

CHOHOGY	
The University of Iowa Libraries	
557.77 I6.1 Ser.2 v.10 1899 cop.3	

IOWA

GEOLOGICAL SURVEY

VOLUME X

ANNUAL REPORT, 1899

WITH

ACCOMPANYING PAPERS

SAMUEL CALVIN, A. M., PH. D., STATE GEOLOGIST H. F. BAIN, ASSISTANT STATE GEOLOGIST



DES MOINES: PUBLISHED FOR THE IOWA GEOLOGICAL SURVEY 1900

DES MOINES: F. R. CONAWAY, STATE PRINTER 1900

 $\frac{1}{2} \sum_{i=1}^{n} \frac{1}{2} \sum_{i=1}^{n} \frac{1}$

1.

GEOLOGICAL CORPS.

Gerlogy 557.77 HG.1 Su. 20 - 7.10 1899 Cop. 3

SAMUEL CALVIN	STATE	GEOLOGIST
H. F. BAIN ASSISTANT	STATE	GEOLOGIST

J. B. WEEMS	CHEMIST
S. W. BEYER	SPECIAL ASSISTANT
W. H. NORTON	SPECIAL ASSISTANT
J.A. UDDEN	SPECIAL ASSISTANT
T. H. MACBRIDE	SPECIAL ASSISTANT
F. A. WILDER	SPECIAL ASSISTANT
BENJ. L. MILLER	SPECIAL ASSISTANT
THOS. J. SAVAGE	SPECIAL ASSISTANT
IRA A. WILLIAMS	SPECIAL ASSISTANT
NELLIE E. NEWMAN	SECRETARY

The University of lows LIBRARIES

GEOLOGICAL BOARD.

HIS EXCELLENCY, L. M. SHAW, - GOVERNOR OF IOWA HON. F. F. MERRIAM, - - AUDITOR OF STATE DR. GEO. E. MACLEAN, PRES. STATE UNIVERSITY OF IOWA DR. WM. M. BEARDSHEAR, - PRES. IOWA STATE COLLEGE PROF. W. H. NORTON, PRES. IOWA ACADEMY OF SCIENCES

CONTENTS.

P	AGE.
Members of Geological Board	3
GEOLOGICAL CORPS	4
TABLE OF CONTENTS	5
LIST OF ILLUSTRATIONS	6
Administrative Reports	9
STATISTICS OF MINERAL PRODUCTION	41
FOSSIL FAUNA OF THE KINDERHOOK BEDS OF BURLINGTON	61
GEOLOGY OF LYON AND SIOUX COUNTIES	81
GEOLOGY OF OSCEOLA AND DICKIKNSON COUNTIES	185
GEOLOGY OF HARDIN COUNTY	241
GEOLOGY OF WORTH COUNTY	315
GEOLOGY OF DUBUQUE COUNTY	379
INDEX	653

LIST OF ILLUSTRATIONS.

PLATES.

i. Map Showing Progress of Detailed Mapping.

ii. A Geological Map of Iowa.

iii. A Portion of the Topographic Map of the Canton Quadrangle.

iv. Sketch Showing Relation Between Galena and Trenton.

v. View Three-fourths of a Mile Below Specht Ferry.

vi. Copy of Illustration by D. D. Owen, Showing Process of Mining at Dubuque.

vii. Dubuque Mine Map, by H. F. Bain.

viii. Reproduction of Whitney's Dubuque Mine Map.

ix. Map of Langworthy and Kelley Crevices in Dr. Knapp's Mine.

x. Sketch Map Showing Crevices in a Portion of the Pike's Peak Area.

xi. Water's Lead Furnace at Dubuque.

FIGURES.

1. Glacial Grove on Quartzite in Lyon County.

2. Jasper Pool, Quartzite Exposure in Lyon County.

3. Cross-bedding in Quartzite of Lyon County.

4. Diagram Showing Relation of Water Pressure to Distance from Source.

5. Benton Shales Exposed Three M4les South of Hawarden.

6. Section on Big Sioux South of Hawarden.

7. Section Showing Sharp Line Between Drift and Loess.

8. Typical Sections, Blue Drift and Loess.

9. Wind-polished Bowlder Resting on Drift and Projecting into Loess.

10. Exposure East of Sioux Falls.

11. Morainic Knob near Little Rock, Lyon County.

12. Sandy Loess Overlying Typical Loess in Lyon County.

13. Railroad Cutting West of Granite.

14. Sketch of the Valley of the Big Sioux at Fairfield.

15. Dam on the Big Sioux at Hawarden.

16. Knobby Drift in Northern Iowa, after Owen.

17. Ocheyedan Mound Seen from the Southwest.

18. Milford Terrace Seen from the East Side of the Little Sioux.

19. A Glimpse of East Okoboji.

20. Natural Rip-rapping on East Okoboji.

21. The Sibley Gravel Pit.

22. Burr Oak in the Lake Region.

23. Iowa River Valley Between Xenia and Eldora.

24. Elk Run near Iowa Falls.

25. Wild Cat Glen near Iowa Falls.

26. Gorge of Iowa River at Iowa Falls.

27. Iowa Falls Section Showing Arching of Kinderhook.

28. Section at Ivanhoe Quarry Showing Local Unconformity.

29. Eldora Sandstone Northeast of Eldora.

FIGURES.

