

INDEX

A

Avervularia profunda zone, echinoderms from, 444, 452, 456
Aclisina stevensana, 245
Actinocrinus latus, 452
 Adair county, strata in, 236, 290
 Adams, G. L., work of, 230
 Admire shale, 233
 Afton Junction, elevation, 274; gravels near, xvi
 Aftonian climate, 106; gravels, xvi, 93, 95
Agassizodus variabilis, 246
 Agelacriniidæ of Iowa Devonian, 399, 419
Agelacrinites, distr., 404, 406; *A. sp.* descr., 421; *hamiltonensis*, 420; *hanoveri*, descr., 419, illustr., 530
Agelacrinus, 420
 Agriculture, gypsum in, xli; limestone in, xxxiv,
 Aicher's quarry, echinoderms from, 416, 427, 434, 447
 Alden, W. C., work of, xviii, 66, 67, 79, 88, 97, 101, 103, 104, 110, 118, 123, 124, 133
Alethopteris grandini, 246
 Alpena, Mich., echinoderms from, 394, 423, 428, 453, 468, 471
Allorisma granosum, 246; *subcuneata*, 245-247, 256; *terminale*, 244-247
 Allotype, definition, 323
Ambocoelia planoconvexa, 244-248, 256, 296
 Ambulacral plates of *Devonocidaris*, 501; of *Nortonechinus*, 487
 Am. Assoc. of Petroleum Geologists, 45
 Anal interradius, definition, 321; plate, definition, 322
 Anamosa dolomite in Lake Calvin, 71
 Anderson, Netta C., work of, 66
 Andrew shale, 233
Annularia sphenophylloides, 246
Anthemocrinus, 330
 Anticlines, in Cass county, 298; in Iowa, 38, 300; oil and gas in, 14
 Anticosti Island, crinoids on, 349, 357
 Appalachian fields, oil and gas in, 7, 22, 23
 Archeocidaridæ from Iowa 399, 481
Archeocidaris, 247, 248, 255, 311, 482;

aculeata, 246; *agassizi*, 247; *dininni*, 247; *hallana*, 247; *triseriata*, 247
Archaeocrinus asperatus, 324, 325; *delicatulus*, 324; *desideratus*, 324; *knoxensis*, 324, 325; *lacunosus*, 324; *microbasilis*, 324; *obconicus*, xi, 325; descr., 328, illustr., 370; *parvus*, 324, 325; *peculiaris*, 324, 325; *pyriformis*, 325, 329; *sculptus*, 326
 Archetype, definition, 322
Archimedes, 392
 Arey, M. F., work of, 228
 Armlets, definition, 322
 Artesian wells and oil, 18
Arthracantha, xiii, 397, 401, decoration, 406, distr., 404, 405; *A. mameionifera*, 496, descr., 463, illustr., 520
 Articulata, history, 398
 Ashgillian formation, crinoids in, 357
 Ashland formation, 233
 Asia, oil in, 7
 Asteroidea, history, 398
 Asterozoa, definition, 398
Astrophyllum rude, 311
Atactocrinus, xii; ? columnals, 343, illustr., 373; *A. wilmingtonensis*, 324, 325
 Atchison shales, 233, 239
Athyris zone, echinoderms from, 434
 Atlantic, well at, 266, 307
Atrypa independencis, 410; *reticularis*, 410; zone, echinoderms from, 421
 Attachment base, definition, 322
Aulopora, 249
Avicula longa, 245
Aviculopecten, 244, 247, 248; *occidentalis*, 244-246, 249, 296; *providencensis*, 244; *whitel*, 245, 246
Aviculopinna americana, 245; *peracuta*, 246
 Axillary canal, definition, 322
 Azygous interradius, definition, 321

B

Backbone, Madison Co., section at, 282
 Bacteria, anaerobic, work of, 5
 Baffin Land, crinoids from, 354, 358
 Bain, H. F., work of, 64, 76, 78, 85, 220, 227, 228, 230, 242, 274-277, 280, 312
 Baraboo quartzite, 79
 Barclay limestone, 233

- Barris, Rev. W. H., work of, 393, 422, 423, 426, 428, 430, 436, 455, 473
 Bartlesville sand, oil in, 35
 Basals, definition, 321
 Base, definition, 320
 Bather, F. A., work of, 332, 357, 391, 413, 483, 486
 Batocrinidæ of Iowa, 399, 444
 Beaver Board Company, xlv
 Becker, A. G., collections, 319, 331, 344, 366
 Bedford, deep well at, 272
 Beede, J. W., 243; and Rogers, A. F., 307
 Beetle remains in peat, 101
 Belanski, C. H., species named for, 441, work of, 401, 412, 419, 441, 462, 463, 471, 492
 Belanski, Hanover H., species named for, 421; work of, 421
 Belanski quarry, echinoderms from, 419
 Belgium, echinoderms from, 404, 471
 Bellerophon, 256, 264; carbonarius, 246-248; percarinatus, 245-247
 Bengtson, N. A., see Condra and Bengtson
 Bethany Falls, Mo., strata near, 312
 Bethany Falls limestone, 231, 233, 241, 274, 281-286; character, 235, 241, fauna, 242, 249
 Beyer, S. W., work of, 26, 79
 Bibliography of drainage of Mississippi river, 219
 Big Cedar creek, old valley of, 180
 Billings, E., work of, 332
 Bird Hill, echinoderms from, 467, 478, 492, 505
 Bituminous rocks and oil, 17
 Blastoids, xii, 421; history, 398; of Iowa, 399, 421
 Blocks and boards, gypsum, use of, xlv
 Bloomfield, crinoids from, 334, 342, 344, 362
 Bluff line of Lake Calvin, 125, 194
 Bluffs, rounded, origin, 197, 199
 Bond, Frank, species named for, 434, work of, 427, 433
 Boulders in Kansan drift, 96; in Lake Calvin, 199; on the terrace, 136; origin, 200; slablike, 155, 201
 Brachials, definition, 320
 Brachioles, definition, 322
 Braddyville, anticline near, 38, 272, 300; limestone, 233, 238, 239
 Brandon, echinoderms from, 399, 400, 421, 437, 456, 459, 464, 467, 496
 Brant, Mr. and Mrs. David, work of, 413, 452
 Briscoe, fault at, 297
 British Columbia, echinoderms from, 399
 Brittle stars, history, 398
 Broadhead, C. G., work of, 227
 Brophy creek, old valley of, 175
 Bryozoa, 249, 253, 264, 296
Bucanopsis marcouanus, 244; **montfortiana**, 245, 246
 Buchanan county, echinoderms from, 416, 459
 Buchanan gravels in Lake Calvin, 98
 Buffalo, Iowa, echinoderms from, 393, 395, 399, 423, 427, 431, 438, 453, 468, 473, 475, 476, 479
 Bureau of Mines, analyses by, 27
 Buried valleys in eastern Iowa, 84, 179; in western Iowa, 273
 Burlingame limestone, 233; character, 239
 Burlington, echinoderms from, 395
 Burlington shale, 233
- C**
- Cable, E. J., work of, 428
 Calamites suckowii, 246
 Calceocrinus barrisi, 476
 Calhoun shale, 233, 240; fauna, 246
 California, oil in, 8
 Call, R. E., work of, 85
 Callaway county, Mo., echinoderms from, 402, 405
 Callaway limestone, Mo., echinoderms from, 436
 Callocystidæ of Iowa, 399, 414
 Calvin, Lake, see Lake Calvin
 Calvin, Samuel, work of, xvi, 55, 61, 62, 65, 66, 67, 71, 76, 78, 84, 85, 87, 95, 98, 104, 106, 107, 118, 123, 145, 173, 219, 228, 231, 245, 247, 261, 280, 310-312, 391, 394, 396, 409, 410, 433, 444, 464
 Calvin collection, echinoderms from, 446, 448, 479
 Calyx, definition, 320
 Cambrian system, 79; echinoderms from, 398; oil and gas in, 7, 29
 Camerata, history, 398; of Iowa, 399, 435
Campophyllum, 312; **torquium**, 248, 310, 311
 Canada, echinoderms from, 402-405
 Cap-au-Gres fault, 273, 297
 Capillarity, effect on oil and gas, 12
Carabocrinus, desc., 345; **dicychicus**, 349; **esthonus**, xii, 349; **geometricus**, 349; **huronensis**, 349, illustr., 375, 376; **ovalis**, 349; **radiatus**, 349; **slocomi**, xii, desc., 350, illustr., 376, 378, 380, 382; **slocomi costatus**, xii, desc., 353, illustr., 378; ? **tuber-**

