

INDEXES

NUMERICAL PATENT INDEX

AUSTRALIAN PATENTS

	Page
111, 151	11
106, 295	58
106, 931	14

BELGIAN PATENTS

427, 333	14
440, 751	32
445, 023	26

BRITISH PATENT APPLICATIONS

15, 106	19
19, 135	60
22, 394	58
22, 734	26
26, 275	34
26, 276	29
26, 624	27
27, 807	19
29, 546	20
29, 636	24
31, 293	40
37, 985	34

BRITISH PATENTS

449, 274	24
453, 973	62
454, 948	16
464, 242	15
468, 434	24
469, 618	15
470, 534	62, 63
473, 932	38
473, 935	62, 63
474, 448	38
480, 442	61
482, 277	67
482, 783	57
483, 316	61
485, 165	61
485, 478	65
487, 317	67
489, 443	67
490, 090	38
490, 785	67
490, 930	62, 63
491, 778	16, 57
492, 595	67
493, 715	64
494, 657	62
496, 169	25
496, 880	38
498, 007	40
500, 182	40
500, 959	58
502, 771	15
503, 206	62, 63
504, 350	62, 63
506, 104	67
507, 306	22

BRITISH PATENTS—Continued

	Page
507, 419	32
507, 521	67
507, 567	61
509, 325	17, 26
510, 350	43, 58
510, 513	32, 43
510, 514	32, 43
513, 674	60
515, 037	19
516, 160	33
516, 329	14
516, 352	24, 25
516, 403	24, 25
517, 002	58
517, 794	30
518, 334	29, 40
518, 372	23
518, 605	61
518, 614	14
519, 613	61
519, 722	16, 57
520, 465	33
526, 814	26
528, 617	29
528, 826	28
529, 300	36
530, 036	34
532, 424	61
533, 459	33
534, 357	26
534, 367	26
536, 169	19
536, 767	40
536, 843	16
536, 912	26
538, 225	26
542, 836	9
542, 925	60
545, 695	11
551, 312	14
559, 041	21, 24
564, 730	24
567, 609	20
574, 973	9

FRENCH PATENTS

49, 424	14
802, 228	62
809, 226	62, 63
819, 701	40
840, 890	64
841, 030	38
841, 043	14
842, 278	34
842, 507	26
843, 305	29
843, 370	61
843, 844	57
843, 874	19
845, 301	30
850, 750	65
853, 302	33

FRENCH PATENTS--Continued

	Page
854, 903	68
854, 962	61
855, 378	24
856, 933	34
860, 390	22
860, 383	05
870, 679	34
871, 909	57
873, 645	24
874, 918	33
877, 257	09
879, 959	30
885, 794	19
	32, 43

GERMAN PATENT APPLICATIONS

St 55, 120	58
St 56, 460	58
St 56, 470	35, 39
St 56, 856	38, 32
St 60, 109	39, 62
St 60, 795	39
St 61, 859	39, 52
St 62, 438	9
St 62, 589	9
I 62, 953	40
I 63, 102	57
I 63, 257	38
I 63, 572	58
I 63, 658	20
I 63, 779	20
I 63, 810	15
St 63, 927	61
I 64, 241	25
I 64, 146	30
I 67, 099	31
R 101, 215	31
R 101, 351	31
R 102, 756	60
R 102, 871	31
R 102, 909	30
R 103, 371	31
R 103, 450	30
R 103, 507	31
R 103, 605	31
R 103, 712	33
R 103, 713	33
R 103, 714	33
R 103, 980	33
R 104, 581	40
R 104, 876	22
R 104, 999	29
R 105, 297	43
R 105, 615	61
K 147, 143	21, 21
K 148, 919	16
B 178, 085	23
B 178, 964	16
B 179, 802	61
B 179, 863	61
B 181, 705	61
B 182, 020	23
B 182, 388	32, 43
B 182, 389	32
B 182, 409	33
B 184, 450	32, 43

GERMAN PATENTS

293, 787	2
481, 337	3
621, 168	3, 52
681, 979	11
692, 836	19
701, 846	33
709, 101	11
709, 225	11
709, 311	19
709, 528	34
708, 512	43, 58
708, 889	38
709, 582	19
709, 843	67
710, 128	60
	33, 43

GERMAN PATENTS--Continued

	Page
710, 963	32, 43
711, 422	34
712, 603	05
714, 775	34
715, 759	57
716, 836	24
716, 853	33
717, 663	09
720, 107	30
720, 685	19
721, 359	14
721, 915	07
722, 533	34
722, 706	33
725, 000	61
725, 185	07
725, 488	20
726, 197	61
726, 885	01
726, 891	61
728, 217	26
728, 706	32
729, 059	34
729, 060	26
729, 897	14
731, 295	57
732, 684	58
732, 719	32, 43
733, 749	65
734, 218	68
734, 993	20
735, 276	26
736, 094	60
736, 471	61
736, 791	66
736, 841	22
736, 922	30
737, 977	36
737, 980	21
738, 091	30, 52
738, 368	32
738, 709	60
739, 509	32, 43
739, 570	60
741, 280	06
741, 826	19
742, 051	20
742, 376	60
744, 078	36
744, 184	45
744, 185	46

ITALIAN PATENTS

379, 250	38
387, 038	20
389, 201	24, 57, 58
389, 688	61
390, 152	61
392, 831	24, 58

JAPANESE PATENTS

130, 551	26
133, 533	26

NETHERLANDS PATENTS

50, 858	40
---------	----

NORWEGIAN PATENTS

65, 700	66, 67
---------	--------

RUSSIAN PATENTS

53, 219	38
54, 392	38
52, 888	26, 30

SWEDISH PATENTS

104, 113	
104, 476	

UNITED STATES PATENTS

1, 503, 587	30
1, 628, 190	30
1, 915, 473	30
2, 148, 545	15
2, 159, 077	24
2, 172, 441	04
2, 178, 824	61
2, 183, 145	38
2, 183, 146	38
2, 189, 200	61
2, 203, 470	58
2, 206, 500	25
2, 207, 581	57
2, 209, 123	32, 43
2, 209, 190	38
2, 211, 022	34
2, 215, 885	29
2, 219, 012	25
2, 220, 261	61
2, 224, 003	28
2, 224, 048	23
2, 224, 049	58
2, 225, 487	61
2, 228, 118	33
2, 231, 990	57
2, 232, 673	38
2, 234, 568	22
2, 234, 911	19
2, 238, 240	28
2, 238, 726	16
2, 238, 766	22
2, 238, 846	30
2, 240, 481	36
2, 243, 760	21
2, 243, 869	30, 52
2, 243, 897	32
2, 244, 196	60
2, 244, 573	32, 43
2, 244, 710	06
2, 247, 087	19
2, 248, 099	20
2, 248, 731	60
2, 250, 421	36
2, 251, 554	45
2, 253, 607	46
2, 254, 748	24
2, 264, 806	
2, 255, 126	
2, 250, 022	
2, 250, 969	
2, 257, 074	
2, 257, 457	
2, 257, 800	
2, 258, 511	
2, 258, 839	
2, 259, 901	
2, 261, 181	
2, 264, 427	
2, 266, 161	
2, 271, 259	
2, 274, 639	

UNITED STATES PATENTS --Continued

	Page
2, 274, 750	24, 58
2, 275, 274	11
2, 278, 644	
2, 279, 052	
2, 286, 814	
2, 287, 082	
2, 287, 891	
2, 289, 731	
2, 292, 570	
2, 296, 405	
2, 301, 687	
2, 309, 031	
2, 318, 602	
2, 318, 625	
2, 318, 146	
2, 327, 056	
2, 338, 175	
2, 338, 805	
2, 339, 927	
2, 345, 957	
2, 317, 682	21, 24
2, 349, 915	
2, 351, 248	
2, 357, 891	
2, 360, 787	
2, 361, 997	
2, 363, 739	
2, 365, 694	
2, 368, 930	
2, 369, 106	
2, 369, 548	
2, 369, 956	
2, 393, 240	

UNITED STATES ALIEN PROPERTY CUSTODIAN

TC 1, 222, OZ 11, 356	15
TC 1, 134, OZ 11, 351	20
TC 1, 136, OZ 11, 312	58
TC 1, 142, OZ 11, 321	20
TC 1, 156, OZ 11, 209	57
TC 1, 158, OZ 11, 491	25
TC 1, 188, OZ 12, 177	40
TC 1, 190, OZ 11, 220	38
TC 1, 204, OZ 11, 158	40
TC 1, 225, OZ 11, 461	25
SN 72, 672	61
132, 770	24
230, 512	66
SN 240, 150	27
SN 260, 214	30
SN 268, 021	61
SN 272, 175	9
280, 054	36
280, 055	60
373, 703	67
373, 912	25
SN 374, 005	9
377, 406	9
382, 394	64
382, 639	10
383, 242	67
389, 039	40
SN 391, 721	36
414, 926	34

