INDEX

A
Abbott, well near .................. 854
Abingdon, wells at ................. 655, 658
Ackley, geology at, 75, 77, 87, 89, 93, 95; wells at and near, 835, 848, 853; plate showing, 310; rock from, analyses, 850; water of, quality, 186, 187, 188, 208, 277.
Acknowledgments to those aiding, .................................. 45, 47
Adair, wells at and near, 930, 931.
Adair county, city and village supplies, 930; geology, 928; springs, 929; topography, 928; underground water, 929; wells, 929; water of, quality, 200.
Adams county, city and village supplies, 1112; flowing wells, 1112; geology, 1111; springs, 1112; topography, 1110; underground water, 1111; wells, 1111; water of, quality, 203.
Adel, forecast for .................... 825
Afton, water supply at .............. 989
Aftonian gravel, occurrence and character, 182; water in, 133.
See also particular county descriptions.
Afton Junction, geology at ........ 990
Agency, wells near .................. 728
Ainsworth, water supply at .......... 742
wells at and near .................... 748
Air lift, use of ...................... 148
Akron, geology near, 1075; spring near, 1075; water supply at, 1075.
Albert City, wells at, water of, quality of ......................... 177
Albia, geology at, 928, 977; water supply at, 979; wells at and near, 977, 979.
Albion, wells near .................. 874, 881
Alburnett, wells at ................. 545
Alds, wells at ...................... 648
Aledo, Ill., geology at, 69, 613; well at, record of, plate showing, 618.
Algona, wells at and near, 744, 756, 768, 780; water of, quality, 171, 206, 208.
Algonkian rocks, occurrence and character, 67, 68, 750, 1094.
Allamakee county, city and village supplies, 294; flowing wells, 288; geology, 71, 75, 77, 283, 290; springs, 113, 292; topography, 50, 281; underground water, 280, 287; wells, 114, 287, 294; water of, quality, 168, 270.
Allison, water supply at ............ 757
Alluvium, occurrence and character, 104; water of, 135; use of, for water supplies, 213.
Alpha, wells at ..................... 399
Alta, water supply at, 1011; wells at, water of, quality of, 177.
Alton, water supply at ............... 1090
Alvord, water supply at ............. 1053
Amana, wells at, 480; water of, head, 155; quality, 181, 183, 206, 209, 274, 481.
Amber, wells near .................. 519
American Railway, Engineering and maintenance of Way Association, standard of quality of water of ......................... 241
Ames, geology at, 42, 45, 76, 77, 89, 91, 95, 98, 811; wells at, 111, 148, 902, 904, 905, 906, 913; plate showing, 458; water of, quality, 186, 189, 208, 270, 271.
Amker, well at ..................... 529
Ammonia in deep waters, cause of 160
Analyses, form, 160; nature, 159; recomputation, 162; logarithms for, 164.
Anamosa, geology at, 73, 74, 75, 79, 85, 87, 520; wells at, 110, 520; plate showing, 424; water of, head, 142; quality, 183, 208, 520.

Angus, wells near .......... 822

Anita, wells at, 1119, 1124; water of, quality, 203.

Ankeny, wells at and near ... 889, 899

Anthon, wells at ........... 1098, 1099

Aplington, wells at .......... 755

Appanoose county, city and village supplies, 934; geology, 932; topography, 49, 932; underground water, 933; wells, 199, 934; plates showing, 448, 814; water of, quality, 201.

Aquifers, overdraft on ........ 152

Aquifers, Iowa, relative heads, 141; texture and porosity, 150; thickness of, dependence of yield on, 149.

Arcadia, wells near .......... 1026

Archean rocks, occurrence and character .......... 68, 750

Arey, M. F., county descriptions by ........ 333, 750

Arey, M. F., and Norton, W. H., county descriptions by .... 301

Argand, wells at ............. 517

Arlon, water supply at .......... 1068

Arlington, water supply at, 396; wells near, 394, 401.

Armstrong, water supply at .... 1047

Artesian field, geologic conditions in, 106; location of, plate showing, in pocket.

Artesian phenomena, discussion of 138

Artesian water, definition, 138; depth, 106; discrimination of, from other ground water, 31, 105; distribution, See Wells; head of, definition, 138; factors affecting, 139; measurement, 139; plate showing, pocket; possible pollution of, by surface drainage, 226; quality. See Water, chemical composition; relation of, to geology, 108; rocks carrying. See Aquifers. See also Flowing wells; Wells; Water.

Ashton, water supply at ........ 1066

Atalissa, springs near, 562; wells at, 570, 571.

Atkins, wells at ............. 429

Atlantic, geology at, 99; wells at and near, 1119, 1124; water of, quality, 203, 264.

Attica, geology near .......... 967

Audubon, geology at, 1115; water supply at, 1116; water of, quality, 202.

Audubon county, city and village supplies, 1116; geology, 1114; topography, 1114; underground water, 1115; wells, 1115; water of, quality, 202.

Augusta, springs at, 676; wells at and near, 633, 640.

Aurelia, wells at and near, 1029; water of, head of, 1011, 1029; quality of, 175, 177.

Austintville, wells at and near ... 755

Avery, wells near ............ 978

Avoca, water supply at .......... 1166

Ayrshire, water supply at, 1068, 1070; water of, quality of, 177.

B

Bagley, water supply at, 837; water of, quality, 190.

Baldwin, wells at .......... 490, 501

Bancroft, wells at, 789, 791, 792; quality, 166, 171, 275.

Bankton, geology near .......... 376

Baraboo, Wis., geology at .... 70

Baring, Missouri, wells at .. 619, 620

Barnum, well near .......... 619

Basal sandstone, correlation of ... 72

Batavia, well at .......... 657

Battle Creek, water supply at, 1047; wells at, water of, quality, 178.

Bayard, well near ............ 831

Bedford, geology at, 45, 91, 95, 98, 925, 1100, 1103, 1108, 1109, 1112; wells at, 122, 126, 128, 1132; plate showing, 1160; rock from, analyses, 1138; water of, quality, 123, 198, 204, 206, 271, 272, 1103.

Belfast, springs at, 676; wells at, 688.

Belle Plaine, flowing wells at and near, 131; geology at, 43, 79, 82, 92, 93; wells at and near, 421, 426, 429; plates showing, 420, 458; water of, quality, 131, 133, 182, 208, 275, 430.

Belle Plaine artesian basin, description, 426, 577, 615.

Belle Plaine, flowing wells at and near, 131; geology at, 43, 79, 82, 92, 93; wells at and near, 421, 426, 429; plates showing, 420, 458; water of, quality, 131, 133, 182, 208, 275, 430.

Belle Plaine artesian basin, description, 426, 577, 615.

Bellevue, geology at, 83; springs near, 498; wells at and near, 498, 497, 503.

Belmond, wells at, 808; water of, head, 782, 808; quality, 173.
INDEX

Benton, wells near ............... 424
Benton county, city and village supplies, 429; geology, 423; springs, 424, 425; topography, 422; underground water, 424; wells, 424; water of, quality, 182.
Bernard, wells at ................ 389
Bertram, wells at ............... 545
Bethany limestone, occurrence of .............................................. 1108, 1109
Bettendorf, wells at ............ 592
Big Rock, geology near, 590; wells at, 605.
Birmingham, wells at ........... 719
Black Hawk county, city and village supplies, 306; geology, 303; springs, 304, 306; topography, 301; underground water, 303; wells, 160, 303; water of, quality, 169.
Blairsburg, well near .......... 845
Blairtown, wells at ............. 432, 438
Blakesville, well near .......... 1056
Bledorn, wells near ............ 458
Bloomfield, geology at, 45; wells at, 623; water of, quality, 195.
Blue Grass, wells at .......... 605
Bluffton, springs near, 412; wells at, 417.
Boilers, corrosion in, causes, 256; interpretation of analyses in regard to, 265; nature of, 255; water softening in, 247.
Boiler scale, composition, 244; decomposition, 242; prevention, 247; properties, 245.
Boiler water, improvement, 247; requirements, 241; scale-forming powers, 246.
Bonaparte, water supply at .... 717
Boone, flowing wells at, 815; geology at, 73, 74, 76, 77, 79, 82, 85, 88, 91, 95, 98; wells at and near, 110, 147, 158, 813, 815; records of, plates showing, 458, 814; water of, quality, 183, 298, 270, 277, 815.
Boone county, city and village supplies, 815; flowing wells, 815; geology, 812; springs, 815; topography, 813; underground water, 814; wells, 814; water of, quality, 189.
Brainard, wells at ................. 399
Braydon, well near ............. 978
Bremer county, buried channel, 315; city and village supplies, 319; geology, 312; topography, 312; underground water, 312; wells, 314; water of, quality, 169.
Bremer "River," buried channel of 315
Bridgewater, wells at and near, 931; water of, quality, 177.
Bristow, wells at ................ 758
Britt, wells at, 780, 782, 783; water of, quality of, 172.
Brompton, wells near .......... 978
Brooklyn, wells at and near, 577, 585; water of, quality, 181, 183, 278.
Brooks, wells at ................. 1113
Brookville, well at ............. 667
Brows, geology at, 456; wells at, 473, 474; water of, quality, 184.
Bryant, geology near, 457; wells at, 473, 475.
Buchanan, wells at ............. 447
Buchanan county, city and village supplies, 337; geology, 103, 335; springs, 336; topography, 338; underground water, 334; wells, 160, 335; water of, quality, 169.
Buchanan gravel, occurrence and character, 303, 499, 423, 506, 571, 901; water in, 134, 303, 334, 424, 597, 575, 753, 872.
Buckeye, wells near ............. 847, 853
Buckingham, wells at, water of, quality of .............................................. 182
Buckley, wells at ............ 821
Buena Vista, wells at .......... 473
Buena Vista county, city and village supplies, 1011; geology, 1009; topography, 49, 1009; underground water, 1009; wells, 1009; water of, head, 1010; quality, 177.
Buffalo, wells at ................. 605
Buffalo Center, wells at, 890; water of, head of, 791, 799.
Bunnell, F. O., aid of ........... 47
Buried river channels, description of, 815, 455, 457, 488, 505, 518, 537, 587, 629, 642, 674, 706, 992. See also Bremer channel; Stanwood channel, Cleona channel.
Burlington, geology at, 70, 76, 77, 81, 84, 86, 92, 94, 95, 619; wells at, 619, 630, 632; plates showing, 618, 626; water of, head, 140, 142, 155, 619; quality, 125, 192, 193, 155, 206, 208, 270, 272.

INDEX

Burlington limestone, occurrence and character, 96, 643, 651, 672, 694, 715; springs from, 127, 631; water in, 127, 629, 644, 675.

Burt, wells at, 793; water of, head, 791, 793; quality, 171.

Bussey, wells at and near, 713, 967.

Butler county, city and village supplies, 757; geology, 749, 752; springs, 756; topography, 751; underground water, 753; wells, 160, 753; water of, quality, 173.

Buxton, geology near, 975; water supply at, 979.

C

Cairo, well near, 702.

Calamus, wells at, 477.

Calcic carbonated alkaline waters, distribution and character of, 275.

Calcic sulphated alkaline-saline waters, distribution and character of, 274.

Calhoun county, city and village supplies, 767; geology, 749, 765; springs, 766; topography, 751; underground water, 753; wells, 160, 753; water of, quality, 173.

Calmar, wells at, 411, 413; plate showing, 280; water of, head, 143; quality, 168, 206.

Calvin, Samuel, 32, 285, 333.

Cambria, wells at, water of, quality of, 201.

Cambrian rocks, occurrence and character of, 67, 71; springs from, 116; water in, 107, 110; quality, 118. See also Jordan sandstone; St. Lawrence formation.

Cambridge, wells at, 902, 905.

Canby, well near, 931.

Canoe, wells at, 417.

Cantril, wells at and near, 719; wells at, water of, quality, 196, 274.

Carbon, springs near, 1112; wells near, 1113.