- culatus*, 349; *vancortlandi*, 346, 349, 354
 Caradoc formation, crinoids in, 357
 Carbon in coals, percentage of, vii, 10
 Carlyle shale, 233
 Carman, J. Ernest, work of, 85, 86, 170, 177, 222
Carpolithes granularis, 246
 Carson, strata near, 313
 Cass county, fault in, 228
 Cast, definition, 323
 Cave Rock shale, 233
 Cedar county, echinoderms from, 418; terraces in, 144, 160
 Cedar Creek limestone, 233, 253, 264, 292; character, 238; fauna, 248
 Cedar river in Lake Calvin basin, 55, 58; terrace on, 134, 138
 Cedar Valley beds, 81; age, 409; character, 410; echinoderms from, 419, 421, 423, 428, 431ff, 452ff, 468ff; in Lake Calvin, 74; *Platyceras* from, 451
 Cement City limestone, 233, 312
 Cement production, v
 Cenozoic, echinoderms in, 398; oil in, 7
 Centerville, oil near, 27
 Centerville Gypsum Company, xliv
 Central America, oil in, 7
Ceriocrinus hemisphericus, 244, 245, 247
 Cerro Gordo county, echinoderms from, 400, 471, 492
Chaenomya leavenworthensis, 256; *minnehaha*, 247, 256
Chaetetes milleporaceus, 242
 Chamberlin, T. C., work of, 64, 80, 209
 Channel, abandoned, in Louisa county, 115; of Leverett, 218; preglacial, 85, 179, 273; see also Buried Valleys
 Chanute shale, 233, 241, 288, 289, 291; character, 236; fauna, 249
 Chazyan beds, crinoids in, 327, 349
 Charleton member, crinoids in, 349, 357
 Chemung beds in Iowa, 409
 Cherokee shales, 305, 312; oil and gas in, viii, 23, 34
 Cherryvale shale, 233, 241, 275-277, 281, 284-289, 299, 312; character, 235; fauna, 242, 249
 Chicago, see Field Museum, Walker Museum
Chonetes, 264; *geinitzianus*, 243-246, 248; *granulifer*, 243-248, 256, 292; *mesolobus*, 242, 311; *striatocostatus*, 291; *variolatus*, 246; *verneuilianus*, 235, 242, 245, 247, 249, 265, 276ff
 City Bluffs bed, 233, 239, 311, 312
Cladopora lowensis, 382
 Clarinda, drilling at, 271; syncline at, 272
 Clarke, J. M., species named for, 451; work of, 420, 450-452
 Clarke's quarry, echinoderms from, 423
 Clay wares production, iv, xxx
 Claypole, E. W., work of, 221
 Clays in Lake Calvin, 181
 Cleland, H. F., work of, 436
 Cleona channel, 65, 67, 86
 Clermont, crinoids from, 330, 331, 334, 339, 340, 342-344, 352, 354, 361, 363, 365, 369, 378
Clidochirus, 397, distribution, 404; *C. lowensis*, 401, descr., 465, illustr., 520, 524; ? *maximus*, descrip., 467, illustr., 522
 Climax, section near, 261
 Clinton county, old valleys in, 175; lobe, 124
 Cloche Island, crinoids from, 355
 Coal, percentage of carbon in, vii, 11; and oil, relations, 34; beds as evidence of oil, vii, 18; production, iv, xxvii
Codaster, distr., 404, 405; *C. gracilis*, 423; *subtruncatus*, 393, descr., 422, illustr., 508
Codasteridæ of Iowa, 399, 422
 Coin, drillings at, 270; well at, 305
 College Springs, well at, 271
 Colmar field, Illinois, oil in, 23, 32
Colobocentrotus atratus, 483, illustr., 492
 Colton, J. M., map of Iowa by, 427
 Columbus Junction, dunes near, 203; gumbotil near, 101; Kansan near, 96; old valley near, 171, 179
 Column, definition, 322
 Columnals, definition, 322
 Comanche beds, oil in, 7
Composita subtilita, 235, 242-249, 256, 265, 276, 277, 282, 287 ff
 Concrete stone and block production, v, xlvi
 Condra, G. E., 306; and Bengtson, N. A., work of, 227, 231, 233, 269
Conostychus broadheadi, 246; *ornatus*, 246
 Cook's Quarry, echinoderms from, 455, 477
 Coppock, old valley near, 179
 Cornell College, echinoderms from, 416
Corynotrypa elegantula, 354, illustr., 373
 Costals, definition, 322
 Cottonwood limestone, 233
 Cotypes, definition, 322
 Council Bluffs, Nebraskan till at, xv

- County line exposures, xviii
 Craghead Creek shale, echinoderms from, 470
 Cremacriniidae of Iowa, 399, 476
 Crescent, sections near, 257, 310
 Cretaceous, oil and gas in, 23, 36; fossils in drift, 83
 Crinoids, xii, 244, 248, 249; columns, descr., xii, 340, illustr., 372; definition, 320; from Iowa, 435; history, 398
 Crooked creek, old valley of, 179
 Crown, definition, 320
 Cullom limestone, 233, 253, 264, 292; character, 238; fauna, 248
 Cupulocrinus *jewetti*, 348
 Curdsville member, crinoids from, 346, 349, 354, 357, 358
 Cyathocrinidae of Iowa, 399, 477
 Cyathocrinus, 397, distr., 404; *rockfordensis*, descr., 477, illustr., 526
 Cyathopora *iowensis*, 392
 Cynthiana formation, crinoids in, 354
 Cystodictya *hamiltonensis*, 392; horizon, 422
 Cystoids, xii, 414; history, 398; of Iowa, 399, 414; rhomb-bearing, 406
 Cythere, 246
- D**
- Dactylocrinus, xiii, xiv, 397, descr., 469, distribution, 404, 405; *concavus*, 470, illustr., 526; *stellatimbasalis*, 412, descr., 469; illustr., 526
 Dake, C. L., work of, 80
 Dakotan sea, fossils from, 402
 Dalmanella *infera*, 496
 Davenport, echinoderms from, 392, 455, 460, 477
 Davenport Academy of Science, echinoderms from, 413, 426, 443, 455, 460, 477
 Davis City, anticline near, 274; elevation of, 274; section near, 274, 275
 Decadocrinus, distr., 404; *vintonensis*, descr., 479, illustr., 528
 Decatur City, anticline near, 275; section near, 268, 275, 299
 Decatur county, anticline in, 274, 275
 Decker, Charles E., 46
 Decorah, oil near, 27
 Decorah shales, 80; crinoids in, 349, 354; oil and gas in, 30
 Deer creek, old valley of, 175
 Deer Creek limestone, 233, 240, 247, 252, 253, 264ff, 280, 294, 296, 312; character, 238; fauna, 243, 246, 247
 DeKalb limestone, 233, 241, 273-278, 281-290, 299, 306; character, 235, 236, 241; fauna, 243, 249; use of term, 230
 Deltacrinus, distr., 404; *D. barrisi*, 395, descr., 476, distr., 402, illustr., 526
 Dendrocrinus, descr., 334; *D. casei*, 336; *kayi*, xi, descr., 335, illustr., 370
 Dennis limestone, 233
 Deocrinus *asperatus*, 324, 325
 Derbya *bennetti*, 243; see *Orthotetes*
 Des Moines series, echinoderms from, 465; fossils of, 311; in Lake Calvin, 78, 82; margin, 312; oil and gas in, 34
 Devonian system, echinoderms of, in Iowa, xii, 398; in Iowa, 408; in Lake Calvin, 72; oil and gas in, viii, 7, 23, 33
 Devonocidaris, xiv, 379, descr., 500, distr., 403, 404, 480; horizon, echinoderms from, 505; *D. jacksoni*, descr., 500, illustr., 540, 542, 546, 548, 550
 Dewey, Arthur H., work of, 94, 95, 98
 Diaboloocrinus *asperatus*, 325; *hieroglyphicus*, 325; *knoxensis*, 325; *parvus*, 325; *perplexus*, 326; *vesperalis*, 326
 Diagonal, preglacial valley at, 273
 Dielasma *bovidens*, 245-247, 292
 Dikes, igneous, oil near, 16
 Dip and strike, 300
 Dip of strata in Iowa, 23
 Dipleurocystis, 358
 Discina *convexa*, 247
 Distal, definition, 322
 Distichals, definition, 322
 Dolatocrinus, 397, distr., 405
 Dolomite, oil and gas in, 6, 22
 Dome, of erinoid, definition, 320
 Domes, oil and gas in, 14
 Dorocidaris *papillata*, illustr., 536
 Dorsal cup, definition, 320
 Douglas stage, 233, 240; area, 313; character, 236; fauna, 243, 248; margin, 306; oil in, 35
 Douvillina *variabilis*, 496
 Drainage of Mississippi river, bibliography, 219
 Drum limestone, 233; use of term, 230
 Dunes in Johnson county, 147, 149; near Lake Calvin, 203; on Illinoian plain, 116, 126; on intermediate terrace, 135
 Durant, old valley at, 173; terrace near, 156
 Dutch East Indies, echinoderms from, 465
- E**
- Eagle Point Lime Works, xxxv
 Earlham, strata near, 306