AUTHOR INDEX

A		B		C		D		E		F		G		H		I		J		K	
Name	Page	Name	Page	Name	Page	Name	Page	Name	Page	Name	Page	Name	Page	Name	Page	Name	Page	Name	Page	Name	Page
Achowak, J.	142	Badrache Anilin u. Soda Fabrik	2	Baczowski, W.	142	Dannpfeiser, W.	62	Egloff, G.	13, 14, 60	Haensel, V.	9, 22, 52	Haensel, V.	9, 22, 52	Jackson, L. C.	137, 138	Kadmer, E. H.	63	Kaiser, E.	27	Kaufmann, H.	61
Ackermann, P.	26	Bahr, T.	39	Buehl, R.	132, 134	Davis, V.	61	Eidus, Y. T.	27, 37, 40, 45, 52, 63, 54, 55	Hagenmann, A.	19, 6	Hagenmann, A.	19, 6	Jacob, W.	69	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Aicher, A. A.	16, 47, 53	Balandin, A. A.	31, 64	Buettner, A.	26, 60	Davis, J. D.	61	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Albert, V.	20	Baldeschwieler, E. L.	66, 67	Buehler, H.	43, 48, 55	Decarriere, E.	25	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Alberts, L.	16, 19	Barr, F. T.	21, 24, 25	Bulanova, T. F.	63	Deccarriere, E.	25	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Albrecht, W. H.	157, 138, 143, 151, 152	Barrett, C. S.	132	Cadman, W. H.	12	Deutsche Erdöl A. G.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Alden, R. C.	70	Baudisch, O.	137, 138, 144	Calcott, W. S.	12	Deutsche Hydrierwerke, A. G.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Aldrich, R. C.	19, 20, 34, 64	Baummann, W.	137, 138, 144	Calvert, —	159	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Altshuler, S. B.	37, 45, 52	Bausehinger, C.	65	Campbell, D. L.	21, 24	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
American Society for Testing Materials.	131, 132	Bayer, O.	65	Carbo-Norit-Union Verwaltungs, G. m. b. H.	21, 24	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Anderson, H. C.	1	Becke, F.	7	Carnegie Institute of Technology, Coal Research Laboratory Staff.	13	De Witt, P. W.	14	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Anderson, R. B.	1	Reck, O.	13	Carr, T. P.	14	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Andrew, T.	1	Bell, E. A.	14	Cawley, C. M.	11, 14, 23, 61	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Anthracite, I.	1	Bellamy, L. J.	66, 67	Chakravarty, K. M.	27	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Appleyard, K.	13, 45	Beltz, J. C.	12	Chao, T. Y.	34	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Aranda, V. G.	61	Berkman, S.	14	Chaudron, G.	156	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Armitage, G. E.	63	Bernman, H.	151	Chemical Age (London)	7, 10, 14	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Asbury, W. O.	13	Berthelot, C.	7, 14	Chemical and Engineering News	25, 66	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Asche, W.	47	Billing, R.	30	Chemical Industries	10	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Atkins, H.	30	Blaschzyk, G.	52	Chemical & Metallurgical Engineering	6	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Atwell, H. V.	9, 15, 22, 23, 24, 25, 61	Blass, K.	67	Chemical Trade Journal	7, 17, 19, 36, 63, 67	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Audibert, E.	4	Blyudov, A. P.	26, 30	Chevalier, R.	7, 17, 19, 36, 63, 67	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Aureden, H.	4	Böhm, J.	138, 141	Choulat, G.	152, 153	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
A vdeeva, A. V.	19	Bolzan, W.	138, 141	Christmann, F.	61, 64	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Ayre, A. L.	13	Borissow, P. B.	66	Clar, C.	61, 64	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
Ayres, E. E.	14	Bosworth, R. C. L.	61	Cohan, L. H.	64	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
		Boyd, G. A.	14	Coke and Smokeless-Fuel Age	171	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
		Braune, W.	32, 42	Colliery Guardian	57	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
		Braunkohle-Benzin A. G.	16, 23, 32, 33, 34, 43, 61	Combined Intelligence Objectives Subcommittee	7, 14, 17	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
		Brennstoff-Chemie.	65	Report 22, 26/50	66, 67	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
		Breywisch, —	65	Report 22 and 30, 27/82	66, 67	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
		Bridgewater, R. M.	10, 62	Report 30, 23/16	62	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
		Brill, R. T.	131	32/107	64, 67	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
		Bristow, W. A.	8, 14, 57	Compagnie de produits chimiques et electro-metallurgiques Alais, Froges et Camargue	9, 61	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
		British Intelligence Objectives Subcommittee	30/447	Cotton, R.	20	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
		Report 22, 31/86	66, 67	Cover, L. W.	20	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
		30/447	20, 32	Craford, S. R.	20, 32, 47, 51, 52, 53	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
				Currie, W. R.	32, 43	Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14, 60	Hahn, F. L.	143	Hahn, F. L.	143	Jacob, W.	25, 38	Karayaama, I.	27	Kaufmann, H.	61	Kaufmann, H. P.	62
						Dewey, D. R.	9, 35	Egloff, G.	13, 14,												

	Page		Page
Wiemer, H.	52	Wolff, B.	65
Wietzel, G.	65	Woodward, L. A.	41
Wilke, G.	8	Woodward, L. D.	14, 51
Williams, A. E.	14, 56, 66	Wright, C. C.	8, 13
Williams, J. P.	08	Wulff, J. A.	132, 134
Williams, K.	11		
Wilson, D. W.	12		
Wilson, E.	152		
Wilson, R. E.	13	Yamada, T.	45
Winkler, F.	22, 25	Yule, G. U.	124
Winzer, K.	60		
Wirth, G.	16, 20, 22		
Wirth, H. R.	61		
Wischermann, W.	24		
Witka, F.	65, 66, 67		

SUBJECT INDEX

	Page
Analysis:	
Exit gases from Bureau of Mines laboratory-scale plant.	87
See also Products, analysis of.	
C	
Catalysts:	
Activity:	
Effect, deleterious, of chlorides on unpromoted iron catalysts prepared from ferric salts.	97
Effect of:	
Addition of thorium, alumina, manganese oxide, or zinc oxide to iron catalyst.	103
Alkali on unpromoted iron catalyst.	97
Conditions of precipitation of active, unpromoted iron catalyst.	98
Variation in induction procedure and operating pressures for unpromoted iron catalysts.	98-103
Variations in methods of catalyst preparation, reduction, induction, and synthesis conditions on activity and durability.	91-130
Ferric nitrate, active; ferric chloride, inactive.	171
Nickel-cobalt alloy.	33
Tests on nickel catalysts at atmospheric pressure.	108
Tests on promoted cobalt catalysts (pelleted), atmospheric pressure, rapid reduction, slow induction $2H_2+CO$ synthesis gas.	table 35
See also Catalysts, physical properties; Catalysts, tests.	
Adsorption.	50
Carbon monoxide.	168
Hydrogen and carbon monoxide on various catalysts—correlation with activity.	50
Nitrogen at $-195^\circ C$. on unreduced and reduced cobalt catalyst 89J.	fig 45
Nitrogen on unreduced and reduced iron catalyst at $-195^\circ C$.	fig 47
Nitrogen and carbon monoxide at $-195^\circ C$. on reduced pelleted catalysts 89H and 89J and reduced cobalt oxide powder.	fig 44
Nitrogen and carbon monoxide at $-195^\circ C$. on unreduced and reduced cobalt catalyst and cobalt oxide.	table 60
By number:	
1E, $Fe^{13}Cu:4:1$, ex $Fe(NO_3)_3$, $Cu(NO_3)_2$, KOH:	
Magnetic susceptibility.	table 55
	156
Preparation.	table 56
	157
	table 18
	83
	table 19
	84
	156, 178
Similarity to catalyst 40A.	158
Tests.	table 23
	92
X-ray diffraction pattern.	table 56
	157
	fig. 40
2A, $Cu:ThO_2$ kguhr:100:18:100:	
Preparation.	table 20
	85
	table 21
	86
	182
Tests.	table 34
	110
5A, $Fe^{13}Cu:4:1$, ex $FeCl_3$, $Cu(NO_3)_2$, KOH:	
Magnetic susceptibility.	156
	table 56
	157
Preparation.	table 18
	83
	table 19
	84
	150, 156, 178
Similarity to catalyst 40A.	158
Tests.	table 23
	92
	150, 156
X-ray diffraction pattern.	table 56
	157
	fig. 40
6A, $Fe^{13}Fe^{12}Cu:3/3:4/3:1$, ex $FeCl_3$, $FeSO_4$, $7H_2O$, $Cu(NO_3)_2$, NaOH:	
Preparation.	table 18
	83
	table 19
	84
	178
Tests.	table 23
	92
9A, $Fe^{13}Cu:4:1$, ex $Fe(NO_3)_3$, $Cu(NO_3)_2$, NH_4OH , $(NH_4)_2CO_3$:	
Preparation.	table 18
	83
	table 19
	84
	178
Tests.	table 23
	93

Catalysts—Continued

By number—Continued

10A. Iron, ex $\text{Fe}(\text{NO}_3)_3$, K_2CO_3 :		
Activity.....	151	98
Comparison with 10B, part A, intermediate with rapid induction procedure.....	98	
Magnetic susceptibility.....	151	98
Preparation.....	table 16	81
	table 17	82
Tests.....	table 25	174
10A + 10B. Iron, ex $\text{Fe}(\text{NO}_3)_3$, K_2CO_3 :		
Magnetic susceptibility.....	151	98
Tests.....	table 55	153
X-ray diffraction pattern.....	table 26	90
10A + 10B, part A. Iron, ex $\text{Fe}(\text{NO}_3)_3$, K_2CO_3 :		
Characterization.....	fig. 33	142
Magnetic susceptibility.....	table 53	148
Tests.....	table 53	148
X-ray diffraction pattern.....	table 53	148
10B. Iron, ex $\text{Fe}(\text{NO}_3)_3$, K_2CO_3 :		
Duplicate preparation in catalyst 10K.....	99	
Magnetic susceptibility.....	table 16	81
Preparation.....	table 17	82
10B, part A. Iron, ex $\text{Fe}(\text{NO}_3)_3$, K_2CO_3 :		
Comparison with 10A, rapid with intermediate induction.....	98	
Magnetic susceptibility.....	151	98
Preparation.....	table 17	82
Tests.....	table 24	94
10B, part B. Iron, ex $\text{Fe}(\text{NO}_3)_3$, K_2CO_3 :		
Activity.....	98	
Characterization.....	table 53	148
Magnetic susceptibility.....	table 53	148
Preparation.....	table 53	148
Tests.....	table 17	82
X-ray diffraction pattern.....	table 24	94
10B, part C. Iron, ex $\text{Fe}(\text{NO}_3)_3$, K_2CO_3 :		
Activity.....	98	
Characterization.....	table 53	148
Magnetic susceptibility.....	table 53	148
Preparation.....	table 53	148
Tests.....	table 17	82
X-ray diffraction pattern.....	table 24	94
10C. Iron, ex $\text{Fe}(\text{NO}_3)_3$, K_2CO_3 :		
Characterization.....	fig. 38	147
Magnetic susceptibility.....	table 53	148
Preparation.....	table 53	148
Tests.....	table 17	82
X-ray diffraction pattern.....	table 16	81
Simultaneous reduction-induction by special procedure.....	table 17	82
Tests.....	table 22	90
X-ray diffraction pattern.....	table 21	94
10D. Iron, ex $\text{Fe}(\text{NO}_3)_3$:		
Characterization.....	fig. 33	142
Electron micrograph.....	fig. 38	147
Magnetic susceptibility.....	table 53	148
Preparation.....	table 53	148
Tests.....	table 16	81
X-ray diffraction pattern.....	table 17	82
10E. Iron, ex $\text{Fe}(\text{NO}_3)_3$:		
Characterization.....	table 53	148
Magnetic susceptibility.....	table 53	148
X-ray diffraction pattern.....	fig. 33	142
	table 53	148