Carboniferous rocks, occurrence and character, 67, 94; water in, 126; quality, 130. See also Mississippian rocks; Pennsylvanian rocks.

Carlisle, wells at, water of, quality, 200.

Carpenter, wells at, water of, quality, 172.

Carroll, wells at and near, 1024, 1026; water of, quality, 179.

Carroll county, city and village supplies, 1024; flowing wells, 1024; geology, 1023; springs, 1024; topography, 49, 1022; underground water, 1023; wells in, 1022; water of, quality, 179.

Carson, water supply at, 1166.

Cascade, water supply at, 379.

Casings, well, corrosion of, causes, 236; defects, 108, 153; effects of mineral water on, 234; life, 108; materials, 235; necessity, 145.

Cass county, city and village supplies, 1119; geology, 1117; springs, 132; topography, 1117; underground water, 1118; wells, 1118; water of, quality, 203.

Castalia, wells at, 417.

Castana, water supply at and near, 1057-1059.

Cedar county, city and village supplies, 447; geology, 440, 613; topography, 49; wells in, 443; plates showing, 448, 458; water of, quality, 184.


Cedar Rapids, geology at, 70, 72, 75, 85, 89; wells at, 110, 234, 421, 559; plate showing, 458; water of, head, 155; quality, 150, 180, 182.

Cedar river, description, 301, 312; water of, quality, 222.

Cedar Valley limestone, distribution of, map showing, Pocket; occurrence and character, 92, 308, 334, 425, 508, 534, 559, 752; water in, 308, 336, 425, 753. See also Devonian rocks.

Center Junction, wells at and near, 523, 530.

Center Point, geology at, 533; wells at, 545.
INDEX

Centerville, geology at, 76, 77, 89, 92, 98, 675, 924, 1003; wells at, 122, 158, 934; plates showing, 448, 814; water of, head, 142, 934; quality, 201, 206, 208, 234, 272, 925, 937.

Central City, geology at, 538; wells at, 543.

Central district, counties in, 811; counties in, descriptions of, 813-922; geology of, 811; location of, map showing, 165; precipitation in, 662; well waters of, 811; quality, 186, 205, 211, 812; map showing, 165.

Centralia, wells near .......... 390

Cerro Gordo county, city and village supplies, 760; flowing wells, 761; geology, 92, 749, 759; topography, 759; underground water, 759; wells, 759; water of, head, 760; quality, 172.

Chadbourn, W. H., aid of ......... 47

Chariton, geology at, 928; well at, 453, 954.

Chariton conglomerate, correlation of ............... 99

Charles City, geology at, 74, 75, 82, 83, 85, 87, 88, 770; precipitation at, 64; temperature at, 61; wells at, 771; records of, plates showing, 280, 324; rock from, analyses of, 773; water of, head, 771; quality, 173, 206, 208; yield, 148.

Charleston, wells at .......... 688

Charlotte, wells at ............. 473

Charter Oak, wells at and near, 1038; water of, quality, 179.

Chelsea, wells at, 613; water of, quality of, 182, 275.

Chemical investigation of well waters, scope of ........ 46

Cherokee, geology at, 84, 86, 1005; wells at and near, 126, 1006, 1027, 1029; plates showing, 310, 1006; rock of, analyses of, 1023; water of, head, 1029; quality, 177, 274, 1032.

Cherokee county, city and village supplies, 1039; geology, 7027; topography, 1027; underground water, 1027; wells, 1027; water of, head, 1028; quality, 177.

Chester, flowing wells near .......... 405

Chickasaw county, city and village supplies, 341; geology, 339; springs, 341; topography, 339; underground water, 340; wells, 340; water of, quality, 169.

Chillicothe, Missouri, geology at .... 926

Church, wells at ................... 299

Churdan, wells near ............. 831

Cities, water supplies of ........ 214

See also particular cities.

Clarence, water supply at ........ 447

Clarinda, geology at, 1100; wells at, 1165, 1156; water of, quality, 294.

Clarion, geology near, 804; wells at and near, 805, 808; water of, head, 806; quality, 173.

Clarke county, city and village supplies, 841; geology, 939; springs, 130, 941; topography, 939; underground water, 939; wells, 939.

Clarkestown, spring at, 757; wells at and near .......... 754, 757

Clay county, city and village supplies, 1035; geology, 1033; topography, 1033; underground water, 1034; wells, 1034; water of, quality, 177.

Clayton, water supply at ........ 350

Clayton county, city and village supplies, 350; flowing wells, 348; geology, 71, 75, 86, 343; springs, 349; topography, 50, 342; underground water, 346; wells, 114, 115, 116, 119, 290, 346; water of, head, 347, 348; quality, 169.

Clear Lake, water supply at ...... 760

Clemons, wells at and near .......... 874

Cleona channel, description of .... 587

Clermont, springs and wells at ............. 399, 403

Climate, character of ........... 59

Clinton, geology at, 83, 85, 420; wells at, 158, 458; plate showing, 458; water of, head, 140, 155; quality, 180, 184, 206, 208.

Clinton county, city and village supplies, 458; geology, 87, 454; springs, 458; topography, 454; underground water, 455; wells, 122, 455; plate showing, 458; water of, quality, 184.

Clogging of wells, causes of, 152, 219; remedies for, 152, 183, 222.

Clutter, wells at, 613, 617; water of, quality of, 182.
Coal Measures. See Pennsylvania rocks.
Coggon, wells at and near ... 368, 543
Coggon beds, occurrence and character of ... 534
Cold, well at ... 1158
Colesburg, wells at ... 368
Colfax, mineral wells at, 858; wells at, 858; water of, 267; quality, 186, 191, 267, 274, 863.
Collins, wells at and near ... 905, 913
Colo, wells at, water of, quality ... 189
Colorado stage, distribution of, map showing, pocket; occurrence and character of, 100. See also Cretaceous rocks.
Columbia, wells at, water of, quality of ... 200
Columbus City, well at ... 703
Columbus Junction, geology near, 839; water supply of, 698.
Columnar section, plate showing ... 66
Comanche, wells at ... 473
Compton, wells at ... 368
Cooesville, wells at ... 570
Conover, wells at ... 417
Coon Rapids, water supply at ... 1025
Cooper, wells at, water of, quality of ... 189
Coralville, wells at ... 508
Corning, water supply at, 1112; water of, quality, 203.
Correctionville, wells at and near ... 1098, 1099
Correlation, methods of ... 40
Corrosion. See Casings; Boilers.
Corwith, water supply at, 783; wells at, water of, head, 782, 791, 806; quality, 172.
Corydon, geology at, 928; water supply at, 1003; wells at, 1001.
Cottage, wells near ... 847
Cotter, wells at ... 700, 703
Cottonwood, wells at and near ... 688, 692
Council Bluffs, geology at, 91, 1160, 1161, 1164; wells at, 126, 128, 1103, 1161, 1164; water of, head, 155, 156; quality, 197, 203, 1165, 1167.
Counties, selection of, as units of investigation ... 32
Country rock, waters of, discrimination of, from artesian waters ... 81, 106
Covington, wells at, water of, quality of ... 122, 183
Cranston, wells at ... 570

Crawford county, city and village supplies, 1037; geology, 1035; springs, 1037; topography, 1035; underground water, 1036; wells, 1036; water of, quality, 179.
Crawfordsville, wells at ... 746
Cresco, wells at, 406; water of, head, 406; quality, 183.
Creston, geology at, 928; water supply, 929.
Cretaceous rocks, occurrence and character, 68, 100, 827, 836; springs from, 132; water in, 107, 132, 836; quality, 132. See also Dakota sandstone; Colorado group; particular county descriptions, pp. 1005-1186.
Crevices in rocks, water supply due to ... 151
Croton, springs and wells at ... 688
Crystal, wells at ... 617
Cylinder, wells at, 1069; wells at, head, 1070.

D
Dahlgren, geology near ... 967
Dakota sandstone, distribution of, map showing, pocket; occurrence and character, 100, 929; springs from, 132, 929; water in, 107, 132, 929; quality, 119, 132, 1052, 1111. See also particular county descriptions, pp. 1005-1186; Cretaceous rocks.
Dallas, geology near ... 629
Dallas county, city and village supplies, 826; flowing wells, 826, 828; geology, 826; springs, 824; structure, 812; topography, 822; underground water, 823; wells, 813, 823; water of, quality, 190.
Danville, geology near, 629; wells at and near, 633, 640.
Davenport, geology at, 81, 91, 594, 618; precipitation at, 64; temperatures at, 61; water supply at, 593; wells at, 421, 591, 596; plate showing, 618, 812; water of, head, 140, 142, 143, 156; quality, 115, 180, 185, 208.
Davenport beds, occurrence and character ... 535, 559
Davidson, G. M., aid of, 47; softening apparatus devised by, 261.
INDEX

Davis county, city and village supplies, 623; geology, 621; topography, 621; underground water, 622; wells, 622; water of, quality, 195.

Dayton, geology at, 95, 98; wells at, 916, 922; plate showing, 914; water of, quality, 188, 208.

Decatur county, city and village supplies, 947; geology, 942; topography, 49, 942; underground water, 944; wells, 944; water of, quality, 201, 945, 948.

Decorah, springs near, 412; wells at, 411, 415; water of, quality, 168.

Decorah Ice Cave, description of, 412

Decorah shale, distribution of, map showing, pocket; occurrence and character, 83, 344, 376, 408, 1107, 1109; thickness, 85, 619; water in, 114.

Deep River, wells at and near, 578, 585; water of, quality, 183.

Delaware county, city and village supplies, 364; geology, 359; springs, 122, 363; topography, 359; underground water, 360; wells, 160, 360; water of, quality, 168.

Delhi, springs at and near, 364; wells at and near, 361, 368.

Delmar, wells at, 471, 474

Delta, section at, 663; wells at, 668.

Demarcation of formations, difficulties of, 43

Denison, wells at and near, 1037, 1039; water of, quality, 179.

Denmark, wells at and near, 671, 690

Denver, geology near, 312; wells of, 319.

Derby, spring near, 954; wells near, 965.

Des Moines, flowing wells at, 888, 899; geology at, 73, 76, 77, 80, 82, 84, 89, 90, 99, 750; precipitation at, 64; temperature, at, 61; water supply at, 889, 899; wells at, 126, 147, 158, 890; plates showing, 626, 812, 814; water of, quality, 190, 206, 208, 267, 276, 590.

Des Moines county, city and village supplies, 632; flowing wells, 629; geology, 618, 626; springs, 631; topography, 625; underground water, 627; wells, 628, 631, 632; water of, quality, 195.

Des Moines stage, distribution of, map showing, pocket; flowing wells, 128; occurrence and character, 98, 506, 576, 622, 627, 705, 723, 784; springs, 129; structure, 1108; water in, 128, 576, 707. See also Pennsylvanian rocks; particular county descriptions, 811-1186.

Des Moines river, water of, quality, 231

Devonian rocks, occurrence and character, 57, 92, 749, 1007, 1102, 1108; springs, 124, 395; structure, 618, 750; water, 123, 1110; quality, 119, 125. See also Sweetland Creek shale; Lime Creek shale; Cedar Valley limestone; Wapsipinicon limestone; particular county descriptions.

DeWitt, springs near, 458; wells at, 457, 471, 478; plate showing, 458; water of, quality, 185.

Diagonal, wells at, 885; water of, quality, 201.

Dickinson county, city and village supplies, 1041; geology, 1040; topography, 1039; underground water, 1040; wells, 1040; water of, quality, 176.

Dike, wells at, water of, quality, 189

Dip, correlation by, 43

Districts, division of state into, map showing, 165

Dixon, geology near, 590; wells at, 605.

Dodgeville, geology near, 629

Domestic water supplies. See municipal and domestic supplies.

Donahue, water supply at, 604

Donnan, wells at, 399

Doon, water supply at, 1053; wells at, water of, quality, 176.

Dow City, wells at and near, 1038

Dows, water supply at, 809; well at, head, 806.

