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The Stratigraphy of the Oread Formation in Kansas

by

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Introduction

The Oread formation is a prominent scarp-forming limestone which outcrops in a continuous band from southwestern Iowa to northeastern Oklahoma. Throughout its outcrop area it is an easily identified formation and is useful in surface mapping. The Plattsmouth limestone member (Upper Oread) has been quarried rather extensively for road material, building stone, concrete aggragate and railroad ballast. In Douglas county the Toronto limestone (lower Oread) is locally quarried.

This report includes the results of a study of the Oread formation from Chautauqua county Kansas, to Andrew county Missouri, which was undertaken as a field problem by the 1941 Stratigraphy Class of the University of Kansas. The purpose of the investigation was primarily to give the members of the class an opportunity to study a typical Pennsylvanian formation in the field and learn the methods and principles used in doing modern stratigraphic work. At the same time it was hoped that data would be accumulated which would be useful to the State Geological Survey.

The work was carried on under the direction of Dr. R. C. Moore, State Geologist and Professor of Geology at the University of Kansas. Members of the class were Oren C. Baptist, John Naff, and Maurice Wallace. Although individual reports were prepared each member of the class is responsible to some degree for part of the data which is used in this report. In addition to the advice and assistance given by Dr. Moore and the members of the class acknowledgement is made of the helpful suggestions and aid in collection and identification of fossils given by members of

the Department and Geological Survey staffs. Russel Jeffords and Phil Kaiser collected fossils and aided in measuring several of the sections. Dr. Moore, Ralph King, Russel Jeffords, Fred Swain, Charles Williams, Allen Graffham and Ruth Mary Dudley aided in the identification of fossils.

Previous Work

The Oread limestone formation was named by Haworth in 1894 from exposures on the hill on which the University of Kansas is situated. Originally this name was applied only to the beds now called the Toronto member but in 1895 he revised the definition so as to include the beds now called Plattsmouth. Bennett in 1896 included the uppermost member which Condra has named the Kereford.

The fauna of the Oread was listed by Beede in 1899 and a number of species were described. Delo (1928) described the fauna of the Oread in an unpublished thesis.

Recent stratigraphic work on the Oread formation has been done by Moore and Newell of the Kansas Geological Survey and Condra of the Nebraska Geological Survey. The classification of the Oread formation by Moore in 1936 is used in this report.

Methods of Study

In northeastern Kansas the shale intervals are small and the exposures are good so that detailed sections could be measured accurately with a hand level and carpenters rule.

South of Melvern the shale intervals are very thick and the various limestone members form separate escarpments. In order to accurately measure these sections it was necessary to use a plane table and aledaide.

A total of 12 days was spent in the field and 40 sections were measured. Fossil collections and lithologic samples were obtained from many of these localties but the time available did not permit extensive collecting except from a few localities. Some of the sections were measured in great detail while others are rather general. Time available and the type of exposure were the chief factors in determining the amount of detailed description made.

The measured sections were then plotted on a scale of five feet to the inch and correlation was made by matching sections. In most cases correlation of the various members could be done in the field but the persistence of certain fossil and lithologic zones was determined by matching sections.

The cross section of the Oread formation which accompanies this report is a correlation of 15 sections and composite sections selected or compiled from 40 measured sections. The horizontal distance between sections is the distance along the strike rather than the actual distance. On the shorter cross section for Douglas county the distances were plotted perpendicular to the strike.

Character and General Relations

The Oread formation as defined by Moore in 1936 includes seven members, three shales and four limestones. The Oread, as

reclassified, (Moore 1936) is the basal formation of the Shawnee group of the Missouri Series.

The type section is exposed on the hill on which the University of Kansas is situated at Lawrence, Kansas. The section used as the type in this report was measured at Willard cut on U. S. highway 40 at the east edge of Lawrence, (section #1) and at the railroad quarry just west of the depot at Lecompton, Kansas, (section #17). A composite section of these two exposures (section F) shows a total thickness of 57 feet of which 37 feet is limestone. This is a typical section of the Oread in northeastern Kansas.

The Oread formation has been subdivided into seven members, the Toronto limestone (Lower Oread), Snyderville shale, Leavenworth limestone (Middle Oread), Heebner shale, Plattsmouth limestone (Upper Oread) Heumader shale, and Kereford limestone (Super Oread).

Lawrence Shale

The Lawrence shale formation as redefined by Moore(1936 p. 155) includes the strata between the base of the Ireland sandstone and the base of the Oread formation. A detailed study of the Lawrence was not attempted but certain observations were made on its relation to the Oread formation.

The Oread rests conformably on the Lawrence shale.

The Williamsburg coal which occurs in the upper part of the Lawrence shale belongs in the same cyclothem with the Toronto limestone. The interval between the Williamsburg coal and the

Toronto varies from about 30 feet near Williamsburg to half a foot west of Yates Center.

Toronto limestone

The Toronto limestone was named by Haworth and Piatt from exposures near Toronto, Woodson county, Kansas. * In Nebraska a limestone in this stratigraphic position is known as the Weeping Water but doubt has been expressed as to their equivalence. (Moore, 1936, p. 163).

From Woodson county north to Doniphan county the Toronto is readily distinguished by its massive character and deep brown weathering. In Douglas and Leavenworth counties the upper massive bed is cherty. In fresh exposures the limestone has a blue gray color but in most places this is masked by the deep weathering. The fracture is irregular.

South of Woodson county the Toronto is not typically developed. According to Delo (1931 p) the Toronto is absent in southern Kansas. However in Ells and Chautauqua counties a limestone is found in the stratigraphic position of the Toronto. This limestone has a very different lithology than does the typical Toronto. At the base of this limestone there is a calcareous shale containing abundant fusulinids. According to Charles Williams** these fusulinids are the same species as those found at the type locality of the Toronto. This limestone is here correlated with the Toronto on the basis of its stratigraphic position.

* Kans. Univ. Quart. Vol. 2 p. 117, 1894

** Personal communication

At two widely separated localities the Toronto is absent and a conglomerate marks the base of the Oread. One of these is section #39, Andrew county Missouri and the other section # 35 near Baldwin, Douglas county, Kansas. At both localities the Toronto is present nearby and the conglomerate contains limestone fragments which may have been derived from the Toronto. It appears that the conglomerate is post-Toronto and pre-Snyderville in age.

Fossils are not abundant in the Toronto but they are every where present and weather out of the limestone and shale partings. Triticites cullomensis, Lophophyllidium, Rhipidomella and Chonetes are common. The uppermost bed of the Toronto is algal in Northeastern, Kansas.

Faunal list

Hodosmelia glabra
Triticites cullomensic 1, 5, 20, 25, 29
Lophophyllidium 5, 16, 20, 21, 25
Axophyllum 25
Aulopora 16
Apagraphiocrinus 20, 25
Delocrinus 25
Batostomella 25
Fistulipora 25
Marginifera spelendens 1, 10, 21, 29
Chonetes granulifer 10, 20, 21, 29
Punctospirifer kentuckyensis 20, 21
Ambocoelia 25, 29
Dictyoclostus 21, 25
Composita 10, 21, 25
Neospirifer 1, 3, 21
Hustedia 20,
Rhipidomella 20, 29
Derbya 1, 10
Enteletes 21
Allorisma 1
Algae 1, 3, 5
Otonosia 5

Snyderville Shale

The Snyderville shale was named (Condra, 1927) from the exposures in the Snyderville quarry west of Nehawka Nebraska. In northeastern Kansas it is a greenish gray clayey shale ranging in thickness from 10 to 21 feet. In central and southern Kansas the Snyderville averages around 75 feet in thickness and contains sandstones, siltstones, red shale, and at a few localities a

fresh water limestone. However the upper 10 feet or more is a greenish gray clayey shale at all of the localities studied. At the very top of the Snyderville there is a very persistent marly zone which contains Chonetes and Derbya. This thin marine zone was be traced from St. Joseph, Missouri Elgin Kansas. At Lone Star Lake this zone is absent and in its place there is a thin calcareous bed made up of pea sized pellets.

The Snyderville is mostly unfossiliferous except for the thin marly zone at the top. This zone contains well preserved Chonetes granulifer and Derbya. Myalina Squamularia, Rhombopora, and Astartella also occur in this zone at some localities. At Lone Star Lake there is a thin zone at the base of the Snyderville which contains well preserved specimens of Hypsolentoma, Bucanopsis and Trachydomia. Another gastropod fauna was found in the middle of the Snyderville at section 39 near Rochester, Missouri. At this same locality there is a black fissile shale which contains extremely abundant thin shelled, white ostracods belonging to the genus Cytherella. A calcareous clay, containing a well preserved microfauna of ostracods and foraminifera occurs a few inches below the black shale.

Faunal list

Ammodiscus 39
Ammodiscoides 39
Nodosinella 39
Holothurian spines 39
Rhombopora 11
Fistulipora 19
Chonetes granulifer 10, 11, 24, 30, 34, 35, 36 39
Derbya 10, 11, 16, 35, 36, 39
Punctospirifer 19
Squamularia 11
Ambocoelia 10, 30
Diclyoctostus 30
Marginifera 30
Hypsolentoma 19
Bucanopsis 19
Pharkidonotus 30
Trachydomia 19
Myalina 11, 30, 36
Astartella 30, 36
Amphicites 39
Cytherella 39

Leavenworth Limestone

Section #9 (Section D of the Cross section) was measured at the type locality of the Leavenworth limestone on the highway northwest of Leavenworth, Kansas. The Leavenworth is a remarkably persistent unit which varies only slightly in thickness and lithology from Rochester, Missouri to Elgin Kansas. It is a dark blue gray, fine grained to sub-lithographic, hard, dense, limestone which occurs in a single ledge with prominent vertical jointing. Near Blair in Doniphan county ~~in~~ the Leavenworth consists of two ledges of limestone. Its thickness varies from a maximum of 2.8 feet near Baldwin to .8 of a foot east of Burlington but these were the only localities where the Leavenworth was less than a foot or more than two feet in thickness. In Southern Kansas the Leavenworth averages a little greater in thickness and is slightly more granular than in northeastern Kansas.

The Leavenworth is fossilifeous but because of its lithology the fossils are very difficult to collect and identify. Small fusilinids were found at all localities where the Leavenworth was examined closely. Various types of gastropods occur throughout the limestone and brachiopods and crinoid fragments are common.

Faunal list

Fusulinids 3, 10, 11, 18, 24, 34,

Crinoid fragments 3.

Marginifera, splendens 3

Ambocoelia 13

Hustedia 13

Punctospirifer 13

Enteletes 1

Rhipidomella 13

High spired gastropods 3, 13, 11

Low spired gastropods 3, 13, 10

Bellerophontid gastropods 3, 13,11

Heebner Shale

The shale occuring above the Leavenworth and below the Plattsmouth limestone was called Heebner by Condra (1937, p. 37) from exposures along Heebner creek west of Nehawka, Nebraska. In fresh exposures this shale can be divided into four parts: (1) a thin .1 foot clayey zone at the base which at some localities contains gastropods, (2) about 2.5 feet of black slaty somewhat flexible shale, containing small phosphatic concretions (3) 1.5 feet of blue to dark blue, platy to blocky shale, (4) about .7 a foot of calcareous clay containing Ambocoelia and small chonetids. These divisions are not usually sharply defined but are readily recognized.