Catalysts—Continued

By number—Continued

10F. Iron, ex $\text{Fe}(\text{NO}_3)_3$:		
Activity.....	151	98
Magnetic susceptibility.....	table 16	81
Preparation.....	table 17	82
10F, part A. Iron, ex $\text{Fe}(\text{NO}_3)_3$:		
Characterization.....	table 53	148
Magnetic susceptibility.....	table 53	148
Preparation.....	table 17	82
Tests.....	table 24	94
X-ray diffraction pattern.....	fig. 33	142
10F, part C. Iron, ex $\text{Fe}(\text{NO}_3)_3$:		
Characterization.....	table 53	148
Magnetic susceptibility.....	table 53	148
Preparation.....	table 17	82
Tests.....	table 24	94
X-ray diffraction pattern.....	fig. 33	142
10G. Iron ex $\text{Fe}(\text{NO}_3)_3$:		
Characterization.....	table 53	148
Magnetic susceptibility.....	table 53	148
X-ray diffraction pattern.....	fig. 34	143
10H. Iron, ex $\text{Fe}(\text{NO}_3)_3$:		
Characterization.....	table 53	148
Magnetic susceptibility.....	table 53	148
X-ray diffraction pattern.....	fig. 34	143
10I. Iron, ex $\text{Fe}(\text{NO}_3)_3$:		
Characterization.....	table 53	148
Magnetic susceptibility.....	table 53	148
X-ray diffraction pattern.....	table 53	148
10J. Iron, ex $\text{Fe}(\text{NO}_3)_3$:		
Characterization.....	table 53	148
Magnetic susceptibility.....	table 53	148
X-ray diffraction pattern.....	fig. 34	143
10K. Iron, ex $\text{Fe}(\text{NO}_3)_3$, K_2CO_3 :		
Adsorption of nitrogen at -195°C	fig. 47	171
Characterization.....	table 53	148
Magnetic susceptibility.....	table 53	148
Preparation.....	table 16	81
Reduction.....	table 17	82
Properties.....	table 61	172
Tests.....	table 27	97
X-ray diffraction pattern.....	fig. 31	143
10L, part A. Iron, ex $\text{Fe}(\text{NO}_3)_3$, K_2CO_3 :		
Characterization.....	table 53	148
Magnetic susceptibility.....	table 53	148
X-ray diffraction pattern.....	fig. 34	143
10L, part B. Iron, ex $\text{Fe}(\text{NO}_3)_3$, K_2CO_3 :		
Characterization.....	table 53	148
Magnetic susceptibility.....	table 53	148
X-ray diffraction pattern.....	fig. 34	143
10M. Iron:		
Activity.....	97	
Characterization.....	table 53	148
Magnetic susceptibility.....	table 53	148
Preparation.....	table 16	81
Reduction.....	table 17	82
Tests.....	table 27	97
X-ray diffraction pattern.....	fig. 34	143
	fig. 38	147
	table 53	148

Catalysts—Continued

By number—Continued

10-O. Iron, ex $\text{Fe}(\text{NO}_3)_3$, K_2CO_3 :

Characterization..... table 53 148
Magnetic susceptibility..... table 53 151

X-ray diffraction pattern..... fig. 34 143
..... table 53 148

11A. $\text{Fe}^{12}\text{Cu}:4:1$, ex $\text{Fe}(\text{NO}_3)_3$, $\text{Cu}(\text{NO}_3)_2$, NaOH , $\text{Na}_2\text{B}_4\text{O}_7$:

Preparation..... table 18 83
..... table 19 84

Tests..... table 23 93
X-ray diffraction pattern..... fig. 40 157
..... table 56 157

12B. $\text{CoO}:\text{ThO}_2\text{kguhr}:82:18:100$:

Preparation..... table 20 85
..... table 21 86

Tests..... table 35 181
..... table 35 181

15A. $\text{FeO}:\text{ThO}_2:5:1$, ex $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, $\text{Th}(\text{NO}_3)_4$, NaOH :

Preparation..... table 18 83
..... table 19 84

Tests..... table 23 93
..... table 23 93

20A. $\text{Fe}^{12}\text{ZnCu}:4:1:1$, ex $\text{Fe}(\text{NO}_3)_3$, $\text{Cu}(\text{NO}_3)_2$, $\text{Zn}(\text{NO}_3)_2$, K_2CO_3 :

Preparation..... table 18 83
..... table 19 84

Tests..... table 23 93
..... table 23 93

21A. $\text{Fe}^{12}\text{CuAl}:4:1:1$, ex $\text{Fe}(\text{NO}_3)_3$, $\text{Al}(\text{NO}_3)_3$, K_2CO_3 :

Preparation..... table 18 83
..... table 19 84

Tests..... table 23 93
..... table 23 93

22A. $\text{Fe}^{12}\text{CuCr}:4:1:1$, ex $\text{Fe}(\text{NO}_3)_3$, $\text{Cu}(\text{NO}_3)_2$, $\text{Cr}(\text{NO}_3)_3$, K_2CO_3 :

Preparation..... table 18 83
..... table 19 84

Tests..... table 23 93
..... table 23 93

23A. $\text{Fe}^{12}\text{Cu}:4:1$, ex $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, CuSO_4 , KOH :

Magnetic susceptibility..... table 56 157
Preparation..... table 18 83
..... table 19 84

Tests..... table 23 93
..... table 23 93

X-ray diffraction pattern..... table 56 157
..... table 56 157

23B. Iron, promoted:

Magnetic susceptibility..... table 56 157
Preparation..... table 56 157

Similarity to 85A..... table 56 157
X-ray diffraction pattern..... fig. 40 157
..... table 56 157

24A. $\text{Fe}^{12}\text{Cu}:4:1$, ex $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, CuSO_4 , K_2CO_3 :

Magnetic susceptibility..... table 56 157
Preparation..... table 18 83
..... table 19 84

Tests..... table 23 93
..... table 23 93

X-ray diffraction pattern..... table 56 157
..... table 56 157

24B. Iron, promoted:

Magnetic susceptibility..... table 56 157
Preparation..... table 56 157

Similarity to 85A..... table 56 157
X-ray diffraction pattern..... fig. 40 157
..... table 56 157

24C. $\text{Fe}^{12}\text{Cu}:4:1$, ex FeSO_4 (anhydr.), CuSO_4 , K_2CO_3 :

Magnetic susceptibility..... table 56 157
Preparation..... table 18 83
..... table 19 84

Tests..... table 23 93
..... table 23 93

X-ray diffraction pattern..... fig. 40 157
..... table 56 157

25A. $\text{Fe}^{12}\text{Cu}:4:1$, ex FeSO_4 (anhydr.), CuSO_4 , NaOH , $\text{Na}_2\text{B}_4\text{O}_7$:

Magnetic susceptibility..... table 56 157
Preparation..... table 18 83
..... table 19 84

Similarity to 85A..... table 56 157
Tests..... table 23 93
..... table 23 93

X-ray diffraction pattern..... fig. 40 157
..... table 56 157

Catalysts—Continued

By number—Continued

30A. $\text{CoO}:\text{NiO}:\text{MnO}:\text{Al}_2\text{O}_3\text{kguhr}:40:40:16:4:100$:

Activity..... table 20 85
Preparation..... table 21 86

Tests..... table 33 109

38A. $\text{NiO}:\text{MnO}:\text{Na}_2\text{O}:\text{Al}_2\text{O}_3:\text{SiO}_2:5:1:6$:

Activity..... table 20 85
Preparation..... table 21 86

Tests..... table 33 109

39A. $\text{Fe}:\text{Co}:\text{Cu}:\text{Hyslo Super-Cel}:4:1:1:26:8:26$:

Preparation..... table 18 83
..... table 19 84

Tests..... table 23 93

40A. $\text{Fe}^{12}\text{Zn}:4:1$, ex $\text{Fe}(\text{NO}_3)_3$, $\text{Zn}(\text{NO}_3)_2$, K_2CO_3 :

Magnetic susceptibility..... table 56 157
Preparation..... table 18 83
..... table 19 84

Similarity to 10, 5A, and 11A..... table 56 157
Tests..... table 23 93

X-ray diffraction pattern..... fig. 40 157
..... table 56 157

43A. $\text{Fe}^{12}\text{Cu}:4:1$, ex $\text{Fe}_2(\text{SO}_4)_3$, CuSO_4 , K_2CO_3 :

Preparation..... table 18 83
..... table 19 84

Tests..... table 23 93

44A. $\text{Fe}_2\text{O}_3:\text{CrO}_3:1:4$, ex $\text{Fe}(\text{NO}_3)_3$, CrO_3 , NaOH :

Preparation..... table 18 83
..... table 19 84

Tests..... table 23 93

47A. Iron, ex FeCl_3 , K_2CO_3 :

Characterization..... table 53 148
Magnetic susceptibility..... table 53 148

Preparation..... table 16 81
..... table 17 82

Tests..... table 23 93

X-ray diffraction pattern..... fig. 35 141
..... fig. 38 147

47B. Iron, ex FeCl_3 , K_2CO_3 :

Characterization..... table 53 148
Magnetic susceptibility..... table 53 148

X-ray diffraction pattern..... fig. 35 141
..... table 53 148

47C. Iron, ex FeCl_3 , K_2CO_3 :

Absorption of nitrogen on reduced and unreduced at -195°C fig. 47 171
Characterization..... table 53 148

Magnetic susceptibility..... table 53 148
Preparation..... table 16 81
..... table 17 82

Properties..... table 61 173
Simultaneous reduction-oxidation by special procedures..... table 22 90

Tests..... table 23 93

X-ray diffraction pattern..... fig. 35 141
..... table 53 148

47D. Iron, ex FeCl_3 , K_2CO_3 :

Absorption of nitrogen on reduced and unreduced at -195°C fig. 47 171
Characterization..... table 53 148