Earlham limestone, 231, 233, 281; fauna, 249
 East Nishnabotna river, cross section along, 258
 Echinoderms, definition, 397; distribution, 402; history, 398; from Maquoketa beds of Fayette county, xi, 319; of Iowa Devonian, xii, 385, 399
 Echinoid material, character, 407; spines, 248
 Echinoidea, history, 398; from Lime Creek shales, 400; of Iowa, xii, 399, 479
 Echinozoa, definition, 398
 Ectenocrinus, descr., 337; *E. grandis*, 338; *raymondi*, xi, descr., 337, illustr., 370; *simplex*, 337
 Eden beds, crinoids in, 327
 Edmondia, 247; *nebrascensis*, 244-246
 Edrioasteroidea of Iowa, 399, 419
 Eifel, Germany, echinoderms from, 406, 471
 Ekblaw, W. E., work of, 396, 405
 Elaeocrinus elegans, 422; *meloniformis*, 428; *obovatus*, 423
 Elkhorn creek, old valley, 174
 Elliott, L. P., work of, 419, 453
 Emporia limestone, 233
 Encrinal limestone, 393, 406
 England, echinoderms from, 404, 407
 English river, terraces on, 151; extension, 109
 English River gritstone in Lake Calvin, 76
 Enteletes hemiplicata, 245-247
 Entolium aviculatum, 245, 247
 Entrochites, 392
 Eocidaris, 500; from Germany, 482; *E. laevispina*, distr., 407
 Erisocrinus typus, 245, 248, 256
 Essex, section near, 260
 Esthonia, crinoid from, 349
 Etheridge, Robt., Jr., and Carpenter, P. H., 433
 Eublastoidea of Iowa, 399, 422
 Euomphalus, 277; *catilloides*, 244, 245-247; *rugosus*, 246-248
 Eupachyrinus tuberculatus, 245, 247; *verrucosus*, 247, 249, 256, 276
 Euphemus carbonarius, 244-247
 Eureka coal seam, 307; shaft, 268
 Europe, echinoderms in, xiii, 465; oil in, 7
 Euryocrinus, distr., 404; *E. barrisi*, 396, distr., 402, descr., 467, illustr., 526, 528
 Eutaxocrinus, distr., 404; *E. gracilis*, 395, descr., 471, illustr., 526; *whiteavesi*, 473

F

Falls of the Ohio, echinoderms from, 433
 Fargo limestone, 233, 260, 261, 264, 270; character, 239
 Farnsworth, P. J., work of, 446
 Farrington, O. C., work of, 344
 Fault in southwestern Iowa, x; see Thurman-Wilson fault
 Faults in Iowa strata, 24; oil and gas near, 15
 Fauna of Missouri series, 242; Pleistocene, age, xvi
 Fayette breccia in Lake Calvin, 73
 Fayette county, echinoderms from, xi, 319
 Fenestella, 249, 277, 295, 392; *perelegans*, 244, 246; *tenax*, 247
 Fenton, Carroll Lane, work of, 344, 397
 Ferro-alloys production, vi
 Field Museum collections, 319 ff
 Fistulipora, 245; *nodulifera*, 244-248, 256
 Fitzpatrick, Mrs. M. F. L., species named for, 440; work of, 413
 Fitzpatrick, T. J., species named for, 448; work of, 413; collection, echinoderms from, 416, 434, 440, 446, 448
 Flexibilia, history, 398; of Iowa, 399, 464
 Flood plains of Lake Calvin, 165
 Floyd county, echinoderms from, 397, 400, 417, 462, 463
 Flushing action of ground water, 28
 Foerste, August F., report on echinoderms, xi, 345; work of, 319
 Folds in Iowa strata, 24
 Forbes limestone, 233, 252, 253, 264, 265, 271, 272, 294; fauna, 246
 Forest City, Mo., well at, 309
 Fort Scott stage, 312
 Fossils, mammalian, of western Iowa, age, xvi
 Fossils and oil, 22
 Fragmental limestone, 233
 France, echinoderms from, 404
 Fremont county, section in, 249
 Frobisher Bay, crinoids from, 354
 Fuller, Myron L., work of, 10
 Fultz, Francis M., work of, 63, 219
 Fusulina, 235, 244, 282, 286, 289, 290, 296, 312; *cylindrica (secalica)*, 244-249, 263, 276, 277, 291, 292; limestone, 231, 233, 265; fauna, 243

G

Galena dolomite, 80; oil and gas in, 22, 30; "oil rock" in, 27
 Galesburg shale, 233, 241, 274, 282,

- 283, 285, 286; character, 235, 241; fauna, 249
 Garnett shale, 233
 Gas, geological age of, 7; in Iowa, 26; in pools, 18; and petroleum, in Iowa, vi, 5; accumulation, 5; origin, 5; see also oil, and petroleum
 Genotype, definition, 322
 Geodes, oil in, 33
 Geological formations, oil in, viii; report, honest, 45; section of Iowa, 22; structure in Iowa, 23
 Geologists, work of, in oil fields, 42
 Germany, echinoderms from, 407, 480, 497
Gilbertsocrinus americanus, 326
 Girty, George H., work of, 311, 312
 Glacial lakes, extinct, evidences of, 168
 Gladwin, Des Moines beds at, 78
 Glenn Falls division, crinoids from, 357
 Glenwood, well at, 254
 Glock, W. S., work of, 506
Glyptocrinus lacunosus, 324; *sculptus*, 326; *submodosus*, 326
 Goat Island, crinoids on, 346, 349
 Goldring, Miss Winifred, work of, 464
 Goose lake channel, 63, 170, 175; use by Mississippi, 217
 Gordon, C. H., work of, 87, 221
 Gose, Bert C., work of, 60
 Gow, James E., work of, 228, 295
 Gower limestone, 79; in Lake Calvin, 71
 Grabau, A. W., work of, 409
 Grand river, cross section along, 273; elevation of, 274
 Granite hills, concealed, 306
 Grant, U. S., work of, 221
 Gravel, deposits of, in lake basin, 201; uses, xxxvi; Buchanan, in Lake Calvin, 98.
 Gravel and sand of western Iowa, xvi; production, v; see also sand and gravel
 Great Britain, crinoids in, 357
 Greene, C. F., work of, 244; see Hinds and Greene
Griffithides scitula, 244, 246
 Ground water, in Iowa, 28; relation to oil and gas, 16
 Gulf Coast of Texas, oil in, 8
 Gumbotil, formation, 106; relation to Lake Calvin, 55, 208; Illinoian, 101, 211; Kansan, 97; Nebraskan, in Lake Calvin, 90, 93; see also Nebraskan, Kansan, Illinoian
Gypidula comis, 410
 Gypsum in agriculture, xli; in portland cement, xli; production, v, xlii; boards and blocks, use of, xliiv
- ### H
- Hackberry fossils, 397
 Hackberry Grove, echinoderms from, 492
 Hall, James, work of, 61, 392, 409, 476
 Hall, James, and Whitfield, R. P., work of, 409
 Hamburg, section at, 250, 259, 269
 Hamilton group, echinoderms from, 427, 431; in Iowa, 409
 Harrison county, Loveland formation in, xviii; volcanic ash in, xviii
 Hartford limestone, 233
 Hauber, U. A., echinoderms from, 453; work of, 422, 468
 Hawleyville, anticline near, 272, 300; strata near, 245
 Hawleyville limestone, fauna, 247
 Hay, O. P., work of, 67, 106
 Haynies, section near, 252
 Helderbergian strata, echinoderms from, 442
 Henderson, strata near, 313
 Henrietta division, 296
 Henton, section near, 255
Hercocrinus beecheri, 326; *elegans*, 326; *ornatus*, 326
 Hershey, O. H., work of, 220
 Hertha limestone, 233, 241, 269, 272, 281-283; character, 235, 241; fauna, 242, 249
 Heterocrinidæ, xi
Heterocrinus ? bases, descr., 339; illustr., 372
Heteroschisma gracile, 423
 Hexacrinidæ of Iowa, 399, 459
Hexacrinus, xiv, 392, distr., 404, 407; *iowensis*, 412, descr., 462, illustr., 520; *occidentalis*, 395, 400, descr., 459, distr., 407, illustr., 520; *springeri*, 400, 412, 419, descr., 461, illustr., 520, 524
 High terrace in Lake Calvin, formation, 218; materials and structure, 151; relation to other features, 150, 161, 184; topography, 145
 Hills, terraces near, 148, 152
 Hinds, Henry, and Greene, C. F., work of, 227, 230, 233, 237, 248, 249, 289, 297, 309, 312
 Hoing sand, oil in, 32
 Holothuroidea, history, 399
 Holotype, definition, 323
 Hopeville, sections near, 277
 Hopper, Bryon C., work of, 229
 Howard limestone, 233, 240, 307; character, 238; fauna, 245

