UNIVERSITY OF TENNESSEE

Upon the request of the Committee on Graduate Study the under-signed have examined a thesis entitled

THE CAVES OF EAST TENNESSEE

presented by Berlen Moneymaker

candidate for the degree of Master of Science in Education, and hereby certify that it is worthy of acceptance.

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THE CAVES OF EAST TENNESSEE

A THESIS

Submitted to the Graduate Committee

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in

Partial Fulfillment of the Requirements

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Master of Science in Education

BERLEN MONEYMAKER

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The Chambers of Commerce and similar organizations in the various cities and towns in East Tennessee furnished a considerable amount of information concerning the location of caves. The students of Geology in the University of Tennessee during the academic year of 1928-29 aided the writer in a similar manner. The owners of the caves were at all times very courteous, and cooperated heartily with the writer throughout the course of the survey.

INTRODUCTION

This study was undertaken for the purpose of securing and bringing together scientific information concerning the caverns of the eastern part of Tennessee. Although the presence of such natural phenomena has long been known, the caves of East Tennessee, with one exception, have not previously been described. In recent years, a few of the larger and more favorably located caves have been developed for commercial purposes. These have been widely advertized, and have become well known throughout the eastern part of the State. The caves in East Tennessee that have been developed, or are being developed, are: Craighead Caverns, Cumberland Mammoth Cave, Grand Caverns, Gregory's Cave, Indian Cave, and Lookout Mountain Cave. The opening of a few other caves is being planned, but definite action towards development has not yet started.

East Tennessee, as treated in this report, is co-extensive with the political division of the state known as East Tennessee. It includes that portion of the state lying between the Tennessee-North Carolina State Line and the western boundaries of the counties of Marion, Sequatchie, Bledsoe, Rhea, Roane, Morgan, and Scott. Thus defined, East Tennessee lies wholly within the Appalachian Province. It is divided into three distinct physiographic divisions: the Unaka Mountain Chain, the Valley of East Tennessee, and the Cumberland Plateau.

The Unaka Mountain Chain is one of the ranges of the Appalachian Mountain System. It extends across the eastern part of the State in a northeast and southwest direction. Its lofty crest, which is, for the most part, the eastern boundary of the State, has a general elevation of 5,000 feet. In many places, however, it is much higher. Mt. Guyot, one of its peaks rising to an altitude of 6,636 feet, is one of the highest mountain peaks in eastern North America. That part of the Unaka Chain lying within the State of Tennessee is a belt of parallel ridges. This belt is about 200 miles long and has an average width of about 13 miles. Its width varies, however, from 2 to 20 miles. The Unaka Region is underlain, for the most part, by igneous and metamorphic rocks of Cambrian and Pre-Cambrian age. Owing to the character of the rocks, there are no caves in the Unaka Belt.

The Valley of East Tennessee lies to the west of the Unaka Chain and to the east of the Cumberland Escarpment. Physiographically, it is a part of the Great Appalachian Valley, which extends from the eastern part of New York to the central part of Alabama. It, like the Unaka Range, is about 200 miles long. It varies in width from 55 miles along the northern boundary of the State to 34 miles along the southern boundary. It has an area of about 9,200 square miles. The entire valley is fluted with parallel ridges and their intervening valleys, all of which have a north-

east and southwest trend. The most of the rocks of the valley region are unaltered sedimentary rocks. Many of these are thick limestones in which there are many caves.

The Cumberland Plateau occupies the western part of East Tennessee. It is a part of the Great Cumberland Tableland which extends from the southern part of New York to the central part of Alabama. Its eastern border is sharply define by a steep escarpment. The East Tennessee portion of the Plateau includes within its limits the counties of Morgan and Scott; the larger part of Bledsoe, Sequatchie, and Marion; and considerable parts of Claiborne, Campbell, Anderson, Rhea and Hamilton. This entire district is underlain by unaltered sedimentary rocks. Some of the limestones, especially those of Mississippian age, contain many caves.

Each of the physiographic divisions of East Tennessee is characterized by a distinct type of structure. In the Cumberland Plateau region the rocks are generally more or less horizontal and are unaltered. The rocks in the Valley of East Tennessee have been steeply tilted, sharply folded, and broken by faults. Cleavage and metamorphism are limited to a few formations. Among the metamorphic rocks is the Holston Marble, in which numerous caverns occur. In the Unaka Mountain Chain the rocks are folded and faulted, but cleavage and metamorphism are the most conspicuous features.

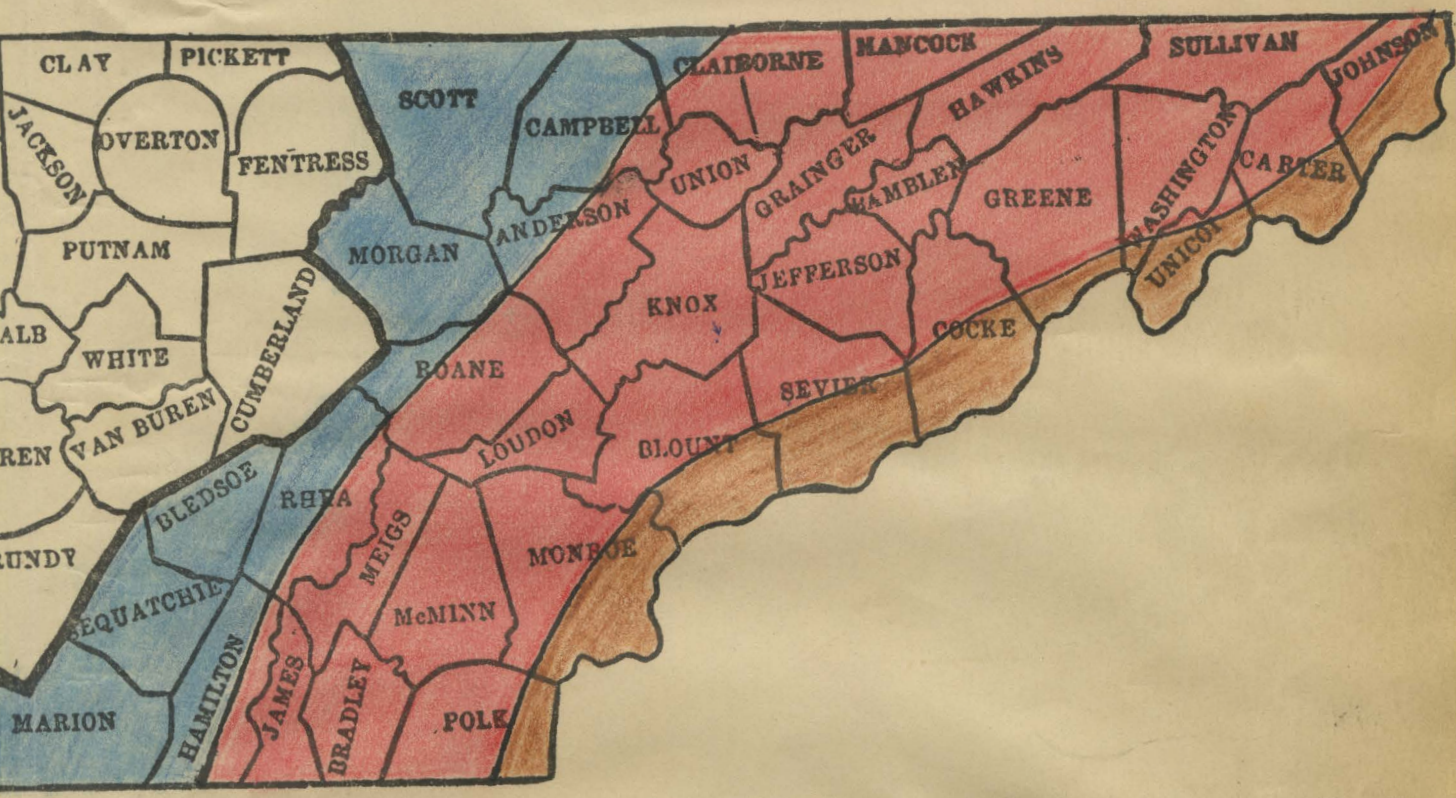

Plate I. Map showing the three physiographic divisions of East Tennessee.

Legend: The Unaka Chain.

The Valley of East Tennessee.

The Cumberland Plateau.

Of the three physiographic divisions, the Valley of East Tennessee contains the most of the known caves in East Tennessee. While the majority of these caves are comparatively small, there are a few extensive caverns in the Valley. Craighead Caverns, Indian Cave and Saltpeter Cave of Campbell County are, perhaps, among the largest in the entire State. The presence of many unexplored caves is indicated by sink-holes.

In the limestone areas of the Valley of East Tennessee, there are numerous sink-holes. These vary in size from a few feet in diameter to areas of many acres. Many of them have been plugged, naturally or artificially, and are now filled with water. Lake Andrew Jackson, known as "Dead Horse Lake" until recently, is one of the largest and best known examples of a plugged sink-hole. The large sink-hole became plugged a few years ago and gradually filled with water. In the course of a few months, water spread over much of the ground covered by the present lake. A house, a barn, a corn crib and other outbuildings were flooded. The buildings have been taken out of the water and the lake turned into a resort lake.

Plate II. Pictures of Lake Andrew Jackson before it was turned into a pleasure resort.

CHAPTER I

THE FORMATION OF CAVES AND CAVE DEPOSITS.

THE RELATION OF CAVES TO TYPES OF ROCKS.

A cave is an underground cavity formed by solution. Since their origin and formation is caused by solution, caves occur only in regions underlain by soluble rocks. All soluble rocks, however, do not favor the formation of caves. Rock salt and rock gypsum are quite soluble, but they seldom occur in masses sufficiently extensive to permit the formation of caves. Moreover, they lack the cohesion necessary to prevent the immediate collapse of the cavities which are sometimes formed in them by solution. Limestones, although less soluble, are more favorable rocks for the formation of caves than either salt or gypsum. They are often quite extensive, and have sufficient cohesion to preserve the caves that are formed in them. The majority of limestones are inherently impermeable to cave-forming ground waters, but are rendered permeable by the presences of crevices and joint cracks.

The most of the caves of the world occur in limestones and the related rocks, marbles and dolomites. A small percentage of them, however, occur in sandstones having calcium carbonate as a cementing material. The Cave Spring Cave, near Knoxville in the Tellico Sandstone, is an example of a sandstone cave.

Some of the largest caves in the world occur in massive limestones containing beds of salt and gypsum. The Carlsbad Cavern of New Mexico, the largest known cave in the United States, occurs in a limestone containing saliferous and gypsiferous beds.