Drainage, description of, 49, 51-59

Drainage wells, location and use of, 739, 807
Dresbach sandstone, character, 73; distribution, 72, 279, 756, 1008; structure of, 279; water in, 107, 111, 280, 421; head of, 142; quality of, 118. See also particular county descriptions.

Drift, occurrence and character of 52

Drift, waters of, discrimination of, from artesian waters, 31, 105; use of, for water supply, 213. See also particular county descriptions.

Drift areas, description of .... 52

Driftless area, description of, 50; water in, 136.

Drillers, opinions of, value of .... 46

Drill holes, diameter, 146; sinking, 217; difficulties in, 145.

Drillings, samples from, collection, 35; erroneous deductions from, 38; examination, 37; mixtures, 39.

Dubuque, geology at, 72-74, 85, 286, 374; precipitation at, 64; temperatures at, 61; wells at, 152, 158, 280, 380; records of, plate showing, 310; water of, head, 140, 142, 279, 390; quality, 140, 180, 206, 208, 231, 265, 270.

Dubuque county, city and village supplies, 379; geology, 373; springs, 378; topography, 50, 372; underground water, 280, 376; wells, 114-116, 378, 380; water of, head, 378, 390; quality, 170.

Dudley, wells near .... 727, 738

Dumont, wells at, 754, 758; water of, quality, 173.

Duncombe, wells near, 845; wells near, water of, quality, 188.

Dundee, wells at .... 368

Dunkerton, water supply at ..... 304

Dunlap, geology at, 1102, 1129, 1130; wells at and near, 1038, 1131; plate showing, 458; water of, quality, 197, 202, 206, 274.

Dunreath, wells near .... 966

Durango, wells at .... 389

Durant, geology near, 441, 445, 587; water supply at, 447.

Dyersville, wells at and near .... 370, 371, 388

E

Eagle Grove, wells at, 809; water of, head, 806; quality, 173.

Earling, water supply at .... 1179

Earville, water supply at .... 364

Early, wells at and near . . . . . 1087, 1088

East Amana, wells at .... 481

East central district, counties, 420; counties in, descriptions, 422-617; geology, 279; location of, map showing, 165; precipitation in, 64; well waters, 421; quality, 150, 206, 211; map showing, 165.

East Iowa City, water supply at . . . . . 513

Eddyville, wells at and near, 267, 727, 728, 738, 965, 976; water of, quality, 195, 267, 729.

Edgewood, wells at .... 355

Elberon, wells near .... 613

Eldora, springs near, 848; wells at, 850, 853; water of, quality, 188, 277.

Eldorado, wells at .... 399

Eldridge, water supply at, 604; wells at, water of, quality, 185.

Elgin, wells at .... 399, 403

Elkader, flowing wells at, 348; water of, quality, 169; geology at, 348; water supply at, 350.

Ellendale, wells at, water of, quality of .... 177

Ellington, water supply at .... 1151

Ellsworth, well at, 845; wells at, water of, quality, 188, 278.

Elon, springs near, 294, 299; wells at, 299.

Elrick, wells at .... 700

Elvira, wells at .... 473, 476

Elwood, geology near .... 455

Ely, geology at, 533; wells at, 845.

Emery, wells at .... 761

Emmet county, city and village supplies, 1044; geology, 1042; topography, 1042; underground water of, 174, 2043; wells in, 1044; water of, quality of, 174, 276.

Emmetsburg, geology at, 70, 80, 84, 86, 749; wells at and near, 1006, 1035, 1067, 1068, 1070; records of, plate showing, 814; water of, head, 1070; quality, 118, 174, 177, 206, 208.

Epworth, geology near, 376; wells at and near, 389, 390.

Essex, water supply at .... 1155, 1159

Estherville, water supply at, 1045; wells at, 1043.

Extra, water supply at .... 1117
INDEX

F

Fairbank, geology at, 394; wells at, water of, quality, 169.
Fairfax, geology at, 533; wells at, 545.
Fairfield, wells at 652, 654, 668
Fairground, well at 649
Fairport, wells at 570
Farley, geology near, 377; wells at and near, 389, 390; water of, quality, 170.
Farmersburg, wells at, 355; wells at, head, 347.
Farmington, flowing well at, 718; wells at, 122, 718; water of, quality, 195, 266.
Farms, water supplies, 215; wells on, pollution, 229. See also particular county descriptions.
Faron, wells near, 738; wells at, water of, quality, 195.
Fayette, springs near, 395; wells at and near, 396, 402.
Fayette county, city and village supplies in, 396; geology, 392; springs, 395; topography, 391; underground water, 393; wells, 395; water of, quality, 169.
Feed-water heaters, softening in 248
Ferguson, wells near 876, 882
filtration, occasional failure of, 226
Flagler, wells at, 267, 965, 968; water of, quality of, 197, 200, 208, 267, 270, 272.
Florence, wells at, head in 806
Flowing wells, distribution of, map showing, pocket. See also artesian waters; particular counties, places, etc.
Floyd county, city and village supplies in, 771; geology, 769; springs, 771; structure, 749; topography, 769; underground water, 770; wells, 160, 770; water of, quality of, 173.
Follets, wells at 473, 478
Fonda, wells at, 1079, 1081; water of, head, 1011, 1080; quality, 177.
Fontanelle, wells near, 331; wells near, water of, quality, 200, 267.
Ford, wells near 934
Forest City, Missouri, geology at 1102
Forest City, Iowa, wells at, 799, 800, 805; water of, head, 799, 800; quality, 171.
Forestville, well near 371
Formation. See Rock formations.
Fort Atkinson, wells at 417, 419
Fort Crook, Nebr., geology at, 1161, 1162, 1166; well at, rocks from, analyses of, 1173.
Fort Dodge, flowing wells at, 917; geology at, 45, 77, 85, 87, 89, 95, 98, 100; wells at and near, 917, 921; plates showing, 310, 814; rocks from, analyses, 920; water of, quality, 196, 198, 206, 208, 270.
Fort Madison, geology at, 92, 95, 619, 674; wells at, 167, 619,
677, 690; plate showing, 618; water of, head, 140, 153, 157; quality of, 196, 206, 208, 270, 677.
Fossils, correlation by means of 40
Foster, wells at 978
Franklin, well near 692
Franklin county, city and village supplies, 776; flowing wells, 776; geology, 94, 749, 776; springs, 776; topography, 776; underground water, 775; wells, 160, 776; water of, quality of, 173.
Frankville, wells at 417
Frederica, wells at 320
Fredericksburg, water supply at 341
Fredonia, wells at 700
Freeport, wells at 417
Fremont county, city and village supplies, 1127; geology, 1125; springs, 1127; topography, 1125; underground water, 1126; wells, 1126; water of, quality of, 203.
Froelich, wells at 355
Frosts, occurrence of 61
Fruitland, wells at 370
G

Galena, Ill., well at, record of 388
Galena dolomite, change in composition, 41, 85; character, 85; discrimination, 630, 675; distribution, 85, 619, 750, 1007, 1109; map showing, pocket; springs from, 115, 287, 292, 350, 412; structure, 619; thickness, 85, 619; water in, 114, 421, 619, 812; head, 143, 347, 411, 456; quality, 119. See also particular county descriptions.
Galt, well at, head in 355
Galva, wells at, water of, quality of 806

INDEX

1195
Garner, water supply at, 783; wells at, water of, head, 782; water of, quality, 172.
Geologic history, outline of. See Sections, geologic.
Geology, account of, 67-104; columnar section showing, 66; relation of, to quality of water, 108. See also particular counties.
Germania, wells at, water of, head, 791; wells at, water of, quality, 171.
Germanville, wells at, water of, quality, 171.
Gilbert, wells at and near, 913.
Gilman, wells at and near, 876.
Gilmont, geology near, 1078, 1079; water supply at, 1081; wells at, head in, 1080.
Glacier -s, deposits, 52; extent, 50, 52.
Glenwood, geology at, 91, 95, 98, 99, 224, 1109, 1108, 1105, 1104, 1161, 1162; wells at, 128, 158, 1137; plate showing, 1100; water of, quality of, 123, 197, 203, 206, 271, 1103, 1138.
Glenwood shale, correlation, 83; occurrence and character, 374.
Glidden, wells at and near, 1025, 1026; water of, quality, 179.
Goldfield, wells at, head in, 866.
Goodell, wells at, water of, quality of, 172.
Goose Lake, wells at, 473.
Gosport, geology near, 967.
Gowrie, wells at, 920, 922; water of, quality, 125, 138.
Grace Hill, wells near, 747.
Graettinger, water supply at, 1072.
Graham, wells near, 390.
Grand Junction, wells at, 829, 831; wells at, water of, quality, 189.
Grand Mound, springs at, 458; wells at, 472, 477, 478; water of, quality, 185.
Grand View, wells at, 700.
Granger, springs at, 539.
Granville, water supply at, 1091.
Gravel screens, development of, 224.
Greeley, wells at, 368, 371.
Greene, wells at and near, 753, 757.
Greene county, artesian basins, 828; city and village supplies, 829; geology, 827; springs, 829; topography, 827; underground water, 828; wells, 828; water of, quality, 179.
Greenfield, geology at, 928; wells at and near, 933, 931.
Green Island, wells at, 494, 508; record of, plate showing, 448; water of, head, 140; quality, 150, 183.
Green Mountain, wells near, 874, 881.
Gridley, wells at, water of, quality, 176.
Grinnell, geology at, 88, 90, 93, 95, 575; wells at, 108, 234, 235, 273, 577, 578, 584; plate showing, 420, 512; water of, quality, 123, 131, 181, 183, 206, 208, 273, 274.
Griswold, wells at, 1123, 1124; water of, quality, 205.
Gruber Ridge, geology of, 291.
Grundy Center, wells at, 832; water of, quality, 125, 189.
Grundy county, city and village supplies, 833; geology, 832; springs, 835; topography, 832; underground water, 832; wells in, 160, 186, 832; water of, quality, 189.
Guthrie Center, wells at, 837; water of, quality, 190.
Guthrie county, city and village supplies, 837; flowing wells in, 837; geology, 835; topography, 49, 835; underground water, 836; wells, 813, 836; water of, quality, 190.
Guttenberg, water supply at, 350.
Gypsum, presence of, correlation by, 42, 90.
Hackberry substage, correlation, 92; deposits of, occurrence and character, 752.
Halfa, wells at, water of, quality of, 176.
Hamburg, wells at, 1126, 1127; water of, quality, 205.
Hamilton, spring near, 967; wells near, 967.
Hamilton county, city and village supplies, 843; flowing wells, 843; geology, 842; springs, 843; topography, 842; underground water, 128, 130, 842; wells, 186, 843; water of, quality, 130, 186, 188.
Hampton, geology at, 83, 85, 87, 88, 89, 95; springs at, 776; water supply at, 778; well at, 119, 777; water of, quality, 119, 173, 208.

Hancock county, city and village supplies, 783; flowing wells, 782; geology, 780; topography, 780; underground water, 781; wells, 781; water of, head, 781; quality, 172.

Hanlonton, wells at, 803; wells at, 169, 171.

Harcourt, wells at, water of, quality of, 188.

Hardin county, city and village supplies, 848; flowing wells, 847, 852, 853; geology, 846; springs, 848; topography, 846; underground water, 130, 847; wells, 186, 847; quality, 130, 188.

Harker, well at, 668.

Harlan, geology at, 1104; water supply at, 1180.

Harpers, wells near, 669.

Harpers Ferry, springs at, 299; wells at and near, 299, 300.

Harrison county, city and village supplies, 1131; flowing wells, 1127, 1128, 1132; geology, 1129; springs, 1128; topography, 1129; underground water, 1129; wells, 1130; plate showing, 1128; quality, 202.

Hartley, water supply at, 1061; well at, water of, quality, 176, 274.

Harvey, wells at and near, 967, 973.

Haskins, wells at, 746.

Hastings, wells at, 1145; wells at, water of, quality, 203.

