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A GEOLOGICAL SURVEY OF PALMER SECTION.

THESIS FOR E.M. DEGREE.

BY J.E. BRANTLY.

John Edward Brantly

Engineer of Mines, 1917

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A GEOLOGICAL SURVEY OF SECTIONS 7,8,9,10,11 & 12 OF RANGE 1 WEST AND TOWNSHIP 15 SOUTH, OF ALABAMA.

By J.E.Brantly.

The sections under consideration, which will be known as Palmer Section in this report, are twenty miles north of Birmingham on the Birmingham Mineral branch of the L. & N. Railroad, and one mile south of Village Springs. The six sections make up a strip one mile wide and six miles long that extends east and west across the anticline that is now Murphree's Valley, and contains outcrops of beds from Cambro-Ordovician age to Upper Carboniferous age.

This section is a part of the Alabama Leeds Quadrangle of which a geological survey has been made by Mr. Charles Butts, and the results published in Folio No. 175 and Bulletin No. 400 of the United States Geological Survey.

Within the section there occur beds of coal, iron ore, limestone and chert, the latter two being the only deposits occurring in economic quantities. The limestone is used as flux in the manufacture of iron and steel and the chert as a road building material. In this report, these beds with their intermediate ones, the general topographic and geologic features of the section and the economic importance of each will be discussed.

General Geology.

Topography.

The general topography of the section is of the ridge and valley type, with the exception of the extreme western part which is of the roughly dissected nature characteristic of the coal fields of this part of the state, where the beds are level or nearly so.

The central part of the section is Murphree's Valley, with Village Mountain, Wildcat Cove and Hayes Mountain on the east and West Red Mountain, Sand Hollow, Sand Mountain and the coal fields on the west.

Village Mountain is the highest one of the ridges, attaining a height of seven hundred feet. Murphree's Valley is seven hundred feet above the sea level and Self Creek Valley on the western edge of this section is five hundred feet.

Village Mountain on the east corresponds geologically to West Red Mountain on the west. Pine Mountain, the end of which is just north of Hayes Mountain on the East, corresponds to Sand Mountain on the west. Hayes Mountain contains the same beds as Village Mountain and corresponds to a ridge east of this section.

Stratigraphy.

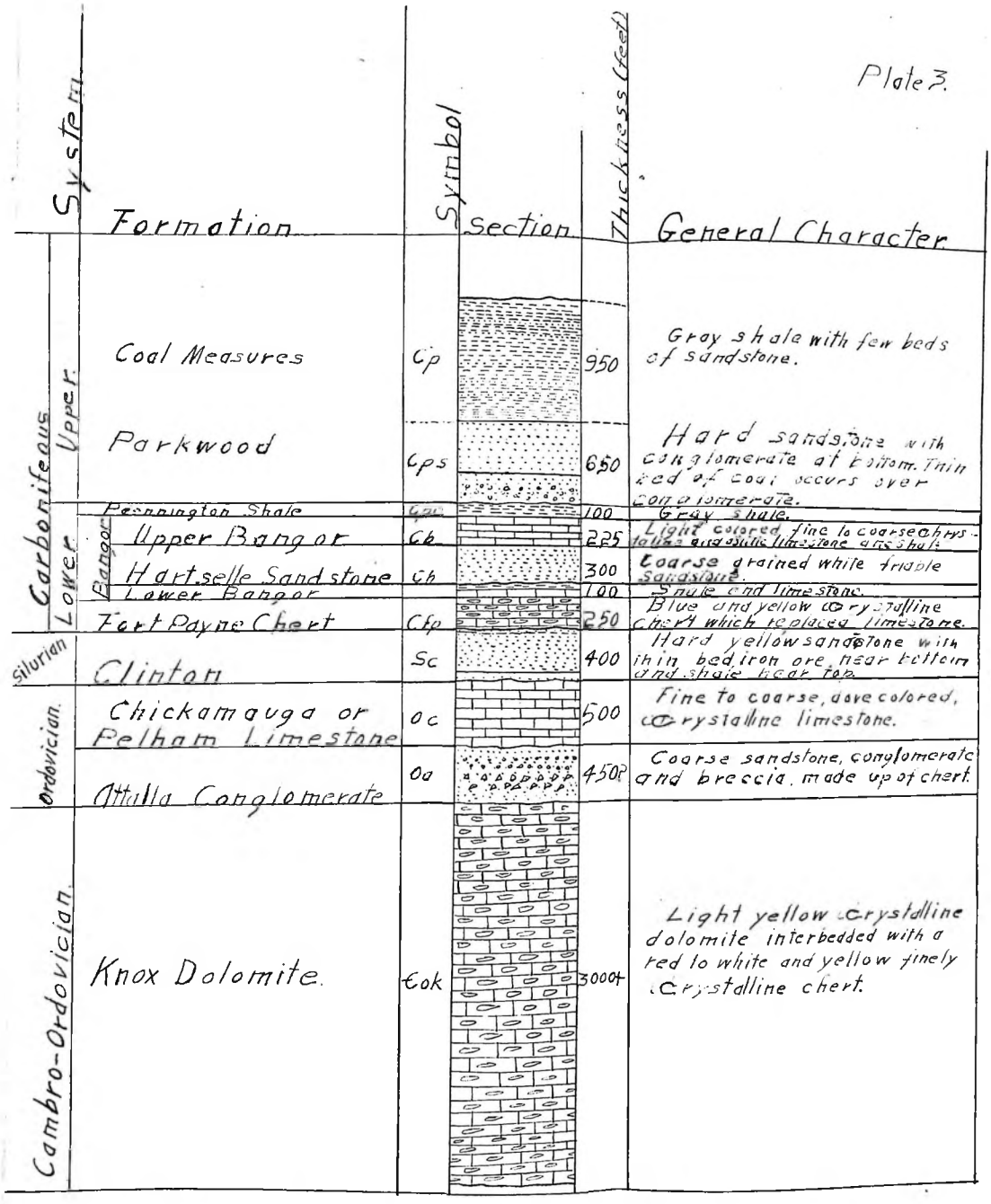
Under this head will be given an outline of the geology of Palmer section with the characteristics of each formation. For the areal distribution and the strike and dip of each formation see Map No. 1.