The Heebner, like the Leavenworth, is remarkably persistent in lithologic character and uniform in thickness throughout the area covered in this report. An exception to this general statement is found near Baldwin and in roadcuts along highway 50N east of Worden in Douglas county where the Heebner is sixteen feet thick. Along highway 50N east of Worden large septarian concretions occur in the upper part of the Heebner. A few of these concretions contain bellerophontid gastropods.

In Douglas and Leavenworth counties conodonts occur throughout the Heebner. They are rather common in the black slaty shale and specimens were obtained by washing the clay in the upper part of the Heebner. Ammodiscus and a few smooth Ostracods were also found in this clay. No search for condonts was made at the other localities.

The small gray phosphatic concretions which occur in the

Heebner often contain organic remains but usually these are unrecognizable. Gastropods and fish scales were recognized in these concretions.

Faunal list

Ammodiscus 1, 3
Ambocoelia 1, 13, 17, 22
Chonetes 1
Lissochonetes 1
Euphemites 13
Conodonts 1, 3, 13

Plattsmouth Limestone

The name Plattsmouth limestone was proposed by Keyes in 1899 for the 30 feet of beds exposed at Plattsmouth Nebraska. The name Plattsmouth was restricted by Condra (1927, p. 37) to the "upper Oread" limestone. Moore has studied the type section and has excluded beds which are the equivalents of the Kereford and Clay Creek limestones in Kansas (Moore, 1936 p. 167)

The Plattsmouth averages about 20 feet in thickness in northern and southern Kansas but is considerably thinner in south central Kansas. It is typically a light blue gray, light weathering, fine-grained, hard, resistant limestone with irregular wavy beds and thin shale partings. In southern Kansas the upper part of the limestone is granular and rather massive. The distinctive wavy bedding is more pronounced in northern than in southern Kansas. Nodular chert is very distinctive of some of the upper beds of the Plattsmouth but no chert was seen south of Osage county.

The chert beds and shale partings can often be traced for considerable distances. A comparison of the plotted sections #2, #3 and 4, # 10, #15, #17 shows the persistence of the upper and lower chert horizons and some of the prominent shale partings as well as some of the faunal zones. A Syringopora bed occurs in the

same position at Melvern that it does at Lecompton. No detailed sections of the Plattsmouth were measured in southern Kansas but coral and Enteletes zones were noted at several localities and detailed sections would probably show that some of these could be traced for some distance.

The fauna of the Plattsmouth is quite varied and the fossils are easily collected and well preserved at some localities. The best collecting is found in quarries at Lawrence, Lecompton, Melvern, and Burlington. Adams quarry, four miles north of Lawrence, was collected rather extensively and some exceptionally well preserved fossils were obtained.

Faunal list

Triticites irregularis 1, 2, 3, 4, 10, 15, 17, 33,
Triticites plummeri 2, 17
Meandrostria 25
Caninia 34
Lophophyllidium 1, 2, 15, 17
Dibunophyllum 15
Anlopora 33
Syringopora 2, 15, 17
Apagraphiocrinus 37
Rhombopora 2, 4, 17
Fistutipora 1, 2, 4, 8, 17, 37
Acanthocladia 37
Linoproductus 2, 34
Echinoconchus 2
Marginifera splendens 37
Dictyoclostus ., 2, 13
Enteletes 2, 3, 16, 17, 33, 34,37
Meekella 33
Wellerella 2, 10, 37
Hustedia 2, 3, 17, 37
Neospirifer 3, 17, 34, 37
Squamularia perplexa 17, 34, 37
Chonetes 17, 37
Ambocoelia 17, 37
Composita 1, 2, 3, 15, 17, 34, 37
Dielasa bovidens 2, 17, 37
Derbya 3, 17, 22, 37,
Punctospirifer kentuckyensis 1, 4, 17, 37
Ameura 2
Ottonosia 22

Heumader Shale

The type locality of the Heumader shale is at the Heumader ~~shale is at the Heumader~~ quarry just north of St. Joseph, Missouri. The shale above the Plattsmouth and below the Kereford is defined as the Heumader but where the Kereford is absent the shale equivalent of the Heumader is included in the Jackson Park shale.

In northeastern Kansas the Heumader is a blue to greenish gray clay which at most localities is three to five feet thick. South of Melvern the Heumader thickens up and becomes silty. In the vicinity of Burlington the thickness is about 25 feet. In Elk and Chautauqua counties the Heumader is 25 to 50 feet thick.

At most localities the Heumader is unfossiliferous but at a few places it contains a molluscan fauna. A zone of Myalinas was noted just below the Kereford near Waverly (#6) and near Burlington (#38). A nice gastropod fauna was found at the latter locality. A microfauna containing minute forams and ostracods was obtained from the Heumader shale near Waverly.

Faunal list

Ammodiscus 6
Hustedia 6
Derbya 38
Euphemites 38
Euomphalus 38
Pharkidonotus 38
High spired gastropods 38
Myalina 6, 38
Astartella 24, 38
Amphisites 6

Kereford limestone

The type locality of the Kereford limestone is in the Kereford quarry at the south edge of Atchison, Kansas. Condra first referred the Kereford to the Kanwaka shale formation (Condra 1927 p. 45) but Moore (1932, p. 94) has classified it as the uppermost Oread on the basis of its position in the normal cycle of deposition

The Kereford is extremely variable in thickness, lithologic character and fauna. At most localities in northern Kansas the uppermost bed is algal and contains no fusilinids. At the type locality and at several other localities oolitic or semi-oolitic

beds occur in the Kereford. At the type locality sandy beds containing plant fragments are included in the Kereford.

Due to the variable character of the Kereford this unit was identified almost wholly on the basis of its stratigraphic position as the first limestone above the Plattsmouth limestone and below the Kanwaka shale.

An examination of the cross section shows that the Kereford is rather uniform in thickness from the Atchison to Burlington if the blue flagstones in Osage and Coffey counties are excepted. The limestone below the flagstone at Melvern corresponds in thickness to the Kereford at Burlington, Lecompton, Tonganoxie and Atchison. There is a sharp lithologic break between the lower part of the Kereford and the blue flagstone which has been called the "Waverly flagging". Above the flagstones there is a thin oolitic and Algal zone which indicates that the so called "Waverly flagging" belongs to the uppermost part of the Oread cycle of deposition.

In southern Kansas a thin limestone occurs between the Plattsmouth and Clay Creek limestones which on the basis of its stratigraphic position is correlated with the Kereford.

The fauna of the Kereford limestone is abundant and varied but is usually difficult to collect. Fusilinids were seen at all of the localities studied in northern Kansas but are seldom found in the uppermost beds. Pelecypods and gastropods are conspicuous but are very difficult to collect. The lower part of the Kereford at Melvern is very fossiliferous and the specimens weather free of the rock. Just south of Melvern there is a zone

of very abundant ratherlarge corals which weather out of the base of the Kereford.

An interesting molluscan fauna was obtained from the Kereford limestone at Adams quarry by etching the silicified fossils out of the limestone. Beautifully preserved clams, snails, pteropods, and ostracods were obtained in this manner.

Faunal List

Triticites 2, 4, 10, 14, 17, 24, 25
Lophophyllidium 8
Caninia 7, 8
Syringopora 8
Parulocrinus 14
Fenestrellina 2
Juresania 8
Echinoconchus 8
Dictyoclostus 2, 8
Linoproductus 8
Marginifera 8
Composita 8, 10
Dielasma 8, 17
Derbya 8
Meekella 8
Chonetes 8
Hustedia 8, 17
Wellerella 8
Conularia 6
Myalina 6, 14
Astartella 2
Allorisma 8
Pinna 2, 14
Bairdia beedei 2
Osagia 4, 6, 24

Kanwaka shale

The Jackson Park shale member of the Kanwaka shale formation conformably overlies the Oread formation. In southern Kansas a massive sandstone known as the Elgin occurs at the base of the Kanwaka. The base of this sandstone contains an abundant marine fauna of with Linoproductus and Derbya the most common fossils.

List of localities for sedimentation samples

#1.	Douglas co.	SW½, 25-12-19E	1 mile west of Lawrence
#2.	Douglas co.	NW¼, 1-12-19E	Adams quarry
#3.	Leavenworth	C E line 7-11-21E	½ mi. W. Tonganoxie
#4.	Leavenworth	C W line 31-10-21E	3 mi. NW Tonganoxie
#5.	Franklin co.	C N½ 24-18-17E	½ mi. W of Williamsburg
#6.	Coffey co.	C S line 7-19-17E	1½ mi. E and 1 N of Waverly
#7.	Osage co.	SW¼, SW¼, 10-18-16E	.8 mi. S RR viaduct, Melvern
#8.	Osage co.	NW cor. 10-18-16E	RR cut Melvern, Kansas
#9.	Leavenworth	NE cor. 22-8-22E	4 mi. NW Leavenworth
#10.	Atchison co.	S½, 7 & N½ 18-6-21E	Kereford quarry, Atchison
#11.	Doniphan co.	NW¼, 20-3-22E	1.1 mi. E of Blair
#12.	Doniphan co.	SW¼, 34-4-21E	WPA quarry 2.7 mi. NE Doniphan
#13.	Douglas co.	SW cor. 33-14-19E	2.5 west of junction US 59 & 50N
#14.	Osage co.	NW¼, NW¼, 3-18-16E	Roadcut .5 mi. N of Melvern
#15.	Osage co.	SW¼, 34-17-16E	Quarry 2 mi. N of Melvern
#16.	Osage co.	NW cor. 12-18-16E	Roadcut and mine 2¼ mi, E of Melvern
#17.	Douglas co.	NE¼, SW¼, 34-11-18E	RR depot, Lecompton, Kansas
#18.	Douglas co.	SE cor. 1-14-18E	Roadcut ½ mi. S of Lone Star, Kans.
#19.	Douglas co.	Center-14-14-18E	Near dam, Lone Star Lake
#20.	Douglas co.	NW 35-13-19E	3/4 mi. W of Three Sisters
#21.	Woodson co.	C W½ 17-25-15E	3 mi. W of Yates Center
#22.	Greenwood	C W line 1-26-12E	4 mi. WSW of Toronto
#23.	Greenwood	N½ line 9&10-26-13E	3 mi. SW of Toronto
#24.	Greenwood	9-10-11-T28S-R12E	1-3½ mi. W of Fall river
#25.	Elk co.	12-29-12E	4 mi. S of Fall river
#26.	Elk co.	NE¼, SE¼, SW¼, 31-30-12E	4.7 mi. ENE of Elk Falls
#27.	Elk co.	Center 33-30-12E	1mi. N 1 mi. W of Longton
#28.	Elk co.	Center 23-30-12E	3 mi. N of Longton
#29.	Elk co.	C S line 15-31-12E	2.6 mi. S. of Longton
#30.	Chautauqua	NW¼, 31-32-12E	7 mi. N of Sedan
#31.	Chautauqua	C E line SE¼ 31-30-12E	2 mi. N of Sedan
#32.	Chautauqua	SW¼, SE¼, 33-33-11E	2.5 mi. SW of Sedan
#33.	Chautauqua	SW¼ 5-34-11E	2.5 mi. SW of Sedan
#34.	Chautauqua	SW¼ 11-35-10E	¼ mi. W of Elgin
#35.	Douglas co.	Center 27-14-20E	1.5 mi. NE of Baldwin
#36.	Coffey co.	S line SW¼, SE¼ 21-21-16E	5 miles E of Burlington
#37.	Coffey county	C W½ 14-21-15E	Pecks quarry, 1 mi N Burlington
#38.	Coffey co.	SW¼ 11-21-15E	2 mi. N Burlington
#39.	Andrew co. Mo.	NW¼ 32-59N-34W	2 mi. SW of Rochester, Mo.
#40.	Greenwood	C N line 33-25-13E	2.5 mi. W of Toronto