THE FORMATION OF CAVES

Atmospheric water falling as rain unites with carbon dioxide (CO_2), which constitutes three parts in 10,000 of the volume of the atmosphere.[1] In this manner, carbonic acid (H_2CO_3) is formed,

$$H_2O + CO_2 = H_2CO_3.$$

In contact with limestone, this acidulated water brings about a chemical change, calcium bicarbonate ($CaH_2(CO_3)_2$) being formed,

$$H_2CO_3 + CaCO_3 = CaH_2(CO_3)_2.$$

In this manner, the limestone is dissolved and carried away by the flowing and seeping waters. The solvent power of water is usually increased by humic acid, which is taken up by the former as it percolates downward through decaying organic matter before reaching the limestone.

A sink-hole is often the first step in the formation of an underground channel, for it is the catchment basin for the ground-waters.[2] These funnel-shaped depressions

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1. Blatchley, W. S. Indiana Caves And Their Fauna, Twenty-first Annual Report, Department of Geology and Natural Resources Indiana, 1896, p. 121.

2. Nelson, Wilbur A. Monteagle Wonder Cave, Resources of Tennessee, Vol. 2, No. 8, August, 1912, p. 297.

may be formed by the acidulated meteoric waters seeping down through crevices or joint cracks to a lower level, along which an outlet is found. The edges of the crevices at the surface are gradually dissolved and rounded off by solution. Excessive solution of the surface limestone finally results in the familiar sink-hole. All sink-holes, however, are not formed in this manner. Underground waters may enlarge their channels, forming a large cavity immediately below the surface. When this cavity is enlarged to the extent that the roof is unsupported, the latter collapses, forming a sink-hole.

The opening in the bottom of a sink-hole gradually enlarges, allowing an increasing volume of water to enter the underground channel. With an increase in the volume of water entering, solution takes place on a larger scale. When the passage has become large enough to allow the water to flow in a stream of sufficient size, the process of corrasion is added to the solvent action of water, and the enlargement of the passage goes on with greater rapidity.

This gradual enlargement goes on for hundreds or thousands of years, and finally results in a cave.[1] The size of the cave varies in accordance with its age, the amount of water flowing through it, and the solubility

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1. Blatchley, W. S., Indiana Caves And Their Fauna, Twenty-first Annual Report, Department of Geology and Natural Resources of Indiana, 1896, p. 122.

of the rock. Some of the larger caves are characterized by great vaulted rooms, deep pits, high water-falls and streams of water. These characteristics usually occur in combinations. They are all present in the Roaring Spring Cave, which is located three miles northwest of Hall's Cross Roads, in the northwest side of Copper Ridge. The streams of water flowing through some caves are large enough to permit the ready passage of a good-sized row-boat.

Caves in the process of formation or enlargement are said to be "active". Changes in drainage and climate may bring about the complete cessation of all action towards further enlargement of a cave. Such caves are said to be "dead". The majority of the caves of East Tennessee are still more or less active, but some of them are distinctly dead.

THE FORMATION OF CAVE DEPOSITS

Subsequent to their formation, many caves are partially filled with secondary deposits of calcium carbonate. Numerous deposits are seldom, if ever, formed except in cavities near the surface of the earth. The acidulated ground water percolate slowly through the open spaces in the rock until it reaches the roof of an underground cavity. Here it comes in contact with the air in the cave, and at the same time suffers a loss of pressure. As a result, the water evaporates, and calcium carbonate is deposited. Cave

deposits assume many different forms, according to their position in the cave and the conditions under which they are formed. However, four general classes of deposits may be distinguished: stalactites, stalagmites, stalacto-stalagmites, and wall deposits.

A stalactite is a pendant cylindrical or icicle-like mass of calcium carbonate hanging from the roof of a cave. As the slowly dripping, mineral-laden water is evaporated, the mineral matter is deposited. Each successive drop of water deposits a small amount of calcite and in the course of time a stalactitic mass is built downward from the roof.

When the amount of water dripping through the roof of a cave exceeds the amount that can evaporate before it falls, the excess drops to the floor below. There it splashes, and eventually evaporates, leaving behind its mineral matter. The latter gradually accumulates, forming a cylindrical or cone-shaped mass, which is called a stalagmite. This upward protruding mass is usually much greater in diameter than the overhanging stalactite. When conditions are favorable for the long-continued growth of the stalactite and stalagmite, the two grow together to form a column or a stalacto-stalagmite.

Where the waters flow over the walls of a cavern, deposits of a sheet-like character are sometimes formed. Such deposits often attain a considerable thickness. Some wall deposits consist of a single layer of calcite of variable thickness. Due to the appearance of these deposits,

they are called "flow stones". Flow stones are, perhaps, the most conspicuous deposits in the caves in the Holston Marble.

The color of cave deposits is dependent on the purity of the calcite. Pure calcite is colorless or white. Cave calcite is frequently stained by the red oxide of iron, and exhibits many different tints of pink, salmon, red, and brown. Where mud is carried down and deposited with the calcium carbonate, the cave formations assume a dirty brown color.

In dead caves the deposits assume a dry and "ossified" aspect.[1] The calcite in caverns in which the action has ceased for a long time may closely resemble badly weathered bone. The abandoned levels in many of the caves of East Tennessee are characterized by deposits of this type.

White, George W., The Limestone Caves and Caverns Of Ohio, Ohio Journal Of Science, Vol. xxvi, No. 2, 1926, p. 77.

CHAPTER II

EXPLORATION AND MAPPING OF THE CAVES.

EQUIPMENT USED.

The amount and kind of equipment used in the exploration of a cave depended upon the size and importance of the cave. All of the equipment was not used in any individual cave. Following is a list of the equipment used during the course of the field work:

2 Two-celled electric lanterns

2 Flashlights of the focusing type

1 Steel tape 100 feet long

1 Fabric tape 50 feet long

1 Ruler 5 feet long

1 Manila rope 135 feet long and $\frac{3}{4}$ inch in diameter

1 Geologist's hammer

1 Brunton Compass

1 Aneroid barometer

1 Peep-sight alidade

1 15 inch plane table

1 Tripod

A ball of twine

A loose leaf note-book

A Kodak.

EXPLORATION

The caves described in this report, with one exception, were explored by the writer. Some of them were explored by the writer alone. The exploration of each cave presented a more or less particular problem, but the procedure was similar in each case. Complete notes were taken in the field, and from these, the descriptions were written in the office.

The first step in the exploration of a cave was to determine the dimensions of the entrance. On entering the cave, its direction, shape and dimensions were ascertained. The height of the roof was measured, unless it was too high, in which case it was estimated. Notes were made as to the character of the floor. The deposits were examined, and the kinds and number noted. The vertical distance of the floor below the entrance was usually determined. In some of the smaller caves, this was estimated. In the larger and deeper caves, however, it was determined by means of an aneroid barometer. In order to avoid errors arising from variations of the temperature, the barometer was set at "0" at the lowest point in the floor. The barometer was then carried to the entrance and read at once. Before leaving the cave, the formation in which the cave occurred was positively identified.

DIFFICULTIES IN EXPLORATION

There are many difficulties to be encountered in the scientific exploration of caves. It is often necessary to crawl through very small openings, over broken stones or through mud and water. In some cases, it is necessary to climb over steep precipices on ropes. When progress is made in such a manner, considerable care should be taken to avoid being hit by falling stones, which may be dislodged by the rope.

As a general rule, caves are very irregular in shape, and possess very uneven floors and ceilings that are not at a uniform distance above the floor. These factors combine to preclude exact measurements. Many of the dimensions given in the descriptions of the caves of East Tennessee are only approximate estimations. These, however, were checked from time to time with a tape and found to be approximately accurate.

METHODS OF MAPPING

The maps were made by means of a 15 inch plane table, and a tripod. For orientation, a Brunton Compass was used. Inside of the caves, where the compass needle was deflected by the electric current, orientation was accomplished by means of back-sights. The selection of the scale to be used on a map was governed by the size of the cave to be mapped. A small peep-sight alidade was used in the work,

as the light was insufficient to permit the use of a telescopic alidade. Measurements were generally taken by means of tapes 50 or 100 feet long, but in a few cases they were determined by pacing.

Similar methods of mapping were applied to all of the caves mapped. A convenient point near the entrance was chosen as a starting point. The plane table was then set up at this point, and a point on the plane table selected to represent the starting point, and marked by a small pin. An electric lantern was carried back into the cave to a point selected to take bearings on. The man at the plane table took the bearings, and drew a light pencil mark along the graduated edge of the alidade. The distance between the two points was then measured and plotted. The pin on the plane table was moved to indicate the new point. The plane table was then moved to the new point, and oriented by means of a back-sight to an electric lantern at the starting point. The major points of the map were fixed by traverse. After the major points were fixed, the walls and passages were carefully sketched. Bearings were then taken on a new point, and the procedure repeated until the map was complete.

The maps in the field were drawn on heavy paper in pencil. They were inked and transferred to tracing cloth in the office. They were then section-lined and lettered. From these, the prints included in this report were made.

CHAPTER III

TYPES OF CAVES AND THEIR GEOLOGIC AND GEOGRAPHIC LOCATION.

TYPES OF CAVES.

Several types of caves may be distinguished. There are three general types of caves occurring in East Tennessee. These are joint caves, dip and strike caves, and fault caves. Caves formed by solution along a set of joints or a joint system may be defined as joint caves. Those owing their origin to solution along the bedding planes of tilted strata are dip and strike caves. Fault caves are caves formed in rocks made permeable to ground waters by faulting. A cave may be a distinct type or a combination of two or more types. The majority of the caves in the Holston Marble and many of those in the Knox Dolomite are joint caves. Dip and strike caves are numerous in the Knox Dolomite and in the true limestones. Combination types are relatively common in East Tennessee. Combinations of joint and dip and strike caves are the most prevalent of the combination types.

GEOLOGIC AND GEOGRAPHIC LOCATION OF THE CAVES OF EAST TENNESSEE

Mississippian System.

Newman Limestone:

Cumberland Mammoth Cave, 1½ miles north of Elk Valley.
Lookout Mountain Cave, Lookout Mountain.

Saltpeter Cave, 7 miles southeast of Monteagle.

Ordovician System.

Tellico Sandstone:

Cave Spring Cave, ½ mile east of Knoxville city limits.

Holston Marble:

Cherokee Bluff Cave, 200 yards south of Knoxville city limits.
Craighead Caverns, 4 miles northwest of Madisonville.

