retorts (Production of CO and H),
     35 A5
Gasification of pulverized coal with steam and oxygen
     atmospheric pressure (Results of 34 tests in pilot
plant gasifier), 4121
Gasification of coal fines, 4021
Gasification of solid fossil fuels in a microwave
      discharge (Extent of gasification depended on C content
discharge (Extent of gasification depended on C content of solid), 5210
Gasification of the dust of Moscow region brown coal and its coke in media ballested by cerbon dioxide, 5211
Gasification of coal fines in a laboratory plasma-
chemical reactor with a spouted bed (Ar plasma), 5212
Gasification of carbonaceous solids (Gasification
      accomplished by introduction of steam at 900°F), 3911
 Gasification of lignite in a gas-producer of ordinary construction (Analysis of lignites used and products
found), 4663
Gasification of solid fuels (Review; lecture), 3657
Gasification of brown-coal briquets and hard brown-coal
in the prometheus-Weber gas producer (Cracking of gas at 500-600°), 3383
Gasification of fuels. Coal gasification in France, 4306
Gasification of solid fuels by fluidization. II
(Comparison of coke, semicoke, and coal), 3843
Gasification of solid fuels by fluidization, 3844
Gasification of solid fuels by fluidization, 7844
Gasification of coal (G/coal and steam/coal ratios investigated), 4462
Gasification of fine coke and coke-coal mixtures
(Production of a gas with a heating value of 1261
  calories), 3304
Gasification of semicokes from brown and bituminous coal
       and high-temperature coke from bituminous coal (Use of
  steem and air saturated with water vapor), 3254
Gasification of coal with pure oxygen and steam instead
of air (20 atmospheres), 3255
 or air (20 atmospheres), 3600
Gasification of finely pulverized, high-ash coal
(Production of water gas), 3816
Gasification of finely divided carbonacecus solid,
liquid, or gaseous fuel (Gas consisting largely of H
and CU made by partial combustion of powdered coal),
        4589
  Gasification of carbonaceous solids (Production of
  synthesis gas from coal), 4003
Gasification of coal in a shaft furnace and simultaneous
        recovery of iron from ores (Equipment and process),
        4344
 Gasification of lignites in a fluidized bed under pressure using air-water blowing (Use of air-water mixture instead of steam to produce water gas), 5266 Gasification of bituminous coal with oxygen in a pilot plant equipped for slurry feeding, 4843 Gasification in a slag bath, 4655 Gasification of Pechorsk basin coal (Composition of gas CO<sub>2</sub> 21.66-30.45%, C/sub n/H/sub m/ 2.75-3.54, CO 9.25-12.71, H 10.46-11.45, CH, 37.51-40.71, C<sub>2</sub>H<sub>6</sub> 6.49-8.48, and N 0.21-3.59%), 3761 Gasification of fuels (With steam and air or 0 with added H at medium pressures and not over 7750), 4164 Gasification of bituminous fuels (Solid bituminous fels that are to be gasified in the fluidized state by 0 or steam are pretreated by contact at <4000 (150-3000) with gas containing free 0 sc no substantial formation
   Gasification of lignites in a fluidized bed under
  with gas containing free 0 so no substantial formation of C oxides occurs), 4601
Gasification of Italian fuels by means of oxygen
  (Production of very pure water gas), 3311
Gasification of coal (Gasification of pulverized fuels),
   Gasification of brown coal (In Brock-Wilson gas
        producer), 3755
    Gasification of solid fuels (Production of synthesis gas
   Gasification of solid fuels (Production of synthesis gas in producer), 4160
Gasification of coal with laser light irradiation, plasma jet, and discharge-generated excited species (Review with 25 references), 5150
Gasification of the Donets anthracites to produce water gas and mixed gas (Calorific value of water gas of 2700 to 2455 cel/m³; mixed gas has calorific value of 1262 to 1185 cel/m³), 3261
Gesification of carbonacecus solids (Two-stage
```

Gasification of carbonacecus solids (Two-stage

5192

4322

gesification process for production of low-sulfur fuel and methane-rich gas), 5392 Gasification of lignite by ECR [Bituminous Coal Research]

two-stage superpressure process (Hot synthesis gas generated internally by reaction of benzene or cyclohexane, C, steam in simulated first stage that entrains and gasifies pulverized coal feed; equipment),

Gasification of fuels. Pressure gasification of brown coal for town gas production in Victoria, Australia,

Gasification of coke with carbon monoxide -- carbon dioxide

```
mixtures (Study of effect of temperature, gas
composition, and lump size on rate of gasification of
coke on samples of 10-60 mm dia. at 900-1100°), 5252
Gasification of coal (Review of major processes of
current interest (1974)), 5614
Gasification of powdered anthracite in a stream of
          superheated steam (Greatest effect obtained by
combining production of water gas with subsequent
calcination of nongasified residue in furnaces), 4629
calcination of nongasified residue in furnaces), 4629 Gasification of anthracite in the Pintsch-type generators (Production of a gas with a calorific value of 1300 cal/cu. m), 3329 Gasification of coals of the Turgaisk Basin (Use of low-rank coals in air-steam blast generators to produce gas of 1400 to 1459 Kcal/m³), 4530 Gasification of Ukrainian brown coals (Coal gasification at 25 atms. and 1000° with steam and C2; heating value of 4253 cal. per cu. m), 3239 Gasification of fuels in gas works with special
  Gasification of fuels in gas works with special consideration of the continuous production of water gas (Review with 15 references), 3375
   Casification of solid fuels for the direct preparation of converter gas (Gasification of semicoked brown coals),
  Gasification of anthracites (Gasification at 500 and 1000 by 0 and C dioxide, resp.), 5036
Gasification techniques (Extensive bibliography for 1960-
  1962 with brief notes), 4894
Gasification of solid carbonaceous materials (Finely
           divided coal or charcoal in fluidized state alternately heated in presence of air and gasified in presence of
  heated in presence of air and gasified in presence of steam), 4605
Gasification of solid carbonaceous materials (Finely ground bituminous coal mixed with petroleum residuum and pumped at 1200 p.s.i. at 700°F to gas generator operated at 250 p.s.i. and 2500°F), 4606
Gasifying finely divided carbonaceous fuel such as dust
  Gasifying finely divided carbonaceous fuel such as dust coal (By producing a substantial pressure difference between the regenerating zone and the gasifying zone and introducing sealing steam into the path during the heating period (700 to 1600°)), 3276 Gasifying fuel with air enriched in oxygen, 3181 Gasifying powdered carbonaceous material, 3897 Gasifying solid fuels in the gas industry (Review of process and commercial installations in Britain and South Africa), 4841
    South Africa), 4841
Gasifying carbon materials (Gasification of coal in the
             presence of a metal oxide as an oxygen carrier
             supplying heat), 4487
    Gasifying coal (Coal is coked on the surface of heat-
exchange pebbles and subsequently gasified), 4488
Gasifying fuels (Manufacture of 1 million cu. ft./day of
water gas), 3909
    Gasifying finely divided carbon fuels such as coal
    casilying linely divided carpon luels such as coal, charcoal or peat (Using gas stream of 700° to 1500°C containing water vapor), 3272
Gasifying carbonaceous fuels (Coking of ground coal at 1200°F; production of 50,000 cu. ft. of CO + H), 3910
Gasifying coal and/or cil with hydrogen, 5180
    Gasifying water-containing coal (Apparatus described for coal gasification), 5520
Gasifying finely divided or powdered fuels (Passage of
     free \mathbb{Q}_2 into gas stream of product prevented), 3365 Gasifying fine-grained solid fuels (Gasification and combustion agents blown through solid fuels at high
  Gasifying fine-grained solid fuels (Gasification and combustion agents blown through solid fuels at high speed to promote boiling action), 3270
Gasmaking from Victorian brown coal (Review), 3430
Generating gas from powdered coal (Use of hot ''converting'' gas in multi-phase process), 3328
Generating producer gas (4100-4200 Kcal/m³), 3526
Generation of water gas and synthesis gas from brown coal, peat, and bituminous coal in the Pintch-Hillebrand plant at the Hamburg gas works, 3337
Generation of heating gas from solid fuels (Gasification at high temperature; use of hydrocarbon oil to reduce carry-over of coal particles in gas stream), 4031
German use of low-grade fuel with rich oxygen (Pressure gasification to produce a 456 B.t.u. gas), 669
Gilbert proposes short lead-time coal-fueled combined cycle (Utilization of ignifluid boiler), 5558
Hearth gasification of coal in power production (Produces high CO:(CO + CO<sub>2</sub>)), 3837
Heat of reaction of hydrogen and coal (Report on heat of reaction of H and various percent gasified coal for 1000-1500°F and pressures up to 1500 psis; heat of reaction for pretreatment of coal; heat capacity of chars), 5025
High Btu gas by the direct conversion of coal, 5042
High-Btu gas by the direct conversion of
      chars), 5025
High Btu gas by the direct conversion of coal, 5042
High-Btu gas by the direct conversion of coal
(Experiments at 1500 and 3000 psig and 725°), 4996
High-Btu gas from coal via gasification and catalytic
methanation (40-atm fluidized-bed gasifier used at 950°
to produce high yields of methane; Raney Ni used as
catalyst), 5155
High-calorific-value gas from coal for pipeline
transportation (Gas high in methane produced from char
                  transportation (Gas high in methane produced from char
from low-temperature carbonization of cal at 800-
1400°F, char treated with H and steam at 1200-2000°F
```

574 CCAL GASIFICATION and 50-150 atm), 4967 High-pressure gasification of coal in Germany (Production of 470-490 B.t.u. gas), 3517 High-pressure fluidized beds [for production of natural substitute from coal or oil] (Three-stage process), 5107 High-pressure liquid-phase hydrogenation of coal by experimental flow plant (Plant designed to hydrogenate 50 to 80 kg of coal/day at 700 atm; coal fed as paste; agitation of paste has effect on results), 6816 High-pressure gasification of brown coal in Victoria (Production of town gas from brown coal briquets by Lurgi process; review), 3887 High-temperature energy systems. Quarterly progress report, August 1--October 31, 1964 (Research progress on 250 psig simulated nuclear coal gasification system), 4922 (TID-21596)
High-temperature energy systems. Quarterly progress report, February 1--April 30, 1965 (Research progress, including studies on alleys for fluidized-bed coal gasifiers using nuclear reactor heat), 4957 (TID-22009) Highlights of a busy year for coal, 594

HRI coal gasification (Hydrocarbon Research Inc. experience in cre gasification during the 1950's. Recent demonstration of feasibility of Synthane process for USBM), 5362 Hydrocarbons and oxygen-containing compounds by hydrogenation of carbon monoxide (Solid fuels gasified under pressure (10-40 atm) with addition of 0 and steam but not CO₂: Fischer--Tropsch synthesis), 6686 Hydrocarbon fuels by pyrolysis of ccal (First portion of char passed to fuel cell or MHD device to produce d.c. and second portion to apparatus where char with steam forms producer gas), 7153 Hydrocarbon-rich fuel gas by hydrogenation of coal (800°, 25 atm), 4153 Hydrogasification of bituminous coals, lignite anthracite, and char (Hydrogasification at 800° and 6000 psig using Mo catalyst), 4854
Hydrogasification of pretreated coal for pipeline gas production, 5046 Hydrogasification of carbonaceous material (Materials such as coal, tar, petroleum residues, oils, and chars; production of high calorific value gas using Al chloride catalyst), 5218
Hydrogasification of brown coal to produce methane natural gas (Equipment and procedures), 5189 Hydrogasification of pretreated coal for pipeline ga production (Tests at 1000 psig and between 1200 and 1900°F), 4988Hydrogasification. Efficient method for the exploitation of low-grade Indian coals (Discussion of relative merits of 3 processes for gasification of Indian coals), 5040 Hydrogasification of coal (Lecture), 4797 Hydrogasification of high-volatile A bituminous coal (At B000 and with coal residence time of several sec, yields of hydrocarbon gases increased from 2000 scf/ton at 250 psig to 7000 scf at 1000 psig), 4907

Hydrogasification of coal liquids (Review on Stone and Mebster Gasification or coal liquids (Neview on Stone and Webster Gasification Process using stepwise addition of H to liquefied coal; heat supplied from nuclear heat source; no references), 5425

Hydrogen - a clean fuel for urban areas (Production of hydrogen by gasification of coal and shale oil or by electrolysis of water), 3133 Hydrogen: key to the economics of pipeline gas from coal. Paper No. 15, 5149 Hydragen as a fuel source (Production of low-Btu hydrogen of hydrogen-rich mixed gas from coal), 5435 Hydrogen-carbon monoxide mixture (Production by coal gasification), 4171 Hydrogen processing of coal and the kinetics of desulfurization. Paper No. 36 (Pyrolysis and gasilication of bituminous coal), 1486 Hydrogen sulfide poisoning of nitrided and carbided iron catalysts in the Fischer--Tropsch synthesis (NONE), 6792 Hydrogenation of cool at high temperatures (Production of CH_a at 1200-1450°F and 6000 lb. per sq. in. pressure), 3691 Hydrogenation gasification of brown coal using heat from high-temperature reactors, 5214 Hydrogenation of carbon monoxide with simultaneous production of fuel gas (Sollid fuel (e.g. coal) gasified under pressure of 20-30 atm with 0 and steam; S compounds removed by washing with CH3OH or C2H5OH), Hydrogenation of coal to gaseous hydrocarbons (Pilotscale test on nonfluidized and fluidized process at high temperature), 4102
Ignition of coal and high-speed gasification (Theoretical), 3301
Importance of temperature approach in heat exchangers (In coal gasification plant), 5290 Improvements relating to gas production (Production of synthesis gas by partial oxidation of atomized dispersions of liquid sturries of solid carbonaceous

fuels), 5396
Improving the calorific value of fuel gases (Calorific value of gases from pressure gasification of coal, etc. by steam and 0 improved by enriching with CH, obtained by reaction at $350-400^\circ$ between CC2 and H in the gases), 4925 situ gasification of coal by gas fracturing (Patent), 5557 Industrial destructive distillation of coal from the Ekibastus deposit (Ccal is suitable for recovery of fuel gas), 4607 Inertia of the process of gasification in a bed of solid fuel, 4528 Influence of operating variables on synthesis gas production in pressure coal gasification (Pilot plant), 3974 Influence of inorganic constituents in the carbonization and gasification of coal: the liberation of ammonia (Lime, CaCO3, and Fe oxide), 68 Influence of volatile constituents on desulfurization of coal during low-temperature gasification (Removal of S in coking coal is more difficult because of tendency to sinter), 1057 Institution Gas Research Fellowship Interim Report 1952-53. Study of fluidized gasification, 3994 Institution Gas Research Fellowship Report: 1953-54. Fluidized gasification of coal (Single-stage process for continuous gasification), 4196
Investigation of the use of oxygen and high pressure in gasification. II. Synthesis of gaseous hydrocarbons at high pressure, 3263
Investigation of the use of oxygen and high pressure in gasification, and Part IV. Synthesis of gaseous hydrocarbons at high pressure (Comparison of 4 gasification processes), 3461
Investigations of the continuous process of gasification of brown coals for the direct production of converter gas for use in ammonia synthesis (Production of H_2-N_2 mixture suitable for production of NH3), 4380 Investigations with a small pressure gasifier I. Study of the reactions occurring in the fuel bed, 4091 Investigation of the use of oxygen and high pressure in gasification. III. Synthesis of gaseous hydrocarbons at high pressure (At 800° and 50° atmospheres pressure), Joint problems of energetics and coal processing (Use of nuclear heat for coal gasification in Poland), 5447 Kalle process (Reduction and oxidation processes according to Kalle principle), 3403 according to Kalle principle), 3403 Kinetic studies on the pyrolysis, desulfurization, and the gasification of coals with emphasis on the nonisothermal kinetic method (Objective was to determine kinetics of desulfurization as aid to design, operation, and evaluation of new process systems for practical desulfurization), 7146
Kinetics and mechanism of the reaction between oxygen and kinetics and mechanism of the reaction between oxygen and carbon and its significance for rapid gasification. I. Kinetics (Below 800°C, C + Ω_2 + $C\Omega_2$; between 800 and $1000^{\circ}C$, $C\Omega_2$ and $C\Omega$ are primary products; above $1000^{\circ}C$, only $C\Omega$ is formed by reaction $2C + \Omega_2 + 2C\Omega_1$, 4803 Kinetics of lighte char gasification. Relation to carbon dioxide acceptor process, 5103
King coal's rebirth (List of principal coal conversion processes inuding gasification and liquefaction; cost of synthetic fuels), 5628 Koppers--Totzek gasification process (Gasification using coal dust and 0), 4472 Koppers--Totzek process for the gasification of pulverized coal, 3719
Koppers--Totzek process for total gasification of coal dust. 4046 Laboratory-scale gasification of coal-water sluppies in a Laboratory-scale gasification of coal-water slurries in a metallic tube coil (Powdered, noncoking, low-rank coal gasified with steam in externally heated tube), 4776 Laboratory-scale work on synthesis-gas production (Including 3 stages, gasification in 3-in. tube with wet purification system, gasification in 6-in. tube with dry residue recovery system, gasification in large unit with pneumatic coal feeding and dry residue recovery system), 3773 Large-scale gas generator IGI-2 (Gasification of coal Large-scale gas generator IGI-2 (Gasification of coal with production of gas with heating value of 1400 cal. per cu. m.), 3285 Lignite gasification plant shown at Grand Forks, N. Dakota. Staff Report, 3435 Liquid gas and coal (Reserves of gas and coal for Liquid gas and coal (Reserves of gas and coal for synthetic liquid fuel processes), 3499
Look at gasification of coal (Estimates for supplementary natural gas needs through the year 2000), 5451
Low-sulfur char as a co-product in coal gasification (Production of low-S producer gas in gasification-desulfurization process; calcium carbonate used as S acceptor), 5388 Low-sulfur char as a co-product in coal gasification (In a gasification-desulfurization operation), 5317 (PB--214 162/0)

Low-sulfur char as a co-product in coal gasification (Production of low-S producer gas), 5316 (PB--214

Low-sulfur char as a co-product in coal gasification (Using calcium carbonate as S acceptor in

162/0)