- Howell, Jesse V., report on oil and gas, vi, 1; work of, 416
- Hurst Lime Works at Maquoketa, xxxv
- Hustedia mormoni*, 244-247, 296
- Hybocrinus*, 347
- Hydreionocrinus mucrospinus*, 246, 247
- Hydrocarbons, origin, 5
- Hydrostatic pressure, effect on oil and gas, 12
- Hypothyridina cuboides* horizon, 410
- Hypotypes, definition, 323
- I**
- Iatan limestone, 233, 240, 273, 292, 293; fauna, 248
- Ichthyocrinidæ of Iowa, 399, 465
- Illinoian bluffs of Lake Calvin, 126; drift in Lake Calvin, 100; glacial lobe, 63, 65; blocking of rivers by, 170; in Iowa, 107; in Lake Calvin, 217; gumbotil, 101; plain, streams on, 117; upland near Lake Calvin, 203; topography, 115
- Illinois, Colmar field, oil in, 23, 32; Lawrence field, 33; echinoderms from, 358, 402, 403, 404; oil and gas in, 7, 8, 22, 23; "oil rock" in, 27
- Impression, definition, 323
- Inadunata, history, 398; of Iowa, 399, 475
- Independence shale, age, 409; echinoderms from, 401, 464, 467, 496; fossils, 410; in Lake Calvin, 73
- Indiana, echinoderms from, 433; oil and gas in, 7, 22, 23
- Infraradials, definition, 322
- Infrabasals, definition, 321
- Interambulacral plates of *Devonocidaris*, 501; of *Nortonechinus*, 484
- Interbrachial areas, definition, 321
- Interbrachials, definition, 322
- Intermediate terrace in Lake Calvin, elevation, 208; formation, 218; materials and structure, 137; relations, 136, 184; topography, 134
- Intersecundibrachs, definition, 322
- Investment, rules for, ix, 47
- Iola limestone, 233, 241, 289, 291, 292; character, 236; fauna, 243, 249
- Iowa, echinoderms of, 319, 385, 494
- Iowa-Cedar valley, bluff lines, 194; drainage of Lake Calvin by, 210, 213; gumbotil in, 103; use by Mississippi, 217
- Iowa City, bluffs south of, 131; Cedar Valley beds at, 74; Des Moines beds at, 78; echinoderms from, 393, 399, 416, 427, 434, 436, 446, 453; **Platy-**ceras from, 451; terraces near, 146, 162
- Iowa City remnant, 125
- Iowa river, flood plain of, 165; in Lake Calvin basin, 58, 67; terraces on, 134, 161, 218
- Iowa rocks, columnar section, 20
- Iowa State Highway Commission, xix
- Iowa State Teachers College, echinoderms from, 428
- Iowa State University, collections, 319, 506 ff
- Iowan drift, 104; drift plain, lobes, 118; glacier, 108
- Isovals, 10
- Ithaca, N. Y., echinoderms from, 480
- J**
- Jaekel, Otto, work of, 358
- Jackson, R. T., species named for, 505; work of, 391, 413, 480, 492, 499
- Jackson county, old valleys in, 170, 176
- Johnson county, bluffs in, 130; Cedar valley beds in, 75; echinoderms from, 399, 412, 440; gravels in, 202; gumbotil in, 94; Iowan plain in, 118; Lake Calvin in, 60; Nebraskan in, 91; preglacial topography of, 84; silts in, 182; State Quarry beds in, 75; terraces in, 146, 152, 163
- Joints in southwestern Iowa, 303
- Jordan sandstone, 79
- Juniper Hill, echinoderms from, 492
- K**
- Kansan drift, bluffs of, in Lake Calvin, 130; character, 96; in Lake Calvin, 95; in western Iowa, xv; Nebraskan drift distinguished from, xvi; thickness, 97
- Kansan glacier in Lake Calvin, 217
- Kansan gumbotil in Lake Calvin, 97
- Kansan upland, remnants, 124; topography, 113
- Kansas, oil in, 7
- Kansas City stage, 233, 241; character, 234, 305, 309; fauna, 241, 249, 311; margin, 306; oil in, 35
- Kanwaka shale, 233, 240; character, 239; fauna, 248
- Kay, George F., annual reports of, iii; work of, 55, 59, 93, 211, 228; on Pleistocene, xv
- Kentucky, echinoderms from, 357, 403, 404, 405, 433; oil and gas in, 7, 22
- Keokuk beds, bitumen in, 27; oil and gas in, 33
- Keyes, C. R., work of, 62, 63, 83, 220, 228, 233, 273, 297, 311
- Kickapoo shale, 233

- Kinderhook age of Sweetland Creek beds, 409
 Kinderhook series in Lake Calvin, 76, 82; oil and gas in, 33
 Kirk, Edwin, see Ulrich and Kirk
 Kirkfield, crinoids at, 348
 Kunda formation, crinoids from, 358
- L**
- Labette stage, 312
 Ladore shale, 233, 241, 274, 282, 283, 285; character, 235, 241; fauna, 249
 Lake Calvin, Anamosa dolomite in, 71; bluff line, 125; bowlders in, 199; Buchanan gravels in, 98; Cedar Valley beds in, 74; character of basin, 57; culture in basin, 58; defined, 57; Des Moines series in, 78; Devonian system in, 72; drainage and history, 208, 211, 218; drainage of basin, 58; drainage of Iowa-Cedar Valley by, 210, 213; duration, 208; elevation of floor, 186; English River gritstone in, 76; evidence and origin of, 168; extent of, x, 109; Fayette breccia in, 73; field work in basin, 59; flood plain of, 165; geology of basin, 58, 69, 78; Gower limestone in, 71; gravel deposits in, 201; history, resume, 215; Illinoian bluffs of, 126; Illinoian drift in, 100; Illinoian upland near, 203; Independence beds in, 73; Kansan drift in, 95; Kansan gumbotil in, 97; Kinderhook series in, 76; Le Claire dolomite in, 71; length of existence, 192; Lower Burlington limestone in, 77; Lower Davenport in, 73; Maple Mill shale in, 76; Mississippian system in, 76; Nebraskan drift, 88; Nebraskan gumbotil in, 93; oolitic limestone in, 77; origin and history of, x, 49, 169, 207, 208, 215; Osage series in, 77; Otis beds in, 73; Pennsylvanian system in, 78; river valleys near, width, 205; rounded bluff lines, 194; shape and extent, 109; silts, clays and sand in, 181; subglacial topography, 83; terraces and age of, 210; terraces in, 133, 183; Wapsipinicon formation in, 72; Wassonville limestone in, 77; towns in basin, 58; width of river valleys near, 205; work of Calvin on, 66; work of Schoewe on, 49; work of Udden on, 65
 Lake Calvin region, Pleistocene investigations in, 61
 Lake Erie, echinoderms from, 405, 464
 Lake Pepin, cause of, 172
 Lane shale, 233, 241, 277, 289, 291; fauna, 248
 Lankester, E. Ray, work of, 483
 Lansing stage, 233, 240; character, 236; fauna, 243; margin, 306, 310; oil in, 35
 Lantern of *Devonocidaris*, 502; of *Nortonechinus*, 490
 Lapham, I. A., work of, 436
 Lateral, definition, 322
 Lawrence field, Illinois, oil and gas in, 33
 Lawrence shale, 233, 237, 240, 273, 293, 294; character, 237; fauna, 248
 Le Claire dolomite in Lake Calvin, 71
 Le Claire's quarry, echinoderms from, 460
Lecanocrinus, 397
 Lecompton limestone, 233, 240, 253, 264, 292, 312; fauna, 248
Leda bellistriata, 245, 246
 Lee county, bowlder ridge in, 63
 Lees, James H., Report on mineral production, xxi; work of, xviii, 26, 60, 221, 228, 297
 Leighton, M. M., work of, 66, 67, 84, 88, 89, 93-100, 110, 118, 123, 124, 129, 133, 162, 188
 Lenses, oil and gas in, 16
 Leon, preglacial valley at, 273; section at, 268
 Leonard, A. G., work of, 227, 298, 311
Lepidechinoides ithacensis, 480, distr., 407
Lepidesthes devonians, distr., 407
Lepidocentridae, descr., 499; of Iowa, 399
Lepidocentrus, 500, ? plates, 408; *L. drydenensis*, distr., 407; *efifianus*, 494, distr., 407; *mülleri*, distr., 407; *rhenanus*, distr., 407
Leptaena unicastata, crinoids on, 353
Lepidodiscus, 420
 Leroy shale, 233
 Letts, gas near, 26
 Leverett, Frank, work of, 63, 64, 66, 85, 87, 107, 115, 169, 171, 179, 180, 181, 208, 209, 219, 221
 Lewis, section near, 265
Lichenocrinus affinis, 354; *minutus*, xii, descr., 353, illustr., 372
 Lime Creek beds, age, 409, distr., 412; echinoderms in, xiv, 400, 403, 407
 Lime production, iv, xxxiv
 Limestone, production, iv, xxiv; in agriculture, xxxiv
 Linder, Anton, work of, 413, 434
 Linder, Carl, work of, 508
 Linder, Miss M. F., species named for, 440; work of, 440
 Linder's boathouse, echinoderms from,