The rocks exposed range from the Knox dolomite of Cambro-Ordovician age to the Coal Measures of the Upper Carboniferous.

The section is as follows:-

Carboniferous:		
Pennsylvanian:		
Pottsville Formation, Coal Measures		1600 feet.
Unconformity.		
Mississippian:		
Parkwood Formation		40 "
Pennington Shale		100 "
Upper Bangor Limestone		225 "
Hartselle Sandstone		700 "
Lower Bangor Limestone		15-100 "
Fort Payne Chert		250 "
Unconformity.		
Silurian:		
Clinton Formation		400 "
Unconformity		
Ordovician:		
Chickamauga Limestone	Chickamauga	500 "
Attalla	Chickamauga	20- 450 "
Unconformity		
Cambro-Ordovician:		
Knox Dolomite		3000 "
		6435- 6965 feet.

Plate 3.



Section of Rocks West of Railroad.

Cambrain and Ordovician Rocks.

In these series occur the Knox dolomite, the Attalla conglomerate and the Chickamauga limestone. The Knox dolomite is classed as Cambro-Ordovician and the Attalla conglomerate and Chickamauga limestone as Ordovician.

Cambro-Ordovician.

Knox Dolomite.

The Knox formation in this section includes all of the rocks below the Attalla conglomerate. The formation is composed of three thousand feet of beds of dolomite and chert. The dolomite is finely crystalline and of a light yellow color, and the chert is finely crystalline silica ($Si\ O_2$) of various colors from red to white and blue. Some oölitic chert is also present, the oölites being about 1m.m. in diameter.

Mr. C. W. Washburn has made extensive studies of the chert and he concludes that it was origionally disseminated throughout the dolomite but that it was subsequently segregated along the bedding planes of the dolomite by solution and redeposition, replacing some of the dolomite which was carried off, possibly to a lower level. Microscopic examination shows the chert to be finely crystalline quartz.

The chert in weathering breaks up into roughly angular fragments, and the dolomite weathers to red mottled clay.

The Knox occurs in Murphree's Valley from near the

foot of West Red Mountain to near the foot of Village Mountain. No exposures of beds in place were found. Cryptozoans were the only fossil forms found.

Ordovician.
Attalla Conglomerate.

Between the Knox and the Chickamauga there is a great unconformity, showing that a long period of erosion intervenes. That there is an unconformity is shown by the fact that upon the Knox there rests a conglomerate which is,in all probability, made up of chert from the Knox. In some places in the Birmingham Valley this conglomerate rests upon the Ketona dolomite member of the Knox formation, the Ketona being several hundered feet below the top of the formation,showing that a long period of erosion elapsed and then a short period of deposition. This conglomerate is known as the Attalla formation.

The Attalla is made up of coarse sandstone, conglomerate and breccia. After the beds have disintergrated the top soil cannot be distinguished fromthe soil of the Knox, hence it is necessary to find exposures of beds in place in order to know where the Attalla occurs. Such exposures were found in section 9 of Palmer section, where it occurs to a thickness of four hundred fifty feet, which is rather unusual as it is generally from twenty to forty feet thick.

No exposures were found on the west side of the Valley.

View of Outcrop of Attalla Beds in Section 9.

The Attala is usually described with the Chickamauga, but owing to its lithological difference and thickness it is classed and described separately in this report.

Chickamauga (Pelham) Limestone.

Overlying the Attala conglomerate apparantly conformably is the Chickamauga or Pelham Limestone. This formation is 500 ft. thick in the Palmer Section and is made up mostly of a dove colored finely to coarsely crystalline limestone, with a thin bed of light yellow fine grain sandstone and a buff colored limestone near the middle of

the formation. Near the top directly under the Clinton formation the Limestone is reddish in color and coarse grained.

Good exposures of the Chickamauga Limestone are found at the base and very near the top of the Village Mountain. The Limestone stops at the foot of West Red Mountain in Palmer Section but west of Village Springs, two miles north, the limestone reaches nearly to the top of West Red Mountain, and good exposures are found.

The Chickamauga Limestone yields a deep red clayey soil. Some beds near the top are very fossiliferous and contain numerous Brachiopods, Cephalopods, Blastoida, and Bryozoa.

Silurian Rocks.

Clinton Sandstones.

The Clinton Formation lies uncorformably on the Chickamauga Limestone. The Clinton with the exception of the Coal Measures is possibly the most important formation in Alabama, since it contains the Red Hematite ores of the state. In the Palmer Section, however, the ore bed is only about 15 inches thick and hence valueless. The other beds of the Clinton are sandstone, shale and limestone. The Clinton sandstone is of the characteristic yellow color, while the shale is yellow, red, blue, green and purple.

The first 10 feet of the formation at the base is sandstone,

than 45 feet of a red coarsely crystalline limestone and on top of that the ore. The Shale occurs near the top of the formation and is 10 feet thick with 6 inches of limestone between it and the Fort Payne chert. Two miles further north this sandstone is 10 ft thick. The entire Chiton in this section is 400 ft. thick. Much prospecting has been done in the district on Hayes Mountain, Village Mountain and West Red Mountain but no workable ore has been found.

Devonian Rocks.

Although the Devonian system is represented by many thousand feet of rocks in the Northern Appalachian region it is entirely absent in this section. The Devonian in Alabama is represented in other places, however, by some 20 feet of black shale (Chattanooga) on top and sandstone (Frog Mountain) at the base.

Carboniferous.

The Carboniferous is made up of two great series of beds, the Mississippian (Lower Carboniferous) and the Pennsylvanian (Upper Carboniferous or Coal Measures).