```
desulfurization phase of gasification-desulfurization
operation), 1787 (PB-214162)
Lurgi gasification experimental work carried out at the
University of Melbourne, 3648
                                                                                                                                         Oxidizing-pressure distillation of solid fuels (Use of
Lurgi-gasifier tests of Pittsburgh-bed coal (Description
of apperatus), 5002
Lurgi process (Production of SNG from coal), 5460
Make SNG [substitute natural gas] from coal (Review with 21 references), 5258
Making coal, water, and carbureted water gas
     simultaneously (Temperature and pressure effects on
yields), 3223
Making producer gas a competitive fuel, 3984
Manufacture of synthesis gas in continuous vertical ovens
(Partial gasification of Japanese coal), 4422
Manufacture of fuel and synthesis gas in the United
     States (Investigation underway on coal gasification),
     3694
Manufacture of cold clean producer gas (Review with 37
references), 4447
Manufacture of industrial and domestic gases by means of electricity (complete gasification of coal with oxygen), 3250
Manufacture of water gas from coal (Review of
possibilities of using coal in water-gas sets), 4187 Manufacture of water gas from anthracite (Effects of
Manufacture of water gas from anthracite (Effects of temperature and heating rate on amount of fines), 4233 Manufacture of substitute natural gas from coal (Review with 61 references), 4677 Mechanism of water-gas reaction. Report on experimental work done for the A. G. A., 3501 Methane and hydrogen mixture from coal gas, water gas, producer gas or the like (Chromiferous iron and water-
liberating agents as catalyst), 3153
Methane formation during gasification of the Velenje
Lignite (Maximum methane yield at 15 atm and 750-900°),
     AGIR
Methane from coal (Hydrogasification for production of
gaseous hydrocarbons), 4840

Methane production from solid fuels and steam (CH, produced by coal and steam at 20 atm and 300-5500),
Method for feeding dry coal to superatmospheric pressure
(Patent), 5555
Method of calculating gasification processes in
suspension, 4075
Methyl fuel could provide motor fuel (Coal is processed
     to synthesis gas which is then catalytically converted
 to methanol and C_2--C, alcohols), 5518 MHD system with dual pressure melt gasification and CO_2
     recycle. Research and development report No. 58, 5134
     (NP-19944)
 Modern coal-gasification methods. I. II. (Review), 3536
 Modern gas producers (Review; equipment), 4331
Modern methods of carbonization (Coal was carbonized to a
 gas; yield of 19,300 ft3 of 425 BTU gas/ton), 121
Much gas from little coal (Neans for improving gas
     yields), 3341
Naphtha and gas from coal, 4892
New coal-utilization methods, 2541
New developments in coal dressing and coal by-products
     (Review of extraction processes and coal gasification),
New efforts at the industrial evaluation of the
gasification of fuels by means of oxygen, 3158
New fuels. Old coal (Design and construction of
     gasification reactors; liquid fuel production using fluidized bed techniques), 5289
 New horizons for pressure gasification. Production of
clean energy (Review of processes for converting fossil
fuel feedbacks into CH<sub>n</sub>; no references), 5262
 New processes brighten prospects of synthetic fuels from
     coal, 5621
 New process for the pressure gasification of brown coal
     with oxygen (At 20 ats pressure using oxygen and steem), 3176
 New technologies in coal utilisation in the USA - key to
New technologies in coal utilisation in the USA - key to future energy supplies (Production of syngas, low Btu gas, and synthetic liquid fuels), 5587

Non-caking coal gasified in a stirred-bed producer, 5612

Nonagglomerated brown-coal gasification of the Ukrain.

SSSR with a steam-oxygen blast under pressure and under laboratory conditions (Pressures up to 50 atm; effect of pressure on Btu of gas), 4181

Noncaking coal gasified in a stirred-bed producer, 5609

Nuclear energy for coal gasification (Review with 10 references), 5424

Office of Coal Research history and activities, 5339

(CON-731027-1)
     (CONF-731027-1)
(CONF-731027-1)
On production of liquid fuel frow coal in India (Deals with coal gasification, gas refining, and application of Fischer--Tropsch synthesis), 6829
Operating experience with a complete gasification plant (Operating difficulties), 4092
Organic sulfur in synthesis gas - occurrence, determination, and removal (Coal gasification as source of synthesis gas), 750
Other Office of Coal Research projects (Survey of projects for production of low- and high-Btu gas and by-products), 5348
```

by-products), 5348 Overview of supply/demand for the next decade, 5477

```
compressed \Omega_2 and superheated steam), 3367

Oxygen gasification of coal. Some unsolved processing problems, 4286
Oxygen gasification of anthracite (Production of higher-
quality synthesis gas and a more compact ash), 3498 Gxygen in the production of hydrogen synthesis gas (58
references, description of Koppers, Winker, Lurgi,
Thyssen-Galocsy and Leuna processes), 3581
Oxygen problem (in fuel gasification) (Gasification of
          soft coals at atmospheric pressure and under pressure),
        3192
Pattern of fuel research (Review), 3599
Pebble heater adapted to coal gasification (Apparatus for use with low-ash-fusion-temperature coals and coals
         with relatively high S content; conversion of organic S
with relatively high S content; conversion of organic compounds to H<sub>2</sub>S), 4035
Performance of a gas-synthesis demonstration plant for producing liquid fuels from coal (Production of gasoline and diesel oil; dust in raw gas removed by cyclone separation, wash scrubbing, and electrostatic precipitation; CG<sub>2</sub>, H<sub>2</sub>S, and organic S compounds were removed with diethanolemine, Fe oxide, and activated
         C), 6761
Performance of the hot gas generator on [oxygen] enriched blast (Results of O enrichment tests; increasing amount
of O increased thermal value of product), 4557
Petrol from coal for US studies (Production of synthetic crude and natural gas), 7016
Physics of gasification processes. Research problems of gasification technique (Physical state of fuel undergoing gasification), 3321
Pilot plant for gasifying powdered coal entrained in oxygen and steam (One-step process for production of low-cost synthesis gas), 3600
 Pilot plant studies on suspension gasification of Neyveli
lignite (Use of Koppers--Totzek suspension-gasification
pilot plant), 4976
  Pilot-plant gasification of high-ash coals under pressure
 with steam-air blast, 4426
Pilot-plant gasification of pulverized coal with oxygen
and highly superheated steam, 3721.

Pilot-plant gasification of pulverized coal with oxygen and highly superheated steam (Production of low-cost
synthesis gas), 3702
Pipeline gas from lignite gasification: current commercial economics, 5124 (PB-184721)
Pipeline gas from coal by methanation of synthesis gas,
4888
Pipeline gas from coal (Gasification of coal to produce synthesis gas from which CH, is produced catalytically), 4054
Pipeline gas from lignite gasification. Feasibility study. Appendix, 4963 (PE-166818)
Pipeline gas from coal using nuclear heat: technical and economic evaluation (Production of 915-Btu gas), 4886
          (CONF-393-5)
  Pipeline gas from lignite gasification. Feasibility study, 4961 (PB-166817)
  Plant-scale investigation of the reactivity of various gasification materials (Wood charcoal; brown coal briquets; cokes from brown coal; coke from bituminous
         coal; increase in gas yield by pretreatment with
  K<sub>2</sub>(O<sub>3</sub>), 3253
Pollution-free fuels (Patent on production of
  desulfurized liquids and gases), 5539
Possibilities of Fischer--Tropsch process, 3963
Possibility of producing a sulfur-free producer gas (Use of CaO to eliminate H<sub>2</sub>S from gas), 4534
Practice of (gas) generating process (Design and
  performance of coal gasification installations), 3175
Preliminary coal gasification experiments (Heating in steam and steam-hydrogen mixtures to 725°C), 5472
          (UCID-16265)
  Preliminary report on coal gasification (Texaco pilot plant studies on production of synthesis gas), 3990
  Preparation of carbon monoxide and hydrogen from
          carbonaceous solids (Synthesis gas from coal
  carbonaceous solids (Synthesis gas from edg.)
gasification), 4238
Prepare coal for gasification, 5613
Present state of the development of complete gasification
(of coal in Germany) (Review), 3369
Present status and future possibilities in gasification
  Present status and future possibilities in gasification processes, 3497

Present state-of-research in gas generation from coal through steam gasification with use of heat generated in high temperature, gas cooled, nuclear reactors, 5561

Pressure gasification of some noncoking coals, 5213

Pressure gasification of solid fuels in the presence of coals, and the presence o
          oxygen and steam (Discussion of principles, methods,
  oxygen and steam (Discussion of principles, methods, economics, and energy calculations), 3725
Pressure-gasification of solid fuels with oxygen, 3357
Pressure gasification with oxygen of solid fuels in Germany (Process changes needed to use bituminous coal in Lurgi brown coal gasifiers; temperature of high-pressure steam has to be lowered), 4796
Pressure gasification of brown coal and other solid fuels (Review and description of new plants in Europe,
```

coal under pressure, 4676
Production of synthesis gas from high ash noncoking coals
in an experimental fixed-bed slagging gasifier (Review
of status of research in slagging gasification of lowgrade, high-ash coal with 0 ad steam for production of grade, high-ash coal with 0 ad steam for production of synthetic gas), 5000

Production of hydrogen and synthesis gas by the oxygen gasification of solid fuel, 3607

Production of electricity via coal and coal-char gasification. R and D report No. 65, interir report No. 3 (First phase of study of potential process alternatives for converting coal or coal char into electricity via the production of low Btu gas for combustion in an advanced combined gas-and-steam turbine power cycle), 5480 (NP-20076) Production of gaseous and liquid fuels from brown coal (Review of European methods and discussion of possible applications in Australia), 3649 Production of high CH, content by reaction of bituminous coal or coke with superheated steam at 800 to 1000° and coal or coke with superheated steam at 800 to 1000° and 5 to 20 atm pressure, 3178

Production of detoxicated pipe-line gas through pressure gasification and synthesis over iron catalysts (Combination of Lurgi pressure gasification process and conversion of CO over Fe catalyst to CO₂, CH_a, and liquid products, (Lecture)), 3714

Production of gas for ammonia synthesis from coalgasification and coke-oven gas (Synthesis gas obtained by catalytic cracking of hot oven gases in 2 steps with addition of steam and O-containing gases at high temperature), 5055 Production of desulphurised liquids and gases from coal, 5385 Production of hydrogen from coal char in an electrofluid reactor, 3148 Production of liquids and gases from Savage, Fontana lignite by hydrogenation with a nickel tungsten catalyst (NONE), 6879 Production of methane from coal. Economic study (Economic study of high-Btu pipe-line gas), 3833

Production of generator gas from Chukurovski coal by oxygen enrichment (Addition of 3.5% 0 to air and steam resulted in 150 kcal/m3 increase in heat content of gas produced), 4802 Production of city gas from solid and liquid fuels (Study of gasification of coal under pressure and combination with gasification of liquid hydrocarbons or with with gasilication of liquid hydrocaroons or with carburetion of H-rich gas from natural gas), 4984 Production of municipal gas by gasification of solid fuel (Historical review of gas production; advantages of high-pressure system), 3651 Production of illuminating gas from Gusinoczerskii coals, 4971 Production of gaseous hydrocarbons from coals and their tars (Production of olefins; economics), 3771 Production of synthetic gas from Joban coal and natural gas (Operation report on Koppers-Totzek furnace), 4564
Progress in coal research (Summary of US work), 7029
Progress in the manufacture of natural gas from coal (Review with 3 references), 5265 Progress of underground gasification (England, 1950). Progress of fuel gasification (Review), 3241 Progress report on operation of pressure-gasification pilot plant utilizing pulverized coal and oxygen, 3966 Proposed prototype plant for the production of high-bu gas. Paper No. 4 (Fluidized bed, steam-oxygen gasifier with methanation unit), 5135
Pulverized-coal-fired gasifier for production of carbon monoxide and hydrogen (Description of pilot plant installed at Morgantown Station), 4111 Pulverized-coal gasification - Ruhrgas processes, 3977
Purification of synthesis gas produced from pulverized coal. Specifications, purification processes, and analytical methods, 3582 Purification of synthesis gas. Removal of dust, carbon dioxide, and sulfur compounds (Production by reaction of coal with O and steam), 953
Quality requirements for substitute natural gas. Paper
No. 6, 5280 Rapid high-temperature high-pressure hydrogenation of bituminous coal (Noncaking high-volatile coal gasified in H at 850-950°; product gas contained 25% methane at 500 atm and 900°), 5048 Rapid high-temperature hydrogenation of coal chars. Part I. Hydrogen pressures up to 100 atmospheres (Experiments performed in tube at H pressure of 100 atm, 800 to 950°C, and flow rate of 80 to 280 liters/hr; hydrogenation gas consists of methane, ethane, and CO), 4959 Reaction between gas and fuel in pressure gasification Reaction between gas and fuel in pressure gasification (Effects of type of coal and operating pressure on heating value of gas produced), 3372
Reaction of coal with steam at high pressures (Experiments with bench-scale apparatus to produce high Btu gas from coal; 12 references), 5080
Reactions of alkali metal compounds during coal gasification for electric power generation. Paper 36, 5430

5430

Recent coal research and its significance for gas technology (Review of German articles on coal

Australia, and South Africa), 4183
Pressure gasification of solid fuels with steam and oxygen (Testing of Russian coals of low calorific value and peat; use of air, air + steam, and 0), 4558
Pressure gasification of lignite (0 and steam used at 500° and 350°; respectively), 4934
Pressure-gas oxygen coal gasifier, 3867
Pressure-gasification pilot plant designed for pulverized coal and oxygen at 30 atmospheres, 3904
Pressurized hydrogasification of raw coal in a dilute-phase reactor (Production of pipeline quality gas after phase reactor (Production of pipeline quality gas after minor methanation), 5465
Pretreatment of bituminous coals for pressure gasification (Evaluation of Seeded Coal Process), 5500 Problem of the gasification of solid fuels on a carbon dioxide-air jet (CO₂ passed over brown coal at 800° gave product containing 0.8% CO₂, 39.4% CO, and 59.75% N₂ yielding 1200 Kcal/m³), 4403
Problems and methods in distillation and gasification of light (Paying of modern exhaust of the second coal at 1500 kcal/m²). lignite (Review of modern methods, with references to Italian practice; catalytic hydrogenation with nuclear radiation), 4743 radiation), 4/43
Problems of caking in the complete gasification of bituminous coals (16 references), 4072
Procedure for increasing the yield of benzene in the gasification of coal at high temperatures (Dependence on thermal treatment of gases formed), 3873
Proceedings of the Montana Coal Symposium (Discusses recoverses in increases and processing), 5169 resources, mining, and processing), 5169
Proceedings: energy resource conference, October 24 and 25, 1972 (2nd). Annual rept (Extraction of natural gas and crude cil; interfuel conversion; Lurgi process; government role in insuring adequate, reliable energy supply and transmission and transportation of energy), 5467 (PR--224 750/N) 5487 (PB--224 750/0) Process and apparatus using resonant sound wave and sonic flame for the production of carbon monoxide, synthesis gases, and synthetic hydrocarbons (Powdered coal gasified in sonic resonant burner at high rate), 4353 Process for a coal gasification (Patents), 5586 Process heat reactor program. Quarterly progress report, May 1--July 31, 1964 (Research progress on fluidizedbed gasifier, test loop, gas turbine system, and gassolids flowmeter), 4923 (TID-21288) Process heat reactor program. Quarterly progress report, August 1--October 31, 1963 (Design and development of fluidized-bed gasifier for He recycle induction-heated riuldized-bed gasilier for ne recycle induction-neated simulated nuclear reactor), 4884 (TID-20319)

Process heat reactor program. Quarterly progress report, February 1--April 30, 1964 (Progress in design, development, and testing of fluidized-bed gasifier for He recycle induction-heated simulated reactor; studies on new test loop), 4919 (TID-20830)

Process of gasification of anthracite and coke with a steam-air blast (Operation of experimental gas producer shown in schematic detail), 4568 Processes for the gasification of solid fuels (Review of 180 processes), 4118
Processes for thermal conversion of coal, 6867 Processing the dust-containing liquid products of pressure gasification of coal, 5223
Processing of coal, 3295
Processing of coal (Brief survey of methods of coal gasification), 4053 Producing fuel gas from solid carbonaceous fuels, oxygen, and steam, 4703 Producing a carbon monoxide and hydrogen gas mixture from carbonaceous materials. Apparatus for gasifying carbonaceous solids (Fiuidized bed process), 3747 Production of hydrogen from coal char in an electrofluid reactor, 5293 Production of combustible gases from coal by gasification, 3322 Production of fuel gases by gasification of bituminous fuel, 3324 Production of town gas by low-temperature carbonization or gasification of fuels (Cracking tars from lowtemperature carbonization or gasification of coals in vortex bed), 4968 Production of synthesis gas and lean gas from coal and oil (Review with 26 references), 4873
Production of a fuel gas from coals of the Angren
deposits in the gas producers of 'air-fountain' type
(Gasification of low-grade brown coal fines can be
commercially realized in air-fountain circulation type gas producers without preliminary beneficiation of raw gas producers without processing gas producers without processing gas by high-pressure gasification of coal and influence of input on the technological parameters of this process, 5113

Production of low-sulfur boiler fuel by two-stage combustion. Application of carbon dioxide acceptor process, 5271
Production of liquid and gaseous fuels by synthesis from coal (Use of low-grade Fe catalyst in carbonization zone with subsequent separation from carbonized coal).

Production of synthesis gas by two-step gasification of