- 446, 447, 448, 449, 451; *Platyceras* from, 451
 Little Cedar creek, old valley of, 180
 Little Sioux, volcanic ash near, xviii
 Littleton, echinoderms from, 416, 428, 444, 446, 448, 466, 471, 478, 492, 495, 498, 505
 Lobes, definition, 359
 Loess, in Lake Calvin, 104
 Logan, strata at, 310
 Lone Tree, terraces near, 146, 154
 Lonsdale, E. H., work of, 228, 261, 264
Lophophyllum distortum, 245; *profundum*, 244-248; *proliferum*, 249, 276
 Louisa county, bowlders in, 199; dunes in, 203; gas in, 26; gumbotil in, 94, 101; Illinoian in, 100; Nebraskan in, 89; old valley in, 115, 171, 179; preglacial topography of, 84; silts in, 182; terraces in, 134, 147
 Louisiana, oil in, 8
 Louisville, echinoderms from, 405
 Louisville limestone, 233, 240, 247, 264
 Loveland formation, xvii
 Low terrace in Lake Calvin, area, 161; fluvial origin, 184; formation, 218; Iowan age, 194; materials and structure, 162; topography, 162
 Lower Burlington in Lake Calvin, 77
 Lower Cretaceous system, oil in, 7
 Lower Davenport, age, 409; in Lake Calvin, 73
 Lower Devonian, echinoderms from, 404
Lyriocrinus, 330; *becheri*, 326; *sculptilus*, 326
- M
- McCoy, Alexander, work of, 305, 309
 McEwan, Mrs. Eula D., work of, 327
 McGee, W. J., work of, 61, 62, 123, 145, 175, 219
 McKenzie Basin, echinoderms from, 402, 405
 McKissick grove, anticline near, 300; section at, 259, 270
 McKissick Grove shale, 231, 233, 239, 252, 260, 269; character, 239; fauna, 244
 Macedonia, strata near, 313
 Macksburg, section near, 278
Macrodon tenuistriatus, 244, 247
 Madison county, sections in, 280
 Malvern, strata near, 313
 Mammals of Pleistocene, 106; fossil, of western Iowa, age of, xvi
 Maquoketa shales, 80; analyses, 31; carbon ratio of, 32; echinoderms from, xi, 319, 327, 349; oil and gas in, 31
 Maquoketa river valley, use by Mississippi, 170, 217
 Maple Mill shale in Lake Calvin, 76
Maquoketocrinus, descr., 330; *ornatus*, xi, 326, descr., 330
Marginifera lassellensis, 243; *longispina*, 242, 244-249, 264, 289, 311; *muricata*, 242, 265, 296, 311; *wabashensis*, 243, 244, 311, 312; see *Productus*
 Martens quarries, 252
Martinia subumbona, 410
 Mason City, echinoderms from, 421
 Mason City dolomite, distr., 412
 Maysville beds, crinoids in, 327
 Meadow limestone, 233, 247, 252, 253, 264; character 238; fauna, 246
 Meek, F. B., work of, 227, 237, 243, 312, 395; and Worthen, 420, 473
Meekella striatocostata, 243, 245-247, 249, 276, 277
Megistocrinus, xiii, xiv, 292, distr., 404, 405, 407; beds, echinoderms from, 399, 447; *M. clarkii*, 400, descr., 449, 458, illustr., 516, 530; *concavus*, illustr., 514; *farnsworthi*, 394, descr., 444, illustr., 512; *fitzpatricki*, descr., 448, illustr., 514, 530; *latus*, 393, 416, descr., 452, illustr., 518, 528; *merrilli*, descr., 455, illustr., 528; *nodosus*, 394, descr., 454, illustr., 518; *pernodosus*, 400, descr., 456, illustr., 518; *robustus*, descr., 446, illustr., 514
 Melocrinidae of Iowa, 399, 435
Melocrinites nodosus, 393
Melocrinus, xiii, xiv, distr., 404, 405, 407; *M. belanskii*, 412, descr., 440, illustr., 510; *calvini*, 395, descr., 438, illustr., 510; *gregeri*, 436, 440; *hinderi*, 400, descr., 439, illustr., 510; *nodosus*, 396, descr., 435, distr., 402, illustr., 510; *nodosus irregularis*, 400, 458, descr., 437, illustr., 510; *solonensis*, 438; *tiffanyi*, 395, descr., 437, illustr., 510
 Mesozoic, echinoderms of, 398, oil in, 7
 Metamorphism, effect on oil and gas, 10; of Iowa rocks, 24
 Metatype, definition, 323
 Mexico, oil in, 7
 Meyers, P. C., work of, 65
 Michigan, echinoderms from, 394, 402-405, 423, 427-431, 442, 476
Microcyclus discus, 473
 Mid-Continent fields, oil and gas in, 7, 23, 34

- Middle Devonian strata, echinoderms from, 404
 Middle river, sections along, 273, 278; elevations on, 279
 Miller, S. A., and Gurley, F. E., work of, 324
 Mills, sections near, 253
 Mills county, sections in, 252
 Milwaukee, echinoderms from, 393, 436
 Mineral production in Iowa for 1919 and 1920, iii, xxiii
 Mineral water production, vi, xlvii
 Mineralization of waters, and oil and gas, 17
 Minnesota, echinoderms from, 349, 358, 405
 Mississippi channel, temporary, 174, 177, 179, 180
 Mississippi river, bibliography of drainage, 219; blocking, 169, 217; preglacial, 85; present course, 87
 Mississippi River Power Company, xix
 Mississippian system, bitumen in, 27; echinoderms from xii, 403, 404, 471; in Lake Calvin, 76, 82; oil and gas in, 7, 23, 33
 Missouri, echinoderms from, 402-405, 436, 470; Missouri strata in, 236; oil in, 27
 Missouri river, cross section along, 249; strata on, 227; tills near, xv
 Missouri series, distribution in Iowa, 306; fossils, 311; in southwestern Iowa, x, 223; margin, 307; oil in, 35; relations, x
Modiola subelliptica ?, 246
 Mohawkian strata, crinoids in, 354, 358
 Mold, definition, 323
 Moline, Illinois, echinoderms from, 477
 Monoclines, in Iowa, 23; oil and gas in, 16
Monotis (gregaria) ?, 296
 Montreal, crinoids at, 357
 Moore, Prentice D., work of, 344
 Moscow, old valley at, 173; remnant, 124; terraces near, 144
 Mosnat, H. R., work of, 85
 Mound Valley limestone, 233
 Mount Ayr, preglacial valley at, 273
 Mud-Elkhorn creek, old valley of, 172
Murchisonia, 246
 Muscatine county, bluffs in, 130; boulders in, 199; echinoderms from, 423, 453; Illinoian in, 100; Lake Calvin in, 60, 65; sand and gravel in, 99; sand dunes in, 135, 203; silts in, 182; terraces in, 133, 137, 159
Myalina, 264; horizon, 235, 242, 243; *kansasensis*, 245, 249; *perattenuata*, 245, 246; *recurvirostris*, 246, 247; *subquadrata*, 243-249, 276, 295; *swalovi*, 243-247, 249, 281, 282, 288
- N**
- Natural mold, definition, 323
 Natural gas, production, vi; and petroleum in Iowa, vi, 1, 5; see Gas
Naticopsis, 277; *altonensis*, 245
 Nebraska, Missouri strata in, 237
 Nebraska City, section at, 268; well at, 269
 Nebraskan drift, character, 92; distinguished from Kansan, xvi; thickness, 93; in Lake Calvin, 88, 215; in western Iowa, xv
 Nebraskan gumbotil, 93; in Lake Calvin, 93; in western Iowa, xv
 Nehawka limestone, 233, 237
Neuropteris ovata, 246; *scheuchzeri*, 246
 New Buffalo, echinoderms from, 423, 473; see also Buffalo
 New Market, anticline near, 38
 New Richmond beds, 80
 New York, echinoderms from, 349, 403-407, 480; oil and gas in, 7, 29; Silurian, 81
 Newman, Nellie E., work of, xix
 Niagaran dolomite, 80
 Nishnabotna river, section on, 260
 Nodaway coal, 240, 271, 272, 303; character, 238; eastern margin, 307
 Nodaway shale, 233
 Nora limestone, distribution, 412
 Nora Springs, echinoderms from, 400, 417, 419
 North America, echinoderms in, xiii
 North Liberty, echinoderms from, 454
 North Liberty lobe, 118
 Norton, W. H., genus named for, 483; work of, xix, 28, 65-67, 71, 79, 83, 85-87, 93, 124, 169, 174, 220, 254, 307, 410, 413, 492
Nortonechinus, xiv, 397, decoration, 406, descr., 481, distr., 403, 404; from Iowa, 480; Hill, echinoderms from, 492; *N. owenensis*, descr., 493, illustr., 540; *stainbrooki*, descr., 495, illustr., 538; *welleri*, 412, descr., 483, discovery, 401, illustr., 532, 534, 536; *welleri latus*, descr., 492, illustr., 538
 Noses, oil and gas in, 15
 Nucleocrinidæ of Iowa, 399
Nucleocrinus, 392, distr., 404, 405, 406; *N. angularis*, 433; *bondi*, descr., 431, illustr., 508; *elegans*, 430; *meloniformis*, 394, descr., 428, distr., 402, illustr., 508; *obovatus*, 394,