Electron micrograph..... fig. 37 146
Magnetic susceptibility..... table 53 148

Preparation..... table 55 153
..... table 16 81
..... table 17 82

Properties..... table 61 173
Tests..... table 23 93

X-ray diffraction pattern..... fig. 35 141
..... fig. 38 147

47E. Iron, ex FeCl_3 , K_2CO_3 :

Characterization..... table 53 148
Magnetic susceptibility..... table 53 148

X-ray diffraction pattern..... fig. 35 141
..... table 53 148

Catalysts—Continued

By number—Continued

47E. Iron, ex FeCl_3 , K_2CO_3 :	Page
Characterization	table 53 148
Magnetic susceptibility	table 53 148
Preparation	151, 151
	table 16 81
	table 17 82
Reduction	173, 175
Tests	90
	table 27 97
X-ray diffraction pattern	175
	fig. 35 144
	table 53 148
	145, 154
47G. Iron, ex FeCl_3 , K_2CO_3 :	
Characterization	table 53 148
Magnetic susceptibility	table 53 148
X-ray diffraction pattern	fig. 35 144
	table 53 148
47H. Iron, ex FeCl_3 , K_2CO_3 :	
Preparation	148
X-ray diffraction pattern	table 54 149
47HX. Iron, ex FeCl_3 , K_2CO_3 :	
Preparation	148
X-ray diffraction pattern	table 54 149
47L. Iron, ex FeCl_3 , K_2CO_3 :	
Preparation	148
X-ray diffraction pattern	table 54 149
47J. Iron, ex FeCl_3 , K_2CO_3 :	
Preparation	148
X-ray diffraction pattern	table 54 149
48A. Fe_2O_3 , ex $\text{Fe}(\text{NO}_3)_3$, NaOH :	
Activity	149
Characterization	97
Magnetic susceptibility	table 53 148
	table 53 148
Preparation	156
	table 16 81
	table 17 82
Tests	156, 173, 177
X-ray diffraction pattern	table 23 92
	fig. 35 144
	table 53 148
	150
49A. Fe_2O_3 , ex sponge iron:	
Preparation	table 16 81
	table 17 82
Tests	173, 177
50A. Fe_2O_3 , ex lavino iron oxide:	
Activity	151
Characterization	table 53 148
Magnetic susceptibility	table 53 148
Preparation	156
	table 16 81
	table 17 82
Tests	173, 175
X-ray diffraction pattern	table 23 92
	fig. 35 145
	table 53 148
50B. Fe_2O_3 , ex lavino iron oxide:	
Preparation	table 16 81
	table 17 82
Tests	173, 175
50C. Fe_2O_3 , ex lavino iron oxide:	
Preparation	table 23 92
	table 16 81
	table 17 82
Tests	173, 175
50D. Iron, unpromoted:	
Activity	table 23 92
Characterization	151
Formation	table 53 148
Magnetic susceptibility	151
X-ray diffraction pattern	table 53 148
	fig. 36 145
	table 53 148
51A. $\text{Fe}^{3+}\text{Th}^{3+}5:1$, ex $\text{Fe}(\text{NO}_3)_3$, $\text{Th}(\text{NO}_3)_3$, K_4CO_3 :	
Preparation	table 18 83
	table 19 84
Tests	174
	table 23 93
50A. $\text{NiO}:\text{CoO}:\text{ThO}_2$:kguhr:45.5:45.5:9:100:	
Activity	108
Preparation	table 20 85
	table 21 86
Tests	181, 183
	table 33 109

Catalysts—Continued

By number—Continued

61A. $\text{NiO}:\text{CoO}:\text{ThO}_2$:Hyflo Super-Cel:1:1:0.2:2.2:	Page
Activity	108
Preparation	table 20 85
	table 21 86
Tests	181
	table 33 109
62A. $\text{NiO}:\text{ThO}_2$:kguhr:4.5:0.5:5.5:0:	
Activity	108
Preparation	table 20 85
	table 21 86
Tests	181
	table 33 109
64A. $\text{NiO}:\text{CoO}:\text{ThO}_2$:Hyflo Super-Cel:1:1:0.1:2.2:	
Activity	108
Preparation	table 20 85
	table 21 86
Tests	181, 183
	table 33 109
65A. $\text{NiO}:\text{CoO}:\text{ThO}_2:\text{Al}_2\text{O}_3$ pellets:1:1:0.2:4.9:	
Activity	108
Preparation	table 20 85
	table 21 86
Tests	181, 183
	table 33 109
67A. $\text{Fe}^{3+}:\text{Co}:\text{Th}^{3+}3:2:1$, ex $\text{Fe}(\text{NO}_3)_3$, $\text{Co}(\text{NO}_3)_2$, $\text{Th}(\text{NO}_3)_3$, K_2CO_3 :	
Activity	103
Preparation	table 18 83
	table 19 84
Tests	178
	table 23 93
68A. Fe_2O_3 , ex "limonite" ore:	
Characterization	table 53 148
Magnetic susceptibility	table 53 148
Preparation	table 16 81
	table 17 82
Tests	173, 176
X-ray diffraction pattern	table 23 92
	fig. 36 145
	table 53 148
	151
68B. Iron, ex "limonite" ore:	
Characterization	table 53 148
Formation	table 53 148
Magnetic susceptibility	table 16 81
Preparation	table 17 82
Tests	173, 176
X-ray diffraction pattern	table 23 92
	fig. 36 145
	table 53 148
	151
69A. Iron, ex $\text{Fe}_2(\text{SO}_4)_3$, ignited:	
Preparation	table 16 81
	table 17 87
Tests	173, 177
	table 23 92
70A. Iron, ex $\text{Fe}(\text{NO}_3)_3$, ignited:	
Characterization	table 53 148
Magnetic susceptibility	table 53 148
Preparation	table 16 81
	table 17 83
Tests	151, 173, 177
X-ray diffraction pattern	table 23 92
	fig. 36 145
	table 53 148
	151
80A. Iron, ex $\text{Fe}(\text{NO}_3)_3$, KOH:	
Activity	98
Adsorption of nitrogen on	fig. 47 171
Characterization	table 53 148
Electron micrograph	fig. 37 146
Magnetic susceptibility	table 53 148
Preparation	151
	table 16 81
	table 17 83
Properties	173, 177
Reduction-induction, simultaneous, by special procedures	table 61 172
Tests	table 22 90
	table 23 92
X-ray diffraction pattern	100
	fig. 36 145
	fig. 38 147
	table 53 148

Catalysts—Continued

By number—Continued

80B. Iron, ex $\text{Fe}(\text{NO}_3)_3$, KOH:	Page
Characterization.....	table 53 148
Magnetic susceptibility.....	table 53 149
X-ray diffraction pattern.....	fig. 38 145
81A. Iron, ex $\text{Fe}(\text{NO}_3)_3$, Na_2CO_3 :	table 53 149
Activity.....	97
Characterization.....	table 53 148
Magnetic susceptibility.....	table 53 149
Preparation.....	table 16 81
Tests.....	table 17 83
X-ray diffraction pattern.....	156, 173, 177
81B. Iron, ex $\text{Fe}(\text{NO}_3)_3$, Na_2CO_3 :	table 23 92
Characterization.....	table 53 148
Magnetic susceptibility.....	table 53 149
Preparation.....	150
X-ray diffraction pattern.....	fig. 38 143
85A. $\text{Fe}^{12}\text{Cu}:4:1$, ex FeCl_2 , CuCl_2 , K_2CO_3 :	table 53 148
Activity.....	103
Magnetic studies.....	table 55 157
Preparation.....	table 18 83
Similarity to 23B, 24B, and 25A.....	table 19 84
Tests.....	158, 173
X-ray diffraction pattern.....	158
89A. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	fig. 40 157
Preparation.....	table 56 157
Tests.....	table 20 85
89B. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	table 21 86
Preparation.....	table 57 161
Tests.....	181, 183
89C. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	table 35 111
Preparation.....	112, 129
Tests.....	table 20 83
89D. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	table 21 86
Preparation.....	table 57 161
Tests.....	181, 183
89E. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	table 35 111
Preparation.....	112, 129
Tests.....	table 20 83
89F. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	table 21 86
Preparation.....	table 57 161
Tests.....	181, 183
Properties.....	table 59 165
Relative efficiencies of Filter-Cel and Hyflo Super-Cel.....	fig. 21 122
Sorption of nitrogen and CO at -195°C	fig. 44 166
Summary of statistical analysis of catalyst data.....	table 47 124
Surface area:	
Correlation between activity of reduced catalyst with surface area of unreduced catalyst.....	168
Effect of reduction.....	167
Tests.....	table 42 117
Variation of activity.....	112, 129
89L. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	fig. 46 170
Preparation.....	table 49 130
Bromine numbers of Fischer-Tropsch products.....	table 20 85
Preparation.....	table 21 86
Properties.....	table 59 165
Tests.....	table 42 117
Variation of activity.....	112, 129
89M. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	fig. 46 170
Preparation.....	table 49 130
Bromine numbers of Fischer-Tropsch products.....	table 20 85
Preparation.....	table 21 86
Properties.....	table 59 165
Tests.....	table 42 117
Variation of activity.....	112, 129
89N. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	fig. 46 170
Preparation.....	table 49 130
Bromine numbers of Fischer-Tropsch products.....	table 20 85
Preparation.....	table 21 86
Properties.....	table 59 165
Tests.....	table 42 117
Variation of activity.....	112, 129
89O. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	fig. 46 170
Preparation.....	table 49 130
Bromine numbers of Fischer-Tropsch products.....	table 20 85
Preparation.....	table 21 86
Properties.....	table 59 165
Tests.....	table 42 117
Variation of activity.....	112, 129
89P. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	fig. 46 170
Preparation.....	table 49 130
Bromine numbers of Fischer-Tropsch products.....	table 20 85
Preparation.....	table 21 86
Properties.....	table 59 165
Tests.....	table 42 117
Variation of activity.....	112, 129
89Q. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	fig. 46 170
Preparation.....	table 49 130
Bromine numbers of Fischer-Tropsch products.....	table 20 85
Preparation.....	table 21 86
Properties.....	table 59 165
Tests.....	table 42 117
Variation of activity.....	112, 129
89R. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	fig. 46 170
Preparation.....	table 49 130
Bromine numbers of Fischer-Tropsch products.....	table 20 85
Preparation.....	table 21 86
Properties.....	table 59 165
Tests.....	table 42 117
Variation of activity.....	112, 129
89S. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	fig. 46 170
Preparation.....	table 49 130
Bromine numbers of Fischer-Tropsch products.....	table 20 85
Preparation.....	table 21 86
Properties.....	table 59 165
Tests.....	table 42 117
Variation of activity.....	112, 129
89T. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	fig. 46 170
Preparation.....	table 49 130
Bromine numbers of Fischer-Tropsch products.....	table 20 85
Preparation.....	table 21 86
Properties.....	table 59 165
Tests.....	table 42 117
Variation of activity.....	112, 129
89U. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	fig. 46 170
Preparation.....	table 49 130
Bromine numbers of Fischer-Tropsch products.....	table 20 85
Preparation.....	table 21 86
Properties.....	table 59 165
Tests.....	table 42 117
Variation of activity.....	112, 129
89V. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	fig. 46 170
Preparation.....	table 49 130
Bromine numbers of Fischer-Tropsch products.....	table 20 85
Preparation.....	table 21 86
Properties.....	table 59 165
Tests.....	table 42 117
Variation of activity.....	112, 129