#51.	Douglas co.	C S line SE¼ 32-12-20E	E of cemetary, 15th st, Lawrence
#52.	Leavenworth		Kans. 32, ½ mi E of Mud Creek
#53.	Douglas	NW cor. 26-13-20E	2 mi. NE Sibleyville
#54.	Douglas	NW¼, NW¼, 12-14-20E	2 mi. NE Vinland
#55.	Leavenworth	NW Cor. 21-12-21E	Intersection K32 & Baldwin road.
#56.	Douglas	NW¼ 13-13-20E	Flat rock
#57.	Douglas	2-14-19E	Roadcut just N of Pleasant Grove
#58.	Osage	SW¼, SE¼ 28-17-16E	2 mi. NNW Melvern
#59.	Leavenworth	W line SW¼ 16-12-21E	6½ miles S Tonganoxie
#60.	Leavenworth	C S line 16-12-21E	2½ mi. W Linwood
#61.	Franklin	11-17-19E	Roadcut SW of Viaduct, Ottawa
#62.	Douglas	36-12-19	KU quarry Lawrence
#63.	Douglas	36-12-19	Excavation for Min. Ind. bldg
64.	Douglas	SE cor 6-13-21E	C. of Endora

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Div. | Beds | Foss | Strat | Name

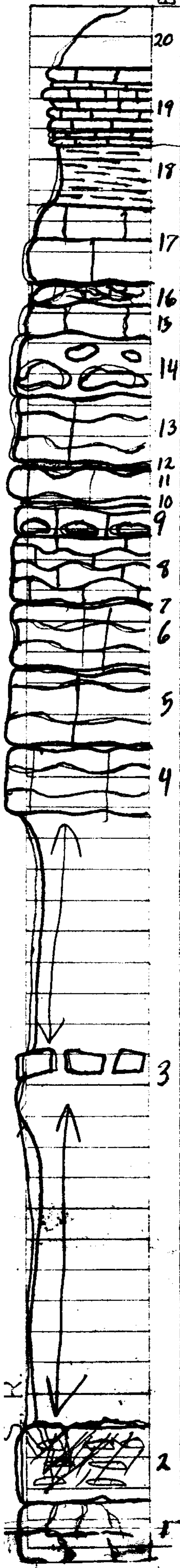
T. 12 S., R. 19 E County Douglas

Sec.

Locality description- Adams Quarry 4 miles N of Lawrence
Also known as SGE quarry.

Measured by- M. H. Wallace + O. C. Baptist Date- March 16, 1941

Remarks-



Heumader/Kereford

Plattsmouth

Plattsmouth

Heebner Leavenworth Snyderville

Toronto

Bed No.	Description	Thickness
20	Red Soil	—
19	Limestone, Blue gray with greenish streaks (glauconite?), hard, fine to medium grained, in 2-4 inch beds. Contains fusilinids, Dictyoclostus, Composita, crinoid stems, Fenestrellina, Pinna, ~~[illegible]~~ pelecypods, ostracods, and gastropods. Many of the fossils are silicified and can be dissolved out of the limestone with Hcl. exposed	2'8"
18	Shale, light olive green to blue, plastic.	2'
17	Limestone, bluish gray, weathers yellowish brown to cream, medium grained, two even ledges. Abundant fusilinids, many very large gastropods in places, also Enteletes, Neospirifer, Composita and Dictyoclostus.	2'6"
16	Limestone, gray, medium grained, weathers yellow brown, nodular, some buff clay, contains fusilinids, crinoid stems, + Composita	9"
15	Limestone, gray, medium grained, weathers yellow brown, contains fusilinids and crinoid stems.	1'0"
14	Limestone, ~~[illegible]~~ blue gray, hard, dense, fine grained, contains numerous large conspicuous chert nodules. The chert is a dark blue-gray and occurs in irregular nodules varying in size from ½ inch to six inches in diameter and when several nodules are connected they are much larger. Both the limestone and the chert contain fusilinids and crinoid stems.	2'0"
13	Limestone, blue gray, fine grained, weathers cream, abundant fusilinids, crinoid stems, and Enteletes.	2'2"
12	Shale parting, buff, calcareous.	1"
11	Limestone, light gray, weathers yellow brown, medium grained, earthy, wavy bedding, ~~[illegible]~~ crinoid stems, Hustedia, Lophophyllidium.	1'0"
10	Shale, buff at base, black in middle, green at top.	3"
9	Limestone, very cherty, limestone gray, fine grained with calcite crystals. Chert, dark blue elliptical to irregular nodules. Most of chert in lower 6 inches. Limestone contains crinoid stems, Hustedia, echinoid plates, gastropods and stylolites.	11"
8	Limestone, light bluish gray, weathers cream, fine to medium grained, massive, wavy bedded, contains crinoid stems, gastropods, Ambocoelia, Wellerella, Fistulipora, Hustedia.	2'2"
7	Shale parting, buff, calcareous	1"
6	Limestone, light bluish gray, weathers cream, medium grained, massive, wavy bedded, contains Hustedia, Ambocoelia, Lophophyllidium, Punctospirifer, Composita, Fistulipora, Neospirifer and crinoid stems. Some of these fossils have a deep red color.	2'2
	(The section below this bed is not expose in the quarry face and was taken from the ravine to the SE.)	
5	Limestone, light gray, medium grained, calcite streaks, weathers cream. Wavy bedded, contains crinoid stems.	2'6
4	Limestone, light gray, medium grained, calcite streaks weathers yellow brown to cream. Contains crinoid stems, Wellerella.	2'2
3	Covered, blocks of Leavenworth limestone occur about 8' below the limestone, bed #4.)	20'
2	Limestone, pink, cherty, weathers brown, hard, fine grained, weathers irregular.	2'6
1	Limestone, brown, weathers yellow brown, medium grained, earthy, massive ledge, contains crinoid stems.	2'1

Div. | Beds | Foss. | Strat. | Name

T. S., R. County Leavenworth

Sec.

Locality description- Roadcuts on highway 16, ½ to 3 miles West of Tonganoxie, Kansas.

Measured by- Maurice H. Wallace Date- March 22, 1941

Remarks-

Bed No	Description	Thickness
49	1. Limestone, blue gray, medium grained, upper surface smooth, laminated, regular parallel joints, Crinoid stems & Osagia.	.8
	2. Limestone, dark blue gray, fine grained, a few fusilinids.	.4
	3. Limestone, dark blue gray, hard, dense, fine grained, abundant fusilinids.	.6
	4. Limestone, blue gray with greenish tint, medium grained, fusilinids common, gastropods, crinoid stems, Fistulipora.	1.
48	5. Limestone, blue gray, nodular, earthy, weathers buff, fine grained, rubbly.	.9
	6 Limestone, yellow brown, weathers yellow brown, earthy, irregular fracture.	.6
	7 Limestone, olive gray, fine grained, hard, dense, no fossils.	.5
	8 Shale and Clay, blue gray to olive gray.	3.5
	9. Limestone, blue gray, weathers brown, fine grained, abundant fusilinids, Composita, and crinoid fragments.	1.4
	10 Limestone, blue gray, weathers brown, fine grained, abundant fusilinids, Composita, Rhombopora, fenestrate bryozoans, bellerophonid snails.	1.
	11. Limestone, brown, rubbly, argillaceous, abundant fusilinids.	.9
	12. Limestone, blue gray, weathers cream, fine grained, crinoid stems, fusilinids, Rhombopora, Composita.	.9
	13. Limestone, light gray with brown streaks, weathers brown, wavy bedded, crinoid stems.	4
	14. Covered ((about)	2.±
47	15. Limestone, brown to buff, rubbly, argillaceous, abundant fusilinids, Composita, Derbya, Hustedia Chonetes, Neospirifer, Enteletes.	2.+
	16. Limestone, blue gray, weathers cream, fine grained, hard, a few fusilinids, crinoid stems, fenestrate bryozoans; 3 beds.	1.3
	17. Limestone and Chert, blue gray limestone and dark blue gray chert, the limestone is silicified and very hard, fusilinids common in chert and limestone	1.
	18. Shale parting, buff.	.1
	19. Limestone, bluish gray, hard, dense, fine grained, weathers cream, 2 even beds separated by 3 inch rubbly zone. Abundant fusilinids in lower bed.	1.7
46	20. Limestone, cream, weathers yellowish, rubbly, argillaceous, Hustedia, crinoid stems, corals.	.7
	21. Shale and clay, thin black streak in middle.	.2
	22. Limestone and Chert, light gray, fine grained limestone with band of dark blue gray chert in lower part.	1.
	23 Limestone, light gray, weathers cream, silty, small brachs, crinoid stems, a few fusilinids.	.5
	24 Shale parting, buff.	.1
45	25 Limestone, light gray, weathers cream to red brown, medium grained, silty, crinoid stems, small brachiopods, a few fusilinids.	1.2
	26 Shale parting, buff and gray, silty	.1
	27. Limestone, cream, fine grained, calcite streaks, fusilinids, Composita.	.9
	28 Shale parting, buff	.1
	29 Limestone, cream, weathers cream, fine grained, crinoid stems, a few fusilinids.	.6
44	30 Limestone, cream, weathers cream, medium grained, wavy bedded, two ledges with thin shale parting, crinoid stems, small brachiopods, Rhipidomella.	.8
	31 Shale parting, buff, silty.	.1
	32 Limestone, blue gray with pinkish tint, medium grained, crystalline calcite common, 1-2 inch chert nodules, three or four beds, Hustedia, crinoid stems, small brachiopods.	2'.
43	33 Limestone, blue gray, weathers cream, fine grained, hard, dense, wavy bedding, crystalline calcite, crinoid stems and corals.	1.
	34 Clay, yellowish buff in upper .5 foot, green gray to blue gray in lower part.	1.8
	35 Shale, dark blue to black in lower part, red iron stains, platy, more blue and plastic towards top.	2.1
42	36 Shale, dark blue to black, slaty, micaceous, contains numerous small discoidal concretions some of which contain fossils, Conodonts common.	2.7
	37 Shale, buff, shell fragments.	.1
41	38. Limestone, dark blue gray, weathers bluish white, dense, hard, fine grained, vertical joints; contains small fusilinids, crinoid stems, echinoid plates, gastropods, Marginifera.	2.
	39 Shale and clay, green and buff	.4
40	40 Shale, dark gray to greenish gray, crinkly, small pellets and shell fragments.	.2
	41 Clay, blue gray and green gray with buff streaks, green predominates in lower part, blue in upper, upper foot blocky.	12.6
39	42 Limestone, brown, weathers yellowish, not sharply separated from bed below, algal.	.8
	43 Limestone, weathers pink, chertified, irregular to concoidal fracture, hard, silty.	2.
38	44 Limestone, red brown, weathers red brown to yellow brown, medium grained, contains fusilinids, crinoid stems, Neospirifer.	3.3
	45. Limestone, buff, argillaceous, rubbly with calcareous clay, crinoid stems.	.7
37	46. Limestone, brown, weathers yellow brown, medium grained, hard, resistant, abundant crinoid fragments, fusilinids, brachiopods. Vertical joints, smooth face.	4.0
	47. Shale, buff, some Mn or carbonaceous material.	.1
36	48. Clay, gray, weathers greenish yellow, calcareous, silty, blocky, micaceous, casts of crinoid stems.	.8
	49. Shale, drab green, soft, micaceous.	2.5