Parker Cave, 1 mile north of Knoxville.

Sheep Pen Caves, 1½ miles west of Louisville.

Chicamauga Limestone:

Clinton Cave, Clinton.

Gregory's Cave, Cades Cove.

Skeleton Cave, Loyston.

Wilsons Cave, 2½ miles northeast of Loyston.

Cambro-Ordovician Rocks.

Knox Dolomite:

Bennetts Cave, 3 miles northwest of Hall's Cross Roads.

Blowing Cave, 3 miles southwest of Chestnut Hill.

Blowing Spring Cave, 4 miles north of Clinton.

Cambro-Ordovician Rocks (continued).

Knox Dolomite:

Bowmans Cave, 5 miles north of Powell.

Carters Cave, 14 miles northeast of Knoxville.

Grand Caverns, 1 mile southeast of Solway.

Indian Cave, 5 miles northwest of New Market.

Nick Thornton Cave, 2 miles northeast of Chestnut Hill.

Roaring Spring Cave, 3 miles northwest of Hall's Cross Roads.

Rock House, 1 mile northwest of Boyds Creek.

Saltpeter Cave, 1 mile northeast of Coal Creek.

Saltpeter Cave, 8 miles east of LaFollette.

Saltpeter Cave, 5 miles east of Edgemoor.

Sid Henderson Caves, 5 miles east of Powell.

Sink-hole Cave, 4½ miles northeast of Tellico Plains.

CHAPTER IV

ECONOMIC VALUE OF EAST TENNESSEE CAVERNS

Some of the caves of East Tennessee have an economic value. Many of them have long been used as storage places for fruits, vegetables and other farm and dairy products. During the Civil War many of them were worked for saltpeter. While such deposits of saltpeter cannot be profitably exploited at the present time, they constitute reserves that may become valuable in the future. At least one of the caves of East Tennessee, the Nick Thornton Cave in Sevier County, has been worked for calcite. A number of the caves in East Tennessee are likely to be used for the manufacture of cheese, providing the cheese industry develops in this section. In recent years, a few of the largest and most favorably located caves of East Tennessee have been opened to the public for commercial purposes.

Several factors combine to determine the value of a cave to be exhibited to the public. The majority of the successfully operated caverns are large, but the number and beauty of the formations is as important as size. Safety and comfort must be provided. Caves in which there is danger of falling stones, or in which the floors are wet and slippery, are undesirable for exhibition. In order to attract visitors, commercially developed caverns should be near a city or near a highway on which there is much travel. Some of the caves on exhibition in East Tennessee are not so favorably located, but the promoters are attempting to

overcome the disadvantage by turning the surrounding grounds into free camping parks and resorts.

The development of a cave for commercial purposes involves a considerable outlay of capital. The installation of lighting systems and the construction of stairways, walkways, and bridges are the principal items of expense. Proper advertisement is quite expensive. The employment of guides is necessary, except where members of the promoter's family are able to serve as guides.

DESCRIPTION OF COMMERCIALLY DEVELOPED CAVES IN EAST TENNESSEE

CRAIGHEAD CAVE

Craighead Cave is located in Monroe County on the Craighead Highway, five miles southeast of Sweetwater and four miles northwest of Madisonville, in the north side of Roy Ridge, on the property of George W. Kile. It is in the Holston Marble Formation.

The entrance to the cave is about half-way up the northwestern slope of Roy Ridge. It is an opening of irregular shape, 8 feet high and 9 feet wide. This opening has been made by artificially enlarging the smaller original entrance. A second entrance to the cave occurs at a higher point on the ridge. It is said that this opening was the first opening to be used as an entrance to the cave.

Craighead Cave is, perhaps, the largest and most spacious developed cave in East Tennessee. It is a cave of the joint type, and is very irregular in shape. It is penetrable in a southerly direction for a distance of 1,500 feet. The spacious chambers extending in various directions from the main part of the cave have a combined length of 1,665 feet. Their combined length, when added to the length of the main opening gives the entire cave a total length of 3,165 feet. The width of the cave varies from 4 to 130 feet, and averages 76 feet. The ceiling varies from 6 to 80 feet, or more, in height, but the average height is about 25 feet. The floor of the cave slopes away from the entrance at a high angle. However, much of the floor is level, but in many of the large rooms it is rough, being covered with broken stone which has fallen from the roof. In addition to the rocky portions, the levelness of the floor is interrupted in places by hills and depressions. A few of the depressions are deep pits, but the most of them are underground gulleys or gorges.

During some previous period in its history, the cave was filled to a considerable extent with clay and sand, which were carried in from above. Later, a lowering of the water level took place and deep gulleys and gorges were cut into the loose sand and clay.

Much of the floor of the cave is dry, and in some places, it is dusty. A spring rises in the lowest level of the floor near the southern extremity of the cave. The water discharged by the spring flows into a good-sized natural lake in the extreme southern end of the cave at a level 200 feet below the entrance. When the cave was studied by the writer, August 5, 1929, the lake was 100 feet long and 40 to 50 feet wide. According to Mr. Kile, there is considerable variation in the size of the lake. The water of the lake extends back under the rock walls and precludes the determination of the origin of the basin. It is probable that the spring brook has been naturally dammed by falling rocks or clay, or both rocks and clay. This, however, could not be ascertained. The basin may be accounted for by assuming that the lower end of the cave has again subsided and is now below the level of ground water. This assumption, however, does not appear to be warranted by the surface topography, and the change in the level of the ground water is regarded as being less probable than the damming of the stream from the spring.

Cave formations of all types, except rock-rimmed basins, are present in Craighead Cave. Deposits, however, are much less numerous than in most caves approaching the size of Craighead Cave. There are a few very large and beautiful stalagmites in the frontal portion of the cave. Very small stalactites are numerous. They occur in rows and

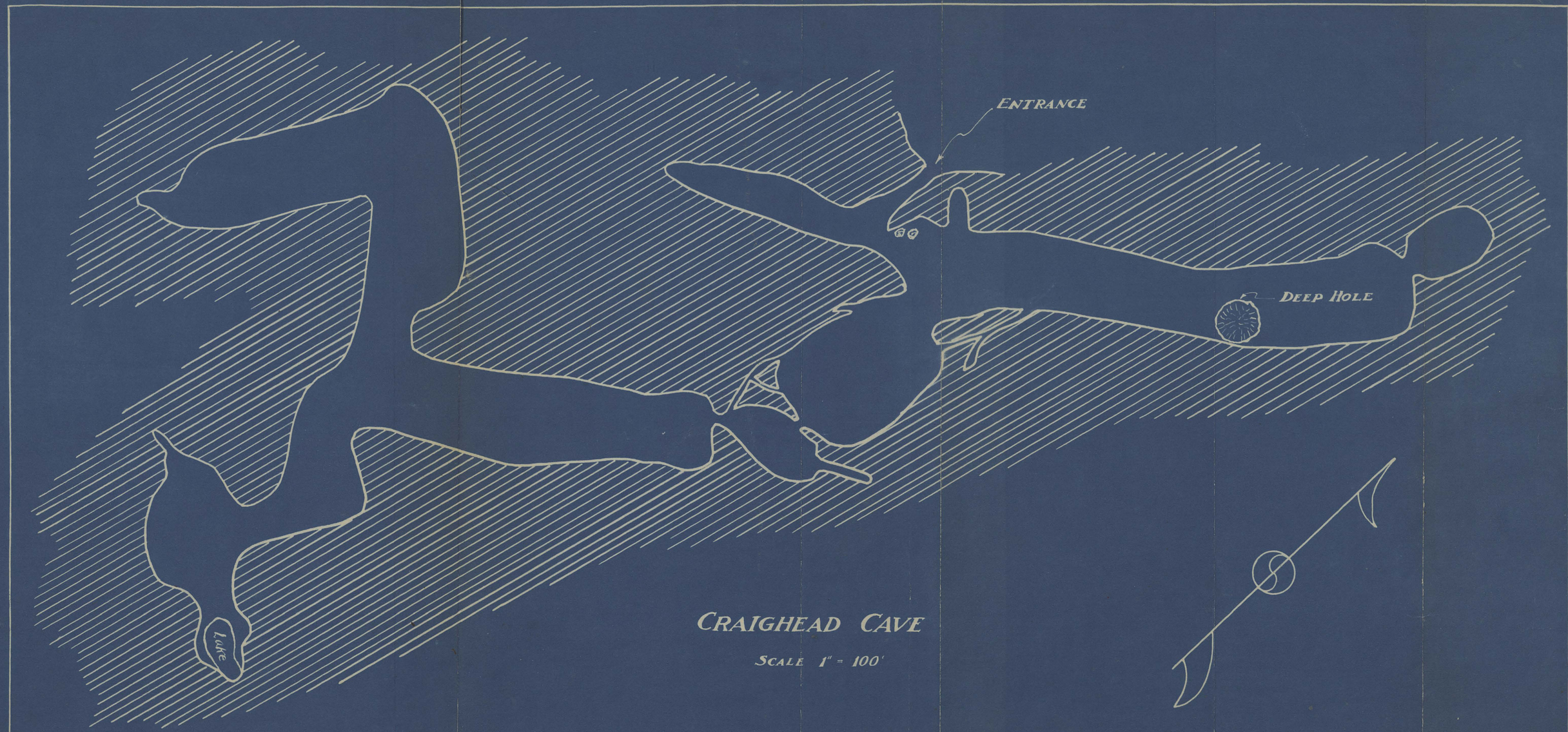
mark the presence of joints. In some of the larger rooms, crust-like deposits of secondary calcite have formed on the marble walls and ceilings, giving them a frost-like aspect. In spite of their fewness in number, formations resembling "bees", "fodder stacks", "monkeys" and other familiar forms are to be pointed out to the visitor by the guides.

Craighead Cave has been known to the general public for a long time. It has frequently been visited by individuals and parties for the last 75 years. Dates on the walls indicate that it was known much earlier. According to Mr. Kile, the cave was worked for saltpeter during the Civil War.

Craighead Cave was opened to the public as a developed attraction June 16, 1929, under the name "Craighead Caverns". The larger rooms have been lighted electrically. A building has been constructed over the entrance, from which stairways extend down to the lower levels of the cave. Guides are always available to conduct visitors through the cave. The terms of admission are:

Adults $1.25

Children $0.50



CRAIGHEAD CAVE

SCALE 1" = 100'

Plate III

CUMBERLAND MAMMOTH CAVE

Cumberland Mammoth Cave is located in Campbell County, one and one-half miles north of Elk Valley and about ten miles south of Jellico in Pine Mountain. It is in the Newman Limestone.