- 423, descr., 423, distr., 402, illustr., 508
Nucula, 244; *bellistriata*, 296; *ventricosa*, 246, 296
 Nyman coal, 231, 239, 252, 260, 270, 311
- O**
- Ohio, echinoderms from, 403, 404, 471; oil and gas in, 7, 22
 Oil, along creeks and rivers, 19; areas favorable for, 38; geological age, 7; in water wells, 19; seum on water and, 18, structures favorable to, vii, 5; surface tension, 13; under hills, 19
 Oil and gas, accumulation, 5; false indications, viii, 18; movement, 12; geology, 5; in Iowa, vi, 1, 26; in southwestern Iowa, 305; origin, 5; relation to carbon in coals, vii, 10; stock promotion, viii, 40; surface indications, vii, 17
 Oil and topography, 19
 Oil, business, hazards, ix, 41; companies, functions of, viii, 40; investments and speculation, 48; leases, value of, 48; promoters, methods, ix, 43; refining, 41; "rock", analyses, 27; "rock" in Iowa, 27, 30; seeps and springs, 17; shales and oil, vii, 17; stock, selling, 43; stock, value of, 47; wells, cost, ix, 42
 Oklahoma, oil and gas in, 7, 23, 35
 Old Mans creek, ramification, 109
Olivanites, 392; *meloniformis*, 429; *obovatus*, 424; *verneuili*, 427
 Olsson, A., work of, 480
 Oolitic limestone in Lake Calvin, 77
 Oneota beds, 80
 Ontario, echinoderms from, 348, 354, 405; oil and gas in, 7, 22
 Ophiuroidea, history, 398
 Ordovician rocks, oil and gas in, 7, 22, 29; echinoderms in, 398, 407, 480
 Oread limestone, 233, 240, 263ff., 271-273, 280, 282, 292ff., 307; character, 236, 237, 298; eastern margin, 310; fauna, 243, 248
 Oreopolis limestone, 233, 237
 Osage series in Lake Calvin, 77
 Osage shale in western Iowa, 233, 239
Orthoceras *knoxense*, 247; *rushense*, 245, 246
Orthonema *subeniatum*, 245
Orthotetes *crassus*, 244-249, 256, 276, 281, 284-287, 291, 295; *robustus*, 247; *verneuili*, 286
 Osceola, strata near, 287, 298
- Otis beds, age, 409; fossils, 410; in Lake Calvin, 73
 Ottawa, crinoids, at, 357
 Ottawa shale, 233
 Owen, D. D., work of, 61, 391, 392, 427, 460
 Owen beds, echinoderms from, 408, 495
- P**
- Paarmann, J. H., work of, 413
 Page county, anticline in, 38, 300
 Paha of Iowan plain, 123
 Paleozoic, echinoderms, 398; oil in, 7
 Palmers, definition, 322
Paralaelodon *wheeleri*, 245
 Paratypes, definition, 323
 Parkville shale, 233
 Parsons stage, 312
 Partridge Point, Mich., echinoderms from, 428, 468
 Patterson's Springs, crinoids from, 337, 341
 Pawnee limestone, 296
 Peat beds, 101
Pecopteris *cyathea*, 246
 Pectinirhombs, definition, 355
 Pelmatozoa, definition, 397
 Pennsylvanian coal, carbon ratios, 11
 Pennsylvanian system, echinoderms from, 465; in Lake Calvin, 78; in southwestern Iowa, x, 223; oil and gas in, 7, 23
Pentremites, 393; *subtruncatus*, 422
 Peorian deposits, 104; stage, loess in, 108
Peripristis *semicircularis*, 246, 248
 Perischoëchinoida of Iowa, 399, 480
Perittocrinus *transitor*, 358
 Permian system, echinoderms from, 465; oil and gas in, 7, 23, 36
 Petroleum, origin of, vii, 5; and natural gas in Iowa, vi, 1, 5; see also Oil
 Petroleum Geologists, American Association of, 45
 Petroliferous horizons, possible, 22
Phanerotrema *grayvillensis*, 244-246
Phillipsastrea horizon, 410
Phillipsia, 242, 248, 253, 282; *major*, 245, 312
Pholidocidaris *acuaria*, distr., 407
Phragmoceras zone, echinoderms from, 477
 Pine Creek conglomerate, 83
Pinna, 246; *peracuta*, 247, 248, 256
Pinnatopora *trilineata*, 246
 Pinnules, definition, 322
 Piqua shale, 233
 Piracy, formation of bluffs by, 198; and draining of Lake Calvin, 211

- Platotype, definition, 323
 Platte shale, 233, 239
 Platteville, Wis.; "oil rock" from, 27
 Platteville limestone, 80; crinoids from, 354, 355, 358; oil and gas in, viii, 22, 30
 Plattsburg limestone, 233, 241, 277, 289, 291; character, 236; fauna, 248
 Plattsmouth limestone, 233, 237, 254, 265, 271, 272, 292, 293
Platyceras inoptatum, descr., 451, illustr., 516; *parvum*, 245, 247
 Pleasanton sandstone, 281
 Pleistocene formations, fossils, xvi, 106; history, 105; of Lake Calvin, 88; oil and gas in, 7, 23, 36
 Plesiotype, definition, 323
Pleurocystites, xii, descr., 355; *P. sp.*, descr., 365; *anglicus*, 357; *angularis*, xii, 369; *anticostiensis*, xii, 357, 367, 369; *beckeri*, xii, descr., 359, illustr., 376, 380, 382; *clermontensis*, xii, descr., 363, illustr., 380, 382; *conicus*, 358; *elegans*, 357; *exornatus*, 357; *filtextus*, 357, 358; *foriolus*, 357; *gibbus*, 357; *mercerensis*, 357; *multistriatus*, xii, descr., 366; illustr., 380, 382; *procerus*, 356; *quadratus*, 357; *rugeri*, 357; *robustus*, 357; *slocomi*, xii, descr., 362, illustr., 380, 382; *squamosus*, 357, 358; *squamosus matutinus*, 357
Pleurotomaria, 247; *perhumerosa* ?, 244
 Polley, J. F., species named for, 419; work of, 417
Polypora crassa, 246; *elliptica*, 246; *submarginata*, 246, 247
Porocrinus, description, 332; *conicus*, 332, 358; *crassus*, 334; *fayettensis*, xi, descr., 333, illustr., 370, 372; *kentuckiensis*, 358; *pentagonis*, 334, 358; *radiatus*, 358; *smithi*, 358; *shawi*, 358
 Port Union mill, section at, 294, 295
 Portland cement, gypsum in, xli; production, v, xlv
 Posterior interradius, definition, 321
 Potash production, vi, xlvii
Poteroocrinidae of Iowa, 399, 478
Poteroocrinus, distribution, 404; *P. bufaloensis*, 395, descr., 478, illustr., 526
 Pottawattamie county, sections in, 256
 Prairie du Chien formation, 80; oil and gas in, 29
 Prairie geosyncline, 10, 23, 297
 Pratt, W. H., work of, 477
 Pre-Cambrian, oil and gas in, 29
 Pre-Kansan drift, 89, see also Nebraska
- Preston, old channel at, 170, 176
 Preston limestone, 233, 234, 240, 260, 261, 270, 307; character, 239; fauna, 245
Productus, 255, 295; *cora*, 244-249, 256, 276, 277, 282ff.; *costatus*, 244-249, 256, 276; (*Marginifera*) *longispinus*, 245, 310; *muricatus*, 311; (*pustula*) *nebrascensis*, 245-248, 253, 264, 265, 276, 277, 284ff.; *pertenus*, 245, 246, 248, 256; *prattenianus*, 287; *punctatus*, 244-247, 249, 311, 312; *semi-reticularis*, 244-247, 249, 253; *splendens*, 311; *symmetricus*, 247; see *Marginifera*
 Prosser, C. S., work of, 231
 Prosser member, crinoids in, 354, 357
 Prices of clay products, xxxi
 Primary types, definition, 322
Primibrachs, definition, 322
 Proximal, definition, 322
Pseudomonotis hawni, 247
Pugnax uta, 244-247
Pustula, see *Productus*
- Q
- Quebec, crinoids in, 357
- R
- Radials, definition, 321
 Radial, definition, 322
Raphanocrinus gemmeus, 326; *sculptus*, 326; *subnodosus*, 326
 Raymond, P. E., work of, 339, 350
 Rays, definition, 320
 Recent deposits, 105; echinoderms, 398
 Red Oak, strata near, 238, 263; well at, 262
 Redfield anticline, 298; test well at, 34
 Reeds, Chester A., work of, 436
 Reger, David B., work of, 10
 Reservoir, effect on oil and gas, 6
Retepora, 392
Reticularia perplexa, 247
 Reval, Russia, crinoid from, 349
 Rhenish Devonian, echinoderms from, 406
 Rhineland, echinoderms from, 407
Rhipidocrinus, 330
Rhipidomella pecosii, 243, 245-247
Rhodocrinidae, xi, definition, 327, species, 323
Rhodocrinus asperatus, 324, 325; *gracilis*, 471; *microbasilis*, 324; *pyriformis*, 325; *vesperalis*, 326
 Rhomb-bearing cystids, 406
 Rhombifera of Iowa, 399, 414
Rhombopora lepidodendroides, 244-249, 256, 276, 295
 Richmond formation, crinoids in, 327, 349, 357