FF 5

Div. | Beds | Foss. | Strat. Name | T. | S., R. | County Franklin

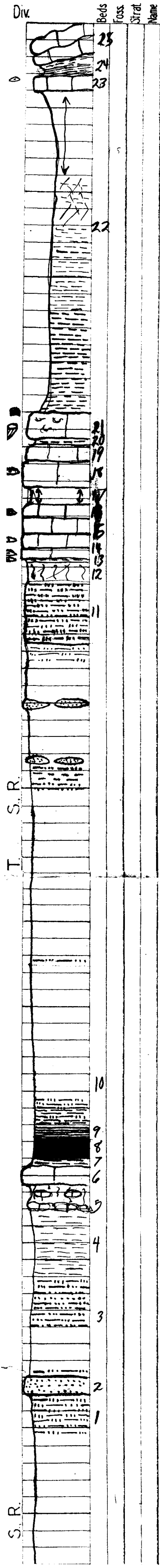
Sec.

Locality description- 1/2 - 1½ miles west of Williamsburg on highway 505.

Measured by- Maurice Wallace | Date- March 23, 1941

Remarks-

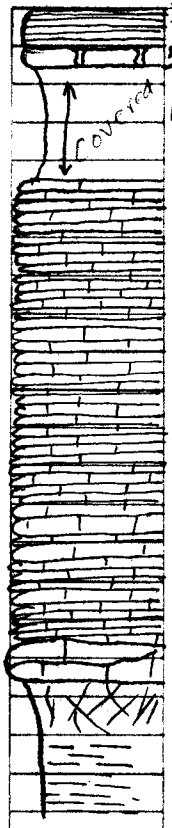
Bed No.	Description	Thickness
25	Limestone, blue gray, fine grained, slumped down. Plattsmouth exposed	2. +
24	Shale, black, slaty, not fully exposed due to slumping of limestone	.5 +
23	Limestone, hard, dense, blue gray, fine grained, fusilinids, poorly exposed.	1. +
22	Shale, buff, green, and blue, top covered, rest poorly exposed.	19.
21	Limestone, brown, hard massive bed, weathed surface full of holes, crinoid stems, corals, Atonogia.	1.5
20	Shale, buff, corals common	.3
19	Limestone, gray, fine grained, weathered surface full of holes, no fusilinids.	1.
18	Limestone, gray, fine grained, crinoid stems, fusilinids.	1.5
17	Covered	1. ±
16	Limestone, pinkish brown, hard, fine grained, weathers yellow brown, crinoid stems, a few fusilinids.	.7



#6

Div. Beds Foss. Strat. Name

T. 19 S., R. 17E County Coffey



Sec. 7

Locality description- 1½ miles east & 1 mile N of Waverly, Kansas, U.S. Highway 50S.

Measured by- Maurice Wallace Date-

Remarks-

Bed No.	Description	Thickness
6.	Limestone, blue gray, medium grained to oolitic, very fossiliferous, gastropods varied and abundant, crinoid fragments, Osagia.	1.
5.	Limestone, blue gray, fine grained, joints filled with calcite; snails, crinoid stems.	.5
4.	Covered	3.
3.	Limestone, blue gray, weathers yellow brown, slabby, silty, fine grained, unfossiliferous.	12.
2.	Limestone, blue gray, nodular, medium grained comparatively hard, Myalina, Cannularia, Wellerella, Composita, fenestrate bryozoans.	1.
1.	Clay & Shale, olive brown, plastic, upper part contains abundant Myalinas and crinoid remains. Contains very small Ammodiscus.	3, 6

S. R.

T.

#7

Div. | Beds | Foss. | Strat. | Name

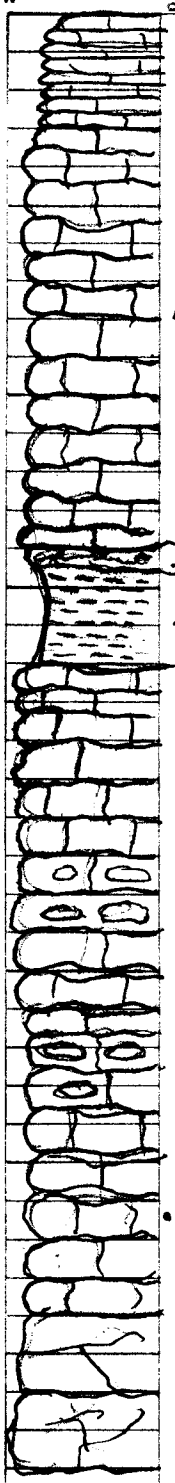
T. 18 S., R. 16 E County Osage

Sec. 10

Locality description- .8 mile south of RR viaduct in Melvern, Kansas.

Measured by- Maurice H. Wallace Date- March 23, 1941

Remarks-



Bed No.	Description	Thickness
4	Limestone, fine grained, lower part wavy bedded upper part flaggy. Compasita. exposed	14.'
3.	Limestone, argillaceous, composed chiefly of corals.	.5
2.	Shale	2.5
1.	Plattsmouth limestone, fine grained, wavy bedded, cherty, fossiliferous, fusilinids rare.	21.

S. R.

T.

#8

Div. | Beds | Foss | Strat. | Name

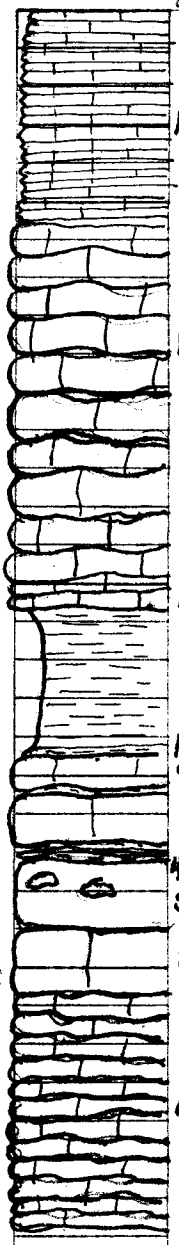
T. 18 S., R. 16 E County Osage

Sec. 10

Locality description- RR cut under viaduct, Melvern, Kansas

Measured by- Maurice H. Wallace Date-

Remarks- Excellent collecting



Bed No.	Description	Thickness
14.	Limestone, blue, fine grained, smooth, even bedded, thin shale partings, flaggy.	5.6
13.	Limestone, light gray wavy bedded, some fusilinids, Composita, Juresania, Wellerella, Hustedia, Allorisma	9.6
12.	Limestone, gray, medium grained, large Caninia.	.4
11.	Shale, dark blue in lower part, green above,	3.8
10.	Shale, gray and red, flaky, well laminated, carbonaceous, ferruginous, micaceous, sulfate crystals,	.1
9.	Limestone, dark blue gray, weathers cream, fine grained, irregular upper surface.	.8
8.	Shale parting, dark gray	.2
7.	Limestone, blue gray, weathers cream, hard, resistant, a few small brachiopods,	1.2
6.	Shale parting, buff	.2
5.	Limestone, blue gray, fine grained.	.2
4.	Shale parting, buff.	.1
3.	Limestone, light blue gray, fine grained, cherty, small brachiopods.	1.9
2.	Limestone, light gray, weathers cream, fine grained, dense, Syringopora and Eutheletes.	1.8
1.	Limestone, fine grained, wavy bedded, cherty, crinoid stems, corals, no fusilinids, 12 beds,	6.1

S. R.

T.

#7

Div. | Beds | Foss. | Strat. Name

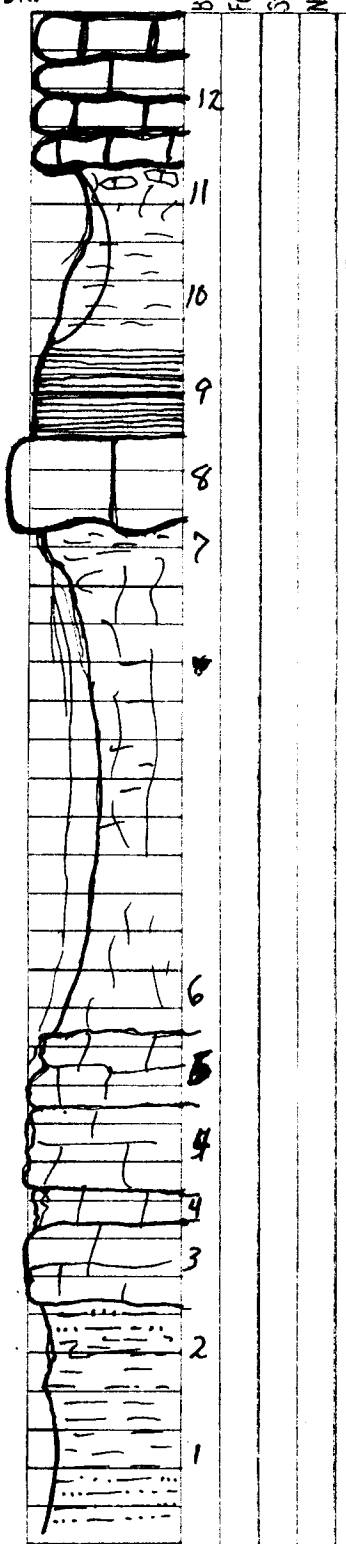
T. 8 S., R. 22E County Leavenworth

Sec. 22 (X)

Locality description- 4 mi W of Leavenworth, roadcut 3 mi W federal penitentiary on U.S. 73

Measured by- O.C. Baptist Date- 4-31-41

Remarks- Very good exposure



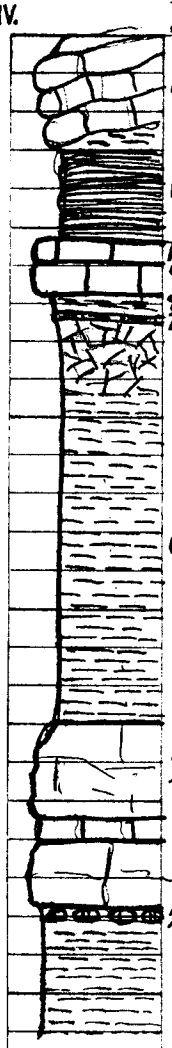
Bed No.	Description	Thickness

S. R.

T.