The entrance is in the northwest side of Pine Mountain. It is an opening of semi-circular shape, 5½ feet wide and 5½ feet high. As shown by the map, the cave is of irregular shape. It is a more or less elongated cavity of the dip and strike type. The limestone beds in which it occurs dip eastward at an angle of 33 degrees. The cave has two distinct levels. A small stream of water flows in a northerly direction through the lower level, the floor of which is about 25 feet below that of the upper level.

The cave is 1,130 feet long along its main axis, but the passages extending out from, and under, the main part of the cave increase its total length to more than 1,630 feet. The roof of the main part of the cave varies in height, but averages 12½ feet. The width also is variable, ranging from 6 to 50 feet. It has an average width of 32 feet. The floor of the entire cave is unusually rocky. Much of it is dry and dusty, especially in the upper level. In one passage, it is so dry and devoid of oxygen that dead rats have been preserved for several years.

The cave formations in Cumberland Mammoth Cave are few in number. They consist largely of flow stones, but stalactites, stalagmites and columns also are present. Most of these deposits are confined to a small room in the lower level of the cave.

Cumberland Mammoth Cave has been known to the general public for more than a hundred years. The earth covering the floor was worked for saltpeter during the war of 1812. Fragments of wooden troughs and hoppers are still to be seen in the cave. There are numerous evidences of digging in the floor. The earth from which the saltpeter had been extracted was dumped over the floor of the cave.

The cave is now being exhibited to visitors. It was first opened to the public as the "New Mammoth Cave" in 1921, by Mr. John Brown. The management of the cave was taken over by Mr. H. D. Blankenship in August, 1928. The name was soon changed from "New Mammoth" to "Cumberland Mammoth". Rock steps and wooden stairways have been constructed for the convenience of the visitor. Guides to conduct visitors through the cave are available at all hours, day and night. The cave is illuminated by gasoline lanterns, which are carried by guides and visitors. Among the features pointed out by the guides are: Egypt, a dry dusty passage; Fat Man's Misery, a narrow opening; The Bottomless Pit, an opening connecting the upper and lower levels; The River, an underground lake; and The Devil's

LAKE

ENTRANCE

CUMBERLAND MAMMOTH CAVE

SCALE 1" = 80'

======== LOWER LEVEL

Plate IV

Slide, an inclined passage extending upward from the main level. The terms of admission are:

$0.50 for the course to the "River"

$1.00 for the course covering the entire cave.

GRAND CAVERN

Grand Cavern is located fourteen miles west of Knoxville, and one mile southeast of Solway, in Knox County. It is on the property of Mrs. Margaret Gentry, and is entered a few yards back of her house. The entire cave lies under Copper Ridge, in the Knox Dolomite. Structurally, it is located along the crest of a gentle anticline.

Grand Cavern was probably known to the Indians. It is reported that a number of flint arrow heads were recently found in the cave. These were regarded as indicating that it was frequented by the Indians. The first white man known to discover the cave was Robert Crudgington, a Knox County Pioneer. For many years, the Crudgington family and neighboring families used it as a storage place for fruits and vegetables during the winter months. It was commonly known as "Crudgington Cave", until it was acquired by the Tennessee Caverns Corporation, of Knoxville, for development.

The entrance to the cave is a triangular opening, a few feet below the level of the surface. A newly constructed stairway, consisting of a flight of concrete steps

and a flight of wooden steps, leads from the surface to the floor of the cave, which is at a vertical distance of 40 feet below. The cave is penetrable in an easterly direction for a distance of 875 feet from the mouth. The total cave length, however, is 1,035 feet. The shape of the cave, as shown by the map, is irregular. The width of the cave varies from a few feet up to 130 feet. The height of the ceiling varies from 6 to 30 feet, but averages about 21 feet.

The developed portion of the cave, which is the first to be entered, is divided into two rooms by undissolved pillars of dolomite, and a line of deposits between them. The northern room is a narrow, elongated opening trending northeast from the entrance. The southern room is parallel to the northern room, but is much larger, being both longer and much wider. The floor of the southern room is much more rugged than that of the northern room, but its stalactites are much more numerous.

The more remote portion of the cave has not been developed. It is separated from the developed part by a deep pit and a small area of clay. It consists of two rooms, the first of which is a narrow, elongated opening. The floor of this room consists of clay and rock fragments. The height of the roof varies, but is very low near the eastern extremity of the room. The second room is a large

irregularly shaped room, constituting the end of the cave. The floor of this room consists of thick beds of rock, which have fallen from the roof.

The cave formations in Grand Cavern are numerous, conspicuous, and beautiful. Many of the deposits were broken away be careless visitors several years before the cave was developed, but in spite of this, the cave is still one of the most beautiful caves in East Tennessee. The stalactites, stalagmites and stalacto-stalagmites are large. Many of them are covered with small, slender, dendritic crystals of calcite. The cave is still very active, and many of the broken deposits are being rebuilt by the dripping waters. Deposits of all types have assumed many fantastic forms. Deposits resembling serpents, ducks, elephants, boots, and human hands are pointed out to the visitor by the guide. Grand Cavern was opened to the public as a commercially developed cave June 9, 1929. The larger and most beautiful part of it is electrically lighted. Stairways have been constructed where needed, and sand walk-ways have been made through the lighted portions. At the time visited, many additional features were being planned by the promoters. The cave is being managed by Mr. Henry Carroll. The admission fees are:

Adults $1.00

Children $0.50

GRAND CAVERNS

"An Underground Fairyland"

THE SHOW PLACE OF EAST TENNESSEE

Electric Lights

Concrete Steps

Walk-ways

Educational

Adults $1.00

Children Under 15 50c

No War Tax

Recreational

IT SEEMS TOO GIGANTIC FOR EVEN NATURE TO MAKE

Located 14 Miles West of Knoxville, Near Byington

ON MACADAM ROAD

One of America's Most Beautiful Caverns

Plate V. Picture of Formations in Grand Caverns.

GRAND CAVERNS

SCALE 1" = 80'

GREGORY'S CAVE

Gregory's Cave is located in Blount County, at the base of Rich Mountain in Cades Cove, on the property of Mr. J. J. Gregory. It is in the Mosheim member of the Chicamauga Limestone, just above the Knox Dolomite.

Gregory's Cave has been known since the Cades Cove region was first settled. While there are no definite records of the cave being known to the Indians, it is probable that they knew of it. The Gregory families have long used it as a storage place for fruits, vegetables and other perishable foods. According to Mr. J. J. Gregory, the temperature of the cave varies from 40 degrees in the summer to 46 degrees in the winter.

The cave is distinctly a joint cave. As shown by the map, it is an irregular, elongated opening, having an east to west trend. It is 590[1] feet long, and varies from 30 to 60 feet in width, but has an average width of 43 feet. The height of the roof above the floor varies from 8 to 30 feet, but the average height is about 19 feet. The floor is about 6 feet below the level of the surface at the entrance. It is covered with moist clay. Pools of water occur at various places in the floor during wet weather, but the only permanent pool in the cave is the "Fountain of Youth", which is located near the remote end of the cavern.

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1. The total cave length is approximately 700 feet.

Formations of all types are numerous and conspicuous in Gregory's Cave. The floor is thickly studded with stalagmites of various sizes. Some of these stalagmites are unusually large for an East Tennessee cavern, having diameters of 10 or 12 feet. The floor around some of these consists of numerous adjoining rock-rimmed basins, which contain water during rainy weather. The stalactites and wall deposits are numerous and beautiful. In places the stalactites and stalagmites have met, forming large columns or "pillars". Some of the wall deposits are covered with fine wart-like deposits closely resembling fish roe. The deposits of each type have assumed many peculiar forms. Formations resembling frogs, sheep, lions, turtles, serpents, fishes, base ball gloves, bananas and hippopotamuses are pointed out to the visitor.

Gregory's Cave has been developed commercially. It was opened to the public July 10, 1925. A Delco Lighting System has been installed, the low places bridged, and other conveniences provided. Guides are available for the visitors. Adults are charged an admittance fee of $0.50, but children are admitted free of charge.

GREGORY'S CAVE

SCALE 1" = 40'

Plate VII

INDIAN CAVE

Indian Cave is located five miles northwest of New Market, on the western side of the Holston River, in Grainger County. It is easily accessible from New Market, over a road consisting of three miles of pike and two miles of well kept dirt road. The river is crossed on a ferry, which is maintained by the Indian Cave Park Association, of which Mr. E. E. Wooten is president.

The cave is one of the largest caves in East Tennessee. It has been known to the white man ever since the surrounding portion of the Holston Valley was settled. It had, perhaps, been known to the Indians long before. According to Mr. Wooten, there was a village of Cherokee Indians just west of the cave. Indians from this village are said to have used the cave as a place of refuge when pursued by the white man. It appears that the same Indians sought shelter in it during inclement weather. The fact that the cave was frequented by the Indians has given it its name.

There are two natural entrances to the cave, both of which are in a bluff along the Holston River. The smaller of these openings,which is now enclosed by a barbed wire fence, is the natural outlet for a stream which flows through the cave. The larger opening is used primarily as an entrance, but a small part of the stream has been

artificially directed through it. This opening is about 40 feet wide and 30 feet high and is located about 20 feet above the ordinary level of the river.

Indian Cave is distinctly a joint cave. Its main axis strikes along a set of joints, which is intersected by another set at right angles. As shown by the map, the cave is an elongated opening in the Knox Dolomite. It is 4,865 feet long, and varies from 40 to 135 feet in width, having an average width of about 56 feet. In height, it varies from 5 to 50 feet, but averages 21 feet. The floor is practically level most of the way through. A good-sized stream of water meanders through the entire cave, but disappears from view four times in traversing the cavity.

The cave formations in Indian Cave are large and beautiful. The stalacto-stalagmites are the most conspicuous and attractive deposits. Considering the size of the cave, however, they are comparatively few in number. The formations have taken many odd forms. The visitor sees deposits resembling the Statute of Liberty, the Madona, birds, monkeys, and many other forms. The "Church" and the "Chimes" are perhaps the most interesting features of the entire cave.