The Mississippian is composed of beds of chert, sandstone shale and limestone. The Pennsylvanian is composed of sandstone, conglomerate, shale and coal.

Missippian (Lower Carboniferous) Rocks.

Fort Payne Chert.

With the great unconformity of the Devonian Rocks between , the Fort Payne Chert lies on top of the Clinton Sandstone. Near the base the chert is thick bedded and dark blue in color.

View Showing Thick beds of the Lower Fort Payne.

Farther up, however, the beds get thinner and are interbeddéd with shale. This part of Fort Payne is highly fossiliferous.

The Fort Payne weathers into a yellow sandy soil with undisintegrated fragments of angular chert, the angle approaching 90° . The Chert also weathers into a very

fine grained yellow, porous and light sandstone.

The formation is two hundred and fifty feet thick in this part of the state.

Upper Beds of Fort Payne, Partly Weathered.

Bangor Rocks.

This formation consists of the Lower Bangor Limestone and shale the Hartselle sandstone and the Upper Bangor Limestone and shale.

Lower Bangor.

These beds consist of limestone at the base with shale on top. There are no exposures of this formation in this section but it is indicated by the small valleys that are found where the Lower Bangor should be. This feature occurs without exception, indicating that the formation is about 100 ft. thick in the Palmer Section, and from 10 to 25 ft. thick west of Village Springs. The writer was informed that a core drill, working at Dale Quarry, found 10 ft. of shale between the Hartselle sandstone and the Fort Payne chert.

Hartselle Sandstone.

This member of the Bangor formation consists of a white, friable, coarse sandstone and a hard medium grained sandstone. The coarse sandstone on exposure becomes exceedingly friable and may be crumbled between the fingers. In some parts, however, the sandstone offers great resistance to weathering and stands up in ridges of exposed sandstone as shown on a small scale by the photograph below.

Exposures of Hartselle Sandstone in Sand Hollow.

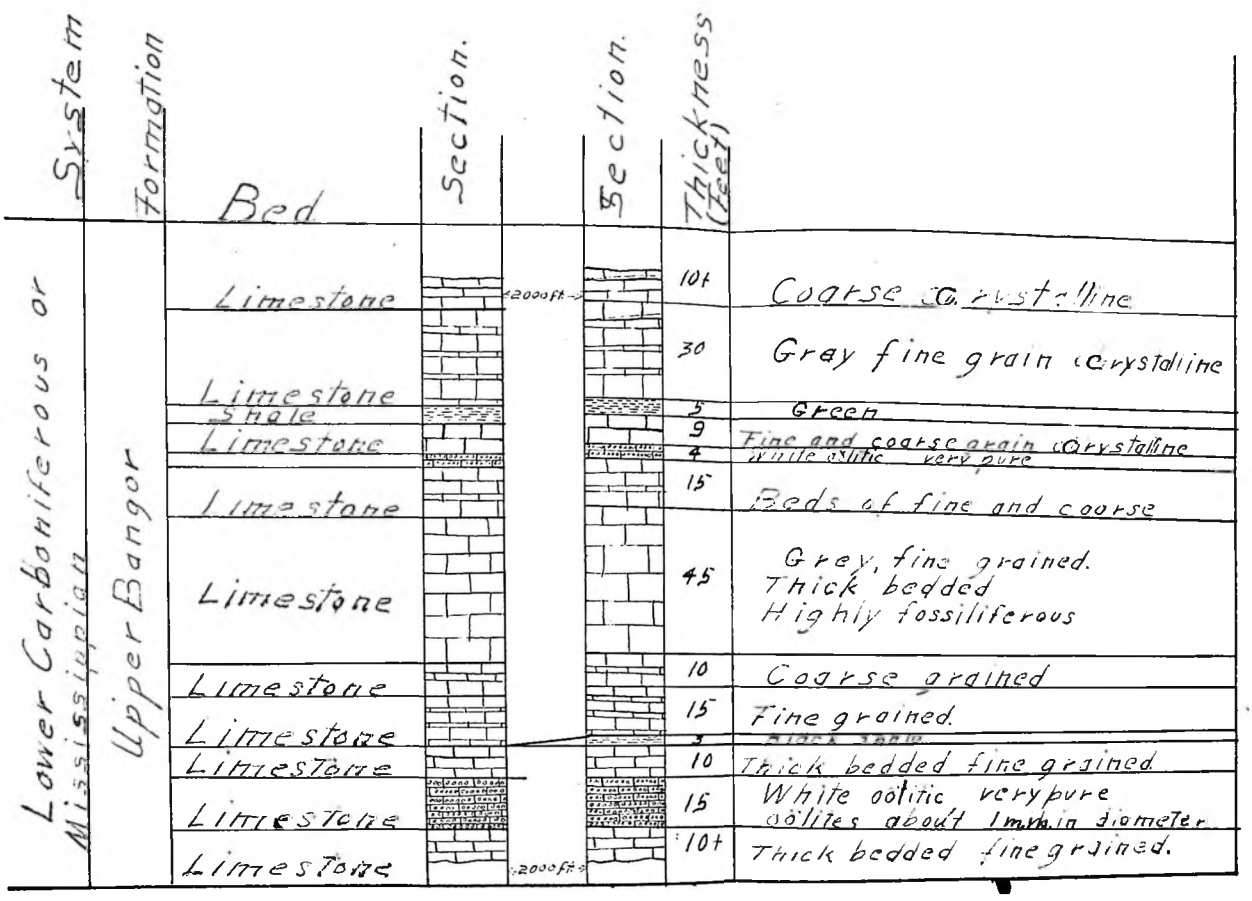
East of Palmer and Village Springs the Hartselle sandstone occurs as a ridge two hundred fifty feet above the bottom of the Valley known as Sand Hollow. This member is about 300 ft. thick in the section studied. The formation is generally thinner in the other sections of the State where it is exposed.