```
research), 3167
Recent developments in liquid phase methanation
(Conversion of synthesis gas to high-Btu gas), 5352
Recent developments in gasification of high-ash fuels,
  4063
```

Recent development in coal preparation and utilization (Review includes O enrichment in complete gasification,

carbonization, hydrogenation, and liquefaction of coal, and synthetic hydrocarbons from gases), 21
Recent developments in gasification (Review), 3527
Refractory bodies as fixed bed coal gasification diluents (Patent; addition of diluents to accommodate coal

swelling in beds), 5631
Regional demonstration program for maximum use of high sulfur coal and maintenance of air quality standards (Methods for reducing sulfur oxides emissions from coal-fired utilities), 200 (WASH-1337-4)
Relation of coal gasification to the production of chemicals (Production of synthesis gas by

chemicals (Production of synthesis gas by gasification), 3898
Research and development on the conversion of coal to gas, liquid fuels, and bulk organic chemicals (Discussion; 11 references), 5569
Research and development work in USA in refining and utilization of coal (NCNE), 6840
Research an brown coal at University of Melbourne (Coal)

Research on brown coal at University of Melbourne (Coal

Research on brown coal at University of Melbourne (Coal gas production), 3868
Results of pressure gasification with oxygen (Mixed steam and U at 20 atm), 3289
Review of the developments in coal gasification (Congestional support of SNG from coal program), 5244
Role of mineral constituents of coal on combustion and gasification (Review with 88 references), 3510
Ruhr coal for gas generation (Desirable characteristics of coal vary with use of the products), 4100
Russian coal gasification (Joint USA-USSR effort to produce fuel gas), 5496
S in fuel gases, 620
Scope for fuller utilization of coal-derived oils (High pressure gasification purposes (Contrast of

Semicoke for gasification purposes (Contrast of properties of semicoke from brown coal and bituminous

coal), 3268 Separation of tars from condensates formed during cityges production (Coal gasification with O-steam

mixture), 5380 Significance of process for direct gasification of coal

Significance of process for direct gasification of coal (General discussion), 3900
Slagging fixed-bed gasification of North Dakota lignite at pressures to 400 psig, 5177 (BM-RI-7408)
Smokeless fuel and gas from moderately caking coal (Technical and conomic study used in planning large carbonization plant), 4948
SNG - where will it come from, and how much will it cost (Coal gasification and desulfurization of resultant fuel gas), 1739 fuel gas), 1739

SMG [subtitute natural gas] from coal via the Lurgi gasification process (Discussion of design of plant to be, constructed), 5368

SNG Process description: Stone and Webster/General Atomic - nuclear coal gasification process (Using HTGR reactor as heat source), 5615

SD, free two-stage coal combustion process (Removal of sulfur from coal under reducing conditions existing during combustion), 1752 (PB--211 888)
Solid and high quality liquid products from coal (Gas with calorific value of 8000 kcal/cu m produced), 6915
Solved and unsolved problems in coal investigation (Catalytic conversion of water gas into liquid

hydrocarbons), 5648
Some aspects of fuel developments in the USA (Critical

Some aspects of fuel developments in the USA (Critical review of coal related processes), 3980
Some aspects of gas-producer practice (Operation of static suction-type generator producing 40,000 ft³ of gas an hr and of a mechanical plant producing 110,000 ft³/hr), 3402
Some operational results from the first plants for the conversion of hot raw gas for the gasification of coals under pressure (Addition of natural gas to enrich coal gas), 4913 gas), 4913

Status and development of the pressure dasification of solid fuels in fixed-bed producers (Review with 42 references), 4754
Status of SO₂ removal systems (Limestone scrubbing seems

to be the only technologically feasible method) Status of the steam--iron process (Production of H for coal gasification), 5373

coal gasification), 5373

Steam-oxygen gasification under pressure (Gasification of brown coals), 3685

Steam-oxygen gasification of various U.S. coals (Process for making supplemental natural gas from coal; removal of S compounds from product), 5270

Strongly caking coal gasified in a stirred-bed producer. Report of investigations (Production of 140 to 165 Btu gas), 5304 (PB--210 985)

Strongly caking coal gasified in a stirred-bed producer (Fuel gas for power generation or industrial heating), 5184

5184

Study of batch manufacturing of water gas (Effects of rate of steam flow on ges output), 4231 Substitute natural gas: processes, equipment, costs

(Production from hydrocarbon liquids and coal), 1794 (Production from hydrocarbon liquids and coal), 1794
Sulfur behavior and sequestering of sulfur compounds
during coal carbonization, gasification, and combustion
(Theoretical, experimental, and practical problems
associated with desulfurization of coal), 1571

consisted with desulturization of coal), 1571
Sulfur behavior and sequestering of sulfur compounds
during coal carbonization, gasification, and
combustion. Final report (Desulfurization and
gasification of bituminous coal, lignite, anthracite,
and pyrite), 5227 (PB-211 481)

Sulfur recovery in the manufacture of pipeline gas from coal (Overall S recoveries are 91 and 81% for low- and high-S coals, resp.), 5165
Sulfur removal from hot producer gas (Gasification in

stirred fixed bed to produce low Etu gas; 32 materials used as sorbents for H sulfide), 1850

Summary presentation: an overview of coal conversion technology, 52

Suspended specimen method for determining the rate of the suspended specimen method for determining the rate of steam-carbon reaction (Steam passed over graphite suspended in electrically heated tube), 4830 Synthane process (Process for producing SNG from any coal), 5458

Synthesis gas from pulverized coal, oxygen, and highly superheated steam is produced in pilot plant, 3759

Synthesis gas (Prouction by gasification of coal slurries), 4786
Synthesis gas from pulverized coal, 4495

Synthesis gas from coal-water slurries (Gasification in a fluidized bed at 1600°F and 250 p.s.i. gage), 4256
Synthesis gas (Produced from coal in a fluidized bed generator), 3943

Synthesis gas containing carbon monoxide and hydrogen (Pressure gasification of coal with steam), 5486

Synthesis of organic compounds from coal (Catalyst of Cr₂O₃--MgO--Fe oxide), 3821
Synthesis gas preparation by continuous gasification of

coal slurries (Laboratory experiments on coal-oil-water mixtures), 5108
Synthesis-gas production by gasification of coal,

especially of powdered coal (Review), 3781
Synthesis gas from coal (Gasification of pulverized coal suspended in superheated steam), 4176

suspended in superheated steam), 4176
Synthesis gas. Its place in chemical industry and for motor fuel (Production by direct gasification of coal or lignite instead of by carbonization of coal and separate treatment of coke, gas, and tar), 3438
Synthesis gas from brown coal, 3318
Synthesis gas (Production by gasification of coal in stream of steam-air and steam-0; coal subjected to thermal decomposition at 550-6500 tto increase effectiveness of process and lower energy comsumption effectiveness of process and lower energy comsumption), 5019

Synthesis gas (Solid, liquid, or gaseous fuel burned with insufficient G; CO₂ and dust removed and remaining gases liquefied and fractionated to give CH,, synthesis

gas, and N), 4339
Synthetic natural gas in the US energy balance. Part 2
(Tabulation of SNG projects in USA (April 1973)), 5492 Synthetic fuels from coal (Role of the federal government in promoting coal conversion processes and the growth of a synthetic fuels industry), 5598 (WASH-1337-

3(Rev.1))
Synthetic fuel gas purification by the Selexol process

(Selective removal of $\rm H_2S$ and CGS), 1967 Synthetic crude oil: is it feasible yet, 5596 Synthetic fuels: will government lend the oil industry a

hand, 5601 Synthetic natural gas interest in US concentrating on

Synthetic natural gas interest in US concentrating on coal (Sixteen high Etu coal gasification plants are proposed by 1985), 5550

Synthetic natural gas as a nuclear energy carrier over long distances (Production from fossil fuels using heat from HTGR-type reactor), 5386

Synthetic fuels: straw man or strong man in energy crisis (Research should emphasize low Etu gas production, coal liquefaction, oil shale conversion, and new coal mining methods), 5509

Tar decomposition and its relation to gasification (Effects of temperature and duration of superheating on

CH, and heavy hydrocarbon yields), 3168
Tars from semicoking and gasification of brown coal (Tables showing detailed characteristics of tars and

their fractions; tars used as raw materials for motor fuels, paraffins, and phenols), 4616

Tars from the gesification of the brown coals of the Irsha-Borodinskoe deposits - a valuable raw material for the chemical industries (Tars produced under pressure in steam-O gasification contain phenols, pyridine bases, and hydrocarbons), 4610
Technical utilization of the Velenje lignite (Economics

of Lurgi and Fischer--Tropsch syntheses in production

of CH.), 3752
Techniques for the conversion of coal into liquid and gaseous fuels in the United States, 6784 Technological possibilities of the Rectisol process, 5100 Technological process analysis of the gasification of raw coal using nuclear energy (Manufacture of gases from

coal and lignite reviewed; 9 references), 5157 Technology and economical situation in the field of coal chemistry, 4195 Ten years of experience at the pressure-gasification plant at Most (Czechoslovakia) (Gasification ratio of steam to oxygen), 4188 The gasification of low-grade fuels for the synthesis of gasoline and methanol (Production of gas rich in CO and H and some tar), 3266 Thermal treatment and gasification of solid fuel (Coal or previously heated solid fuel heated in retort in ascending stream of products from thermal treatment of fuel), 5020 Thermal treatment of coal and recent development in gasification, 3379
Three-stage gasification of coal (CH_{*}-high fuel gas produced by coal gasification of Coal (Ch_{*}-high fuel gas produced by coal gasification of G-steam mixture at 50-70 atm and 1370, 870, and 815-9000, resp. catalytic conversion of synthesis gas produced), 5536 Time relation in rapid gasification (Use of corundum to increase heat capacity of coal), 4449
Total gasification (Review), 3655
Total gasification of powdered coal (Review), 4307 Town gas (Production from coal (Review), 4307

Town gas (Production from coal containing CC and H using
a NiO--MgC catalyst), 4514

Town gas from brown coal (Research), 3885

Town gas from weakly caking coals (By complete
gasification processes), 3770

Treatment of coal to prevent agglomeration (Liquid slurry
of coal treatment of coal to prevent agglomeration can be high of coal treated with cxygen-containing gas at high temperature and pressure to produce surface oxidation of coal. Feed in high-pressure hydrogasification process), 5281 Trends in gas manufacture (Historical review of synthetic gas production), 3964 Two-stage gasification of coal (Production of CH,enriched fuel gas; charred material reacts with 0 above 1370° and above 70 atm to give synthesis gas; this 1370° and above 70 atm to give synthesis gas; this reacts with coal and steam above 870° and 70 atm to give product gas containing H, CH,, and cxides), 5521 Two-stage gasification of pretreated coal (Process for production of methane-rich gas), 5633 Two-stage gasification of sapropelitic matter (Production of oil from sapropeletic coal), 4294 Twc-stage gas producer (Apparatus using 2 stages for making producer gas from caking coals), 5128 Two-stage gasification of coal with forced reactant mixing and steam treatment of recycled char (Patents), 5582 Two-stage gasification of pretreated coal (Two-stage process for production of methane; 1st stage, fine particulate coal and steam react at 13700 and 50 atm to give H-rich synthesis gas; methanation in 2nd stage when partially carbonized coal reacts with synthesis gas at 8700 and above 50 atm; final product is fuel gas of at least 70% CH_a), 5531
Underground gasification of fuels. Products obtained in the continuous heating of coal with an electric current (Elaborate laboratory apparatus shown in schematic drawings; composition and thermal values of gas as functions of time of heating are plotted), 4772
Underground gasification of fuels. Motion of the gasification zone as a function of fuel moisture in underground gasification (Decrease in moisture content from 30 to 9% caused rate of advance of gasification zone of 15-fold), 4763 5582 zone of 15-fold), 4763 Underground gasification of fuels. Effect of preliminary thermal treatment on the composition of the gas from the gasification of Moscow brown coal in a permeable channel (Laboratory scale D gasification experiments on Moscow brown coal that had been preheated to 150, 250, 350, and 550°), 4761
Union Carbide/Battelle coal gasification process development unit design (Two-stage fluidized-bed system involving combustion of coal or char in one fluidized bed and steam gasification of coal in another bed with self-anglore-ration of self-3636. bed and steam gasilication of coal in another bed with self-agglomeration of ash), 5363

Use of a refinery LP [liquid product] model to determine value of coal derived liquid (Development of design for converting coal into high Btu pipeline gas and liquid suitable as feedstock to petroleum refinery), 5263

Use of oxygen to gasify combustibles (Lurgi process for gasifying lignites at 20-30 kg/sq. cm. and Koppers process of cracking fuels), 3509

Use of oxygen and high pressure in complete gasification.

I. Gasification with oxygen. Rept. 39 of Joint Research Committee, Inst. Gas Eng. and Univ. Leeds (Lurgi plant using lignite; use of 02-N2 and 02-CO2, air-steam, and 02-steam mixtures), 3235

Use of oxygen in gasification (Use of 0 in fluidized, entrained, and Lurgi processes), 4093

Utilization of solid heat carriers in coal gasification using nuclear energy, 5183

War on pollution, desulphurization of fuels and fuel gases (State-of-the-art; economics), 1709

Water gas (superheated steam mixed with 02), 3298

Water-gas equilibrium and its relation to practical self-agglomeration of ash), 5363 Water-gas equilibrium and its relation to practical gasification processes, 3717

```
Water gas from gasification of solid suspension of fuel
     Water gas from gasification of solid suspension of fur

(Nonbituminous coal), 4336

Water-gas-shift equilibrium in the gasification of

lignite with steam, 3858

water gas from coal, 4174

Water gas (Produced by simultaneous carbonization and

gasification of coal in fluidized condition at 900-
          9500), 4257
      Water gas (Molten coal ash provides necessary heat for
          coal gasification), 5568
     Water gas (Reaction at 1000-1650°F and 200-800 psia),
     What hydrogen from coal costs [coal gasification,
         iron process or nuclear heat gasification], 4926
     iron process or nuclear near gasilication j, 4920 What results are obtainable by the wet method of gasification [of coal], 3339 When will synthetic fuels begin flowing from coal (Status of several coal gasification and liquefaction processes
     in USA), 5584
Why syngas from coal, 5305
     work of the Gas Research Board. Report of the Director
(Review of complete gasification; synthesis of CH<sub>4</sub>
         using Ni catalyst; removal of organic sulfur from coal gas), 3400
     Yield of gas in the thermal processing of coal and the
         newer developments of gasification (Description of VIAG process), 3368
GASIFICATION/AGGLOMERATING ASH PROCESS
    Coal and technical alternatives (Power production based on lean fuels produced by coal gasification), 5201 Commercial concept designs (6 processes), 5350
     Conversion of coal to clean power (Comparison of Lurgi
and Agglomerating ash processes of gasification for
          production of clean fuel gas for use in combined cycle
power plants), 5264
CGAL GASIFICATION/ANTHRACITE
Gasification of bone anthracite (Efficiency for producer gas formation), 4777
CUAL GASIFICATION/AVG PROCESS
     A.V.G. process, 3151
Gasification of peat with coal in an AVG gas generator,
COAL GASIFICATION/BCR PROCESS
     Computer study of stage 2 reactions in the BCR two-stage super-pressure coal gasification process (0
consumption, coal consumption, and C dioxide formation and removal influenced gas cost in that order), 5032 Economic study of pipeline gas production from coal (Critical analysis of several processes), 5205 COAL GASIFICATION/BIBLIOGRAPHIES
     Current apraisal of underground coal gasification
(Annotated bibliography with 328 references), 5297
(PB--209 274)
    Gasification studies (Annotated bibliography on gasification of solid fuels, decomposition of liquid and gaseous hydrocarbons, and goals of gasification; 54
          references), 4980
    Selected bibliography of coal gasification (392
         references), 3877
     Underground gasification of coal, 1945-60: A
    bibliography, 4881
Underground gasification of coal, 1945-60: a
bibliography, 4891 (EM-IC-8193)
Underground gasification (Review with bibliography of methods for underground gasification), 3135
COAL GASIFICATION/BI-GAS PROCESS
Clean fuels from coal. Development of the EI-GAS process
(Review with 3 references), 5354
    Coal gasification: state of the art (Status of arious gasification processes), 5431
Coal gasification: a review. Paper No. 71-15 (Underground
   and above-ground gasification; environmental effects of coal gasification by 1990's discussed in appendix), 5242 (PB-228887)
Coal gasification. Evaluating the bi-gas SNG process (Production of synthetic natural gas), 5328
Coal technology: key to clean energy. Annual report, 1973-74 (Production of synthetic fuels from coal), 5567 (NP-2007A)
         (NP-20078)
    Commercial concept designs (6 processes), 5350
Design and operation of the BCR fluidized-bed methanation
        PEDU, 5370
    PEDU, 5370

Design and fabrication of bi-gas reactor, 5371

Design of bi-gas pilot plant (For production of high Btu pipeline gas from oal), 5340

Evaluating the Bi-Gas SNG process, 5453

Gasification moves from research to development (Current gasification projects and processes in USA (1972)), 5390
        5320
    Gasification of bituminous coal - status and prospects (Economic evaluation of 4 processes for producing SNG),
        5273
   52/3
Proposed pilot plant, Homer City, Pennsylvania (Bi-gas coal conversion pilot plant), 5233 (PB-200800-D)
Reassessment of the prospects for coal gasification (For production of synthesis gas), 5228
Staff report on coal gasification: processes and effects (Review of processes for production of high Btu gas), 5503
        5523
    Status report: the AGA/OCR coal gasification program (Status of various gasification processes), 5432
```

```
Synthetic fuels from hydrocarbon sources: technology, economics, markets, 5562 (NP-19993)
CUAL GASIFICATION/BITUMINGUS CUAL
Gasification of bituminous coal in producers with special reference to the production of cold clean gas for industrial purposes (Discussion), 3451
CCAL GASIFICATION/EROWN COAL
    Gasification of brown coal in generators with gas recirculation (Effects of moisture content of coal on ter formation and CU<sub>2</sub> and CH<sub>8</sub> evolution), 4232
Gasification of Rhine brown coal by a new process
(Proposed high pressure process that produces by—
product electrical energy from gas turbines along with maximum yields of H and hydrocarbons), 4321 COAL GASIFICATION/CARBON DIOXIDE ACCEPTOR PROCESS
    Pasic features of the CG<sub>2</sub> acceptor gasification process.

Paper No. 17 (Pilot plant status report), 5188

Carbon dioxide-acceptor [coal] gasification process.