- 30. Eldora Sandstone Showing Effects of Wind and Water.
- 31. Eldora Sandstone Showing Wind Erosion.
- 32. Sketch Showing pre-Wisconsin Drainage in Hardin County.
- 33. Sketch Showing Relation Between Present Drainage Lines and Wisconsin Ice in Hardin County.
- 34. Honestone Quarries West of Iowa Falls.
- 35. Section of Kinderhook Beds Exposed at Bigg's Quarry, Hardin County.
- 36. Eldora Sandstone near Xenia, Hardin County.
- 37. Morainal Knobs in Worth County.
- 88. Profile Across Valley of Lime Creek, Worth County.
- 39. Profile Across Shell Rock Creek, Worth County.
- 40. Rock Exposure in Northern Lincoln Township, Worth County.
- 41. A Field of Iowan Bowlders in Lincoln Township, Worth County.
- 42. Section of Morainic Hill, Fertile Township, Worth County.
- 43. Faulting in Glacial Clay, Worth County.
- 44. Diagram Showing Displacemant in Glacial Clays.
- 45. Topography of Driftless Area Underlain by Maquoketa Shales.
- 46. Towers of Galena Limestone West of Rockdale.
- 47. Galena Limestone at Level of Cap Rock.
- 48. Upper Thin Portion of Galena Limestone Overlying Maquoketa Shales.
- 49. Railroad Cutting in Maquoketa Shales West of Graf.
- 50. View near Graf Showing Effect of Maquoketa Shales on Topography.
- 51. Train of Blocks of Niagara Limestone Creeping Down Slope.
- 52. East Farley Quarry Showing Lower Quarry Beds.
- 53. View near Balltown Showing Flagstone Beds.
- 54. Reticulated Galena, Three-fifths Natural Size, from Collection of Dr. Otto Küntze.
- 55. Blende Altering to Dry Bone. The Reticulated Dry Bone Shows Surrounding the Unaltered Blende.
- Section Through Kemling's Spar Cave Showing Floor Suspended in Top of Crevice, Stalactites, and Miniature Lake.
- 57. Group of Stalactites from Kemling's Cave, South of Dubuque.
- 58. Specimen Showing Band of Pearly Argentine in Transparent Calcite from Floor of Kemling's Cave, South of Dubuque.
- 59. Satin Spar Showing Twisted Stem-like Forms, Linden's cave, South of Dubuque.
- 60. Vertical Sheet of Galena in McPoland & Basler Mine.
- 61. Sketch of a Quartering Crevice in Leven's Mine Drawn to Scale.
- 62. Sketch Showing Relation of Flats and Pitches after Chamberlin.
- 63. Weathered Surface of Galena Limestone near Rockdale.
- 64. Diagram Illustrating Apparent Horizontal Faulting.
- 65. Diagram Illustrating Relief of Stress Along a Nearly Parallel Pre-existing Crevice.
- 66 Shearing in Galena Limestone near Specht Ferry.
- 67. An Opening Showing Crevice Cutting Cap-rock Above and an Accumula tion of Dolomitic Sands Below.
- 68. Sketch Showing Location of Durango Zinc Mine in Hill Above the Little Maquoketa, the Crevices Represented.
- 69. Open Cut at Durango Zinc Mine.

LIST OF ILLUSTRATIONS.

FIGURES.

70. Cleaning Ore from the Durango Zinc Mine.

71. The Owens Lead. Redrawn from Dubuque Herald, June 20, 1860.

- 72. Section of Opening at Stewart & Bartlett's Mine (Whitney, fig. 48).
- 73. Section at West End of Stewart & Bartlett's Lead (Whitney, fig. 49).

74. Sketch Map Showing Crevices which Form the Stewart Cave.

75. Leven's Cave as Developed on Mineral Lot 272.

76. Section of Leven's Cave (Whitney, fig. 50).

- 77. Guilford's Prospect on the Dubuque Cave Crevice.
- 78. Dry Bone Mine on Mettle Land.
- 79. Sketch of Karrick Where the Main Body of the Lead Was Found.
- 80. Section at Karrick and Jones Lode (Whitney, fig. 51).
- 81. Section Showing Key Rock in the Karrick (Whitney, fig. 52).
- 82. McGowan Crevice Showing Cap-rock Opening.

83. Halpin Mine on Rake Pocket Crevice.

84. Fourteenth Street Mine.

- 85. Ground Plan of Avenue Top Mine.
- 86. Vertical East-west Section of Avenue Top-workings on McNulty Crevice.
- 87. Vertical Cross-sections of the Bush Mine, 1899.

88. Cross-section of Black Crevice at Alpine Shaft, 1899.

- 89. Blende and Calcite in Kelley Range.
- 90. Bradstreet Mine in Langworthy Crevice.
- 91. Ground Plan of Kane Bros. Mine.
- 92. Occurrence of Galena in Kane Bros. Mine.
- 93. McPoland & Basler Mine.
- 94. Cccurrence of Galena in McPoland & Basler Mine.
- 95. Concentrating Mill for Lead and Zinc, Dubuque.
- 96. Scotch Hearth Furnace as Used at Dubuque.
- 97. Lead Furnace Showing Fume-saving Arrangement.
- 98. Cliff of Galena Limestone at Eagle Point Lime Works.
- 99. Residual Cherts on Catfish Creek.
- 100. Use of Galena Dolomite in Mass of Construction.
- 101. Houston Quarry near Graf.
- 102. Galena Limestone, Dodson's Quarry.

MAPS.

Map Showing Surface Features of Lyon County. Map Showing Surface Features of Sioux County. Map Showing Surface Features of Osceola County. Map Showing Surface Features of Dickinson County. Superficial Map of Hardin County. Geological Map of Hardin County. Superficial Map of Worth County. Geological Map of Worth County. Superficial Map of Dubuque County. Geological Map of Dubuque County.