#11

Div. | Beds | Foss. | Strat. | Name



T. S., R. County Doniphan

Sec.

Locality description: 1.1 miles east of Blair, Kansas. U.S. 36, creek cutbank 1/4 mile south of highway.

Measured by: O.C. Baptist & M.H. Wallace Date: March, 1941

Remarks:

Bed No.	Description	Thickness
12	Limestone, Plattsmouth, slumped and poorly exposed	
11	Heebner shale, largely covered by slumped Plattsmouth, thickness not obtainable.	3'+
10	Limestone, reddish gray, fine grained, hard, dense, bellerophontid snails, fusilinids, crinoid stems.	.5
9½	Limestone, dark blue gray, dense, fine grained, bellerophontid snails, fusilinids, crinoid stems.	.9
8½	Clay and blocky shale, blue to gray	1.0
7½	Shale, coquinoid, Derbya, Squamularia, Myalina, chonetids, Rhombopora.	.4
6½	Shale, green and blue, upper part a blocky clay.	10.7
5½	Limestone, blue gray, dense, hard, blocky fracture, many fusilinids, especially near top.	2.5
4½	Limestone, bluish cream, dense hard, smooth but somewhat scaly fracture, even grained, green stringers, no fusilinids	.6
3½	Limestone, bluish cream, hard, dense, smooth, scaly fracture, even grained, many fusilinids.	1.8
2½	Shale and calcareous nodules, brown.	.9
1½	Shale, green and maroon exposed	3.

S. R.

T.

#12

Div. | Beds | Foss. | Strat. | Name

T. S., R. County Doniphan

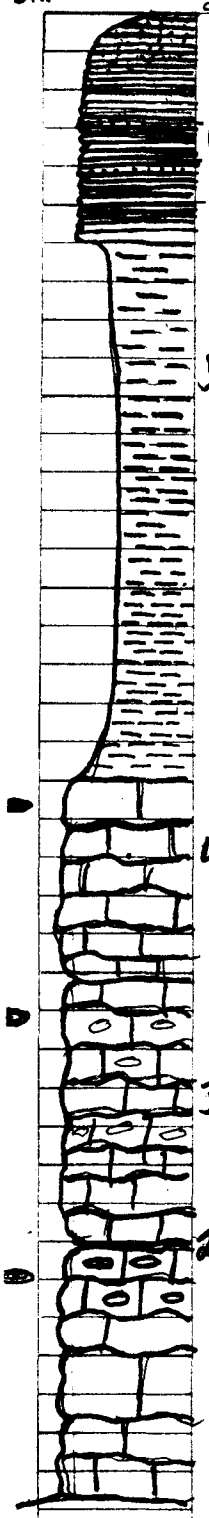
Sec.

Locality description- WPA Quarry, 2.7 miles NE of Doniphan, Kansas

Project 6876-10,

Measured by- O.C. Baptist and Maurice Wallace Date- March, 1941

Remarks-



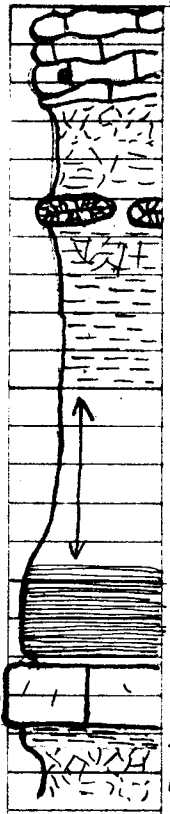
Bed No.	Description	Thickness
6	Shale, and Sandstone, gray, bedding planes brown, thin, slaty, micaceous, more sandy in upper half, plant fragments. exposed	6.4
5	Shale, blue, blocky	14.
4	Limestone, dark brown, dense, many fusilinids.	5.4
3	Limestone, brown & gray, massive ledge, cherty, ~~abundant chert in upper part~~ fusilinids.	6.7
2½	Shale, blue, wavy bedding.	.1
2	Limestone, tan, dense, fine grained, blue chert in upper part, brachs & crinoid stems in lower 1/3, fusilinids in upper two feet.	6.7

S.R.

T.

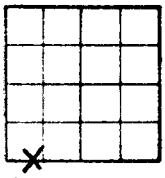
#13

Div. Beds Foss. Strat. Name



T. 14 S., R. 19E County Douglas

Sec. 33



Locality description- 2.5 miles west of junction U.S. 59 & US 50N. Roadcut

Measured by- Maurice H. Wallace Date- March 31, 1941

Remarks-

Bed No.	Description	Thickness
9	Limestone, blue gray, weathers light tan, medium grained, wavy bedded, crinoid stems, bryozoa, Dictyoclostus. exposed	2.5+
8	Clay, buff, Ambocoelia	1.5
7	Shale, blue gray and drab green, blocky, contains prints of Derbya and other brachiopods. About six feet exposed. About three feet below the base of the Plattsmouth there is a zone of septarian concretions about 1 foot in diameter. These contain orange calcite and are non fossiliferous. They are blue gray and fine grained on the inside but there is a one inch olive brown zone on the outside. exposed	6.+
6	Covered	5.2
5	Shale, black, slaty, small phosphatic concretions	2+
4	Shale, gray, poorly bedded, fossiliferous, gastropods.	.1
3	Limestone, blue gray, weathers light cream, fine grained, dense, hard, resistant, vertical joints, Composita, fusilinids, Rhipidomella, gastropods, Punctospirifer, Ambocoelia, Hustedia, pelecypods, crinoid stems.	
2	Shale, yellowish brown, calcareous, bryozoa, crinoid stems.	.6
1	Shale, dark gray when moist, blocky, silty. exposed	1.

S. R.

T.

F14

Div. Beds Foss. Strat. Name

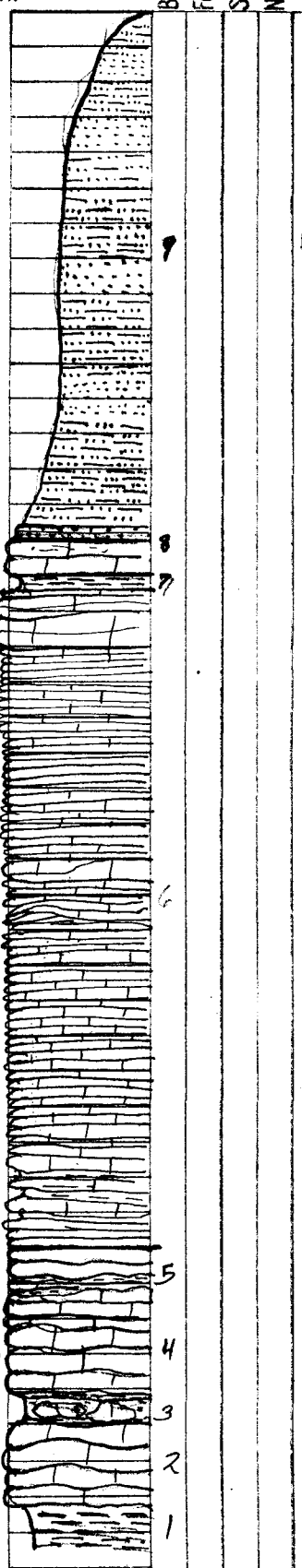
T. 18 S., R. 16E County Osage

Sec. 3

Locality description- Roadcut north of Melvern.

Measured by- Maurice H. Wallace Date- 1941

Remarks- Excellent Section



Bed No.	Description	Thickness
9.	Siltstone and Sandstone, thin bedded, gray, micaceous,	14.5
8.	Limestone, blue gray, weathers gray, coarse grained, upper part coquinoid, Osagia at top, clams, gastropods, pectinoid clams, high spired gastropods, Bryozoa, Rhombopora,	1.5
7.	Shale, dark gray, silty, micaceous, red at top, Derbya.	.4
6.	Limestone, light blue, weathers blue, thin even beds separated by thin shale partings, smooth fracture, more massive towards top, silty, no fossils except one large Parulocrinus cup at base.	16.5
5.	Limestone, blue gray, weathers blueish white, fine grained, thin wavy beds with shale partings, looks like Plattsmouth, very fossiliferous with Juresania, Composita, Derbya Dictyoclostus, Punctospirifer, Myalina, Crinoid fragments.	1.5
4.	Limestone, blue gray to orange gray, weathers orange brown, medium grained, 5 beds, fusilinids, Composita, crinoid stems, Pinna.	2.6.
3.	Limestone, rubbly and shale, weathers buff, earthy, molluscan fauna, Composita, Hustedia.	.8
2.	Limestone, blue gray, dense, hard, 4 ledges, tends towards wavy bedding, weathers cream, corals common, Craterophyllum and Aulopora, Composita, Ambocoelia, Echinoid Spines, crinoid fragments, no fusilinids,	2.2
1.	Shale, blue gray, weathers brown, nodular, poorly laminated, a few prints of fenestellate bryozoans and brachiopods.	1.+

#15

Div. Beds Foss. Strat. Name

T. 17 S., R. 16E County Osage

Sec. 34

Locality description- Quarry

Measured by- Maurice H. Wallace Date- March 31, 1941

Remarks-

Bed No.	Description	Thickness
12.	Limestone, blue gray, weathers yellow to orange brown, weathers pitted, medium grained, fossils weather out in relief, Hustedia, Composita, Enteletes, crinoid stems. This seems to be the top of the Plattsmouth.	1.4
11.	Limestone, blue gray weathers cream, two thin beds enclosed by shale partings. Ambocoelia	.5
10.	Limestone, blue gray, weathers yellow to red brown, medium grained, hard, irregular fracture, Rhipidomella, Enteletes, Neospirifer, crinoid stems.	.9
9.	Limestone, blue gray, medium grained, hard, dense, some 2" chert nodules, Syringopora zone at base, fusilinids rare,	1.1
8.	Shale parting, buff, silty	
7.	Limestone, blue gray, medium grained, hard, two beds, wavy bedded, zone of Syringopora in middle of each bed, also Enteletes zone, Caninia, Rhipidomella.	1.
6.	Limestone, blue gray, weathers yellow brown, medium grained, two nodular beds with shale parting and .5 bed above, Fistulipora Juresania, crinoid stems, horn coral.	1.2
5.	Shale parting, blue gray and brown	
4.	Limestone, gray, chert nodules abundant, 1-8 inches in diameter, dark blue gray, irregular, fusilinids scarce. (2 seen) corals	6.1
3.	Shale, blue, silty, thinly laminated	
2.	Limestone, blue gray, fine grained, weathers light blue on quarry face, thick bedded, lower part even bedded upper part wavy bedded, hard, no chert, Lophophyllidium, Rhipidomella, Composita, crinoid fragments, bryozoa, no fusilinids.	8.
1.	Shale, dark blue to black, micaceous, blocky	.4

S. R.

T.

Div. Beds Foss. Strat. Name T. 18 S., R. 16E County Osage

Sec. 12

Locality description- 2.5 miles east of Melvern, Kansas.