Studies of acceptor properties (Process discussed in light of required properties of CaO acceptor;
         limestones and dolomites are equally useful in
         process), 5045
     Clean energy from coal - a national priority (Status of
     coal gasification, liquefaction, and solvent extraction programs), 5372 (EN-2281)
Clean fuels from coal. Carbon dioxide acceptor process
    (Review with 2 references), 5360

CO<sub>2</sub> acceptor process pilot plant - 1973, 5364

Ccal gasification: a review. Paper No. 71-15 (Underground
         and above-ground gasification; environmental effects of coal gasification by 1990's discussed in appendix), 5242 (PB-228887)
    Coal gasification: state of the art (Status of arious gasification processes), 5431
Coal technology: key to clean energy. Annual report,
         1973-74 (Production of synthetic fuels from coal), 5567
         (NP-20078)
     Coal-to-gas pilot plant (For gasification of lignite by
         CO2 acceptor process to produce clean high Btu gas),
         1788
      Commercial concept designs (6 processes), 5350
     Design of lignite gasification pilot plant. Paper No. 2
(Usin CO<sub>3</sub> acceptor process), 5137
Development of the CO<sub>2</sub> acceptor process directed towards
```

of the bench-scale continuous gasification unit, 5077

commercial economics. R and D report No. 16, interim report No. 4 (Feasibility study of asification of

report No. 4 (Feasibility study of asification of lignite to produce pipeline gas), 5125 (NP-20089) Pipeline gas from lignite gasification (Using the Consol Carbon Dioxide Acceptor Process), 4962 (PB-166817) Reassessment of the prospects for coal gasification (For production of synthesis gas), 528 Staff report on coal gasification: processes and effects (Review of processes for production of high Etu gas), 5523

reactions, 5296
Future catalytic requirements for synthetic energy fuels

New catalytic needs for synthetic fuels. Paper No. 17 (Catalysts for unimproved gasification and methanation), 5260
COAL GASIFICATION/CHARS

Kinetics of bituminous coal char gasification with gases containing steam and hydrogen. 5461
Production of hydrogen from coal char in an electrofluid reactor (Steam gasification of char), 5291
COAL GASIFICATION/CHEMICAL ANALYSIS

Analyses of tars, chars, gases, and water found in effluents from the Synthane process. Technical progress report, 5578 (PB-229218/3)

COAL GASIFICATION/CHEMICAL REACTION KINETICS
53rd Report of the Joint Research Committee of the Gas
Research Board and the University of Leeds.

Status report: the AGA/OCR coal gasification program (Status of various gasification processes), 5432
Synthetic fuels from hydrocarbon sources: technology,
economics, markets, 5562 (NP-19993)
COAL GASIFICATION/CATALYSTS Behavior of nickel methanation catalysts in coal-steam

Pipeline gas from lignite gasification. Current

(PB-184720)

20104)

(From coal), 6982

low-sulfur boiler fuel. Annual report 1 Sep 1970--1 Nov 1971 (Production of low-sulfur fuel gas by coal gasification), 5241 (PB--210 840) Gasification moves from research to development (Current gasification projects and processes in USA (1972)), 5320 How coal-gasification common base costs compare, 5437 Low sulfur boiler fuel using the CONSOL CO₂ acceptor process. Feesibility study, 5058 (PB-176910) Phase II: bench-scale research on CSG process. Operation Phase II: bench-scale research on CSG process. Laboratory physico-chemical studies, 5069 (PB-184719) physico-chemical studies, 5069 (Pb-184719)
Phase II: bench-scale research on CSG process. Studies of mechanics on fluo-solids systems, 5084 (PB-184718)
Phase III and Phase IV - design and construction of the consolidation synthetic gas pilot plant, Rapid City, South Dakota (Plant uses CG₂ acceptor method for gasification of lignite to produce synthesis gas which is methanated to high Btu pipeline gas), 3131 (NP-2010)

Investigation of the use of oxygen and high pressure in gasification. V. Reactions between coke and steam at high presure, 3606 Bench-scale research on CSG process, Phase II. Operation of the bench-scale continuous gasification unit, of the bench-scale continuous gasification unit, December 1, 1965 to July 1, 1968. R and D report No. 16, interim report No. 3, book 3 (Reaction kinetics; equipment; feedstock preparation; operating procedures; calculations), 5085 (NP-20093) Conditions of industrial coal gasfication near the wall of a cyclone reactor, 5104 Elementary processes in the combustion and gasification of coal (Reaction kinetics; reactions in 3 stages are: $C(s) + 1/2 O_2 = CO_3$, $CC + 1/2 O_2 = CO_3$, and $CC_2 + C(s) = 2CC_3$; 16 references), 6535 Foreign developments in coal gasification (Hydrogasification appears to offer more economic method for making higher heating value gases than method for making higher heating value gases than catalytic methods), 4915
Fundamental studies on coal gasification in the utilization of thermal energy from nuclear high-temperature reactors (Rates of gasification as a function of temperature for 7 solid fuels, influence of particle size and steam pressure (10-70 atm), and apparent kinetic parameters of gasification reaction were investigated), 532^9 Gasification of solid fuels in a fluidized bed (Reactions with air and with CO_2 at 800, 850, and 900° at 1 atm pressure), 4179 pressure), 4179
Hydrogen processing of coal and the kinetics of
desulfurization (Conditions for efficient and economic
desulfurization of coal; quipment design), 1497
In situ coal gasification (Gasification by CO₂ and steam;
coal burned to raise temperature above 1000°), 5547
Investigation of a continuous low-temperature solid-fuel
desification process by means of superheated steam gasification process by means of superheated steam (Determination of reaction rates at different (Determination of reaction rates at different temperatures and steam velocities), 4184
Kinetic study of the reaction of coal char with a hydrogen-steam mixture (36 references), 4995
Kinetic study of coal char hydrogasification. II. Second-phase reaction (Reaction kinetics and mechanism of coal char hydrogasification pilot plant reactor under cocurrent and countercurrent flow ystems with both fluiding and moving hed contacting were studied). A935 fluidized and moving bed contacting were studied), 4935 Kinetic study of coal char hydrogasification. I. Rapid Kinetic study of coal char hydrogasification. 1. Rapid initial reaction (Coal char hydrogasification reactions may be regarded as two simultanous reactions differing considerably in their rates), 4955
Kinetic studies on the pyrolysis, desulfurization, and gasification of coals with emphasis on the non-isothermal kinetic method. Final report on phase 2, see also report dated Apr 1969, PB-185 882 (Research on sulfur control by means of coal gasification), 5132 (PR-211 338) (PB-211 338) Kinetics of carbon gasification. II (Discussion with 25 references), 4735
Kinetics of carbon gasification (Discussion with 34 Kinetics of carbon gasification (Discussion with 34 references), 4736
Kinetics of coal gasification in a low-pressure low-residence time, entrained flow reactor, 5428
Kinetics of carbon gasification. III, 4717
Kinetics of gas synthesis using recycle systems
(Conversion of coal to gaseous fuels; hydrogenation of CO and C dioxide over Raney Ni catalyst and a nitrided, dusted Fe catalyst), 5034
Kinetics of coal gasification. Design of atmospheric pressure gasifiers, 4079 pressure gastreers, 4079 Mechanisms of reactions in an underground gas generator (Reaction: $C_4H_2U=CU+H_2$ followed by conversion of CU with catalysts), 4576 Modern theories of the kinetics of the gasification of coals (Review with 55 references), 4211 New knowledge on mechanism of reactors in carbon gasification, 4300
Note on the reaction mechanism in the underground
gasification of coal (System of equations developed
that were solved by analog computer), 5006
Power-coal gasification in plasmochemical flow reactors, 5187 Preliminary coal gasification experiments (Reaction rates of subbituminous coal heated in steam and steam—H mixture investigated up to 725°; at ca. 500° pyrolysis produces CH₄, CO₂, and char; mimiuum temperature for rapid reaction of coal or char is ca. 625° giving mostly H and CO₂; CH₄ production increased by addition of H to steam), 5377 of H to steam), 5377

Primary and secondary reactions in the gasification of coal with steam, 3954 Production of town gas and synthesis gas by pressure gasification of bituminous coal (Thermodynamic conditions ad reaction kinetics for gasification of coal in a fixed bed at high pressure, and differences in process for gasification of coal dust at atm pressure and coal lumps under high pressure are

discussed), 4818
Production of pipeline gas by hydrogasification of coal (Pressures up to 3800 psig and temperatures to 2100°F reasonable physical and mathematical

with H, steam, and steam--H feed gases used), 5275 Reaction model for bituminous coal hydrogasification in a dilute phase (Reaction model developed that allows

chars with H, steam, and steam-H mixtures measured at pressures up to 2500 psig and temperatures to 1700°F),

dilute phase hydrogasification), 5141
Reactivity of coals in high-pressure gasification with hydrogen and steam (Rates of reaction of coals and

interpretation of

```
Some problems of lighte gasification by means of high-
temperature nuclear reactor heat, 5094 (JUL-554-RG)
Steam-oxygen gasification of fine sizes of coal in a
        fluidized bed at elevated pressure. III. Relation of integral to differential rates; effect of carbon level
    on gasification rate, and role of the shift reaction
(22 references), 4834
Steam-oxygen gasification of fine sizes of coal in a
        fluidized bed at elevated pressure. II. Reaction of carbon wth steam (Fluidized bed hydrodynamics have
         important effect on steam--C reaction kinetics;
    references), 4849
Stoichiometric analysis of the processes of combustion
         and gasification of solid fuels, 4279
    Study of the process of gasification of coal with steam (Temperature dependence of reaction kinetics), 3958
    Theory of gas producer. II (Wellman-Seaver-Morgan-type
    gas producer), 3779
Thermodynamics of gasification of coal with oxygen and
        steam. Charts for material and enthalpy balance
    calculations (Examples of use of charts), 3838
Underground gasification (Review of methods; kinetics of
reactions), 3634
CDAL GASIFICATION/CHEMICAL REACTIONS
    Study of gasification. Dissociation reaction of water
vapor, carbon dioxide, and carbon monoxide. Conversion
    reaction of carbon monoxide (Review), 3284
AL GASIFICATION/CHEMICO PROCESS
Union Carbide - Chemico coal gasification process
(Process description with flow diagram), 5495
COAL GASIFICATION/COED PROCESS

Coal gasification. COED process plus char gasification

(Plant utilizes COED coal pyrolysis process along with molten salt process to gasify COED char), 5330
    Coal gasification: the COED process plus char gasification, 5452
    Economic evaluation of CCED process plus char
        gasification, period of performance April 1971-April
         1972, 3144
COAL GASÍFICATION/COGAS PROCESS
    Gasification moves from research to development (Current gasification projects and processes in USA (1972)),
         5320
    Synthetic crude oil: is it feasible yet (Description of
GCOS and COGAS processes), 5593
COAL GASIFICATION/COMBUSTICN
     Coal gasification: a fluidized-bed combustion system,
COAL GASIFICATION/COMBUSTION HEAT
    British trials in underground gasification (If coal is heated in absence of air, volatiles representing 15-40% of bituminous coals are driven off as coal gas), 4288 IAL GASIFICATION/COMPARATIVE EVALUATIONS
    Another hat in the energy ring - FMC's coal-to-gas/oil process (Cogas process concept; production of synthetic pipeline gas), 5245
    pipeline gas, 223
Economic comparison of processes for producing pipeline
gas (methane) from coal. Paper No. 14, 5151
COAL GASIFICATION/COST
    Progress in manufacture of pipeline gas by high-pressure
gasification of coal and high-pressure cracking of
natural gas, both with oxygen (Calorific value specified as 4600-4800 Kcal/cu. m.; N added to keep heating value as specified), 4829
COAL GASIFICATION/CSF PROCESS
Economic study of pipeline gas production from coal (Critical analysis of several processes), 5205
COAL GASIFICATION/DIAGRAMS
    Coal gasification (Review of coal gasification fundamentals including coal characteristics, coal
    processing, chemical reactions, and thermodynamics; low
and high Btu gas production), 5481 (NP-20097)
Processes occurring in the gasification of fuels and
        their presentation in Terbeck diagrams (Gasification of
bituminous ccal with 0 and steam), 3762
COAL GASIFICATION/DUSTS
    Gasification of coal dust, 3973
COAL GASIFICATION/ECONOMICS
   JAL GASIFICATION/ECONOMICS
Advanced coal gasification system for electric power generation. Annual technical report, August 9, 1972-June 30, 1973. Research and development report No. 81, interim report No. 1 (Development of economic, efficient, nonpolluting power plants), 5411 (NP-20074) Basis of the Kcppers--Tctzek process for gasification of powdered coal (Economics of powdered-coal gasification), 3716
Bi-gas process (Conversion of coal to substitute natural gas), 5459
```

```
Clean fuels from coal (Production of liquid and gaseous products recommendations for research programs), 1806
        (PB--224 530/6)
 Coal gasification and enrichment of coal gas, 4051
Coal gasification and enrichment of coal gas, 4051
Coal gasification. Feasibility, economics, and viability
(Review with 20 references), 5375
Coal-oil-gas refinery offers SNG, refinery feed, low-
sulfur fuel oil (Process design, operating variables,
costs, product values, and economic feasibility of
coal-conversion complex for production of high-Btu gas,
coal-conversion complex for production of high-Btu gas, liquid feedstock for petrolem refinery, and low-S fuel for power plants were examined), 5473

Commerce today. Volume IV, number 7 (Economic highlights; review; coal gasification offers key to energy independence), 5583 (COM--73-50835-07)

Considerations in distillation and gasification, 3710

Continuous gasification of powdered-coal suspensions by air-oxygen and air-oxygen-steam mixture (Steam will have to be superheated to at least 2000°F; 22 references), 3636
references), 3636

Economic analysis of underground gasification of coal
(333 references on work with Russian coals), 4845

Economics of pressure gasification of coals with high ash
and sulfur content (Economical coal utilization in
electric power plants and city gas works could be achieved by pressure gasification; removal of SO_2 by washing with CH_3OH or KOH), 4817 Economics of generating clean fuel gas from coal using an
Economics of generating clean fuel gas from coal using an air-blown two-stage gasifier (Low Btu gas version of BI-GAS Process using air at 300 psig), 5234 (NP-20087) Effect of the moisture of Dnieper brown coals on their gasification with oxygen blast (Coal contains ca. 60% moisture; gasification is technically possible but not economically sound), 4842 Engineering study and technical evaluation of the bituminous coal research, Inc., two-stage super pressure gasification process (Concept has been reviewed and is judged to be theoretically sound and to offer genuine practical advantages in coal gasification although it has not yet been demonstrated), 3130 (OCR-RDR-60)
       RDR-60)
 Evaluation of coal-gasification technology. Part I.
       Pipeline-quality gas (Discussion of shortage of natural gas and possible solutions to problem; description of various processes for coal gasification), 5257 (NP-
        20088)
 Foreign developments in coal gasification (Hydrogasification appears to offer more economic
        method for making higher heating value gases than
 catalytic methods), 4915
Gasification in rotating grid furnaces by addition of
 combustion gases (Economic efficiency of combustion raised by recycling combustion gases to system), 4291 Gasification of solid fuels under pressure (Coal
        gasification can compete with petroleum products only in localities where transportation costs make economics
 of former attractive), 4654
Gasification and distillation (Using coal of different
 Gasification and distillation (Using coal of different characteristics), 3690
Gasification of coal in the presence of \gamma-rays (Radiation had no gross effect on gasification rate or on yield and distribution of methane and produced no improvement
 in technology or economics of coal gasification), 4904
Gasification of coal in an experimental Rummel double-
shaft slag-bath gasifier (Satisfactory diluent gas
 produced, but rate of production was disappointing; process would not be economic), 4905
Gasification of lignite with heat from a high-temperature nuclear reactor (Gasifier operates at 70 atm), 5078
Gasification of solid fuels at elevated pressures
 (Economics), 3839
Gasification of coal under conditions simulating stage II of the BCR two-stage superpressure process (Production
or the BCR two-stage superpressure process (Production of ynthesis gas), 4991
Gasification: rediscovered source of clean fuel (Coal can be gasified into S-free synthetic natural gas, but it is economically useful in only some applications), 5321 How and why underground gasification of coal may reduce the cost per kw hr, 3513
Hygas process (Conversion of coal of any rank or S content to high Btu gas interchangeable with natural gas), 3106
 gas), 3106
Impacts of new energy technology, using generalized input-output analysis. Final Rept., see also report dated Aug 1972, PB-220 622 (Comparative economic and environmental impacts of high and low Btu coal gasification), 5436 (PB-226 139/4)
 Industrial operation of the near Moscow station
"'Podzemgaz' (Statistical report on production costs
and quality of output of underground coal gasification
 plant), 4381
Influence of superheated steam temperature on the
        pressure gasification [of solid fuels] (Gas quality, consumption, and economic figures for operating plant),
         4773
 New methods for producer-gas generation from bituminous
coal (Economics), 3871

Operating a pressure-rasification pilot plant using pulverized coal and tygen. Effect of heat loss on economy (Equipment: - fects of coal-feed rate and
```

operating pressure), 4846