Havelock, wells at, head in, 1080.

Haverhill, wells near, 875, 882.

Hawarden, wells at, 1091; head in, 1080.

Hawkeye, water supply at, 397.

Haysville, geology near, 984; wells at, 668.

Hayward, J. K., and Smith, R. H., on mineral water classification, 266.

Hazel Green, wells at, 361.

Head, definition, 138; factors affecting, 139; geographic distribution of, map showing, pocket; measurement, 139; relation of, to geology, 141; plate showing, pocket; See also particular counties, places, etc.

Health, effect of mineral water on, 233.

Hendrixson, W. S., on chemical composition of well water, 159-211; on chemical investigation of well water, 46; on mineral waters, 138-278; on water supplies, 212-260; work of, 31.


Henry county, city and village supplies, 645; geology, 643; topography, 642; underground water, 127, 644; wells, 644; water of, quality, 196.

Herndon, wells at, 812, 838; rock from, analysis, 839; water of, quality, 190.

Hesper, geology near, 409; wells at and near, 417, 418.

Highlandville, wells at, 414.

Hills, wells at, 508.

Hillsboro, well near, 648.

Hocking, wells at and near, 978.

Holland, wells at, water of, quality of, 189, 278.

Holstein, geology at, 79, 84, 86, 1005; wells at, 1006, 1047; plate showing, 1006; water of, head, 142; quality, 178, 206.

Homer, well near, 845.

Homestead, geology at, 93; well at, 421, 481; plate showing, 839; water of, quality of, 183, 189, 206, 208.

Honey Creek, wells at, water of, quality of, 203.

Hopkinton, spring near, 363; wells at and near, 364, 369.

Horton, water supply at, 313.

Houghton, wells near, 691.

Howard county, city and village supplies, 406; flowing wells, 405; geology, 404; springs, 124; topography, 404; underground water, 404; wells, 180, 405; water of, quality of, 168.

Hubbard, wells at and near, 847, 851, 854; water of, quality of, 189.

Hudson, wells at, water of, quality of, 169.

Hull, geology at, 70; wells at, 1008, 1091; water of, head, 1075, 1090; quality, 176, 206, 274.

Humboldt, water supply of, 786.
INDEX

Humboldt county, city and village supplies, 786; geology, 94, 749, 784; springs, 786; topography, 784; underground water, 785; wells, 784; water of, 785; quality, 173, 174.

Hastings, well at, 1000, 1001; water of, quality, 1001.

Hutchins, well at, head in 782.

Hydraulic gradient, explanation of 141.

Ice caves, description of 412.

Ida county, city and village supplies, 1047; geology, 1046; springs, 1047; topography, 1046; underground water, 1046; wells, 1046; water of, quality, 178.

Ida Grove, wells at and near 1049.

Illinoian drift, character, 55, 103; distribution, 55, 103, 559, 627, 643, 711, 594; map showing, pocket; water, 134, 572.

Illinoian drift province, area of, map showing, pocket; topography, 55; water, 137.

Illinoian drift province, area of, map showing, pocket; topography, 55; water, 137.

Illyria, wells at, 392.

Incrustation on well screens, difficulties due to, 219; material of, analysis, 221; remedies, 222. See also Clogging.

Independence, flowing well near 338; water supply, 338.

Independence shale, correlation, 32; occurrence and character, 324, 535.

Indianola, geology at 922.

Industrial supplies, requirements of, 240. See also Boiler water.

Investigation, object of, 32; scope, 31.

Ionia, wells at, water of, quality 167.

Iowa Center, wells at 902, 905.

Iowa City, water supply at 508.

Iowa county, city and village supplies, 480; flowing wells, 480; geology, 420, 478; topography, 478; underground water, 479; wells, 479; water of, quality of, 183.

Iowa Falls, springs near, 848; wells at and near, 847, 352; record of, plate showing, 310; water of, quality, 189.

Iowa Hospital for Insane, wells of, 845; record of, plate showing, 826.

Iowan drift, character, 56; distribution, 56, 103; map showing, pocket; water of, 134. See also particular county descriptions, pp. 279-617, 749-810.

Iowan drift province, area of, map showing, pocket; topography, 58; water, 137.

Iowa river valley, topography in, 505; water of, quality, 231.

Iowa State College, well at, 904, 907; record of, plate showing, 458.

Iroth, water supply at 1092.

Iron tubing, effect of mineral water on 234.

Irving, geology at 611.

Irvinton, wells at, water of, quality 171.

Island City, well at, log of 592.

Jackson county, city and village supplies, 493; geology, 83, 87, 486; springs, 492; topography, 50, 486; underground water, 487; wells, 116, 167; water of, quality, 183.

Jasper county, city and village supplies, 863; flowing wells, 858; geology, 858; mineral waters, 858; springs, 857; topography, 854; underground water, 129, 186; 855; wells, 813, 856; water of, quality, 183, 181, 185.

Jefferson, geology at, 1007; wells at, 1008; wells at and near, 828, 829; plate showing, 458; water of, quality of, 186, 189.

Jefferson county, city and village supplies, 664; geology, 650; springs, 654; topography, 659; underground water, 127, 652; wells, 652.

Jessup, springs at and near, 337; wells at, 339; water of, quality, 125, 169.

Jewell, wells at and near, 843, 845; water of, quality, 188.

Johnson county, city and village supplies, 508; geology, 52, 510; springs, 506; topography, 504; underground water, 507; wells, 507; water of, quality, 184.

Jolley, well at, 1022.

Jones county, city and village supplies, 650; geology, 515; springs, 519; topography, 515; underground water, 516; wells in, 122, 516; water of, quality of, 183.
INDEX 1199

Jordan sandstone, character, 76; distribution, 75, 279, 750, 812, 1006; map showing, pocket; outcrops, 279; springs, 112; structure, 279; water, 107, 111, 280, 421, 812; head, 142. See also particular county descriptions.

Jumbo well, description of........ 427

K

Kansan drift, occurrence and character, 53, 102; water of, 133, 304, 312, 334, 346, 424, 441, 612. See also particular county descriptions.

Kansan drift province, area of, map showing, pocket; topography, 53; water in, 136.

Kellerton, wells at, 985; wells at, water of, quality, 201, 267.

Kelloch, wells at and near........ 884, 888

Kent, wells at, water of, quality of 291

Kenwood beds, occurrence and character of........ 535

Keokuk, geology at, 81, 95, 619, 672; precipitation at, 63, 64; temperatures at, 61; wells at and near, 674, 851, 899; plate showing, 618; water of, head, 140, 157; quality, 130, 193, 196, 205, 270, 272.

Keokuk county, city and village supplies, 665; geology, 660; springs, 665; topography, 669; underground water, 127, 192, 662; wells, 665; water of, quality, 194.

Keokuk limestone, occurrence and character of, 96, 643.

Keosauqua, wells at and near........ 717, 718, 721

Keota, wells at, 665, 747; water of, quality, 194.

Keswick, geology at.................. 661

Keystone, wells at and near, 426, 432; water of, quality, 182.

Kiddor, well at................. 389

Kiersted, W., on Muscatine water supply........ 563

Kibourne, wells at.................. 719, 720

Kimballton, water supply at......... 1117

Kinderhook stage, distribution of, map showing, pocket; flowing wells from, 126; occurrence and character, 94, 423, 506, 614, 1102, 1109; water, 126, 484. See also Mississippian; particular county descriptions, pp. 619-1100.

Kingsley, water supply at......... 1076

Kinross, wells at and near........ 668

Kirkman, water supply at.......... 1180

Kirkville, wells near............ 727, 738

Klemme, well at, head in........ 782

Knoxville, geology at, 928, 966; water supply at, 968; wells at and near, 966, 973; water of, quality, 197, 200, 267, 270, 272, 274.

Kossuth, geology near............ 629

Kossuth county, city and village supplies, 791; geology, 748, 787; topography, 787; underground water, 789; wells, 788; water of, head, 790; quality, 171, 174.

L

Lacey, wells at.................. 711

La Crew, wells at................. 688

Lake City, wells at and near, 1014, 1022; water of, quality, 178.

Lake Mills, wells at, 891; water of, head, 799; quality, 125, 171, 277.

Lake Park, wells at, 1040, 1041; water of, quality, 176, 275.

Lakes, occurrence of............... 58

Lamoille, wells near.............. 882

Lamont, geology at, 943; water supply at, 947.

La Motte, water supply at........ 494

Lane, Nebr., well at, record of........... 1171

Lanesboro, wells near, 1026; water of, quality, 179.

Langworthy, wells at.............. 523, 529

Lansing, geology at, 70, 71, 75, 285; wells at and near, 294, 300; water of, head, 140; quality, 168, 208.

La Porte, geology at................ 305

Larson, wells at.................. 725

Latimer, wells at, 779, 805; water of, quality, 173.

Latta, geology near, 629; well at, 641.

Laurel, well near................ 692, 875

Laurens, wells at, 1079, 1082; water of, head, 1080; quality, 177.

Le Claire, wells at............... 604

Lee county, city and village supplies, 676; geology, 618, 671; springs, 676; topography, 670; underground water, 127, 672; wells, 674; water of, quality, 196.

Le Grande, wells near............ 874, 882

Lehigh, wells near................. 921
INDEX

Le Mars, geology, 68, 1006; wells at, 1076; plate showing, 310; water of, head, 1075, 1090; quality, 177.
Leon, geology at, 928; wells at, 943, 948; water of, quality, 201, 942.
Lester, well near, 1053
Lett's, geology at, 84, 93, 618, 695; wells at and near, 696, 703; plate showing, 660; rock from, analyses, 698.
Lewis, springs at, 132; wells at, 1123, 1124.
Lexington, wells near, 747.
Libertyville, wells near, 657.
Lidderdale, wells near, 1026.
Lima, wells at, 399.
Lime City, geology near, 441, 445.
Lime Creek shale, distribution of, map showing, pocket; occurrence and character of, 92, 93, 752, 754, 756; water in, 753.
See also Devonian rocks.
Lime Springs, wells at, water of, quality of, 180.
Lincoln, Nebr., geology at, 80, 926, 1102, 1108, 1163.
Lineville, wells near, 1003.
Linn county, buried channels, 537; city and village supplies, 538; geology, 534; springs, 539; topography, 533; underground water, 535; wells, 122, 535; plate showing, 458; water of, quality, 132.
Linton, well at, 641.
Linwood, wells at, 378.
Lisbon, geology at, 533, 538; spring at, 539, 543; water supply at, 543; water of, quality, 183.
Liscomb, wells at, 874.
Lithology, correlation by, 41.
Littleport, wells at, 355.
Livermore, water supply at, 787; wells at, water of, head, 791; quality, 173.
Livingood Spring, location and character of, 292.
Lizard creek, wells at, head in, 1080.
Locheen, well near, 692.
Lockridge, wells at, 655.
Locust, wells near, 418.
Loess, definition, 53, 104; occurrence and character, 104; water, 135. See also particular county descriptions.
Logan, geology at, 1104, 1129, 1162; wells at, 1105, 1133; water of, quality, 202, 206, 271.
Lohrville, wells at and near, 1015, 1022; water of, quality, 178.
Long Tree, water supply at, 510.
Long Grove, wells at, 606.
Long Point, wells at, 613.
Lortimer, wells at, water of, quality of, 201.
Lost Nation, wells near, 455, 473.
Louisa county, city and village supplies, 698; geology, 694; springs, 698; topography, 693; underground water, 695; wells, 696; plate showing, 660; water of, quality, 195.
Lovilla, wells at, 977.
Lowden, geology near, 444; wells at, 447; water of, quality, 194.
Lowell, wells at, 644, 648.
Lower Magnesian limestone. See Prairie du Chien group.
Low Moor, wells at, 473.
Luana, wells at and near, 355, 358.
Lucas, spring near, 954; wells at, 955.
Lucas county, city and village supplies, 954; geology, 950; springs, 953; streams, 951; topography, 949; underground water, 952; wells, 952; water of, quality, 951, 952.
Luray, well near, 882.
Luther, wells near, 822.
Lutton, wells at, water of, quality of, 178.
Luverne, wells at and near, 788, 789; water of, head, 791, 903; quality, 171.
Luzerne, water supply at, 432.
Lynnville, wells at, water of, quality of, 191.
Lyon county, city and village supplies, 1002; geology, 1006, 1008, 1050; topography, 1050; underground water, 1051; wells, 1052; water of, quality, 176.
Lyons, geology at, 458; wells at, 462, 463, 478; water of, quality of, 185.