Very few fossils were found in the Hartselle but in places in other parts of the state it is exeeedingly fossiliferous.

Upper Bangor.

The Upper Bangor formation consists principally of limestone with beds of black and green shale fanging from a few inches to several feet in thickness. The limestone is thick bedded and contains generally, thin, less

Plate 4



Two section in the Upper Bangor Limestone at Dale Quarry. The bed of shale shown near the bottom of the right hand section pinches out 2000 feet south of where the section was taken as shown in the left hand section.

than an inch, beds of shale in the bedding planes.

The stone ranges from a light grey fine grained crystalline character to a dark grey, coarsely crystalline character. There are also several beds of a white oolitic limestone. Two of these beds are exposed in the Dale Quarry east of Village Springs, one 4 ft. thick, near the top and one 15 ft. thick, near the bottom.

Two Views of the Upper Bangor Limestone in Dale Quarry.

The Upper Bangor is exceedingly fossiliferous, containing Blastoids, many species of Brachiopods, Cephalopods, Gasteropods and Corals. The Blastoid Pentremites are very much in evidence, particularly in the bedding planes of the limestone.

The best exposures of the Upper Bangor were found at Dale Quarry and in Wildcat Cove along the fault line. A soft sandy rotten limestone was found in Wildcat Cove. This rotten limestone is the weathered product of the upper beds of the Bangor formation and contains Spirifer, Productus, Crinoids, Bryozoa and numerous other fossils.

The Upper Bangor is from 200 to 225 feet thick.

Pennington Shale.

The Pennington formation consists of a gray, thin bedded shale. Only two exposures were found, one in the road leading over Sand Mountain just north of section 11, and the other in the northwestern part of section 7 in Wildcat Cove. The Pennington is 100 feet thick.

Parkwood Sandstone.

The Parkwood is a hard, sparkling, gray sandstone that occurs just above the Pennington shale. This formation is entirely absent in the western part of the section, but occurs in the eastern part, an exposure having been found in the

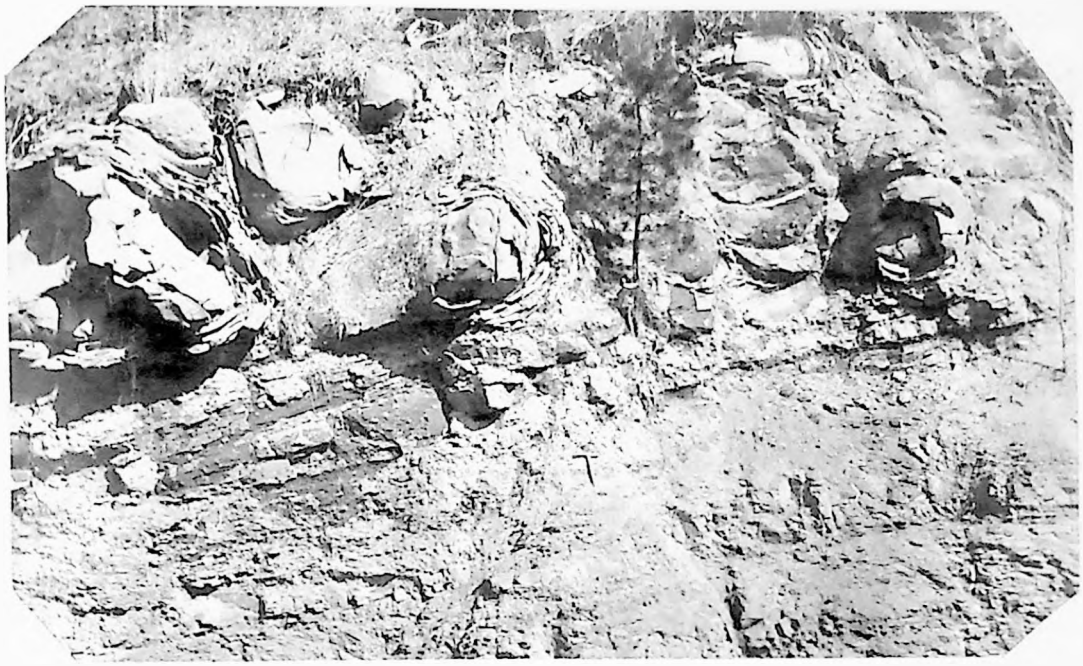
northwestern part of section 7. The Parkwood occurs here for a thickness of about forty feet and then continures in the section north of section 7.

Pennsylvanian Rocks.

Pottsville Formation.

The Pottsville lies unconformably upon the Pennington shale and consists of conglomerate, sandstone and shale. The conglomerate is immediately in contact with the Penningto and is about one hundred feet thick. About 250 feet above the Pottsville-Pennington contact, there is a ten inch bed of coal. The sondstone is usually hard and fine grained and is sometimes banded.

The sandstone is massive in structure, with jointing planes both parallel and perpendicular to the strike. This sandstone is six hundred fifty feet thick and lies under shale which continures to the western edge of the section. The shale is generally of a grayish yellow color, but green, red and purple also occur. Beds of sandstone occur at irregular intervals throughtout the shale. These beds range from ten to fifty feet in thickness. Some of this sandstone shows beautiful examples of spherical weathering, as shown by the photograph on the following page.



View Showing Spherical Weathering of Sandstone in the Coal Measures.

The lower sandstone and conglomerate member is 650 feet thick and the shale, to the western edge of the Section, is 950 feet thick.

The first workable bed of coal outcrops at Bradford, about a quarter of a mile from the edge of the section, and is mined there. The seam is known as the Black Creek Seam.

Structure.

The geological structure of the section is anticlinal with the western beds very much steeper than the eastern. For instance the Clinton of the former dips about 70°, of the latter about 15° .