```
Pipeline gas from coal, 3884
```

Pressure gesification of solid fuels (Review of history of Lurgi fixed-bed gesifier; economy of process; 48 references), 4836
Pressure gasification of bituminous coal in Dorsten (Use

of Lurgi high pressure gasifiers), 4890
Pressure gasification of coal at the gasification plant
of Steinkohlengas Akt.-Ges., Dorsten (**Dry** process
produced savings through lower steam needs), 4628

Froblem of complete gasification, 3360 Production of synthetic natural gas by hydrogasification

(Economic aspects), 5153

Production of crude synthesis gas from ash-rich coal by the Koppers-Totzek process; purification of the crude synthesis gas and preparation of the purified synthesis ges for ammonia synthesis, 4976
Producton of gases of high caloric value by underground

coal gasification (Improved technology can increase heating value from 800 Kcal/m³ to 900-50 Kcal/m³; use of 0-enriched air or steam; economics), 4577

Progress report on 2nd experiment in underground gasification of coal (Study on control of gases, maintenance of combustion, gas quality, methods of obtaining test data, and technical and economic

Information), 3695
Results of work at the Lisichansk station "Podzemgaz" for the period 1954-1956 (Statistical review of report on methods of underground gasification), 4383
SO₂ free two-stage coal combustion process (Coal S is not

cxidized under reducing conditions existing during combustion), 1745 (PE-211888) SO₂ free two-stage coal combustion process (Coal is dissolved by injection into molten Fe and simultaneously dissolved coal C is oxidized with injected air to CG; coal S is not oxidized but is transferred from Fe to slag consisting of coal ash and added limestone; process economics), 1750 (PE-211888)

Synthetic gas (Processes or converting coal to synthetic gas), 5122

Technology and cost of coal gasification (Economics of new gasification processes), 5471 Underground gasification of the Angren lignite deposit

(Description of technical and economic variables), 5215 COAL GASIFICATION/EFFICIENCY

Advanced coal gasification system for electric power generation. Annual technical report, August 9, 1972-June 30, 1973. Research and development report No. 81, interim report No. 1 (Development of economic,

interim report No. 1 (Development of economic, efficient, nonpolluting power plants), 5411 (NP-20074) Determination of chemical efficiency of underground gas generators (Equation for chemical efficiency of underground gasification of coal), 4562 Gasification in rotating grid furnaces by addition of combustion gases (Economic efficiency of combustion raised by recycling combustion gases to system), 4291 Gasification of low-value coals (Data compared for 19 coals and cokes of different grades and response to

coals and cokes of different grades and response to burning in Lurgi—Schweizer, Otto Bochum, rotating grid furnace, and in Winkler and Flesch—Winkler

generators), 4289
Gasification of brown coal from the Vrbica Gacko mine

(Gasification efficiency of 68.3%), 5376
Increasing the efficiencies of plants gasifying solid fuels (Method for obtaining 47% over-all efficiency),

Influence of the thickness of the coal layer on the heat of combustion during underground gasification of coal or combustion during underground gastification of coal (Experimntal and matematical study; empirical formulas fiving dependence of heat of combustion of gas on water content and spcific water flow in gas), 4999

Investigations of a fixed-bed gasifier (Review), 4844

Physicochemical treatment of a coal seam as a method for increasing the efficiency of degasification (Coal seams

treated with aqueous HCl or aqueous HCl with surface active agent; gas yield increased from $300-600~\rm{m}^3/\rm{day}$ after $\rm{H_2O}$ treatment to $900-1000~\rm{after}$ aqueous HCl and to 1200-1530 with use of surface active agent), 5198 Slag-forming-type gasification of pulverized coal, 4345 COAL GASIFICATION/ENVIRONMENTAL EFFECTS

Inpacts of new energy technology, using generalized input-output analysis. Final Rept., see also report dated Aug 1972, PB-220 622 (Comparative economic and environmental impacts of high and low Etu coal gasification), 5436 (PB-226 139/4)

Proposed pilot plant, Homer City, Pennsylvania. Final environmental impact statement. Supersedes report dated

onvironmental impact statement. Superseus report dates

Jul 1971, PE--200 800-D (Testing of process employing
oxygen and steam at elevated pressures in 2-stage
gasifier to convert coal to pipeline-quality gas), 5287
(PB--200 800)

GASIFICATION/EQUATIONS

Simple calculation of the composition of gasification gases in equilibrium with carbon, 3688

COAL GASIFICATION/EQUIPMENT

Apparatus for gasification of fine-grained coal and coal dust (Solid particles of ascending stream of gas are centrifuged, separated, and returned to bottom of chamber), 4698
Apparatus for gasification of a suspension of finely

dispersed solid fuels (Description of mixing and injection nozzle), 4706

Autogenous carbonization for the continuous production of coke and gas (Description of equipment), 4870
Bench-scale research on CSG process, phase II. Studies on mechanics of fluo-solids systems, July 1964 to June 1968. R and D report No. 16, interim report No. 3, book 1 (demonstraton of basic operability and mechanics of hardling the selection of the selection handling the ual flue-solids system proposed in the Carbon Dioxide Acceptor Process), 5079 (NF-20090)

Bench-scale research on CSG process, Phase II. Operation of the bench-scale continuous gasification unit, December 1, 1965 to July 1, 1968. R and D report No. 16, interim report No. 3, book 3 (Reaction kinetics; equipment; feedstock preparation; operating procedures; calculations), 5085 (NP-20095)

Coal combustion and gasification in a commercial cyclone apparatus, 5111
Coal gasification process and apparatus (Calorific value of gas produced is ca. 60% of that of original coal), 5455

Coal gasification (Fluidization; equipment), 4030 Coal gasification (Method and apparatus for generating CO from coal), 5127
Coal gasification - Sumitomo process (Pulverized coal, G,

Coal gasification - Sumitomo process (Pulverized coal, G, and steam jetted diagonally downward into gasifier from lower part of furnace), 4742
Consideration on the pulverized-coal gas producer (Description of 10,000 cu. m./hr. plant), 3780
Development and operation of a pilot plant for feeding bituminous coal slurry to a pressure gasifier (Slurry heated to 600°F; pulverized coal, 70% through -200 mesh, mixed with H₂G to produce slurry), 4811
Experimental pebble-type generator for carbonization and

Experimental pebble-type generator for carbonization and gasification of fuels, 4665

Experiments with a 3-foot-deep bed cocurrent reactor. Ne assessment (Temperature 500-950°; total pressure 500-600 psi; H partial pressure 15-560 psi; coal feed rate

5-36 lb/hr), 5117
Fixed-bed coal gasification (Gasification of caking coal; coal separated into coarse and fines fractions), 5314

Flow-type coal gasifier (Improved cylindrical generator; steam fed at 600°F; air preheated to 800°F; operating pressure of 400 p.s.i.g.), 4824
Fuel gas (Gasification of fluidized powdered fuels;

Fuel gas (Gasification of fluidized powdered fuels; equipment), 4604
Gas (Apparatus for production by coal gasification), 4697
Gas producer for operation at elevated pressures and temperatures, 5015
Gasification of carbonaceous fuels (Apparatus or gasification of pulverized coal with 0 at atm pressure), 4792
Gasification of the tailings of coal-beneficiation plants. II (Apparatus for investigation of oxidation and carbonization in gas stream of refuse obtained from coal beneficiation), 4612
Gasification of solid fuel (Process described in which fuel is brought into close contact with liquid slag in

fuel is brought into close contact with liquid slag in rotatable container), 4930 Gasification of suspended coal dust (Description of

apparatus), 4865

Gasification of caking coals, 5130
Gasification of coal in a slagging pressure gasifier,

Gasification of pulverized coal with oxygen and steam in a vortex reactor (Vortex reactor equipped with multiple entrant tangential slots), 3841 Gasification of coal in a pressure slagging gasifier,

4993
Gasification of coal in a fluid medium with carbon dioxide (Temperature range of 785-985°), 3663
Gasification of low-value coals (Data compared for 19 coals and cokes of different grades and response to burning in Lurgi—Schweizer, Otto Bochum, rotating grid furnace, and in Winkler and Flesch—Winkler generators), 4289
Gasification of coal in an experimental Rummel double—shaft slag-bath gasifier (Satisfactory diluent gas produced, but rate of production was disappointing; process would not be economic), 4905

process would not be economic), 4905
Gasification of low ash-fusion-temperature coals
(Formation of coke coating on heat-exchange pebbles and

(Formation of coke coating on heat-exchange peobles and gasification using steam or 0; equipment), 4037
Gasification of crude lignite (Gasification in tubular, slightly inclined, indirectly heated chamber; water content of coal used as gasification agent), 5315
Gasification of Cherno More coals in gas generators, 4747
Gasification of finely comminuted fuel (Gasification of coal in moving bubbling bed), 3492
Gasification of coal fines (Laboratory and pilot plant tests), 4721

tests), 4721
Gasification of coal under conditions simulating stage 2
of the BCR two-stage super-pressure gasifier (16 references), 5041 Gasification of coal having high moisture content (Heat

may be provided by nuclear reactors), 5217
Gasification of some Chinese coals with steam and oxygen
under pressure (Laboratory scale), 4671
Gasification in rotating grid furnaces by addition of
combustion gases (Economic efficiency of combustion

- raised by recycling combustion gases to system), 4291 Gasification of solid fuel (Fuel mixed with volatile liquid hydrocarbon in ratio to produce semisolid, pumpable mass), 5056 Gasification of water-containing coal (Material heated by
- He gas (e.g., exit gas from nuclear reactor) or by plunging through molten Pb at 10000), 5175
 Gasification of solid fuels with a high content of coal
- fines (Process inhibited wing to poor aerodynamics of fuel bed when coal fines fraction of 0-5 mm exceeds 5%), 4942
- High-BTU gas from coal, 5313
- High-pressure pulverized coal gasifier (Synthesis gas produced from coal, O, and steam in gasifir operating at superatmospheric pressure), 4863
- High-temperature reactors for coal gasification (Use of heat from nuclear reactors for gasification of coal to yield H, CO, and CH,; no references), 5269
- Kinetics of coal gasification in a low-pressure low-residence time, entrained flow reactor, 5428
- Manufacture of liquid products in the Schwarze Pump combine (Techniques of pressure coal gasification and utilization of various gaseous and liquefied products), 5004
- New developments in anthracite gasification (Gas concentration ranges of CO $_2$ 24-7, CO 24-7, and H 40-1; tests using Pennsylvania anthracite in Lurgi generators), 4635
- New methods for producer-gas generation from bituminous
- coal (Economics), 3871

 Optimization of fixed bed methanation processes (Heat of reaction of methanation process is so large that heat removal from reactor is major problem in process deisgn), 5121 (NP-20095)
- Pilot plant studies of C.F.R.I. [Central Fuel Research Institute] on complete gasification of ccal, 4994 Power-coal gasification in plasmochemical flow reactors,
- 5187
- Retort for the continuous gasification of subbituminous coal, 3927
 Studies on spontaneous combustion and underground
- gasification of coal. Coal combustion gas. I, 5031 The complete gasification of coal (Carbonization of
- poorly coking coal and production of blue water gas), 3237
- Theoretical computer study of the gasification of powdered fuel in a flow with frequent circulation, 5114 Underground gasification of coal, 5093 Vortex gasification of coal (Pulverized coal, flux, and
- gaseous medium injected downward and tangentially toward generator bottom; generator in vortex form). 4822
- COAL GASIFICATION/FLOWSHEETS
- Electrothermal hygas process escalated costs. R and D development report No. 22, interim No. 6 (Pipeline gas from bituminous coal and from North Dakota lignite; cost escalation; revised costs), 5220 (NP-20094)
- Engineering study and technical evaluation of the bituminous coal research, Inc., two-stage super pressure gasification process (Concept has been reviewed and is judged to be theoretically sound and to offer genuine practical advantages in coal gasification although it has not yet been demonstrated), 3130 (OCR-RDR-60)
- Gasification of earthy brown coal under pressure in a pilot plant, 4630 Theoretical and experimental studies on fluidized
- gasification of solid fuels (System operates below fusion point of mineral matter in coal), 5082 COAL GASIFICATION/FLUIDIZED BED
- Advanced coal gasification system for electric power generation. Annual technical report, August 9, 1972—June 30, 1973. Research and development report No. 81, interim report No. 1 (Development of economic,
- efficient, nonpolluting power plants), 5411 (NP-20074)
 Bench-scale research on CSG process, phase II. Studies on mechanics of fluo-solids systems, July 1964 to June 1968. R and D report No. 16, interim report No. 3, book 1 (demonstration of basic operability and mechanics of handling the wal flue-solids system proposed in the Carbon Dioxide Acceptor Process), 5079 (NP-20090) Cleaning and gasifying coal, 4966
- Coal combustion and gasification in a commercial cyclone apparatus, 5111

 Coal gasification for production of synthesis and pipeline gas (Use of O, development of suspension gasification processes, and fluidized bed gasifiers, and operation of gasifiers under slagging conditions discussed; 110 references), 4800 Coal gasification for electric power generation
- (Advantages of new multiple fluidized-bed concept), 5543
- Coal gasification. Fluidized bed combustion system of gasticiation, rividized oed combustion system (Thermal efficiency in conversion to electric power of less than 50%, reduction in fuel consumption of 25%, and removal of 50_2 emissions from high-S coals can be obtained by coupling fluidized bed of crushed limestone or dolomite to K--steam gas turbine cycle), 5379

- Coal gasification (Fluidized bed; reaction with steam),
- Coal gasification for clean power production (Coal gasified in 2-stage fluidized bed process by using air and steam at 1400-2100°F and 10-200 atm; fuel gas desulfurized at 1400-1800°F using limestone or dolomite), 5409 Coal gasification (Review of coal gasification
- fundamentals including coal characteristics, coal processing, chemical reactions, and thermodynamics; low and high Btu gas production), 5481 (NP-20097)
- Coal or coke gasification (Process for reducing losses of combustibles in gasification of coal with steam and G in fluidized bed; process carried out at 10-25 atm),
- Coal pretreatment in free fall for gasification in a fluidized bed. Paper No. 26, 5186
- Developments of studies on carbonization and gasification of fine coal by fluidization process, 4726 Evaluation of the fluidized bed combustion process
- Volume I. Summary report. Report for 15 Nov 1969--15 Nov 1971 (Reduction of SO₂ and nitrogen oxide contents of flue gases by fluidized bed coal gasification process), 5243 (PB--211 494)
 Fluid-bed gasification of pretreated Pittsburgh-seam coals (Two-stage gasification process), 4983
- Fluid bed gasification of pretreated Pittsburgh seam
- coals, 5037
 Fluidized bed gasification and combustion for power
- generation (Production of lean fuel gas), 1666
 Fluidized-bed coal gasifier as a load-following clean fuel source, 5464
 Fluidized bed under pressure as a method for transformation of fuels (Erown coal gasified at 20 atm
- gage), 4974
- processing fluidized beds (Review of literature; 68 references), 5070
 Gasification of Krasnoyansk brown coals in a fluidized
- bed at twenty atmospheres, 4827 Gasification of carbonaceous material (Hydrogasification of coal in fluidized bed with countercurrent streams of Fe reduced Fe oxides and steam at 1300-1800°F and 300-1200 psig), 5179
 Gasification of carbonaceous solids (4-stage process for
- producing gases containing CO), 3808
 Gasification of brown coals in a fluidized bed under pressure to obtain fuel gases for use in thermal power stations (Efficiency of gasification increased from 57.8-64% at low pressure to 70-72.8% at 20 atm), 5029
 Gasification of high-sulfur coals in a fluidized bed
- under pressure (Good quality fuel gas (heat of combustion 1100-1270 kczl/cu m) obtained by continuous steam air fluidized bed gasification of high-S), 5416 Gasification of coal fines by fluidization (Effects of temperature and thickness of bed on quality of gas
- produced), 4774
- Gasification of caking coal in a free-fall, fluid-bed reactor (Gas produced to methanator for production of high Btu gas), 5033
- Gasifying coal in high-velocity fluidized beds (For production of low Btu gas for use in gas turbines).
- Gasifying coal in several fluidized-bed compartments (Pulverized coal mixed with CaO dried in 1st bed by gas from 2nd; coal devolatilized and desulfurized in 2nd by gas from 3rd and CaO and CaS discharged from bottom of 2nd), 5485
- High-speed gasification of coal dust from the Dzhergalan and Kok-Yangak beds (Fluidized bed method), 4330 Hydrogasification of brown coal char in a 20-ft. continuous fluidized bed reactor (Countercurrent

- continuous fluidized bed reactor (Countercurrent fluidized reactor system), 5112
 Improvement of gasification of fine-grained coals in a fluidized bed under pressure, 5256
 Manufacture of town gas by external-internal heating fluidized carbonization, 4647
 New systems for clean power (Coal gasification and
- methods for clean combustion), 5248
- methods for clean combustion), 5240
 Preparation of an energy-producing gas from sulfur coals of the western Donets Basin by their pressurized fluidized-bed gasification (Gasification at 900-1000° and 10 atm yielding gas of 1100-1220 Kcal/m³), 5193
 Prepare coal for gasification (Preparations for Lurgi process and for operations using fluid-bed reactors), 5506
- 5606
- Pressurized fluidized beds for intensifying the combustion and gasification of solid fuels (Pressures of 5-20 atm), 5156

 Process to make high-Btu gas from coal (By gasification in fluidized bed process), 5171 (PB-192413)
- Process to make high-BTU gas from coal (Fluidized-bed gasification of coal), 5161
- Production of low Btu gas involving coal pyrolysis and gasification, 5462
- gasification, 5462
 Steam-oxygen gasification of fine sizes of coal in a fluidized bed at elevated pressure. III. Relation of integral to differential rates; effect of carbon level on gasification rate, and role of the shift reaction (22 references), 4834
 Steam-oxygen gasification of fine sizes of coal in a fluidized had at elevated pressure. II Parentee of
- fluidized bed at elevated pressure. II. Reaction of

```
carbon with steam (Fluidized bed hydrodynamics have
          important effect on steam--C reaction kinetics; 9
          references), 4849
     Steam-oxygen gasification of fine sizes of coal in a
         fluidized bed at elevated pressure. I. Reaction of carbon with hydrogen (Review of literature; formation of methane in fluidized bed gasification; 54
          references), 4799
     Synthesis gas (Production from gasification of fluidized
     Synthesis ges (Production from gasilication of fluidized
bed of coal particles), 4173
Thermal cracking of coal tar (Preparation of gas from
coal by fluidized-bed dry distillation and by batch dry
distillation; tar gasification in presence of steam and
         thermal cracking; highest content of C_2H_\bullet obtained at 800-900°), 4857
Town ges from noncaking coal, 4644
COAL GASIFICATION/FLUIDIZED BED REACTORS
     Coal gasification for electric power generation (Use of
fluidized-bed reactors), 5483
CCAL GASIFICATION/FURNACES
Gasification in rotating grid furnaces by addition of combustion gases (Economic efficiency of combustion raised by recycling combustion gases to system), 4291
COAL GASIFICATION/H-COAL PROCESS
      Coal gasification. Scale-up factors in the H-coal process
Coal gasification. Scale-up factors in the H-coal process (Studied using bench units), 5334

Coal gasification: scale-up factors in the H coal process (Hydrocarbon Research, Inc. process), 5446

H-Coal: conversion of western coals (Economic assessment of this gasification process), 5511