- Rick, John L., work of, 28
 Ringgold county, strata in, 273
 River Junction, terraces near, 146, 154
 Riverview Park, Red Oak, strata at, 238, 240, 263
 Rock, age and character, effect on oil and gas, 6, 7
 Rock Island, Ill., echinoderms from, 405, 477
 Rockford, echinoderms from, 467, 480, 492, 499, 505
 Rockingham, echinoderms from, 427
 Roemer, F. A., 323
 Rome, old valley near, 179
 Rowley, R. R., 470
 Rulo limestone, 233; character, 239
 Russia, echinoderms from, 349, 358, 404, 470, 480
- S**
- Salisbury, R. D., work of, 80
 Salt domes, oil in, 16
 Salt waters, and oil and gas, 17
 Sands and Gravels, Aftonian, 95; production, v, xxxvi; in Lake Calvin, 181; in Muscatine county, 99; of western Iowa, xvi
 Sand dollar, 398
 Sanders quarry, echinoderms from, 416
 Sandstones as reservoirs, 7
 Sandusky bowlder ridge, 63
 Sangamon stage, 90, 101; in Lake Calvin, 108
 Sardeson, F. W., work of, 80, 221
 Savage, T. E., work of, 80, 474
 Scaphiocrinus ?, 246
 Scarplocrinus, 247
 Schizodus, 244, 246; *wheeleri*, 247
 Schoewe, W. H., report on Lake Calvin, 49; work of, 66, 95
 Schuchert, C., species named for, 419; work of, 6, 83, 354, 402, 409, 419
 Scotland, crinoids in, 357
 Scott county, echinoderms from, 399; old valley in, 173
 Scranton shale, 233, 240, 260, 261, 264, 270; character, 238, 239; fauna, 244
 Scum on springs and pools, and oil, 18; see also Oil
 Sea-cucumber, 398; history, 399
 Sea-lilies, xii
 Sea-urchins, xii, 398; from Iowa, 479; history, 398
 Searight, Walter V., work of, 446
 Sections in western Iowa, xi, 249ff
 Secundibrachs, definition, 322
 Segments, definition, 322
 Septopora biserialis, 246, 247
 Serpula insista, 246
 Severy shale, 233, 240, 247, 264; character, 238; fauna, 246
 Shakopee beds, 80
 Shales, and oil and gas, 6
 Shannon City, oil near, 26
 Shawnee stage, 233, 240, 313; character, 237; fauna, 243, 245; margin, 306; oil in, 35
 Shell Rock limestone, distr., 411; echinoderms from, 408, 417, 419, 421, 462, 463
 Shenandoah, anticlines near, 38
 Shimek, B., work of, xvi, xvii, xviii, 62, 310, 311
 Shingle, origin, 202
 Shoulder-angle, definition, 359
 Shoulders, definition, 359
 Shueyville lobe, 123
 Silts and clays of Lake Calvin, 177, 181
 Silurian strata, 80; echinoderms from, 398, 404, 407, 480; oil and gas in, viii, 7, 23, 33
 Sioux quartzite, 79
 Skunk river, old valley of, 179
 Slocom, A. W., report on echinoderms, xi, 320; work of, 362, 365
 Smith, George L., work of, 228, 231-233, 244, 246, 250-252, 259, 269, 270, 271, 300, 307, 311, 313
 Soleniscus intercalaris, 247; *paludinaeformis*, 246
 Solenomya ?, 256
 Solon, echinoderms from, 399, 419, 439, 443, 447; *Platyceras* from, 451
 Solon lobe, 123
 Soper, E. K., work of, 222
 South America, oil in, 7
 South Wales, crinoids in, 357
 Southbend limestone, 233
 Southwestern Iowa, oil in, viii, 35, 305; structure of, 297
 Specific gravity, effect on oil and gas, 12
 Spherodoma *primigenia*, 245
 Spines of *Devonocidaris*, 503; of *Nortonechinus*, 488; of *Xenocidaris*, 497
 Spirifer *cameratus*, 244-249, 256, 263, 265, 277, 282, 292 ff; *kentuckiensis*, 312; *parryanus* zone, echinoderms from 453; *pennatus* beds, 410; echinoderms from 427, 460; position, 410
 Spiriferina, 311; *cristata*, 247; *kentuckiensis*, 245-247
 Spragueville, old valley near, 176
 Springer, Frank, species named for, 461; work of, 320, 332, 348, 396, 405, 413, 438, 442, 461, 468, 470, 473, 479; see also Wachsmuth and Springer
 Spurs at junction of valleys, 195
 Squamularia *perplexa*, 247