Catalysts—Continued

By number—Continued

89J. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Filter-Cel}:100:6:12:200$:	Page
Adsorption of nitrogen:	
Carbon monoxide and nitrogen at -195°C	table 60 167
-195°C	fig. 45 168
Bromine numbers of Fischer-Tropsch products.....	table 49 130
Preparation.....	table 20 85
Properties.....	table 21 86
Relative efficiencies of Filter-Cel and Celite.....	table 57 161
Relative efficiencies of Filter-Cel and Portuguese kieselguhr.....	table 59 165
Sorption of nitrogen and CO at -195°C	fig. 21 122
Summary of statistical analysis of catalyst data.....	fig. 22 123
Surface area:	fig. 44 166
Correlation between activity of reduced catalyst with surface area of unreduced catalyst.....	table 47 124
Effect of reduction.....	168
Tests.....	167
Variation of activity.....	table 40 116
89K. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Portuguese kieselguhr}:100:6:12:200$:	table 43 118
Bromine numbers of Fischer-Tropsch products.....	table 46 120
Comparison of two induction procedures.....	fig. 18 121
Preparation.....	112, 125, 127, 129
Properties.....	fig. 46 170
Relative activities of pellets and granules.....	table 49 130
Reproducibility of catalyst preparations and tests.....	fig. 20 122
Summary of statistical analysis of catalyst data.....	table 20 85
Tests.....	table 21 86
Variation of activity.....	table 57 161
89L. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	table 59 165
Preparation.....	fig. 23 123
Tests.....	fig. 17 120
Variation of activity.....	table 47 124
89M. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	table 37 113
Preparation.....	table 38 114
Tests.....	table 39 115
Variation of activity.....	112, 117, 126, 129
89N. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Hyflo Super-Cel}:100:6:12:200$:	fig. 46 170
Preparation.....	table 20 85
Bromine numbers of Fischer-Tropsch products.....	table 21 86
Preparation.....	table 57 161
Properties.....	181
Tests.....	112, 129
Variation of activity.....	fig. 46 170
89O. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Filter-Cel}:100:6:12:200$:	table 49 130
Preparation.....	table 20 85
Tests.....	table 21 86
Variation of activity.....	table 57 161
89P. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Filter-Cel}:100:6:12:200$:	181
Preparation.....	112, 129
Tests.....	fig. 46 170
Variation of activity.....	table 49 130
89Q. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Portuguese kieselguhr}:100:6:12:200$:	table 20 85
Preparation.....	table 21 86
Tests.....	table 57 161
Variation of activity.....	181
89R. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Portuguese kieselguhr}:100:6:12:200$:	112, 129
Preparation.....	table 41 116
Tests.....	fig. 46 170
Variation of activity.....	table 49 130
89S. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Portuguese kieselguhr}:100:6:12:200$:	table 20 85
Preparation.....	table 21 86
Tests.....	table 57 161
Variation of activity.....	181
89T. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{Portuguese kieselguhr}:100:6:12:200$:	112, 129
Preparation.....	table 41 116
Tests.....	fig. 46 170
Variation of activity.....	table 49 130
89U. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{German kguhr}:100:6:12:20$:	table 20 85
Preparation.....	table 21 86
Tests.....	table 57 161
Variation of activity.....	181
89V. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{D-911 kguhr}$:	112, 129
Preparation.....	table 41 116
Tests.....	fig. 46 170
Variation of activity.....	table 49 130
89W. $\text{Co}:\text{ThO}_2:\text{MgO}:\text{D-911 kguhr}$:	table 20 85
Preparation.....	table 21 86
Tests.....	table 57 161
Variation of activity.....	181

Catalysts—Continued

By number—Continued

108B. Co:ThO ₂ :Filter-Cel:100:18:100:	Page
Adsorption of nitrogen and CO at -195° C.	table 60 167
Comparison of induction at atmospheric pressure with that at 100 p.s.i.	fig. 19 121
Electromicrograph	184
Preparation	table 20 85
	table 21 86
	181, 184
Properties	table 59 165
Summary of statistical analysis of catalyst data	table 47 124
Surface area, effect of reduction	167
Tests	table 45 119
Carriers	39, 103
Analysis, chemical, of kieselguhr	table 58 101
Description of Filter-Cel, Hyflo Super-Cel, Portuguese kieselguhr, dicalite 911, and German kieselguhr	169
Effect on carbon deposition	40
Efficiencies:	
Filter-Cel and Hyflo Super-Cel	fig. 21 122
Hyflo Super-Cel, Filter-Cel, and Portuguese kieselguhr	table 39 115
	table 40 116
	table 42 117
	fig. 21 122
	fig. 22 123
	119
Portuguese kieselguhr and Filter-Cel	fig. 22 123
Electromicrographs—kieselguhr and a Fischer catalyst	fig. 41 100
Electron micrographs—Filter-Cel	160-165
Impurities in	159
Johns-Manville Hyflo Super-Cel	108
Magnesium carbonate, barium sulfate, silicon carbide, chromium oxide, aluminum oxide, silicates	40
Properties	table 57 161
Unreduced Fischer-Tropsch catalysts	table 59 165
Purification of kieselguhr	49
Reduction of solubility	40
X-ray diffraction:	
Analysis of various diatomaceous earths	fig. 43 163
Patterns of various kieselguhrs, quartz and cristobalite	fig. 42 162
Studies of kieselguhrs	163
Composition	26
Cobalt	22-35
Analysis	35
Estimation of metallic cobalt in surface	167
Fischer. Co:ThO ₂ :kieselguhr:100:18:100	23, 169
German commercial, normal	28
Hall. Co:ThO ₂ :MgO:kieselguhr:100:6:12:200	159
See also Synthesis gas, composition.	
Oxide powder, adsorption of nitrogen and CO at -195° C.	table 60 167
	fig. 44 166
Surface area, effect of reduction	167
Pretreatment not necessary	37
Promoted	112-130
Temperature coefficient of synthesis rate	table 48 123
Co:Cu:Th:O:kieselguhr	19
Co:Ni	27
Copotassium carbonate	17
Co:ThO ₂ :kieselguhr	11
Co:ThO ₂ :MgO:kieselguhr at 185° to 200° C. Oil yield per unit wt. of catalyst per hour at different gas throughputs	fig. 25 127
Co:ThO ₂ :MgO:kieselguhr. Space time yield at different space velocities at 185° to 200° C.	fig. 24 126
Co:ThO ₂ :MgO:Portuguese kieselguhr, pelleted 89K, atmospheric pressure. Reproducibility of preparation and tests	fig. 17 120
Co:ThO ₂ :MgO:Portuguese kieselguhr, pelleted 89Q, atmospheric pressure. Reproducibility of preparation and tests	fig. 17 120
See also Catalyst, physical properties.	
Co:Co:Th:U	8
Iron	8, 11, 22, 35-39, 171
LeClere and Lefebvre belief	154
	fig. 39 155
Precipitated, alkali addition	38
Unpromoted, characterization	table 53 148
Iron-copper	8
Iron-copper-calcium oxide-kieselguhr	8
See also Catalysts, physical properties.	
Nickel	26
Nickel-aluminum alloy, pretreatment with H ₂	33
Nickel-cobalt	108-130
Hydrogen pretreatment not essential	33
Nickel-manganese oxide-aluminum oxide	6
Ruthenium	39
Effect of increased throughput at 230° C.	table 8 49
See also Products, specific waves.	
Fischer, properties of, Co:ThO ₂ :kieselguhr:100:18:100	table 59 165
Hall, properties of, Co:ThO ₂ :MgO:kieselguhr:100:6:12:200	table 59 165
High-pressure and atmospheric pressure synthesis	4