COAL GASIFICATION/HEZBERG PRCCESS

Modern gas production (Rotary process using Q<sub>2</sub>), 3243

COAL GASIFICATION/HIGH PRESSURE

Bi-gas process (Conversion of coal to substitute natural
     Bi-gas process (Conversion of coal to substitute natural gas), 5459
 COAL GASIFICATION/HIGH TEMPERATURE
     Bi-gas process (Conversion of coal to substitute natural gas), 5459
 COAL GASIFICATION/HYDRANE PROCESS
      Clean fuels from coal. Hydrene process (Review with 3 references), £356
Hydrane process (Direct hydrogasification of raw coal -
status report), 5346
CUAL GASIFICATION/HYDROGENATION
      Hydrogasification of coal in high-pressure fluidized
           beds. 5164
 CCAL GASIFICATION/HYGAS PROCESS
      Clean energy from coal (Review of fundamental chemistry and contacting schemes for gasification processes),
      Clean energy from coal - a national priority (Status of coal gasification, liquefaction, and solvent extraction programs), 5372 (EN-2281)
Clean fuels from coal. HYGAS process (Review with no
           references), 5357
      Coal desulfurization aspects of the Hyges process, 1690 Coal gasification: a review. Paper No. 71-15 (Underground and above-ground gasification; environmental effects of coal gasification by 1990's discussed in appendix), 5242 (PB-228887)
      gasification: state of the art (Status of arious gasification processes), 5431
Coal technology: key to clean energy. Annual report, 1973-74 (Production of synthetic fuels from coal), 5567 (NP-20078)
      Coal gasification: state of the art (Status of arious
      Commercial concept designs (6 processes), 5350
Economic study of pipeline gas production from coal
(Critical analysis of several processes), 5205
       Electrothermal Hygas process escalated costs, 5277 (EN-
      Electrothermal Hygas process escalated costs, 5277 (EN-
2286)
Electrothermal hygas process escalated costs. R and D
development report No. 22, interim No. 6 (Pipeline gas
from bituminous coal and from North Dakota lignite;
cost escalation; revised costs), 5220 (NP-20094)
Fate of trace constituents of coal during gasification.
Finel report (Fate of trace elements (Sb, As, Be, Cd,
Cr, Pb, Hg, Ni, Se, Te, and V) during Hygas coal
gasification), 5494 (PB--223 001/9)
Gasification moves from research to development (Current
castification projects and processes in USA (1972)).
            gasification projects and processes in USA (1972)),
            5320
      Gasification of bituminous coal - status and prospects (Economic evaluation of 4 processes for producing SNG),
            5273
       Hygas-converting coal to gas (Plant operations), 5222
HYGAS pilot yields operating data (Production of substitute natural gas from lignite gasification), 5599
       IGT Hyges Process. Paper Nc. 13 (Development of pilot plant facilities), 5204
      plant facilities), 5204

Large scale high Btu gas from coel on its way (Results of pilot plant studies of Hygas process), 5225

Methenation for coal gasification (Performance of 37 catalysts evaluated), 5408

Process design and cost estimate for production of 265 million SCF/day of pipeline gas by the hydrogasification of bituminous coal, 4969 (PB-176982)

Process design and cost estimate for production of 266 million SCF/day of pipeline gas by the hydrogasification of bituminous coal - hydrogen by the steam--iron process, 5016 (PB-174064)

Staff report on coal gasification: processes and effects
```

```
(Review of processes for production of high Btu gas),
              5523
     5523
State of trace elements of coal during gasification
(Analysis of effluents of Hygas pilot plant), 5502
Status of the Hygas pilot plant for producing pipeline
gas from coal. Paper No. 1, 5138
Status of HYGAS process — operating results (Pilot plant
tests at 1000 psig pressure producing pipeline quality
gas of 1000 Btu/SCF on nitrogen-free basis), 5541
Status report: the AGA/OCR coal gasification program
(Status of various gasification processes), 5432
Synthetic pipeline gas from coal by the HyGas process
(Status of Various gastication processes), 5432
Synthetic pipeline gas from coal by the HyGas process
(Gas is all methane), 5166
Synthetic pipeline gas from coal by the HyGas process
(Production of all-methane gas), 5158
Synthetic fuels from hydrocarbon sources: technology,
economics, markets, 5562 (NP-19993)
COAL GASIFICATION/IG PROCESS
Complete gasification by the G.T. process, 4634
Complete gasification by the G.I. process, 4634 COAL GASIFICATION/INDUSTRIAL PLANTS
       Coal gasification. Design of a coal-oil-gas refinery (Process for producing 100,000 bbl/day of light
       refinery liquid, pipeline gas, liquefied petroleum gas, solvent refined coal, S, and chemicals), 5383
Evaluation of sites for an Illinois coal gasification
              industry. Final report, prepared in cooperation with Institute of Gas Technology, Chicago, IL (Plant can be operational by 1975-76 at a cost of 80 to 91
               cents/million BTU for pipeline gas), 5300 (PB-214
       180/2)
Gasification and desulfurization of coal for power
              generation (Program for development of coal-burning
power station that can meet future stack emission
standards; coal-processing system that produces S-free
               gas), 5418
       Gasification of fuels. Modern plants for the complete gasification of coal (Both cyclic generators (similar
               to water-gas generators) and 2-stage generators are in
       use), 4324
Pressure gasification of solid fuels with oxygen in
               Germany (Practical operation of coal gasification plant), 4804
 plant), 4804
COAL GASIFICATION/IN-SITU METHOD
         Podzemgaz near Moscow (Underground coal gasification
         plant), 4368

''Argus'' underground gasification (What use for 85 ETU
       gas), 3806
A critical review of methods of underground gasification
       A critical review of methods of undergrands of coal, 3187

Acres of promise for synthetic fuels (Cost of synthesis gas production by Bergius process, Fischer—Tropsch synthesis, and underground gasification of coal), 3696

Actual state of underground gasification of coal and
         future problems, Part I; Part II (Technical and economic analysis), 4724
Advances in synthetic fuels technology (Progress report on production of synthetic liquid fuels from coal and oil shale), 3998
Aerodynamic methods for regulating the underground
       Aerodynamic methods for regulating the underground gasification of coals, 4404
Alabama mine test yields gas from coal (Describes underground gasification experiment at Gorgas, Alabama), 3545
Analysis of separate stages of underground gasification of brown coal (Effects of seam thickness, quantity and degree of preheating of air blown into gasification zone on heat of combustion of gas produced were evaluated), 5194
Analysis of geological and mining conditions of underground gas generators at the Moscow Region and
                underground gas generators at the Moscow Region and
Lisichansk Plants of "Experimental Mines for the
         Lisicnansk Plants of "Experimental Mines for the Underground Gasification of Coal", 4719
Analysis of performance of the Moscow Region Plant of "'Podzemgaz" (Underground gasification of coal), 4215
Angren coal as a raw material for underground gasification, 4382
         Angren works for underground coal gasification
         (Description of Augrensk station), 4455
Annual report of research and technologic work on coal, fiscal year 1950 (Review of second underground gasification experiment at Gorgas, Alabama), 3766
Annual report of research and technologic work on coal, fiscal year 1947 (Summarizes underground gasification
       fiscal year 1947 (Summarizes underground gasification experiment at Gorgas, Alabama), 3589
Annual report of research and technologic work on coal, fiscal year 1951 (Review of second underground gasification experiment at Gorgas, Alabama), 3851
Anthracite Institute Program. Report, 1947 (Basic research on pelletization of anthracite silt and underground gasification of coal), 3602
Apparatus for gasification of coal (Designed for use in coal seams of low-grade coal, thin seams, seams dipping sharply, and gassy coal), 4481
Apparatus for cooling of gas in boreholes of an underground gas producer (Introduction of cooling water to boreholes; patent), 3539
Apparatus for removal of solids from gases generated by subterranean gasification (Gas scrubber is placed
```

directly in the drill hole; patent), 3684
Apparatus for feeding a liquid and arrangement for utilizing such apparatus (Underground gasification of coal; patent), 3617 coal; patent), 301/
Apparatus for opening ports in gas pipes in underground
gasification of coal (Patent), 3446
Apparatus for observing the movement of the burning face
in the underground gasification of combustible
materials (Patent), 3494
Application of gravimetry in studying the gasification of coal seams in the underground gas generator, 4050 Application of electric current for indirect reaction on a fuel seam in shaftless underground gasification, 4645 Application of electric current in shaftless preparation of fuel deposits for underground processing, 4216
Application of gas-chemical computations for determination of water inflow into areas of underground coal gasification (Underground waters have great influence), 4713 Applied research on the bituminous coal industry (Underground gasification of coal, hydrogenation and low-temperature carbonization), 3419 Applying an electric current directly to the fuel layer in shaftless underground gasification, 4649 Appraisal of underground coal gasification, 5337
Approximate calculation of water inflow to boreholes in inclined medium thickness seams (In relation to underground gasification of coal), 4620 Approximate representation by chemical models of movement the combustion zone (in underground gasification of οſ coal), 4533 Aspects of Soviet fuel technology (Tables of fuel and coal production in 1955 in USSR), 4600 Automatic regulation of temperature in the gas outlet of boreholes of an underground gas generator (Cooling water pipes with automatic valve were installed), 4543
Basic results of work at the South-Abinsk station
"Podzemgaz" (Statistical review and report on methods of underground gasification), 4385
Behavior of the roof of the coal layer during underground gasification of coal, 3343 Behavior of strata during the underground gasification of coals, 4433
Behavior of the roof during gasification in a horizontalinclined channel in a thin coal bed (from the results of opening up experimental generator No. 1 at Lisichansk), 4536 Belgian experiment in underground gasification (Experiment conducted on a lignite seam), 3572 Belgian underground gasification trials (Experiment at Bois-la-Dawe colliery near Liege), 3618 Belgium and underground gasification, 3485 Borehole for removing gases from gasification of underground deposits (Pipe that brings up gas has outer casing through which cooling water is fed; patent), 3495 Brief report of results and of the most pressing problems the field of underground gasification of coal (Statistical review), 4395 Bright new future of coal (Review of coal conversion methods including underground gasification), 6185 British trials in underground gasification (BTU values of different gases poduced), 4350
British trials in underground gasification (If coal is heated in absence of air, volatiles representing 15-40% of bituminous coals are driven off as coal gas), 4288
British trials in underground gasification, 1949-1955 (Diagnosis and plans of experiments; gas analysis and costs), 4308 Bureau of Mines comments on underground gasification (Evaluation of work in UK, USSR, and US), 4700 Bureau of Mines synthetic liquid fuels program, 1944-55. I. Oil from coal (Summary of research), 4657 Bureau to try new methods of gasifying coal in ground, Byproducts of gasification at the Moscow Region Plant of "Podzemgaz" (Underground gasification of coal), 4058 Calculating and plotting the Intended course of directed drilling for underground gasification of coal, 4431
Calculating structure protection pillars against the harmful effect of surface subsidence during underground coal gasification in the Moscow Basin, 4675
Calculation of heat losses due to heating a layer of damp coal under conditions of underground gasification, 3226 Calculation of heat losses in underground gasification of coal, 3200
Calorific properties of gas from underground gasification of coal, 4413 Carbon monoxide and hydrogen by underground gasification of coal (Introduction of strong mineral acid to coal seam to form gas passages in seam), 4483
Carbonization and gasification of bituminous coal, brown coal, peat, cil, and similar deposits (Use of boreholes for more uniform underground gasification of fuels; use of refractory linings in tubes), 131 Carbonization and gasification. Underground gasification of coal, 4273

Change in permeability of Moscow-Basin ccal effected by

reduction of its moisture content (Underground reduction of its moisture content (Underground gasification), 4107
Changes in the flame canal during the gasification of coal deposits (Effects of changes in temperature, discontinuation of air blast, and changes in O content of air blast on flame canal), 3407
Chemical conversion of the gas formed in the underground gasification of coal (Review of uses of gas from underground gasification), 4944
Chemical utilization of the subbituminous coals of Washington (Review of solvent extraction and Washington (Review of solvent extraction and gasification processes), 7286
Chemically mining coal (Merits of underground gasification), 5508 Chemically mining coal (Advantages of underground gasification), 5512 Chemically mining coal, 5513 Chemicals, pipe line gas, and liquid fuels from coal
(Discusses work on undergound gasification, coal hydrogenation, and the Fischer-Tropsch process), 3921 Chemistry of underground gasification of mineral fuels (Importance of gas velocity in stream method and temperature in percolation method), 3561 Choice of blowers for underground coal gasification plant (For reduction of air compression costs), 4417 Classification of methods and systems of underground gasification of coal, 4319

Coal, science, and the future (Competitive advantages of petroleum and coal; possibilities of underground coal gasification), 3450 Coal becomes cheaper (In-situ gasification for production of SNG), 5585 Coal breakage with nuclear explosion for in situ gasification (Four nuclear explosions cases are analyzed), 5232 (NVC-544-1)
Coal breakage with nulear explosions for in situ gasification (Coal to be converted to C.), 5190
Coal combustion gas. III. Spontaneous combustion and underground gasification of coal (Study of gases from combustion of powdered coal in air stream at 700-1000 to obtain experimental resulsts for combustion control underground gasification), 5071 Coal gasification: a review. Paper No. 71-15 (Underground and above-ground gasification; environmental effects of coal gasification by 1990's discussed in appendix), 5242 (PB-228887) Coal gasification, a state-of-the-art review (Chemical principles of coal gasification, developments from 1935 to 1950, and from 1950 to 1973, production of synthetic natural gas and low btu fuel gas from coal, and underground gasification of coal; reviews with 52 references; diagrams and flowsheets), 5327
Coal gasification (Summarizes work in USA during 1949), 3728 Coal gasification (Buildings of Angren underground gasification station in USSR), 4696 Coal preparation, underground gasification, and coking at U.N. conference, 3999 Coal research in US. Part II (Research on underground gasification, Lurgi process, and permeation method of oxygen production), 3822 Coal seam gives Britain power (Underground gasification in United Kingdom), 4693 Combustible gases by underground gasification of deposits of combustible materials (Electric heating elements introduced into shaft of boreholes; air or 0 forced through carbonized zone), 4335

Combustion in a coal channel with simultaneous secondary reactions, 3441
Combustion stability of low-calorific power gas in a tunnel-type burner (Application to underground gasification of coal), 4082 Combustion of coal in subterranean deposits (Injection pressure of combustion-supporting gas, usually air, controls amount of flammable gas and coal tar liquids), Contacting of electrodes with the seam in the underground gasification of coal (Description of electrolinking process), 4725 Contemporary techniques of gasification of hard fuel under high pressure, 3428 Continental notes - Belgium (Society formed to conduct experimental work on underground gasification at a pit near Liege), 3564
Contribution to underground gasification of coal with oxygen and sterm (Comparison of experimental results), Control of directed drilling and the use of the mass spectrometer for gas analysis in underground gasification of coal, 4401 Control of the flame during underground gasification (of coal) (To avoid obstruction of blowing and gas-shafts), Controlled underground gasification (Coal is prepared and burned in panels to produce 283 BTU gas), 4033 Controlling the subterraneam gasification of fuel, 3350 Controlling the process of underground gasification of coal (Conditions for successful operation; shortcomings; emphasis on further experimentation), 4409

Cost of oxygen in underground gasification of coal, 4337

conditions in underground gas producers, 4624

Effect of hydromechanical factors and structural characteristics of underground gas producers on the

```
Current apraisal of underground coal gasification
      (Annotated bibliography with 328 references), 5297 (PB-209 274)
 Deeply buried coal can be converted to methane
      (Underground gasification with an oxygen-water mixture), 5484
 Degasification of coal beds - commercial source of
pipeline gas, 2108
Dependence of quantity and quality from underground
 gasification of Moscow Region coals on geological and
hydro-geological conditions, 4451
Determination of temperatures in underground gas
      producers on the basis of measurements of the degree of
swelling of roof rocks (Air used as exidizing agent),
Determination of chemical efficiency of underground gas
generators (Equation for chemical efficiency of
generators (Equation for chemical efficiency of underground gasification of coal), 4562

Determination of drill bit position in the coal bed (Underground gasification of coal), 4210

Determination of the humidity in the gases of underground
      coal gasification (New equipment for determination), 4580
 Determination of the heating value of PGU (underground
 coal gasification) gases by measuring the heat
conductivity of the gas mixture, 4582
Development of underground gasification of coal in
Kuzbas, 4105
 Development of the coal industry of the Donets Field,
      4201
 Development and present position of underground
       gasification (Experiments in USSR, UK, Belgium, Italy,
USA, and Morocco), 4237
Development of underground gasification of coal at the Moscow Region Plant of ''Podzemgaz'', 4049
Development of underground gasification of coal by high-pressure method (Introduction of highly compressed air
       into vertical drillings), 3842
Development of the shaftless method of underground gasification with use of electric current (the method of electric linkage), 4110
Development of geophysical methods for estimating the combustion line and the temperatures in the reaction zone of underground gas generators, 4234
Device for recovering fuel from subterraneous fuel-
carrying deposits by heating in their natural location
using a chain heat transfer member (Patent), 4484
Devices determining moisture in gas during underground
coal gasification (Stationary and portable equipment),
4627
Dewatering lignite beds intended for underground gasification in Moscow coal field, 4397
Directional properties of coal and their utilization in underground gasification experiments, 5545
Distilling and gasifying unmined coal, 3162
Distribution and state of slag and packing material in the gasification void (according to material on the opening-up of generator No. 1 at Lisichansk), 4551
Drainage of underground gas generators (Diagrams), 4406
 Drainage of underground gas generators (Diagrams), 4406
Draining coal deposits for underground gasification, 4442
 Draining coal deposits for underground gasification, 444
Drilling of inclined and horizontal boreholes in a coal
bed (Underground gasification of coal), 4207
Drilling of long boreholes in coal (For underground
gasification), 4705
Dynamics of gas formation and effect of various factors
on underground gasification of coal (Effect of blast
on underground gasification of coal (Effect of blast size, sah, and moisture contents, and other factors on gas composition were studied), 4746

Dynamics of the formation of gas in the underground gasification of the brown coal seam of the experimental gas-generating Angren Station for the underground gasification of coal (Effect of length of underground channels on quality and quantity of gas produced; calorific value of gas decreased as amount of coal gasified decreased), 4936