Measured by- Maurice H. Wallace Date-

Remarks-

Bed No.	Description	Thickness
14.	Limestone, blue gray, fine grained, wavy bedded, Enteletes	13.+
13.	Covered, some blue platy shale and buff shale.	4.5
12.	Limestone, blue gray, hard, dense, vertical joints, fusilinids, gastropods, crinoid stems.	1.0
11.	Shale, yellow brown, calcareous, fossiliferous, Derbya	.1
10.	Clay, greenish and blacky	1.
9.	Covered	31
8.	Limestone, yellow brown, silty, Knife edge chert, thin beds, nodular.	5.1
7.	Limestone, yellow brown, deeply weathered, silty, earthy, medium grained, chert nodules in top, crinoid stems, Lophophyllidium, no fusilinids.	3.9
6.	Shale, gray, silty	.3
5.	Limestone, yellow brown, deeply weathered, massive ledge, Aulopora, crinoid stems, no fusilinids.	2.6
4.	Clay, gray when dry	.6
3.	Shale, dark gray to black, thin bedded, abundant plant fragments, thin coaly streaks	2.5
2.	Shale, black, slaty, plant remains	.5
1.	Coal	.8

T. S. R.

S. R.

Div. Beds Foss. Strat Name

T. 11 S., R. 18 E County Douglas

Sec.

Locality description- Quarry west of Depot, Lecompton Kansas

Measured by- M.H. Wallace & O.C. Baptist Date- April 3, 1941

Remarks-

Bed No.	Description	Thickness
32	Limestone, gray, weathers buff, medium grained, fusilinids and gastropods, exposed	1.+
31	Limestone, weathered buff, rubbly, shaly, not resistant, fusilinids, gastropods, Dielasma, Hustedia.	2.3
30	Limestone, blue gray, weathers buff, medium grained, fusilinids, bellerophontid gastropods.	.5
29	Limestone, gray to blue gray, weathers white to buff, limonitic stains and crusts, interbedded with greenish gray to buff shale, not very fossiliferous.	1.5
28	Shale, blue gray below, olive green and brown above.	.2
27	Limestone, gray, weathers brown, earthy, irregular bedding, numerous buff shale partings, silty, fusilinids, high spire gastropods, Dielasma, Composita	2.
26	Limestone, greenish gray, earthy, nodular, with greenish clay, fusilinids, Composita.	.4
25	Shale, blue gray, weathers light blue gray, chippy, upper .2 feet olive green, plastic, structurless clay.	2.2
24	Limestone, blue gray, weathers buff to orange brown, deeply weathered, rubbly, earthy, fusilinids.	1.
23	Limestone, blue gray, weathers buff, fusilinids common.	2.0
22	Limestone, weathered buff, rubbly with shale partings, fusilinids, Hustedia.	.5
21	Limestone, blue gray, weathers buff, fine grained, dense some crystalline calcite, fusilinids common in upper part, Syringopora zone at top.	1.5
20	Shale, light gray	.1
19	Limestone, blue gray, weathers buff, calcite vugs, crinoid stems.	.8
18	Limestone, blue gray, two ledges, very cherty, large irregular nodules of blue gray chert containing fusilinids, chert more abundant in lower ledge.	1.3
17	Limestone, blue gray with brown spots, dendrites and small black spots. Single, massive, hard dense bed, fusilinids abundant, crinoid stems, Neospirifer, Hustedia.	1.7
16	Shale parting, brown	.1
15	Limestone, blue gray when fresh but deeply weathered brown, some chert nodules, rubbly, Corals, crinoid stems, Fistulipora.	.8
14	Shale, greenish brown with black streak in middle	.3
13	Limestone, blue gray, very hard, contains irregular dark blue chert nodules, Cuticles common, Rhipidomella common, fusilinids, Dictyoclostus.	.8
12	Limestone, dark blue gray, hard, dense, some dark blue chert, Rhipidomella, fusilinids, Dictyoclostus.	.7
11	Limestone, light creamy gray, dense, medium grained, irregular fracture, weathers concave, contains Composita, Rhipidomella, a few fusilinids.	1.2
10	Limestone, dark blue gray, weathers cream, fine grained, rather even fracture, crinoid stems, Neospirifer, short fat fusilinids.	1.0
9	Shale, buff, calcareous	.05
8	Limestone, blue gray to cream, medium grained, irregular fracture, wavy bedded, fossils weather out in relief but are poorly preserved, Hustedia, crinoid stems, corals, Rhipidomella, Ambocoelia.	3.6
7	Limestone, blue gray, weathers light yellow brown, wavy bedded, lower part rubbly, crinoid stems Derbya, Squamularia.	.7
6	Shale, buff, calcareous, poorly bedded, Ambocoelia, Composita, crinoid stems,	.7
5	Shale, light blue gray, weathers light blue gray, poorly bedded, a few unidentifiable fossil prints.	1.5
4	Shale, dark gray, red brown stains, blocky, banded.	1.0
3	Shale, black, slaty, contains small phosphatic concretions, poorly exposed	3.5
2	Clay, gray, silty	.1
1	Limestone, blue gray, weathers light gray, fine-grained, hard, dense, vertical joints, small fusilinids, gastropods, crinoid fragments.	1.5

S. R. T.

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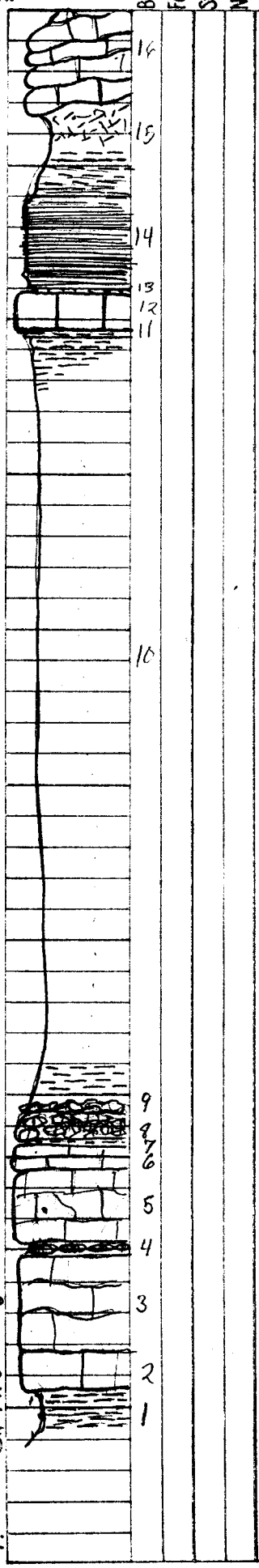
F18

Div. Beds Foss Strat Name T. 14 S., R. 18E County Douglas



Sec. 1

Locality description- Roadcut ½ mile south of Lone Star, Kansas

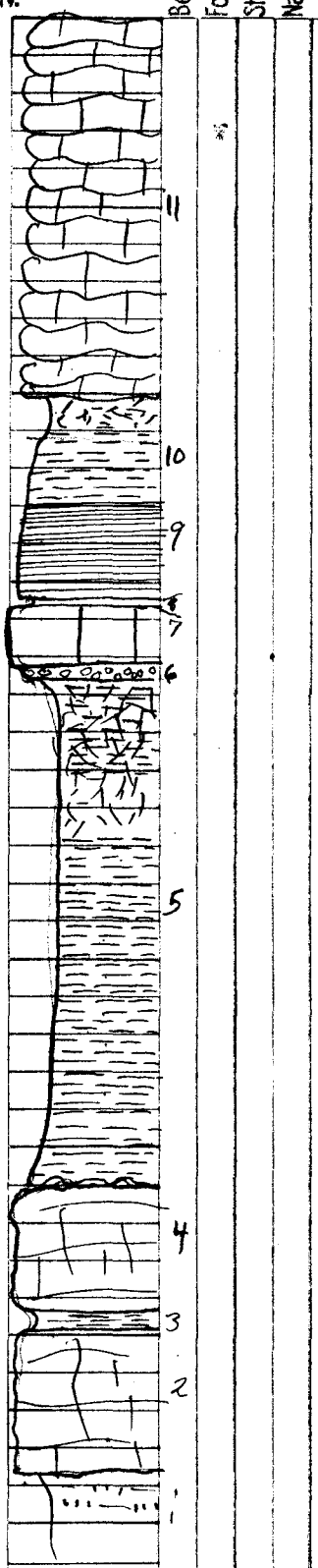
Measured by- Maurice H. Wallace Date- April 3, 1941

Remarks- Excellent exposure of Toronto

Bed No.	Description	Thickness

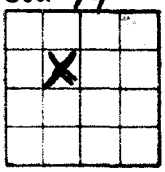
#19

Div. Beds Foss. Strat. Name



T. 14 S., R. 18E County Douglas

Sec. 14



Locality description- Quarry, Lone Star Lake, just west of Dam.

Measured by- Wallace & Baptist Date-

Remarks-

Bed No.	Description	Thickness
11	Plattsmouth limestone	10'+
10	Buff Clay & blue shale	1.2
9	Shale, black, slaty	4.2
8	Clay, dark gray	.1
7	Limestone, (Leavenworth)	1.5
6	Shale, dark gray, contains irregular pea sized nodules in abundance	.4
5	Shale, (Snyderville), dark blue in upper part dark green below.	13.4
4	Limestone (Toronto) The top of the Toronto is well exposed and contains a few gastropods which weather out.	7.6

This section is only about 3 miles from #18 just south of Lone Star and therefore was not measured in detail. This is a good exposure of the Toronto through the Heebner. The interval between the Toronto and Leavenworth at #18 as measured with a hand level is 25 feet while here the Snyderville is well exposed and is only 13.8 thick.

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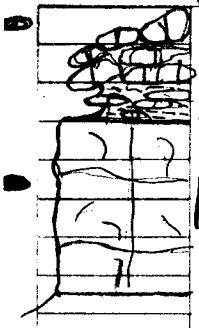
#20

Div. | Beds | Foss | Strat | Name

T. 13 S., R. 19E County Douglas



Sec. 35

Locality description- Quarry 3/4 mi. W. of Three Sisters

Measured by- Maurice Wallace Date- April 1, 1941

Remarks- Locality no. 7707 Good collecting for Toronto

Bed No.	Description	Thickness
4	Limestone, weathered brown, poorly exposed contains abundant fusilinids.	
3	Limestone, Weathered brown, badly weathered, contains crinoid stems, Fistulipora.	1.+
2	Shale and rubbly limestone, Rhipodomella, Crinoid stems, corals.	1.
1	Limestone, light blue gray when fresh, weathers brown, weathers deep, medium grained, some knife edge chert, fossils weather out in relief, Crinoid fragments abundant, corals, Rhipodomella, a few fusilinids throughout the limestone. Vertical joints.	4.3

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. #21 and 21a

Div. | Beds | Foss | Strat | Name

T. 25S., R. 15E County Woodson

Sec. #17

Locality description- 3 miles W. of Yates Center, roadcut on U.S. 54 and on old highway 1/4 mile south.