The northern and western half of the section is uniformally anticlinal with the extreme western beds of

the Coal Measures going into the great Warrior coal field syncline. The extreme eastern part of the section is in the angle of the two great anticlines of Murphree's Valley and Clayton's Cove that make up the still greater anticline of Birmingham Valley,

In Dale Gap west of Village Springs the Clinton beds dip about 25° W. while in Self Creek Gap northwest of Palmer the same bed dips 70° W. This shows that the beds get steeper as you go south until the anticline is overturned to the west a few miles southwest of Palmer.

The axis of the anticline is almost coincident with the railroad track running through the section.

In the eastern part of the section the structure is more complicated owing to two faults and the fact that the beds are in the angle of two joining anticlines. The fault at the end of Village Mountain is a normal fault with a displacement of 1150 feet. The other fault is a normal fault with a vertical displacement of 1300 feet. Each fault gives a horizontal offset of 1500 feet. The two faults appear to have thrust out the angle of joining as shown by Map No. 1. The two faults join in Wildcat Cove.

The western fault caused the strike and dip of the Attalla conglomerate to be changed from a northwest direction to a northeast direction near the fault line. For some distance back from the fault line the Attalla

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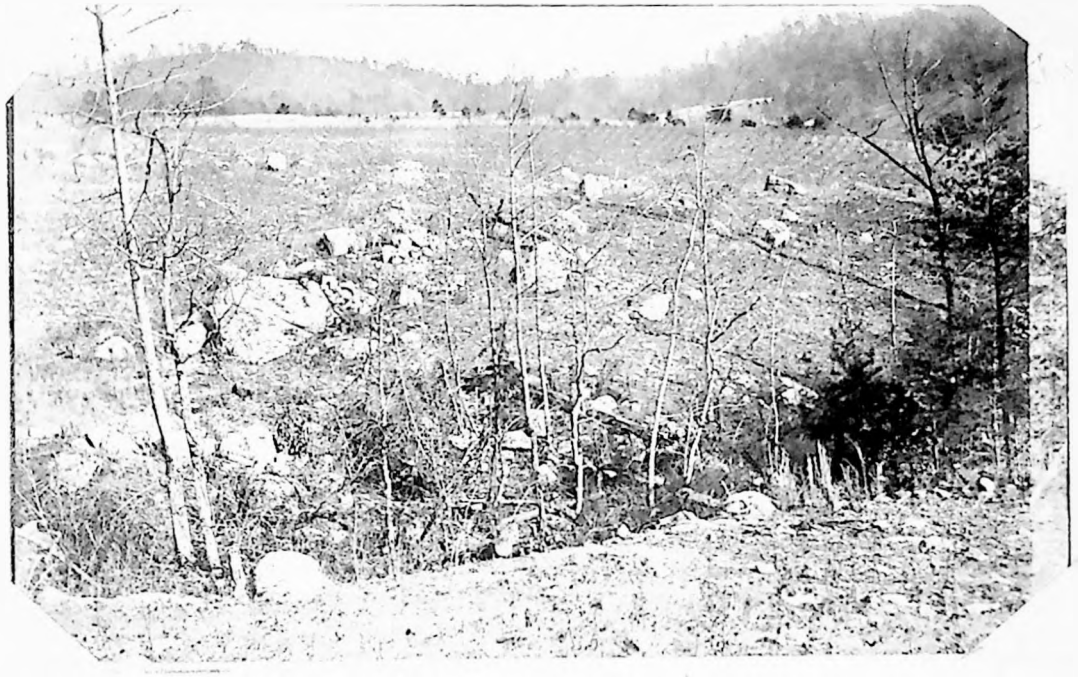


View Showing Disturbance of Hartselle Beds along Fault Line.

There was also a great deal of disturbance through Wore's- Gap. Small hills of fragments of Fort Payne chert and Clinton Sandstone are found along the fault lines and the beds of Hartselle have been entirely overturned or thrown out from the original bedding plane.

The other fault has no such marked disturbance along its course. Along this fault the Upper Bangor beds have been faulted down in contact with the Fort Payne chert.

Disagreements With Previous Surveys.

The greatest disagreement with previous surveys is in the occurrence of the Attalla conglomerate. In the publication by the U. S. G. S. of the Birmingham Quadrangle Folio, the Attalla is mapped as being found only in two small ellipse shaped outliers near the fault in the southern part of section 9. On this survey, however, exposures of beds in place were found in the northern and central parts of the section 1100 feet from the lowest bed of the Chickamauga limestone. The dip of these beds is 45° E. and the strike N. 9° W. In the central part of section 9 the dip of the same beds is 40° E. and the strike N.25° E. The change in strike was caused by the fault. The Attalla through this part of the section is 450 feet thick.

In the western part of the district no exposures of the Attalla were found but it is mapped as occurring with the same thickness as in the eastern part.

In the folio named above the Chattanooga shale and Frog Mountain sandstone of the Devonian is mapped as occurring in the Palmer section. On this survey absolute contact between the Clinton of the Silurian and the Fort Payne of the Carboniferous was found showing that the Devonian is entirely absent.

Other disagreements of minor importance are in the

contacts of the different formations, notably the Fort Payne and Clinton contact along the fault line in Wildcat Cove. The U. S. G. S. geologists map the contact as occurring some 300 feet further northeast than is shown by this report.

Another point of difference is in the Lower Bangor formation west of Village Springs, one and one half miles above Palmer section. The U. S. G. S. maps this formation as having an outcrop 400 feet wide. On this survey, however, the lower beds of the Hartselle were found in place about 25 feet from the upper beds of the Fort Payne, and is so shown on Plate No. 2.

Economics of the Various Formations.

Knox Dolomite.

The Knox Dolomite is not used as a flux owing to the fact that the Dolomite occurs in beds too thin to be quarried. The chert, however, which is interbedded with the Dolomite, is valuable as a road building material and as railroad ballast. The roads through this section of the country are built of this chert and Fort Payne Chert and are excellent highways, being hard and almost dustless and are not easily rutted by the rains.

Chickamauga Limestone.