- St. Ambrose College, echinoderms from, 422, 453
 St. John, Orestes, work of, 227
 St. Peter sandstone, 80; oil and gas in, 30
 St. Petersburg, crinoids from, 358
 Ste. Genevieve beds, oil and gas in, 33
 Stainbrook, M. A., work of, 413, 416, 421, 437, 456, 464, 496
 Stanton limestone, 233, 240, 256, 271, 273, 277, 292, 293; character, 236; fauna, 248
 Stanwood channel, 67, 86
 Starfishes, xii; history, 398
 State Quarry limestone, 81; age, 409; echinoderms from, 436, 439; in Lake Calvin, 75
 State University of Iowa, see University of Iowa
 Stauffer, C. R., work of, 405
 Stem, definition, 322
 Stennett, fossils near, 248; strata near, 238, 264, 313
 Stennett shale, 233
 Stenopora carbonaria, 246
 Stereocrinus, 397, decoration, 406, descr., 442, distr., 403, 404; littletonensis, descr., 444, illustr., 512; triangulatus, 394, descr., 442, illustr., 512; triangulatus liratus, 394, 443
 Stereom, definition, 320
 Stocks, purchase of, 42; selling methods, 46
 Stookey, S. W., work of, 85
 Story county, gas in, 26
 Straparollus catilloides, 245, 248; subquadrata, 249
 Strawn shale, 233
 Streams, development in Lake Calvin, 213
 Strike and dip, 300
 Strobilocystites, 397, 398, descr., 414, distr., 403, 404, 406; S. calvini, 394, 427, 434, descr., 414, illustr., 506; polleyi, 396, descr., 417, illustr., 506; schucherti, 412, descr., 418, illustr., 506
 Stropheodonta demissa bed, echinoderms from, 476
 Strophomena fluctuosa, illustr., 373; S. fluctuosa occidentalis, crinoids on, 353
 Structure, effect on oil and gas, 13; of southwestern Iowa, 297
 Stuart, strata near, 229, 242, 280, 307, 311
 Sturm limestone, 233, 237
 Sugar creek, old valley of, 180
 Superradials, definition, 321
 Supplementary types, definition, 323
 Surface tension of oil, 13
 Survey office, work of, xix
 Sweetland Creek shale, 82, age, 409
 Swift Current, Ontario, crinoids from, 355
 Synaptocrinus nuntius, 474
 Synbathocrinidae of Iowa, 399, 476
 Synbathocrinus, distr., 404; S. matutinus, 393, descr., 475, distr., 402, illustr., 526
 Synclines, oil and gas in, 14; in southwestern Iowa, 297
 Syringopora, 282
- T
- Tabor, strata near, 313
 Tainoceras occidentale, 246
 Tarkio limestone, 231, 233, 240, 260, 268-270, 307; character, 239; fauna, 245
 Taxocrinidae of Iowa, 399, 471
 Taxocrinus, distr., 404; gracilis, 471; interscapularis, 393, 473, descr., 474, illustr., 526; nuntius, 474
 Tecumseh shale, 233, 240; character, 238; fauna, 248
 Tegmen, definition, 320
 Tegulifera armata, 243
 Tennessee, echinoderms from, 403, 404, 442; oil in, 7
 Tentaculites hoyti, 392
 Terraces, age, 193; and age of Lake Calvin, 210; bowlders on, 136; contact between, 190; development, stages, 189; elevation, 187, 193; formation, 190; in Lake Calvin basin, 133, 183; material, 184, 189; origin, 185; relations, 186; topography, 134
 Tertiary strata, oil in, 8
 Tertibrachs, definition, 322
 Texas, oil and gas in, 7, 23
 Test, definition, 320
 Thayer, gravels in, xvi
 Thayer shale, 233
 Theca, definition, 320
 Thecal ratio, definition, 359
 Thomas, A. O., report on echinoderms, xii, 385; work of, 84, 397
 Thunder Bay, echinoderms from, 427, 431
 Thurman, strata near, 250, 313
 Thurman-Wilson fault, 24, 228, 251, 264, 297, 303; strata near, 306
 Thysanocrinus microbasilis, 324; pyri-formis, 325
 Tiffany, A. S., collection, echinoderms from, 438, 453; work of, 396
 Till, see Nebraskan, Kansan, Illinoian
 Tilton, John L., report of, on Missouri series, x, 233; work of, 24, 227, 228,

242, 249, 251, 268, 276, 277, 280, 305-307, 312
 Timor Island, East Indies, echinoderms from, 465
 Tipton lobe, 124
 Todd, J. E., work of, 228, 250, 251
 Topeka limestone, 233, 240, 247, 252, 253, 264; character, 238; fauna, 246
 Topography, Aftonian, 106; preglacial, of Lake Calvin basin, 215; subglacial, of Lake Calvin basin, 83; and oil, 19
 Traverse basin, fossils from, 402; group, echinoderms from, 468
 Trenton formation, crinoids in, 327, 329, 348-350, 354, 357; oil and gas in, viii, 6, 22, see also Platteville
 Troost, G., work of, 441
 Troostocrinus subtruncatus, 422
 Trowbridge, A. C., work of, 60, 80, 83, 106, 215, 217, 221
 Turbinocrinus (Turbinocrinites), 441
 Type, definition, 322

U

Udden, J. A., work of, 55, 65, 66, 71, 76, 78, 83 ff, 130, 134, 136, 137, 141, 142, 144, 156, 168, 171, 174, 177, 189, 208, 209, 217, 220, 228, 244-248, 250, 251, 255-259, 269, 270, 310, 311, 313
 Ulrich, E. O., work of, 349, 354, 358, 366; and Kirk, Edwin, 319, 366
 Unconformities, oil near, 16
 Union county, gravels in, xvi; sections in, 277
 Union limestone, 233, 240, 247, 264
 U. S. Dept. Agri., Bur. of Soils, 58, 135, 137, 169
 U. S. National Museum collections, 369
 University of Chicago collections, 319 ff
 University of Illinois, echinoderms from, 473, 475, 478
 University of Iowa collections, 319 ff, 506 ff
 Upham, Warren, work of, 168
 Uplands of Lake Calvin, 110
 Upper Cretaceous strata, oil in, 7
 Upper Davenport beds, age, 409; echinoderms from, 404, 443, 480; in Lake Calvin, 73
 Upper Devonian beds, 81; in Iowa, 409
 Upper Huronian series, 79
 Utah, gas in, 8

V

Vaginatenskalk, crinoids from, 358
 Valcour limestone, crinoids in, 349
 Valleys, see Buried Valleys, Channels
 Vanuxem, Lardner, work of, 420

Vaurial member, crinoids in, 349, 357
 Ventral disc, definition, 320
 Viele, old valley near, 180
 Vilas shale, 233, 241, 273, 292, 293
 Vinton, echinoderms from, 416, 479
 Volcanic plugs, oil near, 16

W

Wabaunsee stage, 231, 233, 260, 312; character, 239; fauna, 244; oil in, 35
 Wachsmuth, Charles, work of, 433; and Springer, Frank, 324, 391, 395, 436, 441, 443, 444, 453, 455, 460, 473
 Walcott, C. D., work of, 399
 Walker Museum collections, 319 ff
 Walter, Otto T., work of, 413, 506
 Wanner, Johann, work of, 465
 Wapsipinicon beds, 81; age, 409; echinoderms from, 442, 443; in Lake Calvin, 72
 Wapsipinicon river, blocking of, 169; old valley of, 174; use by Mississippi, 217
 Warren, G. K., work of, 220
 Washington channel, 85
 Washington county, Aftonian in, 95; gravels in, 202; Nebraskan in, 92; terraces in, 163
 Wassalem limestone, crinoids in, 349
 Wassonville limestone in Lake Calvin, 77
 Water, see Ground water
 Waterfowl Bay, echinoderms from, 430, 431
 Waterloo, echinoderms from, 400, 413, 444, 452
 Waverly beds, echinoderms from, 471
 Wayne, old valley near, 179
 Webster, strata near, 288
 Webster, C. L., work of, 62, 397, 417
 Weeping Water limestone, 233, 237, 256
 Weller, S., species named for, 492; work of, 311, 324, 409, 413, 436
 West Liberty, bluffs of Lake Calvin near, 129; terrace near, 133, 147, 160
 West Liberty Plain, 85, 130, 133; elevation, 208
 West Virginia, echinoderms from, 403, 404
 Westerville, section near, 276
 Westerville limestone, 233, 275-277; fauna, 249; use of term, 230
 Westgate, L. G., work of, 221
 Weston shale, 233, 240, 292, 293; fauna, 248
 Whipple, E. P., work of, 416, 479
 White, C. A., work of, 61, 62, 227, 228, 256, 258, 280, 310, 312, 394, 409

- White, David, work of, 10, 26
 Whitfield, E. P., work of, 396, 436
 Whitney, J. D., work of, 61
 Wild cat wells, 42
 Wilder, Frank A., report on gypsum, v, xliv; work of, 297
 Willard shale, 233
 Willis, Ivan, work of, 229
 Wilson, H. E., work of, 372
 Wilton Junction, terrace near, 158
 Wilton Valley, 109, 205; terrace, 156, 184, 185, 188
 Winchell, N. H., work of, 221
 Winfield, old valley near, 179
 Winneshiek county, oil in, 27
 Winterset, elevations near, 279; section at, 281
 Winterset limestone, 233, 241, 273, 274, 276, 282-286, 299, 312; character, 235; fauna, 242, 249
 Wisconsin, echinoderms from, 349, 393, 402-405; "oil rock" in, 27
 Wisconsin terraces and valley trains, 105
- Witter, F. M., work of, 62, 63
 Worthen, A. H., work of, 61, 394; see Meek and Worthen; collection, echinoderms from, 478
 Worthenia tabulata, 246
 Wyman, old valley near, 179
 Wyoming, oil in, 7
- X**
- Xenocidaris, xiii, xiv, 397, 482, 483; decoration, 406, distr., 404, 405; from Iowa, 480, 496; *X. americana*, descr., 497, illustr., 540; *clavigera*, 497, distr., 407; *conifera*, distr., 407; *cylindrica*, 496, distr., 407; zone, echinoderms from, 499
- Y**
- Yarmouth stage, deposits, 97; duration, 107
- Z**
- Zeacrinus, 245, 246, 249
 Zittel, Carl, work of, 332, 391