M

McCausland, wells at, 605.
McClelland, wells at, water of, quality of, 203.
McGee, W J, on Shakopee dolomite, 81.
McGregor, geology at and near, 50, 71, 73, 75, 77, 345; wells at, 281, 351; plate showing, 280; water of, head of, 140, 351; quality of, 118, 150, 164, 166, 167, 169, 206, 208, 209, 271.
McPaul, wells at, water of, quality of, 203.
McPoland Pond, location and character of, 115.
McVeigh, well near.................... 721
Mackey, well near.................... 821
Macksville, geology near............. 958
Madison county, city and village supplies, 959; geology, 956; springs, 150, 959; topography, 956; underground water, 957; wells, 957; water of, quality of, 200.
Madrid, wells at, 820, 822; water of, quality, 189.
Mahaska county, city and village supplies, 708; flowings wells 707; geology of, 704; springs, 708; topography, 704; underground water, 127, 192, 199, 707; wells, 705; plate showing, 626; water of, quality of, 194.
Malcolm, water supply at............. 582
Mallard, geology at, 84; wells at, 786, 1035, 1072; plate showing, 814; water of, head, 1070, 1072; quality, 120, 177.
Malone, wells at........................ 473
Malvern, water supply at............. 1145
Manchester, geology at, 73, 74, 75, 83, 85, 87, 286, 363; spring at, 363, 365; water of, analysis of, 170, 264, 277; wells at and near, 250, 360, 363, 364, 369–371; plates showing, 310, 420; water of, quality of, 170, 206, 208.
Mauy, wells at, water of, quality of................. 171
Manila, wells at and near, 1038, 1059; water of, quality, 179.
Manning, water supply at, 1025; wells at, water of, quality, 179.
Manson, wells at and near, 1016, 1021, 1022; plate showing, 310; water of, quality, 174, 175, 206, 220.
Maple Hill, wells at, water of, quality of.......................... 176
Mapleton, wells at and near, 1067, 1058; water of, quality, 179.
Maquoketa, geology at, 79, 83, 87, 489, 490; wells at, 485; plates showing, 424, 448; water of, quality, 183.
Maquoketa shale, character, 87; distribution, 86, 750, 925, 1007; map showing, pocket; springs from, 136; structure, 420, 619; water in, 116; head, 143. See also particular county descriptions.
Marathon, water supply at, 1012; wells at, water of, head, 1011; quality, 177.
Marble Rock, springs at, 771; water supply at, 774; well at, water of, quality, 173.
Marcus, water supply at, 1032; wells at, water of, quality, 177.
Marengo, flowings wells at, 480; wells at, 480, 483; water of, quality, 181, 183, 483.
Marletta, wells at.................... 874
Marion, geology at, 533; springs at, 539, 543; wells at and near, 543; water of, quality, 183.
Marion county, city and village supplies, 968; flowings wells, 966, 967; geology, 962; springs, 967; topography, 962; underground water, 197, 199, 963; wells, 965; plates showing, 420, 460; water of, quality of, 197, 200.
Marne, water supply at............. 1123
Marshall county, city and village supplies, 876; geology, 94, 971; topography, 970; underground water, 872; wells, 186, 873; water of, quality, 186, 190.
Marshalltown, geology at, 86, 89, 90, 96; wells at and near, 872, 876, 880, 882; plate showing, 458; water of, quality of, 123, 190.
Martelle, wells near..................... 519
Martinsburg, section at.............. 663
Marysville, wells near................ 967
Mason City, geology at, 70, 77, 82, 96; flowings wells at, 761; wells at, 115, 283, 761; plate showing, 280; water of, quality, 172, 206, 208, 277.
Masonville, wells at................... 368
Massena, water supply at........... 1123
Massillon, geology near.............. 444
Maud, wells at........................ 299
Maxwell, wells at and near, 901, 902, 912, 913; water of, quality, 189.
Maynard, geology at, 394; wells at, 399.
May Prairie, geology of.............. 291
Maysville, geology near............. 590
Mechanicsville, geology near. 443; water supply at, 448.
Mederville, geology near. 349.
Mediapolis, wells at. 638.
Medicinal waters. See Mineral waters.
Meinzer, O. E., county descriptions by. 339, 404, 780, 822, 862, 1033, 1039, 1050, 1059, 1078, 1114, 1125, 1164, 1178; on finishing wells in sand, 219; on protection of farm wells, 229; work of, 31.
Melbourne, wells at. 875.
Melrose, wells at. 978, 979.
Merrimac, springs near, 654; wells at, 665.
Metz, well near. 858, 868.
Michigan, Lake, water of, quality of. 264.
Middletown, geology near, 629; well near, 640.
Miles, wells at. 498.
Mill creak, springs near. 294.
Miller, W. J., county descriptions by, 611, 1035, 1054, 1083; and Norton, W. H., county descriptions by, 813, 827, 842, 939, 1013, 1045, 1093.
Millheim, spring near. 363.
Mills county, city and village supplies, 1137; geology, 1125, 1136; springs, 1137; topography, 1136; underground water, 1137; wells, 199, 1137; water of, quality, 203, 1138.
Milton, wells at, 719; water of, quality, 196.
Mindin, water supply at, 1176; wells at, water of, quality, 203.
Mineralized waters, distribution, 232; distribution of, plate showing, 204; effect of, on health, 233; on well casings, 234. See also Mineralized waters.
Mineral waters, classification, 268; definition, 261; discussion, 261-278; medicinal value, 261; mineralization of, extent, 263; types, 265-278. See also Mineralized waters.
Mississippian rocks, character and distribution, 94, 421, 611-612; flowing wells from, 126; structure, 924; water in, 126, 421; quality, 130, 421. See also Kinderhook stage; Osage stage; St. Louis limestone; Particular county descriptions, pp. 621-1186.
Mississippi river, ancient channel of, description of. 56.
Mississippi valley, description, 50, 281; underground water in, 288.
Missouri stage, character and distribution, 99, 836, 1100, 1108; distribution of, map showing, pocket; water of, 129. See also Pennsylvanian rocks; Particular county descriptions, pp. 923-1186.
Missouri river, character, 55; water of, quality, 232.
Missouri Valley, wells at, 1135; water of, quality, 202.
Mitchell county, city and village supplies, 795; flowing wells, 794; geology, 793; springs, 794; topography, 793; underground water, 794; wells, 186, 794; plate showing, 324; water of, quality, 172.
Mitchellville, flowing wells at, 888; wells at, 126, 888, 894, 900; plate showing, 812; water of, quality of, 190.
Moline, Ill., well at, record of, 603.
Mondamin, wells at, water of, quality of 202.
Monmouth, wells at, 498.
Monona, water supply at, 353; wells at and near, 281, 353, 356; water of, quality, 199, 203.
Monona county, city and village supplies, 1056; flowing wells, 1056; geology, 1005, 1054; springs, 1056; topography, 1054; underground water, 1055; wells, 1055; water of, quality, 179.
Monroe, wells at and near, 869; water of, quality, 191.
Monroe county, city and village supplies in, 979; flowing wells, 978; geology, 974; springs, 978; topography, 974; underground water, 127, 199, 975; wells, 976; water of, quality, 201.
Montezuma, springs near, 577, 583; wells at and near, 577, 582; water of, quality, 185, 208.
Montgomery, wells at, water of, quality of .......... 176
Montgomery county, city and village supplies, 1151; flowing wells, 1150; geology, 1147; springs, 132, 1151; topography, 1146; underground water, 1147; wells, 1148; water of, quality, 205, 1146.
Monticello, geology at, 75, 85, 87, 518; wells at, 154, 158, 361, 523; water of, quality, 180, 183.
Montrose, water supply at .......... 687
Montrose chert, correlation, 96; occurrence and character, 651, 672, 715-716; water, 659, 975.
Moar, wells at .......... 687
Morley, wells at and near, 519; wells at and near, water of, quality of, 183, 277.
Morning Sun, geology near, 696; wells at, 700, 701.
Morrison, well near .......... 834
Moscow, wells at .......... 570
Motor, geology at .......... 348
Moulton, well at, 326; water of, quality, 201, 274.
Mount Auburn, wells at .......... 433
Mount Ayr, well at .......... 986
Mount Clara, geology at, 95, 674; wells at, 687; record, 688; plate showing, 616.
Mount Etna, wells at .......... 1113
Mount Pleasant, geology at, 45, 81, 86, 91, 94, 95, 618, 675; wells at and near, 126, 645, 649; plate showing, 626; water of, quality, 123, 193, 195, 206, 208, 267.
Mount Sterling, wells at .......... 719
Mount Union, well at .......... 648
Mount Vernon, geology at, 534, 537; wells at and near, 543; plate showing, 458; water of, quality, 180, 277.
Mount Zion, wells at .......... 719
Moville, wells at and near ..... 1098, 1099
Mud creek, channel occupied by, 587; channel occupied by, figure showing, 588.
Mud-rock shales, position of .......... 87
Municipal and domestic supplies, mineral content, 230; pollution, 226. See also Water supplies; Mineralized water.
Municipalities, water supplies of .......... 214
See also particular places.
Munterville, wells near .............. 728
Murray, wells at .......... 941
Muscatine, geology near, 563; water supply at, 562; wells at, 566.
Muscatine county, city and village supplies, 562; geology, 92, 98, 558, 618; springs, 562; topography, 558; underground water, 559; wells, 566; water of, quality, 185, 560.
Muscatine Island, water supply at 559
Myron, springs near .......... 292
N
Napier, well at .......... 822
Nashua, water supply at .......... 341
Nashville, wells at .......... 498, 501
National, wells at .......... 355
Nebraska City, Nebr., geology at, 84, 924, 926, 927; wells at, 1104; rock from, analysis, 1107; water of, quality, 1106, 1110.
Nebraskan drift, occurrence and character, 53, 102, 871; water in, 133, 312, 346, 652, 673. See also particular county descriptions, pp. 279-748.
Nehama, well near, 1088; water of, quality, 178.
Neola, water supply at, 1177; wells at, water of, quality, 203.
Nevada, wells at, 905, 910, 913; plate showing, 458; water of, quality, 123, 189, 274.
Nevinville, wells at .......... 1113
New Albin, geology at, 51, 283, 285, 286, 287; springs near, 294; wells at and near, 296, 300; water of, quality, 163, 208.
Newburg, wells at .......... 864
Newell, water supply at .......... 1012
New Hampton, geology at, 46; well at, 341; record of, plate showing, 289; water of, quality, 163, 169, 275.
New Hartford, wells at .......... 755, 757
New Liberty, wells at .......... 605
New London, geology near, 629, 643; wells at and near, 648, 649.
Newport, wells near .......... 700
New Providence, well near .......... 853
New Richmond sandstone, character, 78; outcrops, 279; position, 76; springs from, 113; water in, 107, 112, 421. See also Prairie du Chien stage.

New Sharon, wells at and near, 708, 714, 715; water of, quality, 194.

Newton, geology at, 97; water supply at, 864; wells at and near, 158, 187, 858, 864, 869; plate showing, 812; water of, quality, 187, 191.

Niagaran dolomite, distribution of, map showing, pocket; occurrence and character of, 88, 750; springs from, 122, 379, 413; water in, 421; head, 120, 143, 347; quality, 122. See also particular county descriptions; Silurian rocks.


Norton, W. H., and Arey, M. F., county description by, 301.