Indian Cave has been developed for commercial purposes. It was opened to the public May 30, 1924. It is electrically lighted and is provided with guides. The

stream has been bridged at 14 points and a dry walk-way constructed through the entire cavern. It requires two hours and thirty minutes to traverse the cave. The grounds around the cave are being used as a resort site. Admission to the grounds is free, but for entrance to the cave, the following fees are charged:

Adults ..... $1.00, plus 10 cents tax

Children $0.50

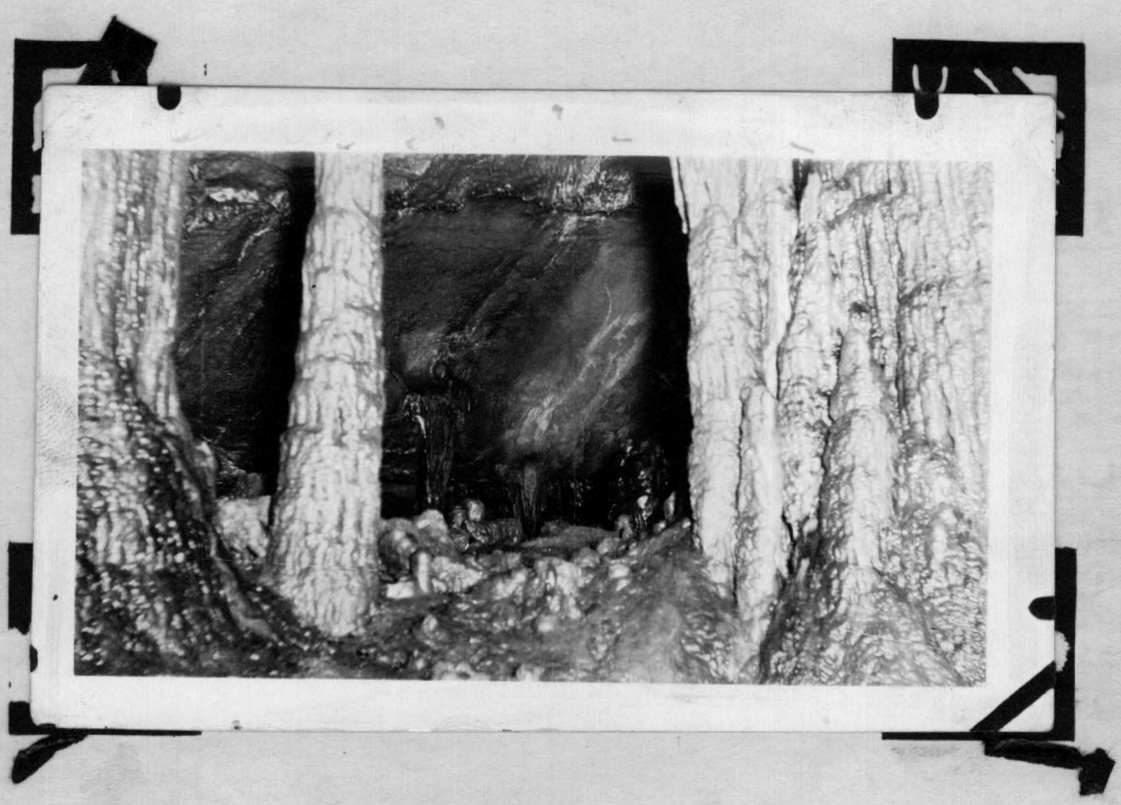


Plate VIII. The "Church", Indian Cave.

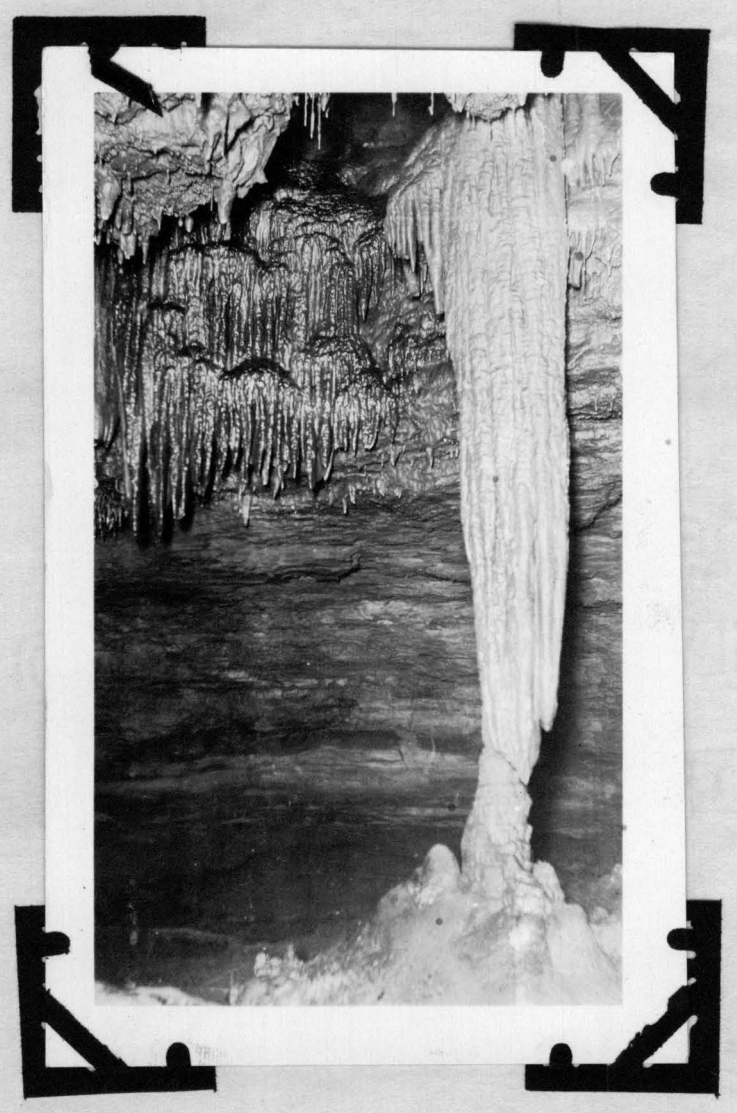
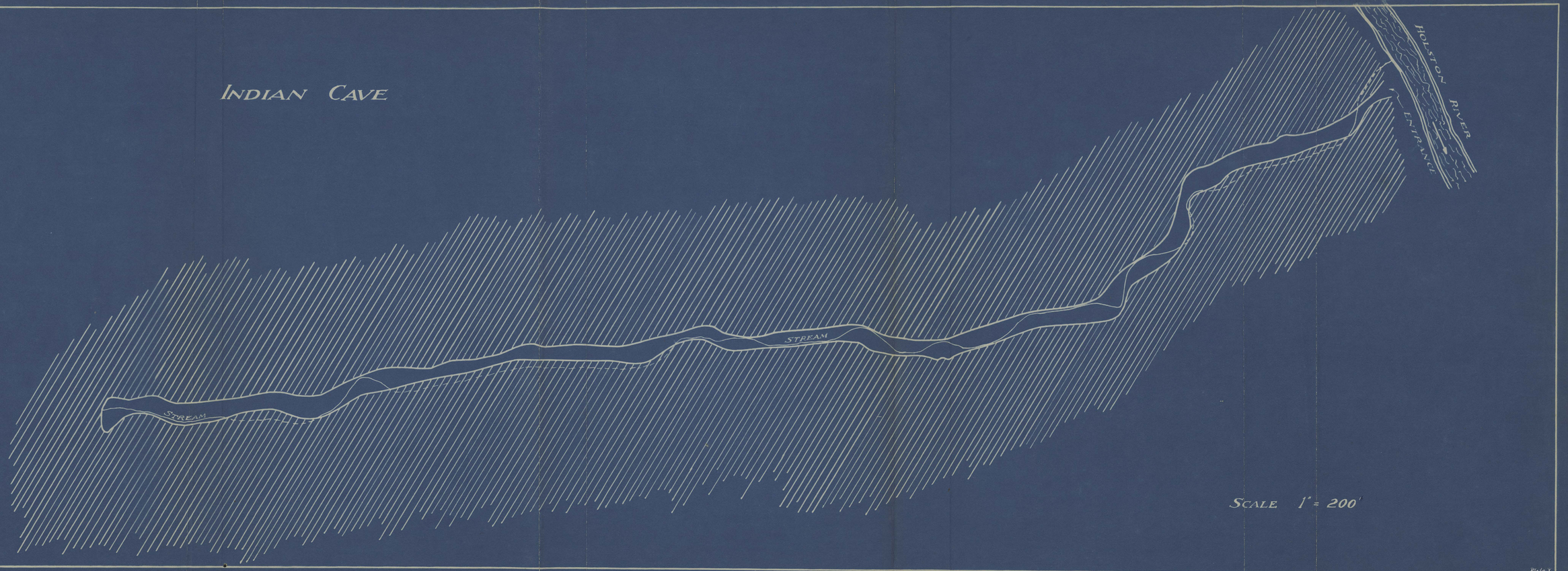


Plate IX. The "Chimes", Indian Cave.

INDIAN CAVE



SCALE 1" = 200'

Plate X.

LOOKOUT MOUNTAIN CAVE

Lookout Mountain Cave is located in Hamilton County in the northern end of Lookout Mountain, southwest of Chattanooga and northwest of St. Elmo. It is in the Newman (Bangor) Limestone.

The entrance to the cave is on the main highway up the Mountain, at an elevation of less than 500 feet above the Tennessee River at Moccasin Bend. This opening is an artificially excavated shaft. The natural entrance, which is at a lower level, has been artificially closed.

The cave was not fully explored by the writer on account of his progress being barred by the work of development. According to Mr. Leo Lambert, Secretary Manager of the Lookout Mountain Cave Company, the cave is a narrow, elongated opening with an unusually high ceiling. Much of the cave is said to be still unexplored. Its extent has been estimated up to many miles, but it is probable that its extent has been greatly exaggerated. There are two main levels in the cave. Mr. Lambert states that the first and second levels are 260 and 415 feet, respectively, below the surface. The first level was probably never entered by man until it was broken into by workmen excavating the shaft December 28, 1928. The majority of the formations of the cave are in the first level. The lower level has long been known to the public.

There are numerous names and dates on the walls of the cave at this level. These appear to indicate that the cave was known as early as 1833, and that it was used by both the Federal and Confederate Soldiers during the Civil War.

Lookout Mountain Cave is being developed for commercial purposes. A shaft has been sunk from the surface to the lower level of the cave, which is stated by Mr. Lambert to be 415 feet below the surface. A beautiful building, Cavern Castle, is being erected over the shaft and will house the cave elevator. The elevator will serve the building as well as both levels of the cave, and will travel through a total distance of 435 feet. Mr. Lambert is of the opinion that the elevator to be installed will accommodate from 300 to 500 people per hour. The cave is to be electrically lighted and provided with guides. The present plans are to open the cave during September, 1929, providing that the entrance building can be completed by that time. The admission fee will be $2.00.