Measured by- M.H. Wallace Date- May 10, 1941

Remarks- Toronto well exposed

Bed No.	Description	Thickness
15.	Limestone, blue gray, medium grained, thin, resistant, Dictyoclostus, Composita.	.2
14.	Shale, olive gray with buff streaks, weathers light gray to white, bedding well developed, abundant fossils, large Chonetes, Dictyoclostus, Neospirifer, bryozoa, horn coral.	1.3
13	Limestone, blue gray to slightly orange gray, weathers yellow brown, hard, smooth surface, contains crinoid stems but no fusilinids.	3.2
12.	Shale, light blue, plastic, crinoid stems	.1
11.	Limestone, blue gray to orange gray, medium grained, irregular fracture, crinoid stems.	.4
10.	Shale, light blue, plastic, well developed bedding, Chonetes, crinoid stems.	.3
9.	Limestone, blue gray, hard, dense, fine grained, persistent even bed, vertical joints, crinoid stems, Dictyoclostus.	.8
8.	Limestone, blue gray, fine grained, weathers orange brown, fusilinids, Punctospirifer, Enteletes, Neospirifer vertical joints.	2.8
7.	Limestone, with buff shale, limestone, blue gray, fine grained, thin (.1-.3 foot) uneven beds, buff shale partings up to 3 of a foot in thickness. Abundant fossils weather out of shale. Fusilinids, crinoid stems, bryozoa, Chonetes, Neospirifer, Derbya, Lophophyllidium, Dictyoclostus, Composita	1.7
6.	Shale, light buff, calcareous, contains crinoid stems.	.5
5.	Coal, blocky, plant impressions.	.7
4.	Shale and covered, some ash gray underclay at top.	17.5
3.	Limestone, nodular, mottled tan and blue gray, silty, weathers yellow brown, crinoid stems, large clams.	10.5
2.	Shale, thin bedded sandstone, and covered	15.±
1.	Sandstone, massive, cross bedded, fine grained, resistant, parallel joints.	

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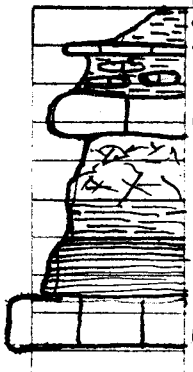
#22

Div. Beds Foss Strat Name

T. 26 S., R. 12E County Greenwood



Sec. 1

Locality description- Walnut creek about 5 miles west of Toronto

Measured by- Date-

Remarks-

Bed No	Description	Thickness
9.	Shale, gray, exposed	1.+
8.	Limestone, blue gray, thin ledge	.2
7.	Shale with nodular limestone, weathered brown, contains crinoid stems.	.9
6.	Limestone, blue gray, weathers yellow brown, hard, dense, irregular fracture, fine grained, sponges common in lower part, Otenosia, crinoid stems, Derbya, no fusilinids.	.9
5.	Clay, yellow or gray weathering, limestone streaks and nodules, contains Ambocoelia, crinoid stems.	.9
4.	Shale, blue gray, platy to blocky	1.5
3.	Shale, dark blue, slaty, iron stained, contains phosphatic concretions which often contain organic remains.	1.8
2.	Shale, gray, clayey	.05
1.	Limestone, hard, dense, dark blue gray, very resistant, top very well exposed in stream bed, joints well developed and well exposed. (Thickness not measured here but ¼ miles east is 1.2)	1.2

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Div. | Beds | Foss. | Strat. Name

T. 26 S., R. 13E County Greenwood

Sec. 9

Locality description- 3 miles SW of Taranto

Measured by- Baptist (plane table) Wallace (rod) Neff (rod) Date-

Remarks- Plane table travers, no dip correction

Bed No	Description	Thickness
9	Limestone, dark blue, hard, dense, fine grained, caps hill, not well exposed.	1.+
8	Shale, red and gray green shale	29.
7	Sandstone, fine grained, glauconitic, light gray, hard, well laminated, weathers blocky.	3.5
6	Shale, gray	2.
5	Shale, maroon	5.
4	Covered	3.8
3	Sandstone, fine grained, thinly laminated, breaks into blocks, light gray, greenish.	2.
2	Covered, mostly shale and siltstone	33.7
1	Limestone, (Taranto)	8.±

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#25

Div. | Beds | Foss. | Strat. | Name

T. 29 S., R. 12 County ELK

Sec. 12

X			X

Locality description- Creekbank and road ditches, 4 mile south of Fall River.

Measured by- M.H. Wallace Date- May 1941

Remarks- Plane Table Traverse

Bed No.	Description	Thickness

13

12

11

10

9

8

7

6

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4

3

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1

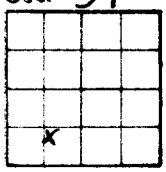
T. S., R.

#26

Div. | Beds | Foss. | Strat. Name

T. 30 S., R. 12 E County Elk

Sec. 31



Locality description-

Measured by- Maurice Wallace Date- May 1941

Remarks-

Bed No.	Description	Thickness
1	Limestone, dark blue gray, fine grained, dense, hard, not well exposed in place.	1.8
2	Covered, some black slaty shale seen	2.3+
3	Limestone,	

T. ... S., R.

Div. | Beds | Foss. | Strat. | Name

T. 30 S., R. 12 E County Elk

Sec.

Locality description- 1 mile N and 1 mile W of Longton.

Measured by- M.H. Wallace, O.C. Baptist, John Neff, Date- May 1941

Remarks-

Bed No.	Description	Thickness
8.	Limestone, dark blue, dense, hard, weathers cream, brachiopeds and gastropods, poorly exposed	1.5+
7.	Covered, shale, siltstone, and sandstone	60.
6.	Covered, limestone in part	6.4
5.	Limestone, mottled bluish and brown, pebbly, crinoid fragments, a few fusilinids, brachiopod fragments,	.6
4.	Shale, yellow, clayey, ferruginous	.2
3.	Limestone, yellowish with bluish splotches and dendrites. Crinoid fragments, fusilinids scarce,	.6
2.	Shale, yellow brown, limestone nodules, fusilinids extremely abundant,	2.+
1.	Covered, shale, siltstone and sandstone seen in this interval, lower 5 feet red shale.	19.

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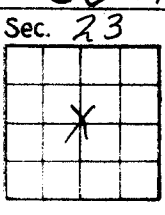
Div. | Beds | Foss. | Strat. | Name

T. 30 S., R. 12 E County Elk

Sec. 23



Locality description- 3 miles north of Longton

Measured by- M.H.Wallace, O.C. Baptist, John Naff Date-

Remarks- Plane table traverse, dip not appreciable E-W

Bed No.	Description	Thickness
12	Limestone, blue gray, fine grained, wavy bedded, about four feet or more exposed in quarry at top of hill.	4.+
11	Covered (estimated)	6.±
10	Leavenworth (estimated)	1.5±
9	Covered	37.
8	Sandstone, fine grained, greenish, thinly laminated calcareous sandstone.	2.
7	Covered	16.5
6	Limestone, hard, no fusilinids, lacy bryozoa, Ambocoelia	1.5
5	Shale, calcareous, very abundant fusilinids	1.±
4	Covered	63.5
3	Limestone, rubbly, fusilinids and Otonosia	1.5+
2	Covered	4.
1	Sandstone, massive	30.

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#29

Div. | Beds | Foss. | Strat. | Name

T. 31 S., R. 12E County ELK

Sec. 15

Locality description- 2.6 mi. S of Longton

Measured by- Maurice H. Wallace Date- May 1941

Remarks- Hand level

Bed No.	Description	Thickness
19	Limestone, blue gray, fine grained, wavy bedded	4.+
18	Shale, lower part black slaty, middle light blue blocky, clayey and yellowish above.	3.9
17	Limestone, dark blue gray, fine grained, dense, hard, vertical joints.	2.
16	Shale, calcareous, buff, Chonetids	.9
15	Shale, clayey, red and gray mottled in lower part greenish gray in upper 6 feet.	10.9
14	Siltstone, olive green, blocky, micaceous.	1.2
13	Shale, red, blocky	4.3
12	Shale, silty, micaceous, mottled red, sts at top.	3.6
11	Sandstone, very fine, micaceous, finely laminated, greenish, hard, well developed mud cracks.	1.0
10	Shale, red, small calcareous nodules	11.7
9	Shale, silty and sandstone, calcareous at top, limestone nodules in upper part, base mottled red.	6.
8	Shale, brick red to maroon, some discolored zones, blocky, cylindrical concretions in lower part.	5.5
7	Shale, silty, olive green when fresh, contains cylindrical calcareous concretions.	1.5
6.	Sandstone, fine grained, buff, hard in places.	22.
5.	Shale, light blue, silty, blocky	3.
4.	Limestone, Conglomeritic, granular, crinoid stems, fusilinids, Ambocoelia, bryozoa.	.1
3.	Shale, olive green, weathers yellow brown, silty.	1.7
2.	Limestone, blue gray, medium grained, dense two ledges.	1.8
1.	Shale, with very abundant fusilinids, crinoid stems, Ambocoelia, Rhipidomella, Chonetes.	.5

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#30

Div. | Beds | Foss. | Strat. | Name

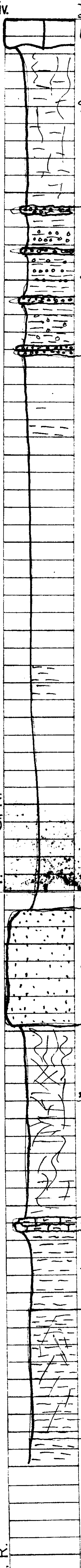
T. 32S., R. 12E County Chautauqua

Sec. 31

Locality description- 7 miles north of Sedan along highway

Measured by- O.C, Baptist, M.H. Wallace, J. Napp. Date- May 1941

Remarks-



Bed No.	Description	Thickness
10.	Limestone, poorly exposed, float blue gray, dense, hard, fine grained.	
9.	Shale, yellow, clayey, poorly exposed	8.8
8.	Pimply shale, algal, calcareous, four distinct ledges separated by shale.	8.6
7.	Covered, mostly shale	31.6
6.	Sandstone, buff, fine grained, hard, well cemented, prominent ledge.	6.8
5.	Shale, yellow, clayey, closely and irregularly jointed.	11.0
4.	Limestone, coquinoid, bluegray, granular, Chonetes, fenestrate bryozoa, crinoid fragments, Marginifera, no fusilinids.	.8
3.	Shale, dark gray, weathered ash-gray, Ambocoelia, large Chonetes, Chonetina, Phrikidonotus, Astartella, Dictyoclastus, large crinoid fragments, Myalinas common at base.	4.6
2.	Shale, dark blue, weathers yellow, blocky	7.1
1.	Shale, red, poorly exposed	1.+

S.K.

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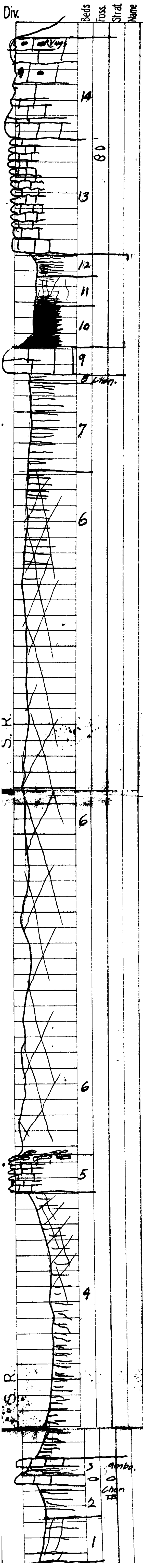


T. 33 S., R. 11 E County Chautauqua

Sec. 23

Locality description- Sedan, 2.0 mi North of, along highway. Good exposure in new road cut.