Catalysts—Continued

MC-15	Page
Physical properties:	table 59 165
Bulk density	165
Correlation with activity	131-172
Crystal structure	33
Durability, variation with operating pressure	100
Electromicrograph of pelleted, unreduced Hall and Fischer type	164
Electron micrographs of unreduced iron catalysts	fig. 37 146
Fischer-Tropsch, unreduced	table 59 165
Iron, original and reduced	table 61 172
Magnetic studies	132-137
Procedure for making	136
Relationship between field strength and magnetizing current for magnetic balance	fig. 30 135
Stability of sample	136
Magnetic and X-ray diffraction studies of promoted iron catalyst	156-158
	table 56 157
Magnetic susceptibility:	
Function of field strength for ferric oxide hydrates and some characteristic catalysts	table 55 153
Iron, unpromoted	table 53 148
	151-159
Presence of magnetite	158
Methods of study	231
Pore distribution, determination	158
Pore volume	table 50 165
Possibility of relationship between enhanced magnetic susceptibility and presence of alkali ferrites in oxide	155
Shape factor, activity of Co:ThO ₂ :MgO-Portuguese kieselguhr in form of pellets and granules	122
	fig. 23 123
Size, relative activities of pellets (about 0.8 bulk density) and granules (about 0.3 bulk density)	table 47 124
Statistical analysis of catalyst data, summary	fig. 23 123
Surface area	table 47 124
Correlation between activity of reduced catalyst with surface area of unreduced catalyst	table 59 165
Effect of reduction	169
Estimation of total	166
Iron, unreduced, higher than those of cobalt catalyst	158
No difference between chloride and nitrate type reduced and unreduced iron catalyst	171
Summary of data on cobalt catalysts	172
Variations of activity of reduced cobalt catalysts of 80 series with surface area of unreduced catalyst	169
Surface properties of Fischer-Tropsch catalyst	fig. 46 170
Thermomagnetic curve for an iron Fischer-Tropsch catalyst	158-172
X-ray diffraction patterns:	fig. 39 155
Iron, promoted	fig. 40 157
Unpromoted	figs. 33-36, 142-145
Magnetic properties of iron catalysts	131-158
	table 53 148
	table 59 157
X-ray diffraction powder patterns of various iron Fischer-Tropsch catalysts and crystalline ferric oxides and ferric oxide hydrates	fig. 38 147
X-ray diffraction studies:	
Catalysts precipitated in presence of chloride ion	table 54 149
Equipment, procedure, and interpretation	132
Iron, unpromoted	144-151
See also Catalysts, carriers; Equipment; Ferric oxides and ferric oxide hydrates.	
Poisons, effect of sulfur	40
Powdered, turbulent fixed bed	21
Preparation	73, 173-185
Addition of water glass to iron catalyst	36
Check catalyst for testing similarity of behavior between 10- and 80- series and oxides of	
Chavallier and Matieu	154
Cobalt	29-32
Cobalt and nickel	181-184
Formation of metal + promoter oxides + carrier	table 20 85
Processing of metal + promoter oxides + carrier	table 21 86
Cobalt-thoria-kieselguhr, alkalization	39
Effect of heating promoted iron catalysts	158
I. G. Farbenindustrie iron catalyst	107
Ignition of nitrate or sulfate	173
Impregnation of carrier with metal nitrates and subsequent roasting	173
Iron:	
Pretreatment with CO	39
Promoted	178-181
Formation of iron + promoter oxides	table 18 83
Processing of iron + promoter oxides	table 19 84
Sintered	38
Unpromoted	173-178
Formation of ferric oxide	table 16 81
Processing of ferric oxide	table 17 82

Catalysts—Continued

Preparation—Continued

Iron-copper

Kieselguhr-manganese-boric acid	35
Kieselguhr-manganese-potassium hydroxide with aluminum oxide	37
Kieselguhr-potassium carbonate	37
Kieselguhr-potassium carbonate-manganese	37
Kieselguhr-rubidium carbonate-manganese	37
Potassium carbonate, nickel and rare-earth oxides	36
Precipitation with sodium carbonate and impregnated with potassium carbonate	36
Kaiser Wilhelm Institute iron catalyst	306
Lurgi iron catalyst	307
Nickel	307
No. 10	174
No. 47	175
No. 50	175
No. 68	175
Precipitation as oxides or carbonates	176
Reduction	173
Modification of slow method	90
Two methods used at Bureau of Mines	90
Reduction-induction, simultaneous, of iron catalysts by special procedures	table 22
Reproducibility of preparations and tests	table 39
	fig. 17

Ruhrchemie Fe-Cu-CaO-kieselguhr:100:5:10:30

Three methods

See also Catalysts, activity; Catalysts, tests; Equipment.

Promoters:

Cu, ThO₂, MgO

Oxides of magnesium, thorium, tungsten, uranium, molybdenum and chromium

Thoria and manganese oxide

Regeneration and reactivation

Tests

Braunkohle Benzin A.-G., Schwarzheide-Ruhland, composition of iron catalysts	table 31
Bureau of Mines experience with vertical catalyst bed	103
Bureau of Mines on Ruhrchemie Fe-Cu-CaO-kieselguhr	104
By number:	
20 a-c. Promoted iron catalyst (11A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
21 a-c. Promoted iron catalyst (25A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
22 a-d. Promoted iron catalyst (6A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
23 a-w. Cobalt-thoria-Hydro Super-Cel catalyst (2A), pellets, 2H ₂ +1CO, 100 p.s.i., slow reduction, rapid induction at 100 p.s.i.	table 34
24 a. Nickel catalyst (38A), pellets, 1H ₂ +1CO, atmospheric pressure	table 33
25 a-u. Unpromoted iron catalyst (10A), pellets, 1H ₂ +1CO, atmospheric pressure, slow reduction, rapid induction	table 25
26 a. Cobalt-nickel catalyst (36A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
27 a. Promoted iron catalyst (23A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
28 a-b. Promoted iron catalyst (21A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
29 a-c. Promoted iron catalyst (5A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
30 a-b. Promoted iron catalyst (15A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
31 a-c. Promoted iron catalyst (9A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
32 a-b. Cobalt-nickel catalyst (60A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
33 a. Unpromoted iron catalyst (50A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
34 a-b. Promoted iron catalyst (22A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
35 a. Promoted iron catalyst (44A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
36 a-f. Unpromoted iron catalyst (10B, Part A), pellets, 1H ₂ +1CO, slow reduction, intermediate induction	table 24
37 a-b. Promoted iron catalyst (20A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
38 a. Promoted iron catalyst (21A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
39 a. Promoted iron catalyst (39A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
41 a-d. Cobalt-nickel catalyst (64A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
42 a-p. Unpromoted iron catalyst (10A+10B), pellets, 1H ₂ +1CO, 100 p.s.i., slow reduction, intermediate induction	table 20
43 a-d. Nickel catalyst (62A), pellets, 1H ₂ +1CO, atmospheric pressure	table 33
45 a-b. Unpromoted iron catalyst (50B), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
46 a-b. Cobalt-nickel catalyst (61A), pellets, 1H ₂ +1CO, atmospheric pressure	table 33
47 a. Unpromoted iron catalyst (68A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
48 a. Promoted iron catalyst (24A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
49 a-b. Promoted iron catalyst (1F), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
50 a-c. Promoted iron catalyst (61A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
51 a. Unpromoted iron catalyst (50C), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
52 a. Unpromoted iron catalyst (49A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
53 a. Promoted iron catalyst (40A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
54 a. Unpromoted iron catalyst (48A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
55 a. Unpromoted iron catalyst (47A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
56 a. Promoted iron catalyst (24A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
58 a-b. Promoted iron catalyst (67A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23

Catalysts—Continued

Tests—Continued

By number—Continued

59 a. Unpromoted iron catalyst (69A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
60 a. Unpromoted iron catalyst (10B, Part B), pellets, 1H ₂ +1CO, slow reduction, intermediate induction	table 24
61 a. Promoted iron catalyst (43A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
62 a-e. Unpromoted iron catalyst (10C), pellets, 1H ₂ +1CO	table 24
Simultaneous reduction-induction of iron catalysts by special procedures	table 22
63 a. Unpromoted iron catalyst (88B), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
64 a. Unpromoted iron catalyst (81A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
65 a-b. Unpromoted iron catalyst (10B, Part C), pellets, 1H ₂ +1CO, slow reduction, intermediate induction	table 24
66 a. Unpromoted iron catalyst (81A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
67 a-b. Promoted cobalt catalyst (89A), pellets, 2H ₂ +1CO, rapid reduction, slow induction, atmospheric pressure	table 35
68 a-d. Promoted cobalt catalyst (80A), pellets, 2H ₂ +1CO, rapid reduction, slow induction, atmospheric pressure	table 35
69 b-d, f-g. Promoted cobalt catalyst (89B), pellets, 2H ₂ +1CO, rapid reduction, slow induction, atmospheric pressure	table 35
70 b-e, g. Promoted cobalt catalyst (89B), pellets, 2H ₂ +1CO, rapid reduction, slow induction, atmospheric pressure	table 35
71 a-c. Promoted cobalt catalyst (89B), pellets, 2H ₂ +1CO, rapid reduction, slow induction, atmospheric pressure	table 35
72 a-d. Unpromoted iron catalyst (10D), 1H ₂ +1CO, slow reduction, intermediate induction	table 24
73 a-e. Promoted iron catalyst (85A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
74 a-c. Unpromoted iron catalyst (40F, Part C), 1H ₂ +1CO, slow reduction, intermediate induction	table 24
75 a-f. Promoted cobalt catalyst (12B), pellets, 2H ₂ +1CO, rapid reduction, slow induction, atmospheric pressure	table 35
76 a. Unpromoted iron catalyst (10F, Part A), 1H ₂ +1CO, slow reduction, intermediate induction	table 24
77 a. Unpromoted iron catalyst (47C), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
78 a. Unpromoted iron catalyst (47D), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
79 a. Unpromoted iron catalyst (10C), pellets, 1H ₂ +1CO, slow reduction, intermediate induction	table 24
80 a. Unpromoted iron catalyst (47C), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
Simultaneous reduction-induction of iron catalysts by special procedures	table 22
81 a-c. Unpromoted iron catalyst (80A), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
Simultaneous reduction-induction of iron catalysts by special procedures	table 22
83 a. Cobalt-nickel catalyst (65A), pellets, 1H ₂ +1CO, atmospheric pressure	table 33
84 a-b. Unpromoted iron catalyst (24C), pellets, 1H ₂ +1CO, atmospheric pressure	table 23
X-12 a-c. Unpromoted iron catalyst (10K), 1H ₂ +1CO, 100 p. s. l., slow reduction, slow induction with contraction schedule	table 27
X-15 a. Unpromoted iron catalyst (10M), 1H ₂ +1CO, 100 p. s. l., slow reduction, slow induction with contraction schedule	table 27
X-16 a b. Unpromoted iron catalyst (47F), 1H ₂ +1CO, 100 p. s. l., slow reduction, slow induction with contraction schedule	table 27
X-17. Co:ThO ₂ :MgO:Portuguese kieselguhr catalyst, 16.9 grams, (89K), granules, atmospheric pressure. Tests a to z, 100 p. s. l. Tests t to z, 2H ₂ +1CO, rapid reduction, slow induction with temperature schedule	table 37
Comparison with test X-18	fig. 20
Statistical analysis of catalyst data, summary	table 47
X-18 a-w. Co:ThO ₂ :MgO:Portuguese kieselguhr catalyst, 16.0 grams, (89K), granules, 2H ₂ +1CO, atmospheric pressure, rapid reduction, slow induction with contraction schedule	table 38
Comparison with test X-17	fig. 20
Relative activities of pellets (about 0.8 bulk density) and granules (about 0.3 bulk density)	fig. 23
Statistical analysis of catalyst data, summary	table 47
X-19 a-z. A-B. Co:ThO ₂ :MgO:Portuguese kieselguhr catalyst, 38.8 grams, (89K), pellets, 2H ₂ +1CO, atmospheric pressure, rapid reduction, slow induction, with contraction schedule	table 39
Relative activities of pellets (about 0.8 bulk density) and granules (about 0.3 bulk density)	fig. 23
Relative efficiencies of Portuguese kieselguhr and Filter-Cel	fig. 22
Reproducibility of catalyst preparations and tests	fig. 17
Statistical analysis of catalyst data, summary	table 47

Catalysts—Continued

Tests—Continued

X series—Continued.