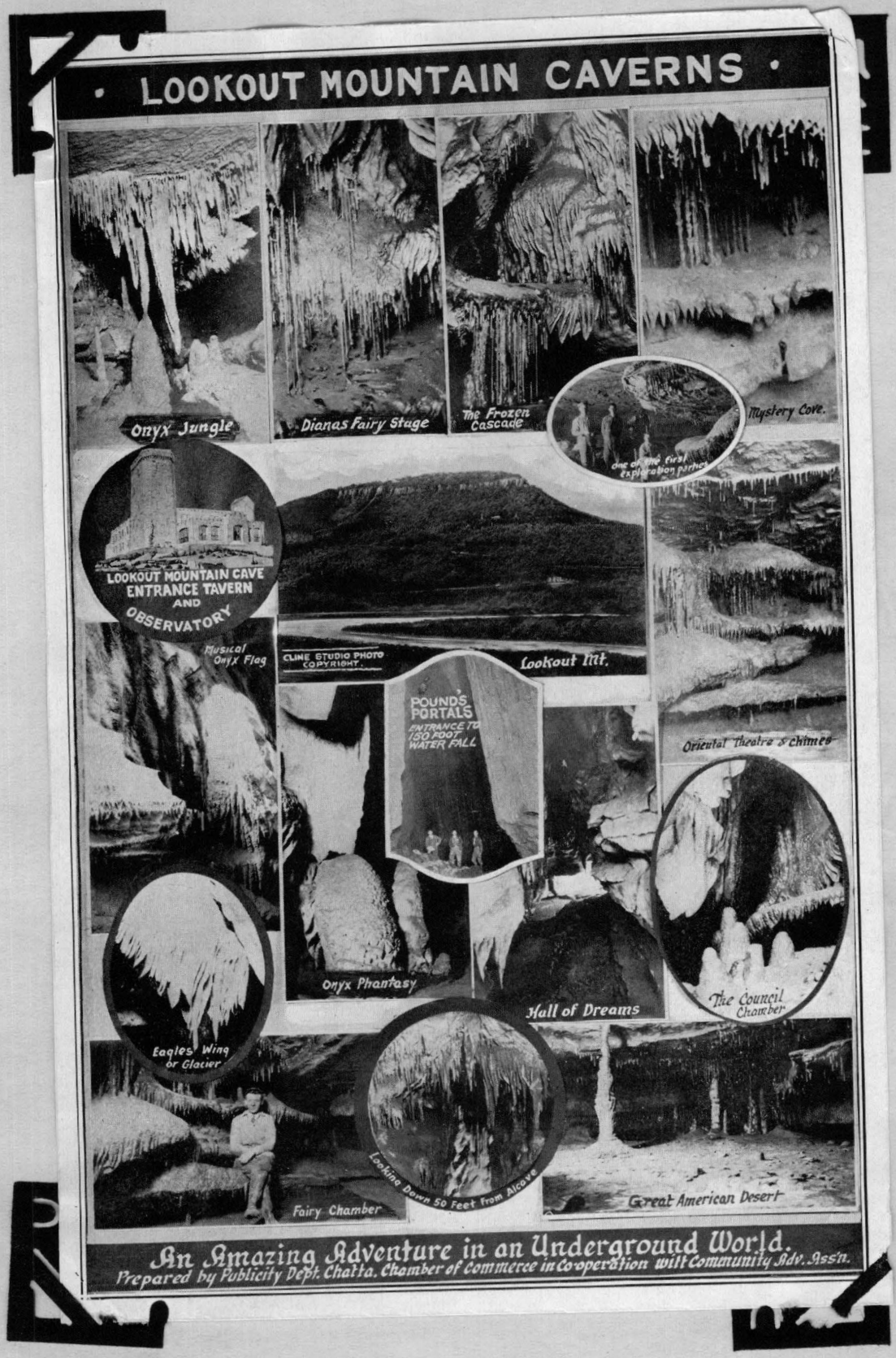


Plate XI. Scenes from Lookout Mountain Cave.

CHAPTER V

REPRESENTATIVE UNDEVELOPED CAVES OF EAST TENNESSEE.

SALTPETER CAVE (CAMPBELL COUNTY)

Saltpeter Cave is located in Campbell County eight miles east of LaFollette in the southern base of Longmire Ridge, on the property of Mr. J. P. Meredith. It is in the Knox Dolomite.

The cave is the largest known cave in East Tennessee. It is a long winding and branching cave of the joint type. The entrance, which is now enclosed by latticework and a gate, is a semi-circular opening 40 feet long and 12 feet high. Immediately back of the entrance, there is a spacious room about 190 feet long and from 40 to 60 feet wide. Back of this, the most of the cave is much narrower. The combined length of all of the penetrable passages is at least 5,149 feet. The average width for the entire cave is about 25 feet. The ceiling is unusually high, probably averaging between 60 and 70 feet. The most of the floor is dry, and in places it is dusty. There are a few places, however, in which the dripping water keeps it wet. Much of the floor is approximately level, but there are several places where it is necessary to progress up or down stairways.

There are several cave formations in Saltpeter Cave,

especially in the most recently discovered portion of the cavern. All types of deposits are present, with the exception of rock-rimmed basins. Many of the formations are still in the process of formation, especially in the most remote portion of the cave, where the roof approaches the surface. The most of the deposits are black in color as a result of natural staining.

During the Civil War, the earth on the floor of the cave was worked extensively for saltpeter. The remnants of several wooden troughs and hoppers are still in the cave. Wagon tracks and markings where the walls of the cave were scratched by the wagon wheels are still to be seen in the cave several hundred feet back of the entrance. Numerous white chalk-line deposits occur in the dryer portions of the cave. Recent prospecting for saltpeter has been carried on by Mr. Meredith.

At present, the cave is being used by the entire community as a storage place for fruits and vegetables. In the dry places, such perishable farm products as sweet potatoes are said to keep from year to year.

Saltpeter Cave has not been developed as an attraction. It is reported, however, that plans are underway to develop it at some future date. Several stairways have already been constructed at places where they are needed. The cave, in itself, is worthy of development. If the disadvantage of its location can be overcome, its development may be well worth while.

BLOWING CAVE

Blowing Cave is located on the property of Cal Derrick, three miles southwest of Chestnut Hill; one mile south of the Sevier-Jefferson County line, near the foot of English Mountain, on the north side, in Sevier County. It is in the lower part of the Knox Dolomite.

The entrance is in the edge of a thin woodland, a few yards northeast of Mr. Derrick's house. It is a triangular hole in the northern slope of a hill. The original opening was 7 feet wide and 3½ feet high. The present opening, which was the central portion of the original opening, is only 2½ feet wide. The reduction of width was brought about artificially by placing fragments of stone in the side of the original opening. A small gate has been constructed in the remaining opening.

The cave is distinctly a dip and strike cave. The Dolomite, which is inclined at an angle of 32° S. 38° E., has been dissolved out along the bedding planes. The main room is the first to be entered. It is a little less than 100 feet wide, but extends along the strike for a considerable distance. The roof and floor are more or less parallel, and conform with the stratification. The roof has an average height of 8 feet above the floor. The latter is littered with angular blocks of stone, which have fallen from the roof. The lowest point in this room

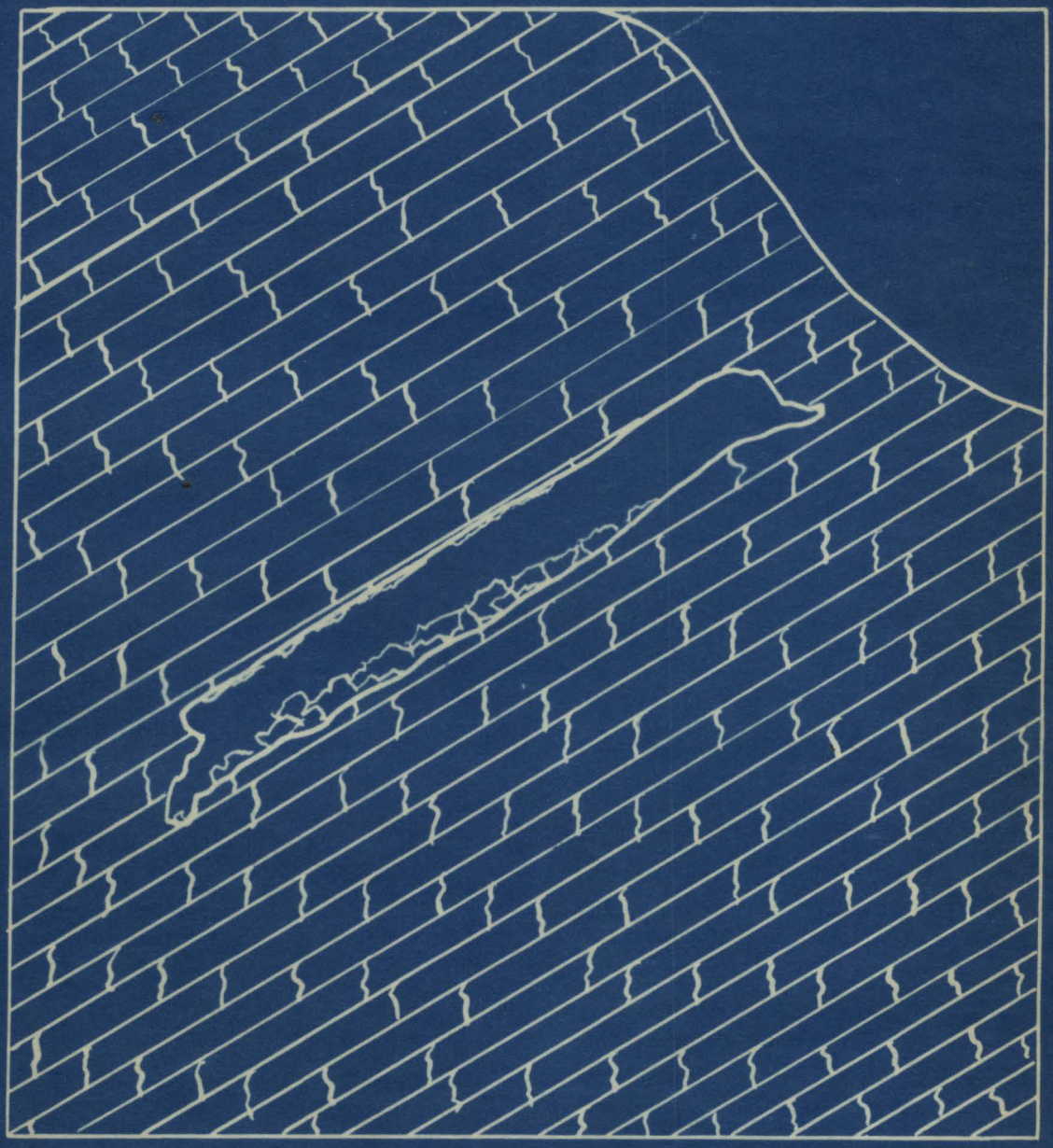
has a vertical depth of 80 feet below the entrance.