Dynamics of gas formation in underground gasification of (brown) coal at the Moscow Region of Podzemgaz Station.
       (brown) coal at the Moscow Region of Podzemgaz Station,
        4274
  Economic analysis of underground gasification (In USSR),
       4448
Economic advantages of using oxygen in the underground gasification of coal, 3138
Economic analysis of underground gasification of coal (333 references on work with Russian coals), 4845
Economic basis for underground gasification of coal by the Zhuraviev method (Heat value of gas in 1420 cal/m³ and yield of dry gas is 2m³/kg of coal), 3203
Economic efficiency of underground gasification (Review of a book on the subject), 4541
Economic efficiency of using enriched blowing in underground lignite gasification, 4648
Economic estimates of the Lawrence Livermore Laboratory concept of in-situ coal gasification, 5438 (UCRL-51340)
Economics of underground gasification of coal in the Moscow coalfield, 4452
  Economic advantages of using oxygen in the underground
  Moscow coalfield, 4452
Economics of underground gasification of coals, 3202
 Effect of various factors on the heat of combustion of gas produced by underground gasification of coal (Discussion of effects of various factors on amount and quality of gas produced), 4909

Effect of slag formation on aerodynamic and thermal
```

```
losses of blow and gas, 4608
Effect of the rate of blow on the speed of drifting combustion zones to the stage of connecting channels in
combustion zones to the stage of connecting channels in underground coal gasification, 4670

Effect of subsurface waters on underground gasification of coals (Review with 20 references), 4879

Effect of heating on permeability of Moscow-Basin coal (Underground gasification), 4108

Effect of permeability of enclosing rocks and of borehole diameter on output, 3439

Effect of coal gasification process on regime of underground water. 4730
underground water, 4730

Effect of preheating on the thermal conductivity of blocks of Moscow coal and of oil shale (In relation to underground gasification), 4444

Effect of geological conditions on the process of
underground gasification of coal, 4209

Effect of water on underground gasification of coals

(Optimum quantity of water produces maximum calcrific value in the gas), 4362
Effect of static pressure in underground (coal) gasification sites on the gasification process
        (Relation between static pressure and BTU value of
(Relation between static pressure and blo value of gas), 4436

Effect of steam on gas composition in reduction zone of an underground gas generator (At 800 and 900°; the following reactions are most probable: C + CO<sub>2</sub> = 2CO; C + H<sub>2</sub>C = CO + H<sub>2</sub>; C + 2H<sub>2</sub>O = CO<sub>2</sub> + 2H<sub>2</sub>; gas may contain 70-89% combustible components), 4660

Effect of moisture on the gas-formation process under the
        conditions of the Angren gasification station
''Podzemgaz'' (Office for Survey, Design, Planning, and
Development of Experimental Mines for Underground
        Gasification of Coal) (Heat of combustion of gas formed
        depends on amount of moisture that participates in its
 formation), 4896
Efficiency of supplying gas turbine power stations with
Efficiency of supplying gas turbine power stations with gas from underground gasification of coal (Possible schemes are examined with diagrams), 4509

Electrical coal gasification (Underground electrocarbonization), 3679

Electrical equipment for underground gasification installation (For controlling the position of the fire
 zone; patent), 3614
Electro-hydrogenation of coal under conditions of
 underground gasification (Bergius process), 2397
Electrocarbonization of coal (Underground gasification experiment near Hume, Missouri), 3729
 Electrocarbonization process of underground gasification (Missouri coal mine experiment), 3748
Electrocarbonization of coal and related hydrocarbons,
 4004
End of gasification research plant (In United Kingdom),
        4691
 Energy and power supply (Reviews energy sources on a global basis including the nuclear power program, underground coal gasification, pumped-water storage, and the cross-channel cable), 4505
Energy and economic evaluation of the parameters of
         several underground gasification processes (Site
         preparation and air compression are major cost
preparation and air compression are major cost parameters), 4556
Energy from underground (Coal gasification project at Gorgas, Alabama), 3746
Engineering aspects of underground gasification, 3823
Equipment and design (underground gasification) (Various problems connected with the process), 3805
Equipment for underground coal gasification, 4123
Examination of the Djerada Mine after the underground gasification experiment, 4024
Expansion of combustion zone during linkage (In underground gasification of coal), 4282
Experience with the drilling of horizontal-linkage boreholes from an inclined borehole at the sub-Moscow station (For underground gasification of coal), 4427
Experience in connecting vertical bore holes by sloping drillings in the coal seam (for underground gasification of coal), 4443
Experiments about the phenomenon of underground gasification of coal in area No. 1 of the Yuzhno—Abinsk Installation, 4387
Experimental exploitation of inclined boreholes, 4071
Experimental work on technological gas production at the Moscow Region Plant of Podzemgaz (Underground gasification of coal), 4199
Experiments in underground gasification of coal in the USA. 3724
         parameters), 4556
  Experiments in underground gasification of coal in the
  USA, 3724
Experiment on underground gasification in the United
  States (Historical review; description of project at Gorgas, Alabama), 3591
Experimentation on underground gasification of coal
 (Details of experiments at Gorgas, Alabama), 3745
Experiments in underground gasification of coal
(Description of experiments at Gorgas, Alabama), 3635
Experiments on hydraulic fracturing of bituminous coal
```

seams (For underground gasification), 4554 Experiments on a small coal panel at the Lisichansk mine (on underground gasification) (Forcing air and steam through bore-holes; gas produced has heat value of 800 to 1200 cal/m³), 3196 Experiments in the underground gasification of coal (Review of laboratory and field-scale experiments), Experiment on underground gasification of coal in the Lenin-Kuznetzk District (Discussion of reactions taking place during gasification), 3206 Experiment in the underground gasification of coal at the Gorgas Mine of the Alabama Power Company, 3552 Experiments on underground gasification et Djerada (Morocco) (Review), 3917 Experiment in underground gasification of coal, Gorgas Ala. (Procedures and products), 3504 Experiment in underground gasification (Details of tests at Gorgas, Alabama), 3565

Experimental method preliminary to underground gasification (Addition of oxygen to air blast promotes breakdown of refractory roof; patent), 3421

Experiment in underground gasification of coal, Gorgas, Alabama (Conducted by Bureau of Fines and Alabama Power Company), 3575
Experiment in underground gasification (Alabama Power Company and Bureau of Mines), 3576

Experiments in underground distillation of coal continue at Gorgas (Research progress), 3689

Exploitation of coal depose by means of gasification by means of gasification (Tests in mined out coal seams), 3568 Extent of utilization of coal in underground gas generators in Kuzbass, 4548 Extraction of energy fuels. Open file report (Technical assessment of stimulation of petroleum and natural gas production; production of oil from tar sands; development of oil shale; underground gasification of coal; oil and gas production from organic wastes; primary extraction of coal), 5311 (PB--220 328/9) Feasibility of using rapid turbodrills for boring inclined directional holes in the coal seam (for underground gasification), 4621 Field-scale experiments in underground gasification of coal at Gorgas, Alabama. Use of electrolinking-carbonization as a means of site preparation (Use of air, C, and steam separately or in various combinations), 4424 Filtration linkage of boreholes in coal seams (Underground gasification), 4064 Filtration of gas through carbon layers. (Concerning leakage of gas and oxygen under pressure during underground gasification of coal deposits), 3523 Fire-percolated borehole linkage by high pressure air in coal seams (for underground gasification), 4457 First American experiment in underground gasification of coal (Illustrated note on tests at Gorgas, Alabama), 3549 First generator gas under conditions of underground gasification (of coal) (Gas produced has heat value of 1000 cal), 3197 first results in the field of underground gasification. 3189 First Russian gas turbine power station (Powered by produced by underground gasification of coal), 4374 First underground gasification of coal), 43/4
First underground gasification experiments at the
Valderno lignite field (Effects of air flow rate on
heating value of gas produced), 3587
Flow of gases in the coal seam and in the rocks around it
(Underground gasification), 4088
Foreword to ''Proceedings, First International Conference on the Underground Gasification of Coal, Birmingham and Gorgas, AL, February 12-14, 1952.**, 3852
Formation of the fire channel in underground gasification of coal (Gasification with oxygen is superior to air), Four new ways to manufacture high BTU gas from coal (Diagrammatic illustrations of Fischer-Tropsch, Lurgi, Bergius, and underground gasification processes), 3562 Fracture of coal and oil shale for in-situ processing or remote removal: a proposal support document, 5522 (SLA-73-946) Fresh try at underground gasification (Account of experiment at Hume, Missouri and plants for work at Gorgas, Alabama), 3804
Frontiers of fuel technology, 3603 Fuel and power (Review of coal, as related to economy of the UK), 4982 Fuel and power research in Britain (Research in progress including underground gasification of coal), 4251
Fuel gas by in-situ partial combustion of a coal seam
(Bore holes provided at coal seam for introducing
material and reoving products; nuclear reactor preferred to heat materials, e.g.; water, hydrocarbons, for injection), 5011
Fuel revolution (Review of advances in coal conversion including underground gasification), 3537
Fundamentals involved in the projecting of underground gasification of coal, 3204

Further developments in underground gasification of coal by the boreholes method (Feview of work in England between middle of 1950 and early 1952), 3757 Further experiments on underground gasification of Moscow coals (Collection of coal gas from blowing of air through borings into 250 tons of coal), 3208 Further underground gasification test (Second experiment at Gorgas, Alabama), 3675 Future for coal (Describes Fischer--Tropsch process, Bergius hydrogenation process, and briefly underground gasification), 6282 Future gas making methods (Survey of potential methods), Future of the coal industry (In Japan), 4731 Future of carbonisation and gasification (Review of conditions in Great Eritain and USA), 3563 Gas as agent reducing the mechanical strength of the coal seam during its hydraulic fracturing (For underground gasification of coal), 4617
Gas condensate from the underground gasification of coals, 5102
Gas filtration in reacting porous medium, 3519
Gas from coal in the ground (Historical review of early experimnts in USSR; primarily the stream method), 3550
Gas from coal (Mixture of water and O piped into top of broken layer of coal to ignite it and produce mainly methane, CO, H, and C dioxide), 5564
Gas from the mine (Discussion of underground coal gasification experiment at Gorgas, Alabama), 3738
Gas production in Belgium: 1900-1950 (Historical review including underground gasification of coal), 3813
Gas supply of the eastern regions of the USSR based on the gasification of solid fuels, 4652
Gaseous fuels and their significance for the future (General discussion), 3743 Gaseous fuels. Underground gasification (Description of borehole-producer, stream, and filtration methods), 3767 Gasification of coal deposited in enclosing sandrock (Leakage of air and gas complicate gasification in sand), 4614 Gasification of coal underground (Cost in comparison to normal use of coal), 3508 Gasification of carbonaceous fuels in situ, 3159 Gasification of coal - survey of recent experiments (Condensation of report of conference on underground gasification), 4019 Gasification of coal underground, 3280
Gasification of underground carbonaceous deposits (Patent), 4264 Gasification of coal underground. Fundamental difficulties of four known methods (Brief review), 3525 Gasification of coal beds, 4689
Gasification of coal beds (Patent), 4690
Gasification of Moscow Basin coal in the first half of the 19th century, 4217 Gasification in a coal tunnel with a steam-oxygen blast, 4636 Gasification of coal underground (Discusses first British attempts), 3737 Gasification of coal. Part 1. Underground gasification (Description of general principles and methods and brief history of tests conducted in USSR, Italy, Belgium, French Morocco, USA, and UK), 3959 Gasification of coal underground (Economics), 3530
Gasification of Moscow coals and fuel shales underground, 3305 Gasification of coal deposits (Summary of results of experiments in USSP, Belgium, Italy, and USA), 3665
Gasification of brown coal underground by preheating the coal seams and removing the gas in two stages, 4398
Gasification of coal deposited in sandy rocks
(Gasification of coal deposited in sand is complicated because of leaking of air and gas and sand displacement), 4631 Gasification of coal and oil shale, 4220 Gasifying coal underground (Operations at Gorgas, Alabama), 3548 Gasifying underground coal deposits (C dioxide reacts with C in coal deposit to fom CC; conbustile gas product is of much higher quality than gases otained by blowing air into coal deposits), 5173
Gasifying coal to undergo test in Gorges mines (USA) (Stream method), 3493 Gasifying coal, 3149
Generation of synthesis gas by subterranean gasification (Patent), 788 Generation of synthesis gas (Arrangement of ducts or underground gasification; patent), 3673 Geodetic measuring method of determining the position of the fire zone during underground gasification in the conditions of the lower Moscow Basin, 4287 Gorgas, Alabama, experiment in underground gasification of coal, 3595
Gorgas coal gasification provides basic data (Undergound combustion experiment by Bureau of Mines and Alabasa Power Company), 3553 Gorgas experiments (Underground gasification of coal), 3807

Heat and gas calculations underlying the project of underground gasification (of coal) (Discussion of gas

```
movements, heat losses, and gas compounds), 3209
Heat conductance of a layer (of coal), 7418
Heat transfer into the earth surrounding an underground
gasification system, 3960
 gastrication system, 3950
Heat-transfer phenomena and the combined method of the
underground gasification of oil shale, 4676
Heating in depth of the coal seam and the enclosing rocks
in the process of underground gasification, 4651
Heating of steam and surrounding strata in underground
gasification (Theoretical), 3142
Highlights of progress in coal research, 3489
History of the idea of underground gasification and its
History of the idea of underground gasification and its realization (Review of experience in USSR, USA, UK, Selgium, and Morocco, with diagrams), 4500
How and why underground gasification of coal may reduce the cost per kw hr, 3513
How coal is burned in the mine to produce power and synthesis gas (Three methods of underground gasification used in Russia are outlined), 3502
Humidity balance in the underground gasification process (Problems resulting from accumulation of H<sub>2</sub>O), 4578
Hydraulic disruption of seams in the underground gasification of coal seam), 4540
Hydraulic fracturing for underground gasification of coal deposits, 4901 (SLA-73-6002)
 deposits, 4901 (SLA-73-6002)

Hydraulic resistance of a layer of spherical particles in an isothermal or non-isothermal air flow (Problem
 an isothermal or non-isothermal air ilow (Problem relates to underground gasification of coal), 3623 Hydroaromatic solvents (Preparation of hydroaromatic solvents by destructive hydrogenation of resins from underground gasification of coal in 2 stages, first above 700° at 50 atm and then at 350-80° and atm pressure; catalyst 5% NiG, 4-7% Cr oxide on active Al
        oxide), 5096
 Hydroaromatic solvents from low-pyrolysis tar-
(Hydroaromatic solvents from underground coal
         gasfication tar), 5088
  Hydrodynamics of the underground gasification process,
  Ignition of underground generators (Compares airlinking,
  electrolinking and air-electrolinking), 4559
Improved process and plant for underground gasification
        (Patent), 3628
  Improved underground gasification installation (Patent),
        3631
  Improvements relating to the underground gasification of
  coal (Patent), 4373
Improvements in recovery by underground distillation
        (Patent), 3425
 Improvements in underground gasification (Addition of axygen, steam and oxygen, or carbon dioxide to airblast determines quality of gas obtained; patent), 3462 Improvements in and relating to the operation of gas turbine installations (Gasification of underground coal
  seems with air; patent), 3630
Improvements in underground gasification installations (Saturation of air blast with water vapor; patent),
 In situ coal gasification (Gasification by CO<sub>2</sub> and steam; coal burned to raise temperature above 1000°), 5547
In-situ coal gasification, 5588 (UCRL-75494)
In situ combustion of stratum having an exposed face (Underground gasification of coal; patent), 4699
In situ coal gasification process (CO<sub>2</sub> and steam are injected, volatile hydrocarbons and high Btu gas are produced), 5423
In situ coal gasification (Air supplied to burning coal seam until temperature is at least 1832°F after which steam is supplied with air to maintain less than 2600°F
         3422
   steam is supplied with air to maintain less than 2600°F in seam), 5054
In situ coal gasification (Underground coal fractured by
         fluids under high pressure; superheated steam is injected to remove volatile components; air injected and bed ignited to burn residual char), 5475
    In-situ coal bed gasification. Patent application No. 257
          965, 5303
  In situ exploitation of lignite using steam (Underground gasification of lignite; patent), 4788
In-situ gasification of bituminous coal, 5095
In situ gasification of coal: solving the energy crisis
  In situ gasification of coal: solving the energy crisis (Borehole and underground roadway methods are discussed), 5489
In situ gasification of coal by gas fracturing, 5556
In situ gasification of coal by gas fracturing, 5338
Inclinometer for use in underground gasification, 4485
Increase in the heat of combustion of gas in underground gasification of coals (Addition of steam to air produced increase in H content of gas by 8% after first steam blowing and by 7% after repeated steam blowing), 5030
          5030
```

Industrial operation of the near Moscow station

plant), 4381
Industrial utilization of gas from the underground gasification of coal in gas turbines, 334
Influence of static pressure in an underground gasgenerator on the characteristics of the gasification process (High static pressure increases gas leakage to also increases the calorific value of the gas), 4386

"'Podzemgez' (Statistical report on production costs and quality of output of underground coal gasification

```
Influence of the principal factors on the gasification progress in No. 1 panel of the Yuzhno--Abinsk Underground Gasification Station, 4550 Influence of water upon underground coal gasification (Ground water content of up to 30% is beneficial to gasification process and increases Etu value of gas),
  Influence of \gamma-rays on the underground gasification of
          coal (Laboratory experiments using cobalt 60; heating
 value of gas increased), 4848
Influence of moisture on the process of underground
 gasification, 4429
Influence of the thickness of the coal layer on the heat
          of combustion during underground gasification of coal
(Experimntal and matematical study; empirical formulas fiving dependence of heat of combustion of gas on water content and specific water flow in gas), 4999