Norton, W. H., and Miller, W. J., county descriptions by, 813, 827, 832, 842, 846, 914, 1013, 1022, 1045, 1093.


Norway, wells at ................. 545

Nugent, wells at .................. 668

No. 10 Junction, geology at, 925, 980; wells at, 980; water of, quality, 261.

O

Oakdale Sanitarium, wells at ...... 510

Oakland, water supply at ............. 1177

O'Brien county, city and village supplies, 1061; geology, 1059; topography, 1059; underground water, 175, 1060; wells, 1060; water of, quality, 175, 176.

Odell, wells at and near ....... 1087, 1088

Oelwein, geology at, 394; wells at and near, 397, 406; water of, quality, 165, 166.

Ogdens, wells at and near, 814, 820, 821; plate showing, 458; water of, quality, 189, 274.

Olin, water supply at ............ 525

Olivet, wells near ................. 797

Ollie, wells near, 669; water of, quality, 194.

Omaha, Nebr., geology at, 1161, 1170; precipitation at, 64; temperatures at, 61; wells at, 1161, 1170, 1173.

Onawa, geology at, 1008-1009; wells at and near, 1056, 1058; water of, quality, 179, 1055.
<table>
<thead>
<tr>
<th>Place</th>
<th>Relevant Text</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oneida, wells at</td>
<td>INDEX 1205 Oneida, wells at .................. 368</td>
<td></td>
</tr>
<tr>
<td>Oneota dolomite,</td>
<td>position, 76; springs from, 113; water in, 112, 421. See also Prairie du Chien</td>
<td>368</td>
</tr>
<tr>
<td>Orange City, wells at</td>
<td>1092; water of, quality, 176.</td>
<td></td>
</tr>
<tr>
<td>Ordovician rocks,</td>
<td>occurrence and character, 67, 76-88; springs from, 116; water in, 107, 112;</td>
<td></td>
</tr>
<tr>
<td>Osage, geology at</td>
<td>Osage stage, definition, 94; distribution of, map showing, pocket; divisions,</td>
<td>200</td>
</tr>
<tr>
<td>Osage county, city</td>
<td>626; occurrence and character, 96, 575, 645, 651; springs from, 127;</td>
<td></td>
</tr>
<tr>
<td>Osceola, geology at</td>
<td>Osceola county, city and village supplies, 1066; geology, 1064; topography,</td>
<td>928</td>
</tr>
<tr>
<td>Osceola county, city</td>
<td>1063; underground water, 1064; wells, 1065; water of, quality, 176.</td>
<td></td>
</tr>
<tr>
<td>Oskaloosa, geology at</td>
<td>Osceola, geology at, 928; water supply at, 941; wells at and near, 923, 941, 942.</td>
<td></td>
</tr>
<tr>
<td>Ossian, springs at</td>
<td>417; wells at, 411, 416, 419; plate showing, 280; water of, quality, 168.</td>
<td>535</td>
</tr>
<tr>
<td>Otis beds, occurrence</td>
<td>Ottumwa, geology at, 89, 95; water supply at, 729; wells at, 126, 730; plate</td>
<td>535</td>
</tr>
<tr>
<td>Oxford, water supply</td>
<td>729; wells at, 126, 730; plate showing, 448; water of, head, 142; quality, 183,</td>
<td>510</td>
</tr>
<tr>
<td>Oxford Junction, geology at</td>
<td>PACIFIC JUNCTION, WELLS AT........ 1146</td>
<td></td>
</tr>
<tr>
<td>Oxford Mills, geology at</td>
<td>PACIFIC JUNCTION, WELLS AT........ 1146</td>
<td></td>
</tr>
<tr>
<td>Palo Alto county,</td>
<td>occurrence and character, 96, 575, 645, 651; springs from, 127; thickness, 97; water in, 127.</td>
<td>545</td>
</tr>
<tr>
<td>Panama, water supply at</td>
<td>PANAMA, WATER SUPPLY AT........... 1180</td>
<td></td>
</tr>
<tr>
<td>Panora, water supply at</td>
<td>PANORA, WATER SUPPLY AT........... 841</td>
<td></td>
</tr>
<tr>
<td>Paralta, wells at</td>
<td>PARALTA, WELLS AT............................... 545</td>
<td></td>
</tr>
<tr>
<td>Pella, geology at</td>
<td>Pella, geology at, 80, 84, 86, 91, 94, 95, 97, 619, 925; wells at, 965, 969;</td>
<td>1061</td>
</tr>
<tr>
<td>Pennsylvanian rocks,</td>
<td>plate showing, 420, 626, 660; water of, head, 142; quality, 123, 197, 200, 208, 270, 272, 926, 989.</td>
<td></td>
</tr>
<tr>
<td>Page county, city and</td>
<td>Page county, city and village supplies, 1070; flowing wells, 1070; geology, 1067; topography, 1067; underground water, 174, 1069; wells in, 1069; plate showing, 814; water of, head of, 1070; quality of, 174, 177.</td>
<td>116</td>
</tr>
<tr>
<td>Patterson, well near</td>
<td>PATTERTON, WELL NEAR...................... 960</td>
<td></td>
</tr>
<tr>
<td>Paulina, water supply at</td>
<td>PAULINA, WATER SUPPLY AT........... 1061</td>
<td></td>
</tr>
<tr>
<td>Peosta, wells at</td>
<td>Peosta, wells at, 389</td>
<td></td>
</tr>
<tr>
<td>Perlsee, springs near</td>
<td>Peosta, wells at, 389</td>
<td></td>
</tr>
<tr>
<td>Permian rocks,</td>
<td>Permian rocks, occurrence and character of ..........................................</td>
<td>100</td>
</tr>
<tr>
<td>Perry, wells at</td>
<td>Perry, wells at, 898; water of, quality, 190.</td>
<td></td>
</tr>
</tbody>
</table>
INDEX

Persia, water supply at.............. 1135
Petersburg, wells at...................361
Peterson, wells at, 1035; water of, quality, 177.
Pincing, disappearance of forma-
tions by ................................ 42
Pioneer, well near.......................921
Pittsburg, well at.........................720
Placid, wells at...........................389
Plainfield, wells at.......................313, 321
Plainsview, geology near.................590
Platteville limestone, distribution of, map showing, pocket; occurrence and character, 63, 619, 750, 1007, 1102; structure, 619; thickness, 86, 619; water, 114, 619, 812; head, 143.
Pleasant Grove, geology near..............629
Pleasant Plain, wells at.................655
Pleasantville, wells at and near, 971, 973; water of, quality, 200.
Plenocene deposits, occurrence and character, 68, 191; water in, 132.
Plymouth county, city and village supplies, 1076; geology, 1068, 1074; springs, 1075; topography, 1074; underground water, 1074; wells, 1074; plate showing, 310; water of, quality, 177.
Pocahontas, wells at, 1079, 1082; water of, head, 1080.
Pocahontas county, city and village supplies, 1081; drainage wells, 1080; geology, 1078; topography, 1078; underground water, 174, 1079; wells, 1079; water of, head, 1011, 1080; quality, 174, 177.
Polk county, city and village supplies, 889; flowing wells, 888; gas wells, 888; geology, 885; topography, 884; underground water, 188, 888; wells, 813, 886; plate showing, 626, 812, 814; water of, quality of, 151, 186, 190.
Pollution of water supplies, sources of ..............................................226
Pomeroy, water supply at..............1018
well at, water of, quality, 179.
Porosity of aquifers, importance of 150
Portsmouth, water supply at...........1181
Postville Junction, well at.............298
Pottawattamie county, city and village supplies, 1166, 1176; geology, 1160; topography, 1169; underground water, 1163, 1176; water of, quality, 202, 1163, 1165, 1166.
Poweshiek county, city and village supplies, 577; geology, 421, 575; springs, 577; topography, 574; underground water, 181, 575; wells, 577; water of quality, 130, 181, 183.
Prairieburg, geology at, 533, 537; wells at, 545.
Prairie City, wells at, 866; water of, quality, 191, 275.
Prairie du Chien, Wis., well at, record of ...........................................353
Prairie plain, character of..............48, 59
Prairie du Chien stage, character, 77; distribution, 77, 750, 1006; map showing, pocket; springs from, 113, 293; subdivisions of, 76; water in, 112, 619, 813; head of, 142. See also Oneota dolomite; New Richmond sandstone; Shakopee dolomite; particular county descriptions.
Pre-Cambrian rocks, occurrence and character, 68; water in, 109.
Precipitation, controlling conditions, 61; geographic distribution, 62; records, 62-65; seasonal distribution, 63; variations, 65.
Prentiss, G. N., aid of ...................47
Prescott, water supply at...............1113
Pressure in wells, decrease of, 153; factors in, 148.
Preston, water supply at, 488; well at, record of, 489; water of, quality, 183.
Primghar, wells at, 1061; water of, head, 1075, 1090; quality, 176, 275.
Primrose, wells at..........................688
Pulaski, wells at and near................627
Pump cylinders, position of .............1155
Pumps, requirements of ..................225

Quality of water. See Water, chemical composition of; particular counties. rock formations, places, etc.
Quarry, wells near................. 874
Quaternary deposits, occurrence and character, 101; underground water, provinces, 136; water in, 107, 132.
Quimby, wells near, head in.....1029

R
Radcliffe, wells at and near...845, 853
Rainfall. See Precipitation.
Rake, wells at, head in............. 799
Ralston, well near.................. 831
Ramsay, geology at................. 789
Randalia, wells at................. 384, 393
Realdin, well at................... 321
Reasonor, wells at and near...867, 869
Red clastic series, occurrence and character of........... 70
Redfield, well at.................. 825
Red Oak, springs at and near, 132, 1151; wells at, 1111; water of, quality, 203.
Red Rock, wells near............. 966
Red Rock sandstone, occurrence and character, 129, 964; water in, 129.
Rembeck, wells at and near, 834; water of, quality, 189.
Relief, description of.............. 48, 50
Rembrandt, well at, head in.....1011
Remsen, water supply at..........1078
Renwick, wells at, 784; wells at, water of, head, 806; water of, quality, 173.
Rhodes, wells at, 875; water of, quality, 190.
Riceville, spring at, 797; spring at, water of, quality, 172; water supply, 797.
Richland, springs near, 665; wells at, 748; water of, quality, 194.
Ricketts, wells at, water of, quality 179
Ridgeway, wells at and near...417, 418
Ringgold county, city and village supplies, 984; geology, 982; topography, 49, 982; underground water, 983; wells, 984; water of, quality, 201.
Ringsted, geology at, 739; water supply at, 1045; well at, record, 1043; water of, head, 791.
Rippey, well at...................... 831
Rivers, water supplies from, 212; mineral content of, 290.
Riverside, wells at................ 746
Rochester, geology near............ 445
Rock formations, correlation, 40; demarcation, 43; dip, 43; relation of, to quality of water, 108; sequence, columnar section showing, 66; correlation by, 42; waters, 106; use of, for water supplies, 212. See also Aquifers.
Rock Island, Ill., wells at, 115; record, 603.
Rock Rapids, water supply at, 1053; wells at, water of, quality, 176.
Rock Valley, water supply at.....1093
Rockwall, wells at and near, 1018, 1021; rock of, analyses, 1019; water of, quality, 178, 210.
Roland, well near.................. 845
Rolfe, geology near, 1079; wells at, 1079, 1082; water of, head, 1080; quality, 177.
Rome, geology near................ 644
Roscoe, wells at and near....639, 641
Rowland, wells at, water of, quality 188
Rowley, springs at................. 337
Rubio, wells at..................... 746
Runnells, wells at, water of, quality, 191, 267.
Russell, spring near, 964; water supply at, 955.
Ruthven, water supply at, 1072; wells near, head in, 1070.
Rutledge, wells at, water of, quality of.............. 195
Ryan, geology near, 261, 362; wells at and near, 361, 367, 368.