The Ckickamauga Limestone has been used as a fluxing material in the manufacture of iron. This limestone occurs in a suitable condition to be quarried on the east side of Village Mountain where it occurs to within 100 ft. of the top of the Mountain and is 600 ft. thick dipping from 28° at bottom to 18° at top. The Chickamauga could also be quarried west of Village Springs on West Red Mountain where it occurs to within 100 ft. of the top of the mountain and is 525 ft. thick. The use of this limestone has been practically discontinued in the past few years owing to its high silica content and owing to the fact that better grades of limestone can be quarried from other formations.

Analysis of Chickamauga Limestone from Gate City Quarry.

SiO_2	5.70%	5.50%
Fe_2O_3	1.37%	2.14%
$CaCO_3$	91.12%	91.77%

1. Average Sample from Crusher,-Henry McCally, Analyst.
2. " of four samples.-J. M. Miller. "

From " Report on Valley Regions of Alabama" By Henry McCally.

Clinton Formation.

Next to the Coal Measures this is the most important formation in Alabama, owing to the fact that it contains the veins of hematite iron ore used by the Alabama blast furnaces. The ore ~~vein~~ bed in this section is of no importance however, owing to the fact that it is too thin to be worked profitably (10" to 20").

The rest of the Clinton is made up of sandstone with shale near the top. This shale would probably be valuable for the manufacture of brick, tiling, pottery etc., provided it could be found in sufficient quantity. The shale is only 10 ft. thick in this section and hence of no value. Good exposures found in the railroad cuts both west of Village Springs and Palmer and in the road going over Village Mt.

northeast of Village Springs. In the latter place there are two beds each about 15 feet thick.

ort Payne Chert.

The Fort Payne Chert is valuable as a road building material and as railroad ballast. In some places it occurs for a depth of 100 ft, so broken and loose that it can be handled by a steam shovel without any previous blasting.

Lower Bangor.

No exposures.

Hartselle Sandstone.

The Hartselle sandstone is a white sandstone and is so friable and free from impurities as to be valuable in the manufacture of glass and is so used near Birmingham. Workable exposures are found in Wildcat Cove (Sand Ridge) and in the Valley between West Red Mountain and Sand Mt.

Upper Bangor Formation.

The Upper Bangor consists of limestone and shale with the former by far the major part of the formation. The limestone is valuable as a flux and is so used. It is quarried at Dale Quarry, one mile west of Village Springs, by the Republic Iron & Steel Company. There are also several abandoned quarries north of Dale. They have been

abandoned because of the overburden getting too thick. An elevation through the Dale Quarry is shown on Plate --4--. The bed of shale near the bottom of the quarry pinches out some 1700 feet below where the cross section was made. The beds dip from 21° W. at the bottom of the quarry to 10° W. at the top.

The oölitic limestone in this quarry is said to be one of the best fluxes in the state.

There is an outcrop of this formation in Willcat Cove near the fault line that is suitable to be quarried. The rest of the Bangor in the section is covered.

Pennington.

The Pennington shale is workable in two places, one in Willcat Cove and the other on the east side of Sand Mountain. The shale is, however, without value unless it be for brick manufacture.

Pottsville.

The Pottsville sandstone and shale of this section has no commercial value and there is no workable coal in this section.

Historical Geology.

Knox Epoch.

At the time the Knox was deposited nearly the whole of the interior part of the United States was under water and the Birmingham Valley district was far enough from shore for pure calcareous material to be deposited and during the latter two-thirds of the epoch a great deal of silica. No shale or sandstone occurs in the formation above, hence the distance of the district from shore must have been considerable.

The origin of the Knox is not certainly known. Its being pure dolomite and chert and its great extent and thickness, 3000 feet, makes the study of its origin exceedingly interesting. The immediate source of the Knox was sea water which it is safe to say has always contained in solution the constituents of dolomite, lime and magnesium as carbonates, sulphates and chlorides, but whether it is of organic origin or is the product of precipitation is hard to say. The dolomite could have been secreted by living organisms or could have been precipitated by evaporation or by chemical agencies.

The silica is very likely of organic origin since it would have necessitated a great excess to promote precipitation.

Ordovician Period.

Attalla Epoch.

At the close of the Knox there was an uplift along the Birmingham Valley ahd the Knox beds were subjected to erosian. They were only slightly eroded in some places and in others the beds entirely carried away, so that the Attalla rests locally on the Conasauga (the formation below the Knox).

Before the Attalla was deposited this part of the country was slightly lowered so that sandstone, conglomerate and breccia were deposited on the eroded surface of the Knox. This deposit is the Attalla.

Chickamauga Epoch.

The country was then lowered considerably more, so that this part was some distance from shore or far enough so that limestone and shale might be deposited.

Clinton Epoch.

There is no evidence in this section of an unconformity between the Chickamauga and the Clinton. In other parts of the valley, however, there is an abundance of evidence. For instance on top of Butler Mountain there occur rocks of a later Ordovician Age than the rocks in the Palmer Section.

After the Chickamauga erosian period the land was again submerged to such an extent that sandstone was laid down on top of the Chickamauga. After a period of

...stone, some 65 feet in thickness, the sea ...ground further in and the iron ore ...deposited. The original bed have been low and erosion slow, in order that the iron ... carbonate, and calcareous material might be dissolved out and brought down to the sea and deposited. This is one theory. Another is that the iron was brought down and deposited in the overlying sandstone and was subsequently dissolved out and deposited where the bed now occurs, replacing limestone. This is the replacement theory. After this period the sandstone and shale was deposited above.

Post Clinton Erosion Period.

Evidence was found that there is an unconformity at the top of the Clinton by comparing the beds west of Palmer and those west of Village Springs. West of Palmer at the top of the Clinton there occurs 12 ft. of shale with 6 inches of sandstone above, then the Fort Payne. West of Village Spring there is the 12 ft. of shale then 12 ft. of sandstone and east of Village Spring there is the equivalent 12 ft. of shale then 35 ft. of soft sandstone, 20 ft. hard sandstone, 4" of black shale, 3" of sandstone, 10 ft. of green, purple and yellow shale and then the Fort Payne. The latter three beds may be of the Devonian Age. No fossils were found by which to distin-

which them.