Several winding passages lead from the main room to levels approximately 20 feet below the floor of the main room. The floors of these passages are covered with rock debris, which consists of angular blocks of dolomite ranging in size from small pieces to blocks several feet in diameter. Progress through these openings has to be made in a prostrate position, and is slow and difficult.

Blowing Cave is unusually dry. Water drips from the roof in only a few places. There is not a stream in the cave, but there are indications that water runs through one of the lower levels during rainy weather.

There are but few formations in the cave. These are confined largely to the lower levels. While stalactites, stalagmites and flow stones are all represented, the flow stones are the most conspicuous.

In warm weather a cool current of air rushes out of the cave. It is this phenomenon that gives the cave its name. The current could be felt for a distance of 50 feet from the mouth when visited by the writer July 7, 1929. So cool is the current that the owner is able to cool water, milk, butter and other foods by placing them in the mouth of the cave.



A Cross Section of Blowing Cave

A Typical Dip and Strike Cave

Plate XII

Many other caves in East Tennessee are "blowing" caves to a greater or less degree. The cause of such behavior is easily explained. In the summer, the air near the earth is heated by insolation. The heated air is lighter than cool air and tends to move upward. As the heated air moves upward, the cool air in the cave rushes out to take its place. This, in turn, is soon heated and moves upward and is replaced by more air from the cave. In winter, the reverse movements take place. The air in the cave is warmer than the air on the outside. The colder and heavier air on the outside rushes into the cave and replaces the warmer and lighter air.

BLOWING SPRING CAVE

Blowing Spring Cave is in Anderson County, four miles north of Clinton in Black Oak Ridge. It is in the Knox Dolomite. The mouth of this cave is a few yards north of State Highway No. 9. It is an opening of irregular shape, 5 feet wide and 4½ feet high. The cave is an irregular, elongated cavity about 360 feet long. It varies in width, but on the whole it is very narrow. At one place, however, where two narrow rooms extend into the rocks on opposite sides of the main channel, it attains a width of 108 feet. The roof is highest above the floor a few feet from the entrance, where it is 20 feet high. In most places it is too low to permit one to walk erect. The floor is about

15 feet below the entrance. It is dry and dusty in the front, but is wet and muddy towards the back, where there is dripping water. A small stream of water flows in a shallow channel about 15 feet below the floor. It emerges as a spring a few yards west of the mouth of the cave. In warm weather, a cool current of air rushes from small holes in the bank just above the spring. It is this phenomenon that gives the cave its name. There are but few cave formations. The deposits in the dry portion of the cave have assumed a dry and ossified aspect, while those in the wet portion of the cave have a more brilliant appearance. There were numerous bats and a few salamanders in the cave when visited in December, 1928. The cave is used as a storage place for vegetables during the winter months.

THE CLINTON CAVE

The Clinton Cave is in Clinton, about 300 yards west of the Anderson County Court House. It is in the Chicamauga Limestone. The mouth of this cave is a vertical opening of triangular shape. The cave is roughly elliptical in outline, being 40 feet long and 21 feet wide. The floor is covered with earth and is at no place more than 8 or 10 feet below the roof, nor 18 or 20 feet below the surface. The cave is "dead", and the deposits, which are few in number, have assumed an old and ossified aspect. It was being used as a dumping place for rubbish when visited in December, 1928.

THE NICK THORNTON CAVE

The Nick Thornton Cave, known locally as the "Calcite Mine", is located on the property of Nick Thornton, two miles northeast of Chestnut Hill, in Jefferson County. It lies under a large, low, dome-shaped hill, in the Knox Dolomite. The entrance is on the western slope of the hill in thin woods.

The cave was unknown until a few years ago. It was discovered as a result of the working of an outcropping deposit of calcite. An open-cut quarry a few feet wide was being worked back into the face of the hill when the cave was broken into. The cave was originally much larger than at present. Its nearness to a forest-covered surface has resulted in the abnormal deposition of calcium carbonate, which has almost filled the great cavity formed by solution. The mineral-laden waters dripping from the roof are continuing to decrease its size.

The cave consists of numerous, irregular openings, which are penetrable only a few yards in a lateral direction. It extends to a vertical depth of about a hundred feet below the entrance. The deposits are numerous and beautiful. Flow stones, stalactites, stalagmites and columns are present in great profusion. The calcite is snow white in some places, while in other places it is tinged with red. The calcite produced from the cave was of high grade, but cost of production was responsible for the cessation of operations.

THE ROARING SPRING CAVE

The Roaring Spring Cave is located on the Hill farm, three miles northwest of Hall's Cross Roads, in Copper Ridge, Knox County. It is in the Knox Dolomite, and underlies a forest covered hill. The entrance is 15 feet wide and 6 feet high. From the entrance, there is a passage 87 feet long, averaging 6 feet in width, which dips at an angle of about 40 degrees. The height of the roof above the floor increases with distance from the entrance. At a distance of 87 feet from the entrance, the passage is interrupted by a precipice, which extends to the bottom of a large pit, 15 feet below. The pit has a width of 48 feet and a length of 55 feet. The floor is littered with rock debris, except where covered by a stream of water. The latter falls from the roof of the cave 35 feet above the floor. It drains out of the cave through a channel 6 feet high and 4 feet wide. The channel is penetrable for several hundred feet away from the pit. The stream, which is a good sized brook, is corrading its channel just as a surface stream does. The cave is completely devoid of deposits.

CARTERS CAVE

Carters Cave is located 14 miles northeast of Knoxville, and one mile southeast of Carters High School, in Knox County. It is in the Knox Dolomite, which dips to the northwest at an angle of about 30 degrees. The mouth of the cave is at the head of a small valley, in a thin woodland. It is an opening 5 feet wide and 3 feet high, facing the northwest. The cave is a small, irregularly shaped cave of the dip and strike type. It is 100 feet long, and has a maximum width of 20 feet. At a distance of 45 feet from the entrance, the cave enlarges and forks. One prong of it extends northeastward, parallel to the strike, for a distance of 40 feet. A stream rises near the end of this room and flows southwestward along the strike to the junction of the two prongs of the cave. It then flows to the northwest and emerges as a spring a few feet from the entrance of the cave. The other prong of the cave extends to the southeast for a distance of about 50 feet. The height of the roof varies, but is at no place higher than 10 or 12 feet. At one place the roof has collapsed, forming an opening which extends to the surface. The floor of the cave is, for the most part, covered with earth, and is quite muddy along the stream. There are no cave formations, except a few wall deposits.

Carters Cave is well known in Knoxville and Knox

County. The grounds around the spring at the entrance are used as a picnic site, for which they are well suited. This fact probably accounts for the cave being so widely known.

SALTPETER CAVE (KNOX COUNTY)

Saltpeter Cave is located in Knox County, five miles east of Edgemoor, in Copper Ridge. It is in the Knox Dolomite, but at this point the rock is not typical of the formation, being massive and coarsely crystalline. The entrance is in a woodland near the top of the ridge. It is unusually large and conspicuous. The cave consists essentially of an elongated room, 475 feet in length. It extends from the entrance, which is on the northwest side, 350 feet in a northeast direction, and 125 feet in a southwest direction from the same point. The roof is very high throughout the cave, and in places it is as much as 100 feet above the floor. The floor, being covered with rock debris, is very irregular. The cave deposits are few in number, inconspicuous and unattractive.

SALTPETER CAVE (MARION COUNTY)

Saltpeter Cave was not visited by the writer, but has been described by Bailey.[1] Following is Bailey's description:

"Location.- Seven miles southeast of Monteagle on the land of J. H. Shetter at the foot of the mountain on the south side of Cave Cove, 100 yards from a small farmhouse. It is 6 miles from the Tracy City branch of the Nashville, Chattanooga, & St. Louis Railway. It is in Mississippian limestone about 800 feet below the Lee Sandstone.

"There are two mouths about 200 yards apart. It is in the woods above the bed of a dry creek and near the edge of an old field and orchard. The cave is dry. The main part averages 30 or 40 feet in width and 15 or 20 feet in height. There are a number of side passages, some of which are almost as large as the main cave, while others are very narrow. A white coat of gypsum incrusts practically all the walls. The cave is over two miles long and winds about very much. The earth is 5 or 6 feet in thickness, though many banks are 15 feet or more. There are at least 25 or 30 old hoppers that were used in obtaining the niter from the earth. They are a little larger but similar to those in Saltpeter Cave of Putnam County and three or four tons of earth are heaped up in each of them. There are many evidences of digging. This earth is exceedingly dry and dusty like that in Big Bone Cave. There are no stalagmites or stalactites, but the walls and roof are very irregular in places. The passages are so numerous and intricate that it is very easy to get lost in them."

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1. Bailey, Thomas L., Report on the Caves of the Eastern Highland Rim and Cumberland Mountains. The Resources of Tennessee, Vol. VIII, No. 2, April, 1918, pp. 106-107.

SALTPETER CAVE (ANDERSON COUNTY)

Saltpeter Cave is located one mile northeast of Coal Creek, in Anderson County. It is in the Knox Dolomite. The entrance of the cave is in the bottom of a large, steep-sided sink-hole, near the top of a ridge. It is an opening of irregular shape, 5 feet wide and 6 feet high. From the entrance, the floor of the cave slopes downward at a high angle, dropping a vertical distance of 75 feet in a horizontal distance of 100 feet. At a distance of about 125 feet from the entrance the floor becomes level. The level portion of the floor, which is 60 feet long and 25 feet wide, is covered to a considerable depth with mud. The inclined portion of the floor is covered with angular fragments of stone, stumps and logs. The roof is unusually high, being between 90 and 100 feet above the floor at the highest point. A small stream of water falls from the roof into a deep pit and disappears. There are no cave formations in this cave.