S
Sabula, geology near, 82, 492; water supply at, 498; wells at and near, 492, 498; plate showing, 424; water of, head, 140, 157; quality, 183, 208, 277.
Sac City, springs near, 1085; water supply at, 1085; wells at and near, 1085; water of, quality, 178, 274, 1085.
Sac county, city and village supplies, 1085; flowing wells, 1084; geology, 1083; springs, 1085; topography, 49, 1083; underground water, 1083; wells, 1083; water of, quality, 178.
Sageville, wells at.................. 389
INDEX

St. Ansgar, well at, 797; plate showing, 324.
St. Anthony, wells near 874
St. Benedict, wells near, 789; head in, 791.
St. Charles, wells at and near, 957, 958, 961.
St. Lawrence formation, distribution, map showing, pocket; occurrence and character, 73, 750, 306; water in, 110.
Saint Louis limestone, distribution of, map showing, pocket; occurrence and character, 97, 575, 784; thickness, 97; water in, 127. See also particular county descriptions, pp. 618-748; Mississippian rocks; Carboniferous rocks.
St. Paul, wells at and near 691
Saint Peter sand rock, occurrence and character, 630, 674, 677
Saint Peter sandstone, character, 81, 1006; discrimination, 630, 674; distribution, 80, 279; map showing, pocket; elevation, 279, 618; plate showing, pocket; outcrops, 279; position, 927, 1102, 1103; plate showing, pocket; springs from, 114; structure, 279, 420, 618, 750, 811, 926, 1005; water in, 107, 115, 280, 421, 619, 812, 925, 1104; head, 143, 347, 410, 596; quality, 119, 631, 1104. See also particular county descriptions, pp. 284-612.
Salem, wells at 648, 649
Salina, wells at and near 656, 658
Salina formation, occurrence and character, 89, 925; water in, 123, 925.
Sanborn, geology at, 79, 84, 86, 1005, 1007; wells at, 1006, 1008, 1062; plate showing, 1006; water of, quality, 177, 306, 274.
Sagd, finishing wells in 219, 1010
Sand Springs, wells at 361, 368, 369
Sandusky, well at 689
Sattre, wells near 300
Sawyer, wells at 688
Saylorville, gas well at 888; wells at and near, 898.
Scale. See Boiler scale.
Schaller, wells at and near, 1087, 1088; water of, quality, 178.
Schaufner, well at 371
Schleswig, wells at and near 1038, 1039
Scope of work 31
Scotch Grove, wells at 518, 530
Scott, wells near 394
Scott county, city and village supplies, 652; flowing wells, 652; geology, 95, 98, 586; topography, 586; underground water, 586; wells, 589; water of, quality, 155.
Scranton, water supply at, 839; well at, water of, quality, 189.
Screens, well, incrustation on, 219, 1010; incrustation on, analysis, 221; remedies for, 222, 1010; use, 219.
Seasons, distribution of precipitation by 63
Sections, geologic, location of, figure showing, 66; plates showing, 280, 310, 324, 420, 424, 448, 485, 618, 626, 666, 812, 814, 1006, 1106.
Sewal, wells at, water of, quality 201
Sexton, wells near, water of, quality 201
Seymour, well at 1003
Shakopee dolomite, character, 77, 78, 84, 408; distribution, 77; position, 76; water in, 421. See also Prairie du Chien stage.
Shallow wells, pollution 227
Shannon, wells at, water of, quality 201, 278
Shelby county, city and village supplies, 1179; geology, 1178; topography, 1178; underground water, 1178; wells, 1179; water of, quality, 202, 1178, 1179.
Sheldahl, wells at, water of, quality 191
Sheldon, water supply at, 1063; wells at, water of, head, 1075; quality, 177.
Shell Rock, water supply at, 757; wells near, 755, 784.
Shellsburg, spring near, 425; water supply, 433.
Shenandoah, water supply at, 1155, 1159; wells at, water of, quality, 204.
Shueyville, wells at 511
SIDEY, water supply at 1066; wells at, water of, quality, 176.
Sidney, water supply at 1127, 1128
Sigourney, geology at, 94, 95, 98; section at, 662; wells at and near, 158, 662, 665; plate showing, 666; water of, quality, 194.
INDEX

Siloam Springs, description of ................................. 348
Silurian rocks, character and distribution, 67, 88, 618, 925, 1007, 1102, 1109; structure, 618; water, 120, 421, 619, 1103; head, 619; quality, 122, 812, 925. See also particular county descriptions; Niagara formation; Salina formation.


Simpson, H. E., county descriptions by, 422, 574, 722, 870, 884, 900, 962, 974, 1117; on geology of Iowa, 67-104.

Simpson, H. E., Hendrixson, W. S., and Norton, W. H., on geologic occurrence of underground waters .......................... 105-137

Sink holes, distribution ................ 115

Sioux City, geology at, 68, 1007, 1008; precipitation at, 63, 64; temperatures at, 61; wells at, 110, 1095; water of, quality, 175, 178, 206, 1096.

Sioux county, city and village supplies, 1096; geology, 1008, 1089; topography, 1089; underground water, 1089; wells, 1099; water of, head, 1099; quality, 176.

Sioux Falls granite. See Sioux quartzite.

Sioux quartzite, distribution of, map showing, pocket; occurrence and character, 67, 68, 1006, 1008, 1051, 1052; structure, 1008; water, 109.

Sioux Rapids, water supply at ................................ 1012

Siletz, well near .............................................. 913

Slichter, C. S., on well-flow measurement .................. 144

Sloan, wells at .............................................. 1095, 1099

Smith, G. L., on Nebraska City well .......................... 1104, 1108

Smith, R. H., and Hayward, J. K., on mineral water classification ..................................................... 263

Smithland, wells near ..................................... 1099

Snow. See Precipitation.

Sodic-calcic carbonated alkaline-saline waters, distribution and character .................................................... 277

Sodic-calcic sulphated alkaline-saline waters, distribution and character ....................................................... 273

Sodic muriated alkaline-saline waters, distribution and character ................................................................. 269

Sodic muriated-sulphated alkaline-saline waters, distribution and character ..................................................... 271

Softening. See Water softening.

Soils, character of ........................................ 51

Soldier, wells at, water of, quality ................................ 179

Solon, geology at, 506, 507; wells at, 507, 511; water of, quality, 184.

Somers, wells at and near ........................................ 1020, 1021

South Amana, wells at, water of, quality ........................................ 183

South Augusta, well at .................................... 691

South-central district, counties, 923; counties in, descriptions, 928-1004; geology, 929-928; location of, map showing, 165; precipitation in, 62; wells, 210; well water, 925; quality, 197, 205, 211; map showing, 165.

Southeast district, counties, 618; counties in, descriptions, 621-748; geology, 618; location of, map showing, 165; precipitation in, 62; well water of, quality, 192-196, 205, 211; map showing, 165.

South English, geology at, 661, 664; section at, 665; wells at, 665.

Southern Iowa Junction, wells at, water of, quality of ........................................ 194

South Ottumwa, wells at, water of, quality ........................................ 196

South Parkersburg, well at .................................... 756

Southwest district, counties, 1100; counties in, descriptions, 1100-1186; geology, 1100; figure showing, 1101; location of, map showing, 165; precipitation, 62; well water, 1103; quality, 197, 202, 205, 211; map showing, 165.

Spechts Ferry, geology near, 374; wells at, 388.

Spencer, geology at, 1035; water supply at, 1035; wells at, water of, quality, 177.

Sperry, geology near, 629; well near, 841.

Spirit Lake, wells at, 1041; water of, quality, 176, 275, 1042.

Spring Creek, waters of ........................................ 122

Sodic-calcic sulphated alkaline-saline waters, distribution and character .......................... 273

Sodic muriated alkaline-saline waters, distribution and character ......................................................... 269

Sodic muriated-sulphated alkaline-saline waters, distribution and character .......................... 271

Softening. See Water softening.

Soils, character of ........................................ 51

Soldier, wells at, water of, quality ................................ 179

Solon, geology at, 506, 507; wells at, 507, 511; water of, quality, 184.

Somers, wells at and near ........................................ 1020, 1021

South Amana, wells at, water of, quality ........................................ 183

South Augusta, well at .................................... 691

South-central district, counties, 923; counties in, descriptions, 928-1004; geology, 929-928; location of, map showing, 165; precipitation in, 62; wells, 210; well water, 925; quality, 197, 205, 211; map showing, 165.

Southeast district, counties, 618; counties in, descriptions, 621-748; geology, 618; location of, map showing, 165; precipitation in, 62; well water of, quality, 192-196, 205, 211; map showing, 165.

South English, geology at, 661, 664; section at, 665; wells at, 665.

Southern Iowa Junction, wells at, water of, quality of ........................................ 194

South Ottumwa, wells at, water of, quality ........................................ 196

South Parkersburg, well at .................................... 756

Southwest district, counties, 1100; counties in, descriptions, 1100-1186; geology, 1100; figure showing, 1101; location of, map showing, 165; precipitation, 62; well water, 1103; quality, 197, 202, 205, 211; map showing, 165.

Spechts Ferry, geology near, 374; wells at, 388.

Spencer, geology at, 1035; water supply at, 1035; wells at, water of, quality, 177.

Sperry, geology near, 629; well near, 841.

Spirit Lake, wells at, 1041; water of, quality, 176, 275, 1042.

Spring Creek, waters of ........................................ 122
Springdale, geology near, 445; wells at, 448.
Spring Hollow, springs at ........ 539
Springs, possible pollution in water of, 226; See Cambrian rocks; Ordovician rocks; particular counties, formations, localities, etc.
Springville, geology at, 534; water supply at, 545.
Stabler, Herman, corrosive formulas proposed by, 246; softening formulas proposed by, 252.
Stanhope, wells at, water of, quality 184, 277
Stanton, geology at, 420, 441, 443; wells at, 446; plate showing, 458; water of, quality, 184, 277.
Stanwood Channel, description, 441; figure showing, 442; wells in, 446.
Stark, wells at, water of, quality 190.
State Center, wells at and near, 875, 879; water of, quality, 189.
State Quarry limestone, correlation, 92; distribution of, map showing, pocket. See also Devonian rocks.
Steamboat Rock, well at......... 864
Steam, water for. See Boiler water.
Steel tubing, effect of mineral water on ........ 235
Stennett, well near............. 1153
Stockport, wells at, 710; wells at, water of, quality, 196.
Stockton, wells at.............. 570
Stock wells, development of........ 215
Stone, wells at................ 526
Storm Lake, water supply at........ 1012
Story City, water supply at........ 912
Story county, city and village supplies, 906; flowing wells, 905; geology, 901; topography, 900; underground water, 128, 902; wells, 902; plate showing, 458; water of, quality, 189.
Stratford, wells at, water of, quality ........ 188
Strawberry Point, water supply, 346, 354.