If there was any deposition of Devonian age in this district there is no evidence except that just given. It is here accepted that the Devonian beds were eroded away, since in other parts of the valley the beds are found.

Carboniferous Period.

Fort Payne Epoch.

At the end of the Devonian Period the sea transgressed further in on the land. In fact the whole interior of the U. S. was submerged at this time. The Fort Payne may have been clastic silica or it may have been secreted by organisms with calcareous material. The calcareous material being later replaced.

Bangor Epoch.

The Bangor Epoch includes the time of the deposition of the Lower Bangor, shale and limestone, the Hartselle sandstone and the Upper Bangor limestone and shale. The Lower Bangor must have been deposited not very far from shore because of the deposition of the shale. The sea then regressed slightly and the Hartselle sandstone, 200 ft. thick was laid down. The sea then transgressed slightly

and the Upper Bangor limestone 225 ft. thick was deposited. These beds contain many fossils, showing that the conditions for animal life were particularly favorable.

Pennington Epoch.

After the Bangor, only clastic material was deposited in this region, showing that it was near shore. Shale was deposited during the Pennington.

Parkwood Epoch.

During this epoch sandstone was laid down showing that the sea regressed slightly.

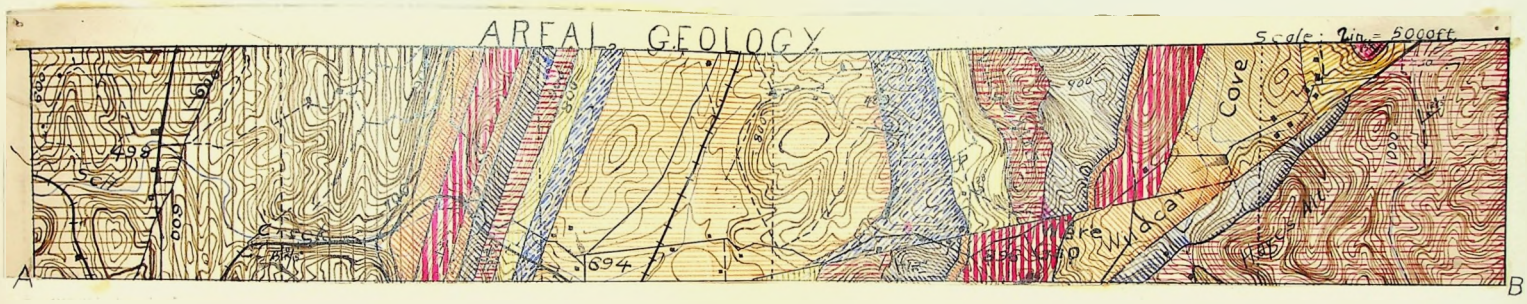
Post-Parkwood Epoch.

There must have been a period of erosion after the Parkwood was laid down for in the eastern part of the section the Parkwood occurs and in the western part it is entirely absent. At this period then this district was dry land.

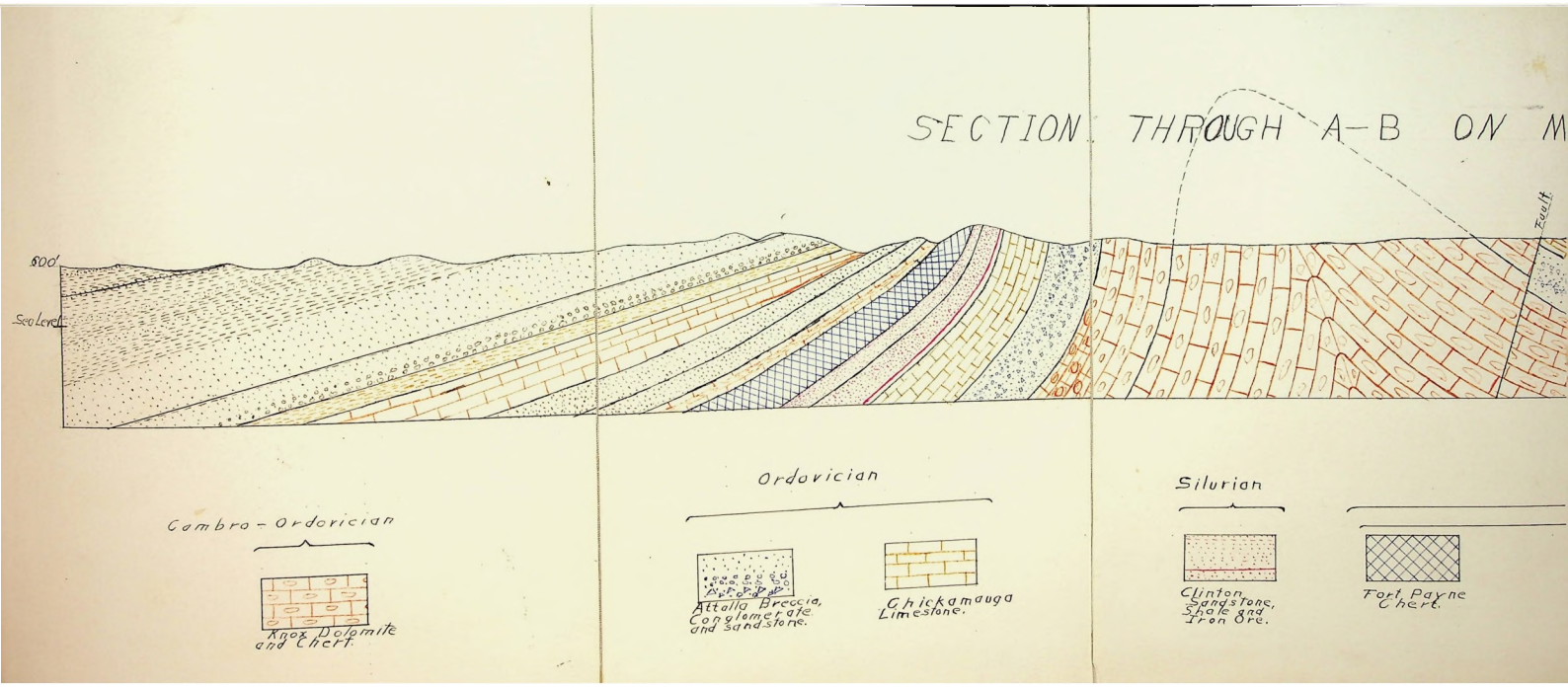
Pottsville Epoch.