Influence of steel electrodes and berehole casing on electric power losses during the process of electric library (Management assistantian of casil 4005)
electric power losses during the process of electric linkage (Underground gasification of coal), 4045
Information from underground gasification experiments carried out in the United States (Report of work at Gorgas, Alabama from Jan. to Mar. 1947), 3619
Initiating in situ combustion in a stratum (Process suitable for lignite-type coal beds; patent), 4686
Installation of gas plant in mines (Underground gasification of coal in USSR), 3482
Installing and operating experimental gas generators under natural conditions (Underground gasification of coal), 4227
under natural conditions (Underground gasilication of coal), 4227
Instrumentation systems development for in situ processing (Energy sources), 5504 (SLA-73-919)
Introductory statement at the opening of the scientific conference on underground gasification of coal on October 26, 1954, 4285
Investigation on models of the effect of various factors
 on the outline and rate of displacement of the combustion zone (in underground gasification), 4419
Laboratory and field-scale experimentation on the underground gasification of coal, 3650
Land, sea, and air. Survey of some auxiliary sources of energy for electricity generation (Includes gentlement)
Land, sea, and air. Survey of some auxiliary sources of energy for electricity generation (Includes geothermal heat, underground gasification, tidal power, wind power, and solar energy), 4018

Laws governing gasification with steam and oxygen (Theoretical equations for perculation method), 4456

Leading principles on gasifying above and below ground, 3658
  Let's take another lock at the fuel situation (Reviews the potential fuel situation in the US around 1952
   including synthetic liquid fuels and underground gasification), 3888
Liberation of gas from rocks in underground gasification,
            4059
   Linkage of boreholes by high pressure blowing
 Linkage of boreholes by high pressure blowing
(Underground gasificatton of coal), 4208
Liquid gas and coal (Reserves of gas and coal for
synthetic liquid fuel processes), 3499
Losses of air and gas in underground generators of the
Moscow-Region Plant of Podzemgaz, 4067
Main results of the work of the Institute of Combustible
Minerals, Academy of Sciences USSR, on underground
gasification of fuels, and tasks for future research
(Gasification of brown coal, hard coal, and oil
shales). 4445
   shales), 4445
Main technical and economic indicators of the new plants of "Podzemgaz" (Underground gasification of coal),
            4081
   Make high-B.t.u. pipeline gas from coal (Conversion of
  Make high-B.t.u. pipeline gas from coal (Conversion of coal to synthesis gas and subsequently to high Etu gas), 4850

Making an actual shaft layout in boring inclined-level holes (In underground gasification of coal), 4622

Making oil from coal (Fischer—Tropsch process, Bergius process, and underground gasification), 6324

Material balance of process of underground gasification (Presents a laboratory developed method), 4560

Mechanisms of reactions in an underground gas generator
  (Presents a laboratory developed method), 4560 Mechanisms of reactions in an underground gas generator (Reaction: C,H<sub>2</sub>O = CO + H<sub>2</sub> followed by conversion of CO with catalysts), 4576 Memorandum on coal industry (From mining to marketing of products including underground gasification), 3668 Method and plant for underground gasification of coal seams on fire (Patent), 3616 Method for in-situ utilization of fuels by combustion (Underground gasification; patent), 4598 Method for upgrading coal gasification products (Patent), 5635
   Method of gasification of the coal seam and deformation of the overburden in underground gasification of coal in the Moscow coal field, 4389
Method of underground thermal treatment of coals and shales (Use of electric currents to produce semicoke which is gasified by means of an oxygen-enriched blast; patent), 3538
Method of underground gasification of coals (Construction of smalle) channels in coal seam one for coals in coals.
    Method of gasification of the coal seam and deformation
```

of parallel channels in coal seam, one for gasification at increased pressure, the other for removing products

formed from semicoking the coal panel; patent), 3483 Method of analyzing the process of underground coal gasification (Examples of calculations for processes of using air, O-enriched air, and O alone), 4206 Method of underground electrolinking and electrocarbonization of mineral fuels (Patent), 4490 Method of underground gasification of coal by means of pit holes, 3205 Method of underground electrolinking and electrocarbonization of mineral fuels (Underground gasification of coal; patent), 4243 Method of gasifying solid fuels (Addition of halogens and their compounds to airblast to delay complete combustion; patent), 3597 Method of packing the galleries of an underground gasification site without mining (Packing with Raschig yastitude to stee without withing (racking with Raschig rings by hydraulic stowage; patent), 3487 Method of preparing waterlogged combustible strata without mining (Drainage of strata by introduction of compressed air; patent), 3488 Method of calculating blast, coal, and gas losses in the (Theoretical), 4408
Method of electrically heating coals or shales for process of underground gasification of coal (Saturated solutions of salts are introduced into strata to increase electric conductivity; patent), 3588 Method on gas-chemical calculation of the gas generation process in underground gas generators, 4418
Methods for calculating losses of compressed air, coal, and gas in underground gasification, 4399
Methods of hydrodynamic calculation of blowing and gas losses (Relating to underground coal gasification processes), 4197 methods of coal gasification underground (Principles are explained and methods described), 5524

Methods of controlling the conversion reaction of carbon monoxide with water vapor when producing tecnological gas in an undergound generator (Composition of the gas changes as it travels along the underground generator), 4532 Methods of determining the economic efficiency of underground gasification (46% cheaper than mined coal; 18% higher than open-pit coal), 4455 Mine-gas producers (Outline of several methods of underground gasification of coal), 3514 Mine-gas producers (Underground gasification methods developed by Soviet engineers), 3448
Mining procedure for underground gasification of
combustible strata (Control of gasification reaction by
progress of borehole drilling; patent), 3577
Mobile installation for underground coal gasification (Description of experimental mobile station), 4434
Moisture balance in underground gasification (Water generally has an unfavorable effect on the reaction and should be drained when possible), 4544
More about underground gasification of coal by means of bore-holes, 3195
Movement of a plane combustion front in solid fuel (Hypotheses and conclusions are given), 4553 Movement of gas in a shaftless underground gas generator, Nature of hydrogeological studies of coal deposits subjected to gasification (Underground water interfered with readying coal for gasification), 4414 Need to give greater attention to underground gasification of coal (Economics), 4366 New apparatus for distillation of coal *'in situ'' (Underground coal gasification; patent), 3426 New concept for in situ coal gasification, 5312 (URCL--51217(Rev. 1)) New concept for in situ coal gasification (Coal shattered with conventional explosives, then retorted with 0-H₂C mixture at 700-1300°K; reactants pumped into deposit at 500-1000 psi and carbon dickide and methane removed from bottom), 5387

New concept for in situ coal gasification (Use of conventional explosives and oxygen-water retorting), 5298 (UCRL-51217) New data for calculating the water balance of underground generators (Equations, calculatons, and curves are New developments in underground gasification of coal (In USSR), 4618 New price for gas produced by underground coal gasification, 4669

New technological systems of underground gasification of lignites and the preliminary results of their use, 4305

Note on the reaction mechanism in the underground gasification of coal (System of equations developed that were solved by analog computer), 5005 and Scotia Research Foundation. Fourth annual report, 1950 (Studies on the effects of inhibitors of $\rm CO_2$

formation on rate of burning at coal face and calorific value of gas), 3776
Nova Scotia Research Foundation. Fifth annual report,

1951 (Laboratory equipment designed to study underground gasification), 3855

Oil production by heat from burning coal veins (Use of pressure developed during underground gasification to force oil and gas out of overlaying strata), 3907 On the plan of scientific research and experimental w on subsurface coal gasification (In the USSR), 4549 Operation and arrangement of underground gasification installation (Methods for modifying gasification zone; patent), 3463 Operation and arrangement of underground gasification installation (Introduction of inert gas into air-gas passages between airblast direction changes prevents explosions; patent), 3464
Operation and arrangement of underground gasification installation (Arrangement for preheating airblast; patent), 3465 Operation of underground gasification (Carbon dioxide removed from gaseous products is added to the airblast; patent), 3466 Operation of underground gasification (Method for lowering temperature of gaseous products; patent), 3467
Operation of underground gasification (Regulation of rate
of combustion; patent), 3468
Operation of underground gasification installation (Maintaining pressure in the gasification zone; patent), 3469 Operation of underground gasification installations (Pyrometer installation; patent), 3470 (Pyrometer installation; patent), 3470

Operational results of the underground coal gasification plant at Lisichansk in the years 1954 to 1956, 4430

Optimum operating conditions in underground gasification sites in the Moscow coal field, 4412

Optimum operating conditions of underground gasgenerators of the sub-Moscow "Podzemgaz" station, 4378 Optimum requirements from the mining geological viewpoint for sites for the subterranean gasification of coal, 3358 Outline and completeness of the gasification of a coal seam (from results of opening up VNII Podzemgaz Gas Generator No. 1 at the Lisichansk Underground Gasificaton Station), 4535
Outlook for the development of underground gasification Outlook for the development of underground gasification of coal in the Turgay Basin, 4454
Outlook for underground gasification of coal (Review of methods used in Poland), 4501
Outlook for technological gas production in the process of underground gasification of coal, 4069
Oxidation by steam in underground gasification of coal (Proposed method for calulating the ratio of stream to other oxidizing gases), 4001
Participation of enclosing rocks in the process of underground coal gasification, 4650
Percolation method of underground gasification of coal seams (Patent), 3484 seams (Patent), 3484 Percolation method of underground gasification of coal, Performance of the Moscow Region Plant of "Podzergaz" (Underground gasification of coal), 4214
Perspectives of underground gasification, 4314 Physicochemical properties of lean coals in the Kamenskaya Station area for underground gasification of coal (Air input and flow rate must be increased to obtain stable gasification), 4938 Possibilities of underground gasification in the UK (Methods, gas quality, and uses of gas are discussed), 3922 Possibility of using ultrasonic logging as precautionary measure in underground gasification of coal, 4437 Potential development of underground gasification of coal, 3812
Power from underground fire (Underground gasification of coal), 4499 Power plant for utilizing the energy in the upcast gas from an underground gasification reaction (Patent). 4504 Power station operating on coal seam gas (Description of underground gasification plant at Newman Spinnery), 4692 Preliminary results on opening up the burnt-out space at experimental gas generator No. 1 in the Lisichansk Underground Gasification Station (Describes the burnedout generator and gives conclusions), 4390 out generator and gives conclusions), 4390
Preliminary report of the first experiments and an outline of problems in connection with underground gasification of coal (Lisichansk and Shakhtinsk mines; gasification in lump form and unbroken blocks by air blow; 1300 to 1700 kg cal/m³ heat value), 3188
Preliminary results released for Wyoming in situ gasification test, 5559 Preliminary results of trials of directional boreholes (Large-scale testing of linkage possibilities of inclined boreholes), 4557 Present situation in underground gasification of coal beds, 4261 Present situation of underground gasification of coal, Present state and future development of underground coal

gasification according to the date of discussions, Present state of research (July 1953) on underground

gasification, 4039

```
Present state and future development of underground gasification (In the USSR), 4595
Pressure control in underground gasification of coal,
```

Pressure gasification of Uereeniging coal (Underground

gasification with the Lurgi process), 3860
Principal elements in the method of Zhuravlev (for underground gasification of coal), 3185
Principles of underground gasification [of coal]

(Production of gas with heating value of 1100 to 1300 cal/m³), 3278

rinciples of production of fuel gases (Development of underground gasification in USSR; description of Soviet methods), 3599

Principles of the interpretation of the physico-chemical processes of underground gasification of coal by air, and their nature as shown by experiments, 4720

Principles for interpreting physiochemical processes in underground gesification of coal by air and their experimental illustration (Use of C), rather than air,

is recommended), 4775
Problem of classification of methods of underground gasification and of systems of ignition and combustion, 4060

Problem of effect of aerodynamics of blowing and gas streams on the process of underground gasification of coal in operating panels of underground gas generators, 4085

Problem of scientific classification of methods of underground gasification of coal, 4047
Problems of underground gasification of coal (Some

results indicate simply combustion not gasification), 3629

Problems of the underground gasification of coal, 4204 Problems of classification of methods used in underground gasification of coal, 4284
Procedure and apparatus for underground gasification

(Airblast is passed through tubular heat exchanger carrying external baffles; patent), 3423

Procedure and apparatus for underground gasification (Airblast is preheated in a heat exchanger passing into it the product from an oxygen generator; patent), 3424 Procedure for underground gasification of combustible strata (Patent), 3578

Procedure for underground gasification of combustible strata (Enrichment of gas by addition of gasified liquid hydrocarbons; patent), 3579
Process and apparatus for recovery of volatilizable

constituents from underground carbonaceous formations (Underground gasification; patent), 3678
Process for the underground gasification of coal

(Patent), 4584
Process for initiating in-situ combustion (Liquid hydrazine is introduced and decomposed with no light to

heat the mineral; petent), 4789
Process of gas formation in the combustion of coal in beds (Chemical mechanisms of gas formation), 3533

Process of underground electrocarbonization), 3555
Process of underground electrocarbonization (Results of studies on coal and oil shale), 3890
Process of the undergound gasification of thin coal seams with an air blast and a blast enriched with oxygen at Listchansk (Use of inclined boreholes and high-pressure air linkage), 4538
Producer and producer as (Details of stream method for

Producers and producer gas (Details of stream method for underground coal gasification), 3437 Producing gas in coal seams (Experience in USSR and UK),

4486

Production of oil from coal (Principles of Bergius and Fischer-Tropsch processes; USSR and USA practices in underground gasification), 3790
Production of energy by means of underground gas production, 4502
Production of gases of high caloric value by underground

caal gasification (Improved technology can increase heating value from 800 Kcal/m³ to 900-50 Kcal/m³; use of 0-enriched air or steam; economics), 4577

Progress in coal mining technology (Review of missing and underground gasification techniques during 1948 to 1950) 3274

1950), 3734

Progress report on 2nd experiment in underground gasification of coal (Study on control of gases, maintenance of combustion, gas quality, methods of obtaining test data, and technical and economic information), 3695

Project Thunderbird: nuclear trigger for coal

gasification, 5066
Proposals and deliberations at the debate **On the position and future development trends of science with regard to underground gasification of coals which too regard to underground gastification of coal which the place in the Soviet Academy of Sciences from 23 to 28 May 1957 (Technical and economic aspects are discussed), 4393
Prospects for synthesis of liquid fuel and chemical

products from gases obtained by underground gasification (Gases regime upgrading due to low carbon monoxide content), 4316

Putting into operation underground gas producers without mining at the Lisichansk 'Podzemgaz' Plant, 4666 Reaction kinetics of the conversion of carbon monoxide by water vapor in the presence of Lisichansk coal ashes (Comparison of Al₂O₃, CaO, MgO, Fe₂O₃, Fe₃O₄, and SiO₂

as catalysts in underground coal gasification), 4384 Reaction of coal with steam at high pressures (Use of

tungsten sulfide as catalyst to convert carbon oxides and hydrogen to methane), 5097 (BM-RI-7209)
Reactivity of coal in underground gasification, 4168
Realization of D. I. Mendeleev's idea regarding underground gasification of coal (Review), 4626 Realization of a dream. Underground gasification of coal, 4016

Realized dream at the plant of underground gasification of coal, 4352

Recent developments in underground gasification (Background and summary of British experiments), 4599 Recent developments in underground gasification (of

coal), 4515
Recent investigations on the combustion and gasification of beds of solid fuels (Review covering 1944-48; 51

or beds or solid fuels (Nevlew covering 1944-48; 31 references), 3659
Recovering sub-surface bituminous deposits by creating a frozen barrier and heating in situ (Frozen barrier presents intrusion of water and loss of product gas;

presents intrusion of water and loss of product gas; patent), 4477
Recovery of chemicals from underground coal gasification gas in a large-scale laboratory apparatus (Filot-scale laboratory apparatus), 5035
Recovery of hydrocarbons from lignite in situ (Injection of dry, superheated steam at 500-750°F and 150-750° ps.si.g. or higher), 4787
Recovery of hydrocarbons by in-situ combustion (Underground gasification; patent), 4695
Reduction of blowing and gas losses in underground gas generators. 4215

generators, 4213

Reflections on world power conference (Discussion of US research into undergound coal gasification), 3741
Regenerative method of underground gasification process

egenerative method of underground gasification process of coal (Heating value of 900-1000 Kcal/m³ increased to 1300-1400 Kcal/m³ by increasing 0 content to 25%; with 0 and steam it was 2500 Kcal/m³; gas composition of CO_2 13.58, 0 0.22, C0 6.32, H 58.5, CH, 4.28, N 17.1%), 4579

Regulation of the quality of gas from underground gasification (of coal) by blowing with periodically changing velocity, 4440
Regulation of the temperature for subterranean

gasification, 3346

Relation between aerodynamics of gas-blast streams and technical parameters of underground gasification of coal, 4407

Relation of underground coal-mine fires to underground

gasification of coal, 3182
Relation of the process of underground gasification of coal to the type and rate of flow to the gasifying

agent, 4983
Relation of calorific value and of composition of gas
from the underground gasification of coal to humidity the gas, 4832

Relationship between the length and cross section of the gasification channel in underground gas generators (Application of gasification laws to underground operations), 4317
Removal of hydrogen sulfide from gas by the arsenic-scda

method (Results are not satisfactory), 1072
Report of the activities of the center in 1948
(Laboratory tests relating to underground gasification

of coal), 3596 Report of research and technologic work on coal and related investigations, July 1, 1952, to December 51, 1953 (Describes quality of gas produced with air O2, or steam in first three experiments at Gorgas, Alabama),

Report of the activities of the center in 1949 (Laboratory tests relating to underground gasification of coal), 3653 Report on the work with multiple systems of bore holes

(in underground gasification) at an anthracite mine (Iron-lined bore holes), 83
Research carried out in 1956 in the Academy of Sciences

Research carried out in 1950 in the Academy of Sciences of the USSR by the G. M. Krzhizhanovskii Electric Power Institute on the use of electric current for purposes of underground coal gasification and further investigation tasks, 4400
Research data and immediate tasks of the All-Union Sci.
Research Inst. underground gasification of coal

(Review), 4410
Resolution of the expanded scientific conference of October 29, 1954, on the results of research and experimental work in underground gasification of coal, 4212

Results and prospects of work of the Commission on Problems of Underground Gasification of Fuels at the Academy of Sciences of the USSR, 4080
Results of latest experiments (on underground gasification of coal) at the Lisichansk mine (Production of produces as well-sciences)

(Production of producer gas using air; 1421 kg cal/m3), 3184

Results of a competition for the science and planning of proposals for underground gasification, 4326
Results of the third experiment (on underground