Measured by- [illegible]

Date- May 1941

Remarks- p 55

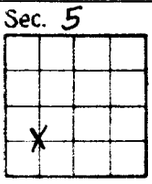
Bed No.	Description	Thickness
14	Limestone. Mottled, dense and coarsely x-line or coarsely x-line at top. Weathers orange-brown which extends inward 2" to 3". Abundant shells make wavy lines in gray. Composita, algae, fusulinids scarce.	6.4
13	Limestone. Dense, hard blue, mottled with some finely x-line. Uneven wavy beds. Most beds 0.1 to 0.3' except 0.8 at base. No shales. Entelets fusulinids in upper part. More tan & sublitho. in upper part. Fossils break out well. (Total Plattsb. 13.7)	7.3
12.	Shale. Very finely laminae, uneven bedded. Neospirifer, Bryozoa, Crinoid fragments.	1.5
11.	Shale. Olive drab, blocky. Weathers lt. tan	1.8
10	Shale. Very dark blue, fissile. Platy, breaks into plates 2" square. (Total Heebner 6.0)	2.7
9.	Limestone. Dense hard blue, weathers buff. A single bed.	1.6
8	Shale. Calcareous, yellow, much Chonetes	0.5
7.	Shale - yellow - blocky	5.3
6.	Shale - Maroon, blocky, clayey. Weathers granular and lt reddish tan.	4 3.7
5.	Limestone. Fresh water. Nodular, silty, blue gray to buff mottled. Banded 0.1 thick especially in upper part. Rubbly	2.1
4.	Shale - Greenish - yellow. Sticky in lower part grading to red in upper	17.0
3.	Limestone. Blue-gray, hard, finely x-line. Two 0.4' beds separated by marly yellow to rusty mottled clay. Ambocoelia, Fusulina in lower limestone, Crinoid fragments	1.3
2.	~~Shale [illegible]~~ Greenish gray. Ambocoelia, Chonetes, Crinoid fragments	[illegible]
1.	Shale - Unfossil. Olive drab, silty, clayey, blocky, weathers buff.	2.8

#33

Div. | Beds | Foss. | Strat. Name

T. 34 S., R. 11 E County Chautauqua

Sec. 5



Locality description- 2½ miles S west of Sedan on 166

Measured by- M. H. Wallace Date-

Remarks-

Bed No.	Description	Thickness

TT 54

Div. | Beds | Foss. | Strat. | Name

T. 35 S., R. 10E County Chautauqua

Sec. 11

Locality description- 1/4 mile west Elgin, roadcut

Measured by- M.H. Wallace Date- May 12, 1941

Remarks- Good Exposure, corals abundant

Bed No.	Description	Thickness
	Sandstone, basal part marine with Lineproductus americana, Derbya, and clams.	15.
	Limestone, thin bed, Fistulipora, Rhombopora, Enteletes, Punctospirifer, Apollocrinus, no fusilinids.	.05
	Covered	21.
	Limestone, blue gray, fine grained, dense, abundant corals in lower part, also Neospirifer, Enteletes, upper part granular.	19.5
6	Covered, may be some limestone	14.
5	Limestone, fine grained, blue gray but weathers deeper than to the north, seems to be slightly coarser grained, weathers yellow brown, pitted, abundant fusilinids.	1.8
4	Covered, mostly shale, thin calcareous Chonetes zone at top.	11.2
3	Sandstone, fine grained, thinly laminated [redacted] upper part covered but seems to be mostly sandstone or siltstone.	9.
2	Covered	9.
1	Sandstone, fine grained, light yellow brown, weathers brown, spotted dark brown.	15.

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Div. Beds Foss. Strat. Name

T. 14 S., R. 20 E County Douglas

Sec. 27

Locality description-

Measured by- Maurice Wallace and Phil Kaiser Date- May 1941

Remarks-

Bed No.	Description	Thickness
6.	Limestone, light blue gray, fine grained, dense, wavy bedded.	8.+
5.	Covered, some black slaty shale and phosphatic concretions	12.5
4.	Leavenworth Limestone, blue gray, dense, hard, fine grained, top few inches weathered buff. Fusilinids, gastropods, Hustedia.	2.6
3.	Shale, greenish gray, clayey, poorly exposed, top few inches calcareous and contains Derbya and Chonetes.	37.6
2.	Conglomerate, composed of limestone pebbles, granules and grains, ferruginous, resistant ledge, worn crinoid stems and fossil fragments.	7.3
1.	Shale & Siltstone with some sandstone	30.+

Plattsmouth

Heebner

Leavenworth

Covered

Snyderville sh.

Lawrence sh.

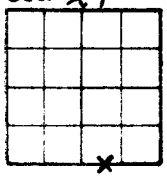
S. R.

" 34

Div. | Beds | Foss. | Strat. | Name

T. 21 S., R. 16E County Coffey

Sec. 21



Locality description- 5 miles east Burlington

Measured by- M. H. Wallace Date-

Remarks-

Bed No.	Description	Thickness
4	Limestone, light blue gray, dense, fine grained, wavy bedded.	5'+
3.	Shale, poorly exposed, some black slaty shale	2'+
2.	Limestone, dark blue gray, hard, dense, fine grained, vertical joints,	.8
1.	Shale, upper part marly and very fossiliferous, Abundant well preserved Derbyas, Myalina.	4.+

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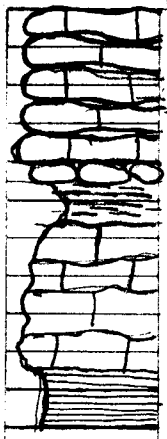
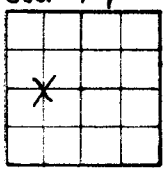
#37

Div. | Beds | Foss. | Strat. | Name



T. 21 S., R. 15E County Coffey

Sec. 14



Locality description- Pecks Quarry, one mile north of Burlington, just east of North side of bridge.

Measured by- Baptist, Naff, Wallace Date-

Remarks-

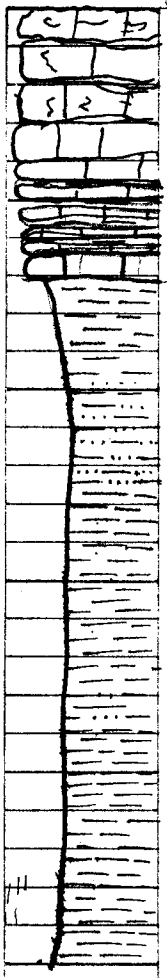
Bed No.	Description	Thickness
5.	Limestone, blue gray to orange gray, hard, fine grained, weathers brown, thin wavy beds, numerous thin shale partings, rather smooth fracture, corals, crinoid stems, Fistulipora, Enteletes. exposed	4.
4.	Limestone, blue gray, weathers gray, nodular, fossiliferous.	.5
3.	Shale, blue gray to dark gray, very fossiliferous, corals, crineids, Hustedia, Punctospirifer.	1,
2.	Limestone, blue gray, weathers bluish to yellow brown, earthy, breaks easily, irregular fracture, wavy blue gray fossiliferous shale partings, limestone contains large white Marginifera, small corals, Fistuliporas, Rhipidomella, Enteletes.	4.
1.	Shale, black, slaty, poorly exposed	1.5

S. R.

T.

#38

Div. Beds Foss. Strat. Name T. 21S., R. 15E County Coffey



Sec.

Locality description- Roadcuts on highway and section line road to the east, 2 miles N of Burlington

Measured by- Baptist, Naff, Wallace Date-

Remarks- Covered interval to top of Plattsmouth at least 6'

Bed No.	Description	Thickness
1	Shale, brown and blue, silty, fossiliferous with Myalina, Euphemites, Euomphalus, Pharkidonotus, good collecting. exposed	18'
2	Limestone, blue gray weathers buff, single ledge, fine grained, dense, smooth fracture	.5
3	Limestone, earthy, weathers brown, slabby with buff shale partings	2.1
4	Limestone, bluegray, weathers brown, hard, resistant irregular pitted weathering, gastropods, crinoid stems, fucoids,	4.5

S. R. T.

#39

Div. | Beds | Foss | Strat | Name

T. 59 N., R. 34 W County Andrew, Missouri

Sec. 32

Locality description- About 2 miles SW of Rochester, Mo.

Measured by- M. Wallace, O.C. Baptist, & J. Naff Date-

Remarks- Section shown us by Mr. Cheyney

Bed No.	Description	Thickness
11	Limestone, light blue gray, fine grained, dense, some chert, poorly exposed.	5.+
10	Covered, some black shale and phosphatic concretions	3.±
9	Limestone, dark blue, dense, hard, fine grained, weathers into rounded boulders	1.
8	Shale, greenish gray, marly, Chonetes and Derbya	1.5
7	Shale, blue and gray, blocky in upper part	20.
6	Shale, dark gray, fissile, surface covered with extremely abundant ostracods. These give the shale a white speckled appearance.	.5
5	Shale, gray, blocky to clayey, abundant small gastropods, this shale contains an abundant well preserved microfauna of clams, snails, holothurian spines, Ammodiscus, Ammodiscoides, Nodosinella, Cytherella, and Amphicites.	.5
4	Shale, blue	9.
3	Conglomerate, angular limestone pebbles, top only exposed.	1.5
2	Covered	3.5
1	Limestone, nodular, algal, shale partings, clams and snails.	3'.

S. K.

T.

40

Div. | Beds | Foss. | Strat. Name

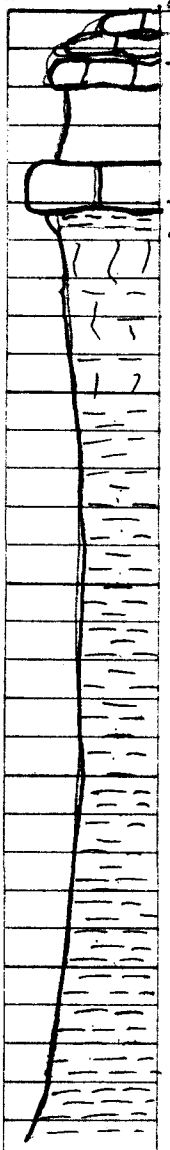
T. 25 S., R. 13E County Greenwood

Sec. 33

Locality description- 2½ miles North West of Toronto, roadcut

Measured by- M. H. Wallace Date-

Remarks-



Bed No.	Description	Thickness
5	Limestone, poorly exposed, contains sponges in lower part.	2.+
4	Covered, some black slaty shale and phosphatic concretions	2.+
3	Limestone, dark blue, fine grained, dense, hard, even fracture.	1.2
2	Shale, calcareous, fossiliferous, Chonetes	.5
1	Shale, greenish gray and red, clayey in upper part,	24.+

S. K.

I.