BOWMANS CAVE

Bowmans Cave is located 5 miles east of Heiskell and 5 miles north of Powell, on the northern side of Copper Ridge. It is on the property of Mrs. W. E. Bowman, in the Knox Dolomite. The mouth of the cave is an opening 3 feet high and 5 feet wide. The cave is a very irregularly shaped opening 200 feet long. In width it varies from 2

to 42 feet, but on the whole it is narrow. The height of the roof varies from 6 to 50 feet. The floor is very uneven, and extends to a vertical depth of 35 feet below the entrance. It is covered with earth, and is slippery, but not muddy. A small amount of water drips from the roof and collects in small pools in the lower levels. The cave deposits consist of wall deposits and a single stalactite.

WILSON'S CAVE

Wilson's Cave is located in Union County, two and one-half miles northeast of Loyston, on the Wilson Farm. It is a joint cave in the Chicamauga Limestone. The entrance, which is on the western side of Lone Mountain, is an opening about 8 feet high and 5 feet wide. The floor slopes downward from the mouth at a high angle. At a distance of about 50 feet from the mouth, it consists of beds of limestone resting on undissolved pillars of stone. Under this is the floor of a second level of the cave, which is 30 feet below. The roof varies in height from a few feet up to 10 feet. Its length was not fully determined, but it is known that it extends under the ridge for several hundred feet. The portion of the cave explored is entirely devoid of cave formations.

THE SHEEP PEN CAVES

The Sheep Pen Caves are located in Blount County, one and one-half miles west of Louisville, on the south side of the Tennessee River. They are in the Holston Marble. A large portion of the marble bluff along the south side of the river is honeycombed with solution cavities. These cavities are all elongated openings, the longest of which are about 120 feet long. In width, they vary from a few feet to 40 feet. The ceilings are low at most places, and in many places they are so low that progress has to be made lying flat. The floors are uneven and are covered to a considerable thickness with moist clay. A stream of water flows through one of the lower openings. There is no water in the other openings, except a small amount which drips from the roof. Cave formations of all types are numerous in the higher openings, but they have assumed an old and ossified aspect.

It is probable that the greater part of a much larger cave has been removed by erosion, which has left only remnants of the former opening. This inference is drawn from the fact that the entrances and front portions of all of the openings are very large in proportion to the sizes of their remaining portions. The appearance of the entire bluff seems to indicate that the present caves are only the unremoved rooms of a much larger original cave. The

presence of a good-sized natural tunnel near the top of the bluff is further evidence of the previous existence of a larger opening.

It is reported that the caves take their name from the fact (or supposition) that sheep were kept in, and near them during the Civil War.

PARKER CAVE

Parker Cave is located one mile north of Knoxville, on the Knoxville and Bristol Division of the Southern Railway. It is in the Holston Marble. The mouth of this cave is in a depression about 18 feet below the general surface. It is a triangular opening, 12 feet wide and 5 feet and 18 inches high. The floor of the cave is about 12 feet below the entrance, and at no place more than 30 feet below the roof. The cave consists of two major prongs. The larger of the two prongs has a southwest trend, while the other prong trends in a northerly direction. The southwestern prong is 225 feet long and has an average width of 26 feet. The small prong is 150 feet long and varies in width. The cave is damp and muddy, but has no stream. The water dripping from the roof collects in pools. There are but few cave formations. The most interesting of these are the rim-like floor deposits that surround the pools of water.

SINKHOLE CAVE

Sinkhole Cave is located in Monroe County, four and one-half miles northeast of Tellico Plains on the farms of Stephens and Porter. Geologically, it is in the Knox Dolomite; structurally, it is in the limb of a gentle anticline.

The cave is a winding, elongated tunnel, striking N. 70° E. It is 400 feet long and has an average width of about 40 feet. The height of the roof varies, but averages about 12 feet. The cave is traceable on the surface its entire length by a line of four sink-holes.

Sinkhole Creek enters the northwestern end of the tunnel, flows through it and emerges at the southeastern end. The opening through which the stream enters is an irregular, oblique opening, more or less parallel to the beds, which dip northward at an angle of about 30 degrees. This opening is 60 feet wide and 15 feet high. The opening through which the stream emerges is a similar opening, 75 feet wide and 10 feet high. Owing to the presence of the stream, the floor of the cave is wet and muddy. Drifts carried into the cave by the stream cover the floor in places and practically obstruct the opening at others.

The cave formations in Sinkhole Cave are few in number. They consist almost entirely of stalagmites,

which occur only in the lower end of the tunnel.

A feature of special interest is the presence of bats in Sinkhole Cave. They occur in great profusion in the lower part of the tunnel.

ROCK HOUSE

Rock House is located in Sevier County about a mile northwest of Boyds Creek, on the northern bank of the French Broad River. It is in the Knox Dolomite.

The cave is in a bluff overlooking the river. It has two entrances, the larger of which is 31 feet wide and about 40 feet high. The smaller entrance is a tunnel 40 feet long and 10 feet wide. The cave consists of one room and a few small passages which extend into the rock a few feet from the room. The main room is 47 feet long and 70 feet wide. The longest of the passages is 39 feet long and extends back from the room at its widest point, giving the cave a total length of 86 feet. The entire cave is dry and completely devoid of formations.

Until recently, the room was floored. The floor has all been removed, except the beams to which the flooring was nailed. The cave was long used as a place for religeous and social gatherings. It is said that the Indians congregated in the opening on some occasions.

THE SID HENDERSON CAVES

The Sid Henderson Caves are located on the Sid Henderson farm, about five miles north of Powell, in Knox County. The caves, two in number, are in a thin woodland, in Copper Ridge, in the Knox Dolomite. The smallest of the two caves consists of a single channel. The channel is about 40 feet long, and dips into country rock at an angle of 30 to 40 degrees. It comes to an abrupt end, due to the natural plugging of its lower portions. The deposits in this cave are few in number and have assumed a dry aspect.

The large cave is a few hundred yards east of the small cave. It is entered through an opening eighteen inches wide and thirteen inches high. From the entrance, the passage slopes at an angle of about 45 degrees for a few feet and then becomes nearly horizontal. Along this passage, about 75 feet southeast of the entrance, there is a pit 50 feet deep. The bottom of the pit, which is 60 feet below the mouth, is 30 feet wide and 60 feet long. The roof is about 60 feet above the floor. The latter is very uneven, consisting of irregular heaps of clay and rock fragments. There is a passage 40 feet long, 20 feet wide and 4 feet high extending northward from the bottom of the pit. This cave is damp, but there is no water in it other than a small quantity which drips from the roof. The deposits are few in number and rather inconspicuous.

"SKELETON" CAVE

"Skeleton" Cave is located in Union County, two and one-half miles northeast of Loyston, and one-half mile northwest of Wilson's Cave. It is in the Chicamauga Limestone. The mouth is a small vertical opening in a thin woodland. The floor of the cave is 9 feet below the surface and 8 feet below the roof. In shape, the cave is an irregular, elongated opening. It is penetrable for a distance of about 15 feet, but extends much further. It is very narrow, being only 8 or 10 feet wide at the widest point. The deposits were few in number, and of an ossified appearance.

The only room of this cave that could be explored was a small room immediately under the entrance. The floor of this room was littered with fragments of human skeletons. These had been known to be in the cave since its discovery a few years ago. No one in the entire community is known to have known of the existence of the cave until its recent discovery. When first discovered, three skeletons were on the floor. These were later broken up and scattered over the cave. The presence of the bones cannot be accounted for. It is highly improbable that Indians ever inhabited the cave, for the cave is not at all suitable for a dwelling. It is also improbable that the bones are Indian remains, for they were lying loose on the floor of the cave rather than buried as Indian remains

are found. The bones may be the remains of murdered slaves or murdered white people. This, however, is only a conjecture, as neither the sex nor race can be determined from the remains.

BENNETTS CAVE

Bennetts Cave is located in Knox County, 3 miles northwest of Hall's Cross Roads, in Copper Ridge. It is in the Knox Dolomite. The cave is scarcely more than a solution channel. At the entrance it is a few feet wide and is high enough to allow a man to walk in an upright position. A few feet from the entrance the roof becomes very low and progress has to be made in a prostrate position. About 30 feet from the entrance, the cave forks, but neither fork is penetrable more than a few feet. The floor of the cave is covered with several inches of slimy mud, through which a small sluggish stream flows towards the entrance, where it collects in a pool. The deposits are few in number, and have assumed a dry and ossified appearance.

THE CHEROKEE BLUFF CAVE

The Cherokee Bluff Cave is located in Cherokee Bluff, on the Tennessee River, just south of Knoxville. It is in the Holston Marble. The mouth is about 45 feet above the ordinary level of the river. The cave is a narrow, elongated cavity of the joint type. It strikes along a set of joints parallel to the river and is penetrable for a distance of about 100 feet. The floor is dry and dusty. There are but few cave formations, and these have assumed the characteristics of the deposits in dead caves.

Rumors are current in Knoxville and vicinity that this cave is connected with a small opening in Sterchi Park, and that persons, in times passed, have traversed the underground passage from one opening to the other. The veracity of these rumors is to be questioned, for the following reasons: (a) the geologic structure of the area separating the two openings is such as to preclude the formation of a continuous passage between the two caves; (b) if it were structurally possible for such a connection to be formed, it would be impossible for it to have formed below the river, for caves are not formed below the level of ground water; (c) if it be assumed that the hypothetical connection had formed above the level of ground water and suffered depression subsequent to its formation, that portion of it beneath the river,

being below the level of ground water, would be flooded; (d) the supposed passage connecting the caves cannot be discovered by actual exploration.

CAVE SPRING CAVES

The Cave Spring Caves are located northeast of Knoxville, just outside of the city limits, on the south bank of the Tennessee River. They are in the Tellico Sandstone. The openings are only a few feet above the ordinary level of the river.

The larger of the two caves is about 110 feet long and varies from 2 to 10 feet in width. The entrance is an opening of rounded shape, 10 feet wide and 8 feet high. The roof varies in height from 1 to 12 feet. The floor slopes upward from the entrance, and is dry and dusty from one end to the other. There are but few deposits.

The small cave is entered about 15 feet west of the larger cave. The entrance is from 2 to 3½ feet wide and 6½ feet high. The opening is 90 feet long and varies in width from 2 to 9 feet. It is more or less parallel to the larger opening. The roof is 8 or 9 feet above the floor. The latter is covered with earth, which is moist, but not muddy, except along a small stream which flows through the cave.

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