X-20 b-f. Co:ThO ₂ :MgO:Hyflo Super-Cel catalyst (89N), pellets, atmospheric pressure.	table 49	130
X-21. Co:ThO ₂ :MgO:Filter-Cel catalyst 30.5 grams (89J), pellets, atmospheric pressure.	table 40	118
Tests a to o, 100 p. s. i. Tests o to u, 100 p. s. i. 2H ₂ +1CO (except a and b, where 1H ₂ +1CO was used), rapid reduction, slow induction with contraction schedule.	table 40	118
Analysis of gaseous products recovered from charcoal trap.	table 50	130
Comparison of operation with 30- and 90-cm. catalyst depths.	fig. 18	121
Relative efficiencies:		
Filter-Cel and Hyflo Super-Cel	fig. 21	123
Portuguese kieselguhr and Filter-Cel	fig. 22	123
Statistical analysis of catalyst data, summary	table 47	124
X-22 a-e. Co:ThO ₂ :MgO(alkali washed):Filter-Cel (acid extracted), catalyst, 28.5 grams (89-O), pellets, 2H ₂ +1CO, atmospheric pressure, rapid reduction, slow induction with contraction schedule	table 41	116
	table 49	130
	table 49	130
Statistical analysis of catalyst data, summary	table 47	124
X-23 a-k. Co:ThO ₂ :MgO:Hyflo Super-Cel catalyst, 38.7 grams (89-I), pellets, 2H ₂ +1CO, atmospheric pressure, rapid reduction, slow induction with contraction schedule	table 42	117
	table 49	130
	table 49	130
Statistical analysis of catalyst data, summary	table 47	124
X-24 a-k. Co:ThO ₂ :MgO:Hyflo Super-Cel catalyst, 35.2 grams (89-H), pellets, 2H ₂ +1CO, atmospheric pressure, rapid reduction, slow induction with contraction schedule	table 42	117
	table 49	130
	table 49	130
Relative efficiencies of Filter-Cel and Hyflo Super-Cel	fig. 21	123
Statistical analysis of catalyst data, summary	table 47	124
X-25 a-e. Co:ThO ₂ :MgO:Filter-Cel catalyst, 11.0 grams, (89J), granules, 2H ₂ +1CO, atmospheric pressure, rapid reduction, slow induction with contraction schedule	table 43	118
	table 49	130
	table 49	130
Statistical analysis of catalyst data, summary	table 47	124
X-27 a-m. Co:ThO ₂ :MgO:Portuguese kieselguhr catalyst, 31.2 grams, (89Q), pellets, 2H ₂ +1CO, atmospheric pressure, rapid reduction, slow induction with contraction schedule	table 44	118
	table 49	130
	table 49	130
Reproducibility of catalyst preparations and tests	fig. 17	120
Statistical analysis of catalyst data, summary	table 47	124
X-29 a-a. Co:ThO ₂ :Filter-Cel catalyst, 38.8 grams, (108B), pellets, atmospheric pressure. Tests a to g, 100 p.s.i. Tests h to o, 2H ₂ +1CO, slow reduction, slow induction with temperature schedule.	table 45	119
Comparison of induction at atmospheric pressure with that at 100 p.s.i.	fig. 19	121
Statistical analysis of catalyst data, summary	table 47	124
X-30 a-l. Co:ThO ₂ :MgO:Filter-Cel catalyst, 85.7 grams, (89J), pellets, 2H ₂ +1CO, atmospheric pressure, rapid reduction, slow induction with contraction schedule.	table 46	120
	table 49	130
	table 49	130
Comparison of operation with 30- and 90-cm. catalyst depths.	fig. 18	121
Statistical analysis of catalyst data, summary	table 47	124
X-31 a-j. Co:ThO ₂ :Filter-Cel catalyst, 36.0 grams, (108B), pellets, 2H ₂ +1CO, 100 p.s.i., slow reduction, slow induction at 100 p.s.i. with contraction schedule.	table 45	119
	table 49	130
	table 49	130
Comparison of induction at atmospheric pressure with that at 100 p.s.i.	fig. 19	121
Statistical analysis of catalyst data, summary	table 47	124
X-39 a-f. T.O.M. catalyst, sample 231, FeCu:CaO:kieselguhr:100:2.5:10:15, granules, 51.0 grams. 1 atmosphere 2H ₂ +1CO, operated at 100 p.s.i. of 1H ₂ +1CO, except in test a, where pressure was atmospheric	table 30	105
	table 33	108
	table 33	108
Cobalt-nickel and nickel pellets, atmospheric pressure of 1H ₂ +1CO	table 30	105
Co:ThO ₂ :MgO:Hyflo Super-Cel at atmospheric pressure	table 32	106
Cooperative tests on iron catalysts at Braunkohle Benzin A.-G., Schwarzhede-Rubland	table 32	106
Flow diagram:		
First series	fig. 6	71
X series	fig. 8	75
Iron:		
Pelleted, 1H ₂ +1CO at atmospheric pressure	table 23	92
Promoted		
Unpromoted:		
10A, pellets, 1H ₂ +1CO, atmospheric pressure, slow reduction, rapid induction	table 25	95
10A+10B, pellets, 1H ₂ +1CO at 100 p.s.i., slow reduction, intermediate induction	table 26	96
101B, 10C, 10D, and 10F, pellets, 1H ₂ +1CO, slow reduction and intermediate induction	table 24	94
10K, 10M, and 47F, 1H ₂ +1CO of 100 lbs. gauge pressure, slow reduction, slow induction with contraction schedule.	table 27	97

Catalysts—Continued

Tests—Continued

Iron-copper-thorium dioxide-potassium carbonate-kieselguhr:4:1:0.08:0.08:5

Product recovery:

First series:

X series	fig. 7	74
Run, 5-week, with 10C	fig. 9	75
3-week, with 80A		100
Significance of variations based on statistical method developed by Student		101
Summary		124
Work at Bureau of Mines laboratory since 1934		173
Vertical temperature gradient:		71
In 30-cm. catalyst bed		
In 90-cm. catalyst bed	fig. 15	80
See also Catalysts, activity.	fig. 16	87
Copper ferrite, preparation		156
Cupric oxide, magnetic susceptibility		156
Dufschmid process		25
Economics		1, 6
Bureau of Mines estimates for steel requirements		69
Costs:		
Data		
Estimates based on Ruhrechemie process	table 13	68
Estimates on synthetic liquid fuel processes if operated in United States in 1942	table 14	69
Gasoline production from natural gas		69
General summary of cost data for synthetic liquid fuels process	table 15	70
Steel requirements, over-all		60
Raw materials		68, 70
Electrosynthesis		11
Equipment:		
Assembly of 12 laboratory-scale Fischer-Tropsch units		
End-gas meters, rear view	fig. 12	77
Flowmeters and flow recorders	fig. 14	79
Catalyst chamber. See Equipment, reactor.	fig. 13	78
Preparation		
Charcoal trap for X series of catalyst tests		184
Converter. See Equipment, reactor.	fig. 10	76
Heat exchanger, internal		
Magnetic balance:		21
Description and operation		
Front view		132-137
Side view	fig. 28	133
Pressure controller for liquid-vapor bath in X series of catalyst tests	fig. 29	134
Reactor	fig. 11	76
Auxiliary apparatus in Bureau of Mines laboratory-scale plant, description		6, 10
Heat exchanger, external		77
Heat transfer, direct		24
Indirect		23
Pressure, medium		15
Normal		15, 20
Fischer-Tropsch		15, 19
German	fig. 2	17
Standard middle, used in Braunkohle-Benzol A.-G. iron-catalyst tests		19
Recycle gas, hot		105
Tube, Fischer-Tropsch, 100-150 p.s.i.		23
Single, modified Downs type	fig. 1	16
See also Catalysts, physical properties; Catalysts, tests.	fig. 5	73
Ferric oxide and ferric oxide hydrates		
Diffraction pattern		137-141
Electron micrographs	fig. 31	139
Magnetic susceptibility	fig. 32	140
Properties, crystalline	table 52	138
Specific	table 51	138
Amorphous hydrous ferric oxide (α-Fe ₂ O ₃ ·H ₂ O):		
Electron micrograph	fig. 32	140
Formation		
In inactive unpromoted iron catalysts	137, 141	147
Indication that absence of, in catalyst 47F, was not fortuitous		97, 147
Magnetic susceptibility	table 52	138
No relationship to acid-insoluble oxide in 47 series	table 65	153
Properties, crystalline	table 51	138
Stability		149
X-ray diffraction pattern	fig. 31	139
	fig. 38	147
Goethite (α-Fe ₂ O ₃ ·H ₂ O):		
Electron micrograph	fig. 32	140
Formation		
In active catalysts	137, 149	
In active unpromoted iron catalysts		147
Magnetic susceptibility	table 52	138
Properties, crystalline	table 55	153
Separation, from acid-soluble ferric oxide	table 51	138