Stuart, wells at, 836, 841; water of, quality, 190.
Summitville, geology near, 674; wells at and near, 688, 689.
Summer, geology at, 74, 75, 85, 87; wells at and near, 280, 321, 399; water of, head, 143.
Sunbury, geology near, 445; springs and wells at, 448.
Sutherland, well at ............. 1060, 1063
Swan, wells near................ 966
Swan City, geology at, 789; water supply at, 793; wells at, head in, 791, 793.
Swedesburg, wells at............ 648, 649
Sweetland, wells at.............. 570
Sweetland Creek shale, correlation, 92; distribution of, map showing, pocket; occurrence and character, 559. See also Devonian rocks.
Swisher, wells at................. 511
T
Tabor, water supply at............ 1127, 1128
Tallyrand, wells at................ 668
Talmage, geology at, 990; wells at, water of, quality, 301.
Tama, wells at and near, 122, 207, 618, 617; water of, 267; quality, 181, 182, 207, 208, 267.
Tama county, city and village supplies, 613; flowing wells, 613; geology, 94, 420, 611; springs, 613; topography, 611; underground water, 131, 613; wells, 612; water of, 615; quality, 131, 182.
Taylor county, city and village supplies, 1182; geology, 1181; topography, 1181; underground water, 1182; wells, 1182; plate showing, 1190; water of, quality, 204.
Taylorsville, wells near........... 394
Teeds Grove, wells at............ 473, 476
Temperature, records, 60; relation of, to ground water, 61.
Tertiary deposits, occurrence and character of ................... 101
Texture of aquifers, importance of 150
Thayer, geology at................ 990
INDEX

A

Acheson, A. O., county description by ...................... 504
Thompson, water supply at, 801; wells at, head in, 799, 501.
Thornburg, wells at ...................... 668
Thorp, wells at ...................... 368
Thurman, water supply at ...................... 1128
Ticonic, well near ...................... 1058
Tiffin, wells at ...................... 511
Till, definition of ...................... 53
Tilton, J. L., county description by ...................... 991
Tipton, geology at, 70, 72, 73, 74, 85, 87, 89, 441, 444, 619; wells at, 448; plate showing, 448; water of, quality, 180, 184, 206, 208, 277.
Titonka, wells near ...................... 789
Todd, J. E., method of well-flow measurement by ...................... 144
Toledo, geology at, 611; wells at and near, 615, 617; water of, quality of, 182, 275.
Toolsborough, geology at ...................... 695
Topography, description of ...................... 48-59
See also particular counties.
Toronto, geology near, 457; wells at, 473.
Torpedoing, use of ...................... 154
Tower, wells at ...................... 977
Towns, water supplies of ...................... 214
See also particular towns.
Town wells, pollution of ...................... 227
Tracy, wells near ...................... 767, 713, 967, 973
Traver, wells at, 616; water of, quality, 182.
Treton formation, change in name of ...................... 82
See also Platteville limestone; Decorah shale.
Tripoli, water supply at, 323; wells near, 315.
Turkey river, flowing wells near, 281, 348; geology along, 86; springs along, 122, 124.

U

Underground conditions, knowledge of, importance of ...................... 32
Underground water. See Water, underground; particular counties.
Union county, city and village supplies, 989; geology, 986; springs, 199, 989; topography, 49, 986; underground water, 987; wells, 989; water of, quality, 201.
United States Geological Survey, cooperation of ...................... 33

V

Upper Iowa river, springs in, 294; underground water of, 288.
Urban, wells at and near ...................... 433, 438
Ute, wells at and near ...................... 1057, 1058
Utica, wells at ...................... 721

W

Vail, wells at and near ...................... 1038, 1039
Valley Junction, wells at ...................... 898, 900
Van Buren county, city and village supplies, 717; flowing well, 718; geology, 715; topography, 715; underground water, 127, 717; wells, 717; water of, quality, 195.
Van Cleve, well near ...................... 875
Van Horne, wells at, 434; water of, quality, 182.
Veo, wells at ...................... 655
Verdi, geology at ...................... 742
Victor, water supply at ...................... 485
Village creek, springs near, 294; wells near, 289.
Village Creek, wells at, water of, quality ...................... 168, 208
Villages, water supplies ...................... 214
See also particular villages, counties, etc.
Villisca, water supply at, 1152; wells at, water of, quality, 203, 1152.
Vincent, well near ...................... 921
Vining, wells at, 613, 617; wells at, water of, quality, 182, 275.
Vinton, wells at and near, 154, 425, 434; plates showing, 324, 420, 424; water of, 421; head, 143; quality, 180, 182, 208.
Viola, geology at, 554; wells at, 545.
Volga, wells at and near ...................... 355, 366
Volga river, flowing wells near, 283, 349

Wadena, springs at, 396; well at, 393.
Walch, water supply at, 604; wells at, water of, quality, 185.
Walker, geology at, 533; wells at, 545.
Wall Lake, wells at and near, 1087, 1088; water of, quality, 178.
Walnut, water supply at ...................... 177
Wapello, wells at, 695, 699; water of, quality, 195, 700.
INDEX

Wapello county, city and village supplies, 728; flowing wells, 728; geology, 722; topography, 722; underground water, 127, 733; wells, 724; water of, quality, 195.

Wapsipinicon limestone, correlation, 92; distribution of, map showing, pocket; occurrence and character, 303, 333, 423, 508, 534, 554; water from, 305, 335. See also Devonian rocks.

Wapsipinicon valley, description, 312, 333; wells in, 331.

Warren, wells at ................. 688

Warren county, flowing wells in, 994; geology, 991; topography, 991; underground water, 992; wells, 993; water of, quality, 200, 993.

Warsaw, Ill., well at, record ..... 686

Warsaw limestone, correlation, 97, 671; correlation of, plate showing, 66.

Washington, geology at, 82, 84, 93, 675; wells at and near, 748; plate showing, 448, 660; water of, quality, 193, 194, 278.

Washington county, city and village supplies, 742; geology, 739; topography, 739; underground water, 137, 740; wells, 740; plates showing, 448, 660; water of, quality, 194.

Washington Mills, spring at ...... 379

Water, chemical composition, 159-211; chemical composition, relation of, to corrosion, 234, 255; relation of, to health, 233. See also Analyses; Wells; particular districts, places, etc.; corrosion by, 236, 255. See also Mineral waters.

Water, underground, climatic conditions conducive to supply of, 59, 66; geologic classification, 105; geologic occurrence, 105-137; head of, map showing, pocket; pollution of, 228; quality of, relation of, to geology, 205; plate showing, 204; to geology, 108; water supplies from, 212; mineral content, 230; effect of, 233. See also Well waters; Artesian waters; particular counties.

Water, underground, hard and soft, distribution, 208; plate showing, 204.

Waterloo, flowing wells near, 304; geology at, 45, 85, 87, 88, 305, 306, 309; springs near, 304; water supply, 308; wells at and near, 110, 304, 309; plates showing, 310, 324; water of, head, 142; quality, 169, 206, 206.

Waterloo Ridge, geology of ........ 290

Water softening, application of, 247, 254; cost, 254; limits, 253; methods, 248.

Water supplies, adequacy, 215; recovery, 215; search for, 195; selection, 216. See also Municipal and domestic supplies; Industrial supplies.

Water table, depth to ............ 105

Waterworks, distribution of, plate showing, pocket; number and character, 214. See also particular counties, water supply at.

Waucoma, wells at ............... 399

Waukon, geology at, 252, 291, wells at and near, 291, 298, 300; water of, quality, 183, 206.

Waukon Junction, springs near ... 294

Waupton, wells at ................. 389

Waverly, geology at, 73, 75, 83, 85, 88, 93, 312; water supply at, 313, 324; wells at, 280, 324; plate showing, 324.

Waverly Junction, wells at ....... 326

Wayne county, city and village supplies, 1003; flowing wells, 1003; geology, 999; topography, 999; underground water, 1000; wells, 1000; water of, head, 1003; quality, 201, 1001, 1003, 1004.

Webster, geology at, 664; wells at, 668.

Webster City, wells at and near, 786, 844; plate showing, 310; water of, quality, 183, 188, 208, 844.

Webster county, city and village supplies, 916; flowing wells, 916, 917, 918, 920; geology, 914; springs, 918; topography, 914; underground water, 213, 186, 915; wells, 915; plate showing, 310, 814; water of, quality, 186, 188.

Weems, J. B., analyses by ........ 47

Wellman, wells at ................ 977

Wells, wells at ................... 748; water of, quality, 194.
INDEX

Wells, age of, deterioration due to, 140; clogging, 152, 219; remedies for, 152, 154, 222; connection of, by underground pipes, 946, 1004, 1116, 1127; depth of, in aquifer, importance, 149, 224; depth to water in, forecasts, 44; diameters, 222; distribution of, map showing pocket; drilling, 144, 217; finishing of, in sand, 219, 1010; geologic investigation of, data for, 35; drillings from, collection, 35; study, 37; means, 34; geologic source of water in, doubtfulness of, 108; pollution, 227; pressure in, 148; rocks in, correlation, 40; sections of, plates showing, 280, 310, 324, 420, 424, 448, 458, 618, 626, 660, 812, 814, 1006, 1100; location of, figure showing, 69; torpedoing, 154, 741; water-bearing beds in. See Aquifers; water supplies from, 212; mineral content, 230; yield, 144. See also Yields of wells. See also Artesian water; particular districts, places, counties, etc.

Wells, drainage, location and use of, map showing, 799, 807, 1080
Wells, flowing, distribution of, map showing, pocket. See also Artesian waters; particular counties, places, etc.
Well samples. See Drillings.
Well water, chemical investigation of, scope of. 46
Welton, wells at, 473, 477
Wesley, wells at and near, 788, 789; water of, head, 752, 791.
West Bend, wells at, 1088, 1070, 1073; water of, head, 791, 1077, quality, 177.
West Branch, water supply at, 450
West Burlington, well at, 641
West-central district, precipitation in, 62. See also Southwest district.
West Chester, wells at, 746
Westfield, well at, record, 305
Westgate, geology at, 394; wells at and near, 398, 399.
West Keokuk, well at, 689
West Liberty, wells at and near, 567, 571; plate showing, 812; water of, head, 167; quality, 181, 185, 209.
West Point, springs at, 676; wells at and near, 688, 691.
West Union, wells at, 398; water of, quality, 169, 277.
What Cheer, wells at, 668; wells at, water of, quality, 194.
Westland, wells at, 147, 477
Wheatland Ridge, well on, 290, 300
Wheeler, W. D., aid of, 47
White sandrock, occurrence and character of, 706, 725, 964, 976
Whittemore, wells at and near, 788, 790; water of, head, 793.
Wickhorst, M. H., aid of, 47
Williams, I. A., on Kinderhook stage, 95; on Coal-Measures springs, 857
Williamsburg, wells at, 485; water of, quality, 181, 183, 278.
Wilton, geology at, 560; wells at, 569; plate showing, 812; water of, 421; head, 157; quality, 180, 185.
Winchell, N. H., on St. Lawrence formation, 75
Winfield, wells at, 648, 649; wells at, water of, quality, 195.
Winnebago county, city and village supplies, 800; drainage wells, 799; geology, 797; topography, 797; underground water, 797; wells, 798; water of, head, 799; quality of, 171.
Winnebico county, city and village supplies, 413; geology, 71, 75, 77, 80, 83, 86, 408; springs, 124, 412; topography, 50, 407; underground water, 410; wells, 114, 115, 123, 411; water of, quality, 168.
Winteret, geology near, 957; wells at and near, 958, 959, 961; water of, quality, 200.
Winthrop, springs at, 337; water supply at, 339.
Wisconsin drift, character, 57, 103; distribution, 67; map showing pocket; water in, 125. See also particular county descriptions, pp. 749-922. 1005-1099.
Wisconsin drift province, area of, map showing, pocket; topography of, 57, 884; water of, 137.
Woden, wells at, water of, quality of, 171
Woodbine, wells at, 1103, 1129, 1136
Woodburn, wells at, water of, quality of, 201
Woodbury county, city and village supplies, 1095; geology, 1008, 1094; springs, 1095; topography, 1093; underground water, 1094; wells, 1094; water of, quality of, 178

Woolson, wells at ................ 655

Worth county, city and village supplies, 803; geology, 802; topography, 802; underground water, 802; wells, 160, 802; water of, quality of, 171.

Worthington, wells at and near, 389, 376, 375, 383, 390; wells at and near, water of, quality of, 170.

Wright county, city and village supplies, 808; drainage wells, 807; flowing wells, 806; geology, 749, 804; topography, 804; underground water, 804; wells, 804; water of, head, 806; quality, 173.

Wyman, wells at .................. 200

Wyoming, water supply at ........ 526

Y

Yarmouth, geology near, 629; wells at and near, 641.

Yarmouth stage, deposits of, 163; deposits of, occurrence and character of, 671, 694; water in, 673. See also Buchanan gravel.

Yellow river, spring head of, 293; wells near, 289.

Yield of wells, decrease in, remedies for, 153; decrease in, statistics of, 155-158; factors affecting, 144; measurement of, 144.

Z

Zearing, wells at, water of, quality of ....................... 189