The district was again covered and the Pottsville was laid down very near shore. This is shown by the conglomerate and a small bed of coal. Some 650 feet of sandstone was depositedand then about a thousand feet of shale and sandstone with a few thin coal beds. This completes the series of this district.


TOPOGRAPHY
40'
R. 1 W. (Birmingham 1/125000)
Scale 1 in = 5000 ft.
Village Mtn.
Sand Ridge
Cove
Ware Gap
Wildcar
Hayes
MTN.
Creek
Mills Spring
1694

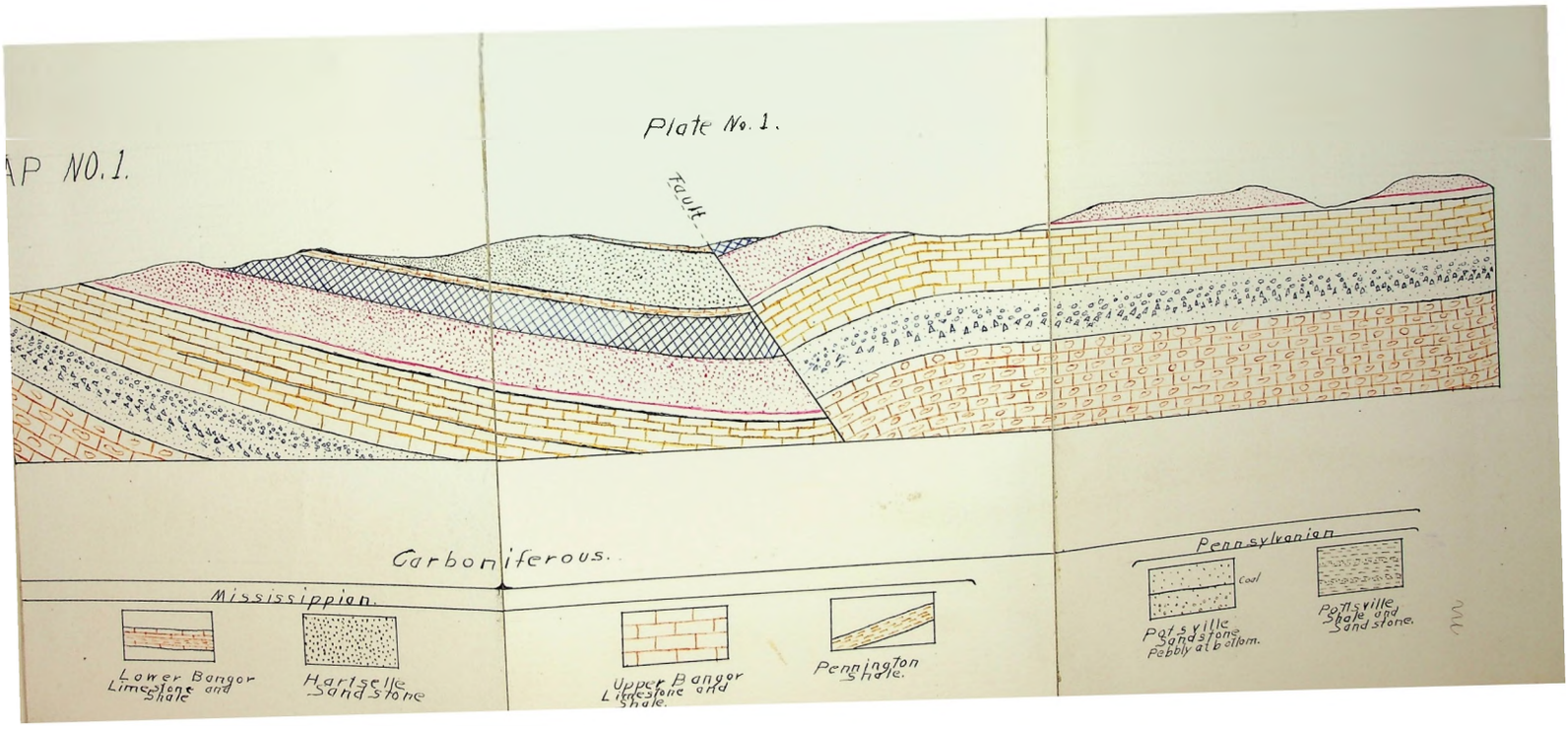

AREAL GEOLOGY
Scale: 1in. = 500ft.
A
B
Cove
Wydeax
Pottville Shale
Sandstone
Pennington
Upper Bangor, Hartselle and Lower Bangor.
Fort Payne
Clinton
Chickamauga
Attalla
Knox
Fault

Map No. 1.


SECTION THROUGH A–B ON M
800'
Sea Level
Fault
Cambro-Ordovician
Knox Dolomite and Chert.
Ordovician
Attalla Breccia, Conglomerate and Sandstone.
Chickamauga Limestone.
Silurian
Clinton Sandstone, Shale and Iron Ore.
Fort Payne Chert.

AP NO. 1.

Plate No. 1.



Section West of Village Springs.

Plate No. 2.

Scale: 1 in. = 1000 ft.