Ferric oxide and ferric oxide hydrates—Continued

Specific—Continued	
Goethite—Continued	
Stability	Page 150
X-ray diffraction pattern	fig. 31 139
	fig. 38 147
	145
Hematite ($\alpha\text{-Fe}_2\text{O}_3$):	
Formation	137, 144, 147, 153
In active catalysts	147
In active unpromoted iron catalysts	87
Magnetic susceptibility	table 52 138
Properties, crystalline	152, 156
Size, crystalline, in 47 F	table 51 138
Stability	154
X-ray diffraction pattern	fig. 31 139
	fig. 38 147
	145
Lepidocrocite, ($\gamma\text{-Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$):	
Electron micrograph	fig. 32 140
Formation	137, 144
Magnetic susceptibilities	table 52 138
	table 55 153
Properties, crystalline	table 51 138
X-ray diffraction pattern	fig. 31 139
	fig. 38 147
Maghemite ($\gamma\text{-Fe}_2\text{O}_3$):	
Curie point of solid-solution limit of potassium oxide in	154
Formation	137, 144
Magnetic susceptibility	table 52 138
Properties, crystalline	table 51 138
X-ray diffraction pattern	fig. 31 139
	fig. 38 147
See Catalysts, physical properties.	
Foam process, discussion	24
Disadvantages	24
Modified	24
Gas, natural, supply in Scotland	11
Goethite. See Ferric oxides and ferric oxide hydrates.	
Hematite. See Ferric oxides and ferric oxide hydrates.	
Iron oxide. See Ferric oxide.	
Iso-synthesis process, discussion	8
Lepidocrocite. See Ferric oxides and ferric oxide hydrates.	
Maghemite $\text{FeO} \cdot \text{Fe}_2\text{O}_3$, Curie points	154
Maghemite. See Ferric oxides and ferric oxide hydrates.	
OxO process, discussion	9
Physical conditions:	
Calculation of activation energy of reaction	123
Catalyst:	
Amount	16
Depths, comparison of operation with 30 and 90 cm	fig. 18 121
Feed	15
Induction	103
At atmospheric pressure compared with 100 p.s.i.	fig. 10 121
Effect of different procedures	table 37 113
	table 38 114
	table 45 119
	fig. 20 122
	117
Kaiser Wilhelm Institute results on induction of iron catalyst precipitated with Na_2CO_3 or NH_4OH , washed and mixed with 0.25 percent of their dry weight of K_2CO_3	table 29 102
Rapid, intermediate, slow	89
Special procedure	101
Contact time	46
Effect of increased throughput at constant temperature	table 7 49
Effect on yield	47
Two-stage operation at various throughputs	table 5 48
Yields and carbon balance v. throughput in intermediate synthesis	fig. 4 46
Experimental work by Fischer and Tropsch	15-23
Heat transfer	20, 23
Dufschmid process	25
Foam process	24
Modified	24
Liquid	24
Solid	25
Vaporization of water	16
Induction that reaction rate is directly proportional to partial pressure of reactants and inversely proportional to concentration of products	50
Pressure	3, 36, 42-44
Atmospheric, temperature 280°-320° C.	4
Effect:	
Subatmospheric	41
Two-stage operation	42
Using cobalt manganese catalyst	43
Using ruthenium catalyst	43

Physical conditions—Continued

Pressure—Continued	
Operating, effect on boiling range of product:	
From cobalt catalyst	table 28 100
From iron catalyst, tests made by Ruhrchemie	fig. 24 100
Space-time yield at different space velocities	fig. 25 127
Temperature	6
Coefficient, calculated	50
Of synthesis on cobalt	table 48 128
	fig. 27 129
Narrow range	49
Reaction, measurement	101
Variation with flow at constant contractions	fig. 26 128
	fig. 27 129
Plants:	
General:	
Australia	11
Canada	11
Germany	6-10
Great Britain	10
Italy	11
Japan	10
Scotland	11
Spain	11
United States	12
Specific:	
Braunkohle-Benzin A.-G., at Ruhland	7
Composition of iron catalysts used in comparative tests	table 31 105
Cooperative tests on iron catalysts	table 32 106
Brumet pilot plant near Pittsburgh	12
Carrières-Kuhlmann at Hernes, France	19
Carthage Hydrocol, Inc.	12, 21
Gesellschaft Viktor at Castrop-Rauxel	8
Hydrocarbon Research Inc., pilot plant:	
Montebello, Calif.	12
Olean, N. Y.	12
I. G. Farbenindustrie A.-G.:	
Cooperative tests on iron catalysts at Schwarzhelde-Ruhland	table 32 106
Composition of iron catalysts used in comparative tests at Braunkohle Benzin A.-G., Schwarzhelde-Ruhland	105
Dufschmid process	25
Experimental work on iron catalyst at Michaels laboratory	22
Foam process	24
Iron catalyst preparation	107
Recycle process, hot gas	23
Kaiser Wilhelm Institute:	
Activity and durability of unpromoted iron catalyst at various pressures	99
Composition of iron catalysts used in comparative tests at Braunkohle Benzin A.-G., Schwarzhelde-Ruhland	105
Cooperative tests on iron catalysts at Braunkohle Benzin A.-G., Schwarzhelde-Ruhland	table 32 106
Effect of alkali additions to unpromoted iron catalysts	97
Effect of conditions of precipitation of active, unpromoted iron catalysts	98
Iron catalyst preparation	106
Iso-synthesis process	8
Recent work on preparation, induction, and testing of iron catalysts	91
Results on induction of iron catalyst, precipitated with Na_2CO_3 or NH_4OH , washed and mixed with 0.25 percent of their dry weight of K_2CO_3	table 29 102
Special induction procedure	101
Lurgi:	
Composition of iron catalysts used in comparative tests at Braunkohle Benzin A.-G., Schwarzhelde-Ruhland	105
Cooperative tests on iron catalysts at Braunkohle Benzin A.-G., Schwarzhelde-Ruhland	table 32 106
Experimental work on recycle operation	21
Iron catalyst preparation	107
Mitteldeutsche Treibstoff und Oel Werke, Kassel	7
Morpet Gas Works	21
Rheinpreussen Colliery	7
Composition of iron catalysts used in comparative tests at Braunkohle Benzin A.-G., Schwarzhelde-Ruhland	105
Cooperative tests on iron catalysts at Braunkohle Benzin A.-G. at Schwarzhelde-Ruhland	table 32 106
Ruhr Benzin A.-G. at Oberhausen-Holten	7
Ruhrchemie A.-G.	6, 8, 18
Composition of iron catalysts used in comparative tests at Braunkohle Benzin A.-G., Schwarzhelde-Ruhland	105
Cooperative tests on iron catalysts at Braunkohle Benzin A.-G., Schwarzhelde-Ruhland	table 32 106
Experimental work on recycle operation	21
Foam process, modified	24
Iron catalyst preparation	107
OxO process	9
Tests made on effect of operating pressure on boiling range of product from an iron catalyst	table 28 100
Stanolind Oil and Gas Co., proposed plans	13
Viktor colliery at Castrop-Rauxel	7

Potassium carbonate:	Page
Effect of addition to iron-kieselguhr catalyst	103
Effect on catalyst activity	97
Procedure:	
At Ruhrechemie in Oberhausen-Holten	8
In German plants	15
Medium-pressure operation in German plants	20
Multistage operation	15, 19
Normal-pressure operation at Carrières-Kuhlmann	19
Recycle operation	21
Modification	21
Starting up operation	21
Temperature control	51
Two-stage operation	15, 18
Process development	5, 6-13
Cobalt-copper-manganese oxide, at atmospheric pressure and temperatures 245°-284° C.	3
Use at 230°-280° C.	4
Iron phosphate or iron borate at 150 atmospheres	4
Products:	
General	54
Analysis	4, 6, 7, 18, 21-23
From recycle operation	22
Gases recovered from charcoal trap in test X-21	table 50
Residual hydrocarbon gas	table 9
Bromine numbers, for Fischer-Tropsch products from cobalt-thoria-magnesia-kieselguhr catalyst operated at atmospheric pressure	table 49
For liquids from cobalt catalysts	129
Obtained with Ruhrechemie Fe-Cu-CaO-kieselguhr catalyst	104
Properties:	
From cobalt catalyst	129
From two-stage operation	table 1
Recovery	21, 23
Hydrocarbons from refrigerator trap	fig. 7
Using active charcoal	83
Working up:	
Cracking primary liquid products	60
Cyclodehydrogenation of synthetic paraffin hydrocarbons	68
Fatty acids and related products	65
Residual gas	68
Yields in cooperative tests on iron catalysts at Schwarzheide	107
Specific:	
Alcohols	4
Diesel oil	57
Fatty acids	59
Gasol	59
Gasoline	59
Determination of octane number	62
Obtained by cracking of kogasin in true vapor phase operation—properties of	table 12
Storage tests	61
Kogasin	56
Composition	table 10
From two-stage operation, distillation	table 2
Lubricants	62-63
Mersol	67
Oil yield per unit weight of catalyst per hour at different gas throughputs for Co:ThO ₂ :MgO:kieselguhr at 185°-200° C.	fig. 25
Olefins	3
Oxygenated cyclic compounds	67
Soap	67
Synthol	2
Waxes	15, 58
Paraffin yield, estimates	table 6
Solvent extraction of solid paraffin obtained by using ruthenium catalyst at 1,000 atmospheres pressure	table 11
Wax-oil solid mixture formed in test at 160 p. s. i.	130
Reaction mechanism	4
Carbide intermediate hypothesis	32
Catalyst, behavior	64
Energy	53
Fischer's postulate	3
Formation of primary complex upon active center of catalyst and growth by copolymerization	54
Oxygenated intermediate hypothesis	54
Summary of carbide intermediate hypothesis	51-53
Recycle process, hot-gas, discussion	23
Research program: Bureau of Mines:	
Resumption in 1942	12
Scope	1
Reviews:	
Historical	2-4
Technical	7, 13-15
Robinson-Bindley Process	10, 17
Solvent extraction. See Products, specific, waxes.	
Synol process, discussion	9

Synthesis gas:	Page
Composition	5, 17, 20
Diluents:	
Effect:	
On iron-copper-kieselguhr catalyst	44, 45
On nickel-manganese-thoria catalyst	45
Nitrogen	table 36
Effect of C:O:H ratio	45
Production:	
Bureau of Mines	88
Conversion of coke-oven gas with steam over coke	5
Purification; desulfurization	5
Tests. See Catalysts, tests.	
Yield:	
Carthage Hydrocol plant	12
Character and yield of products at 180° C. and various pressures with ruthenium catalyst	fig. 3
Decrease of solid paraffin with increased throughput	47
Effect:	
Ethylene	5
Hydrogen sulfide	table 3
Pressures above atmospheric	table 4
In Germany	8
In Japan 1944	10
Low, for C ₂ hydrocarbons	46