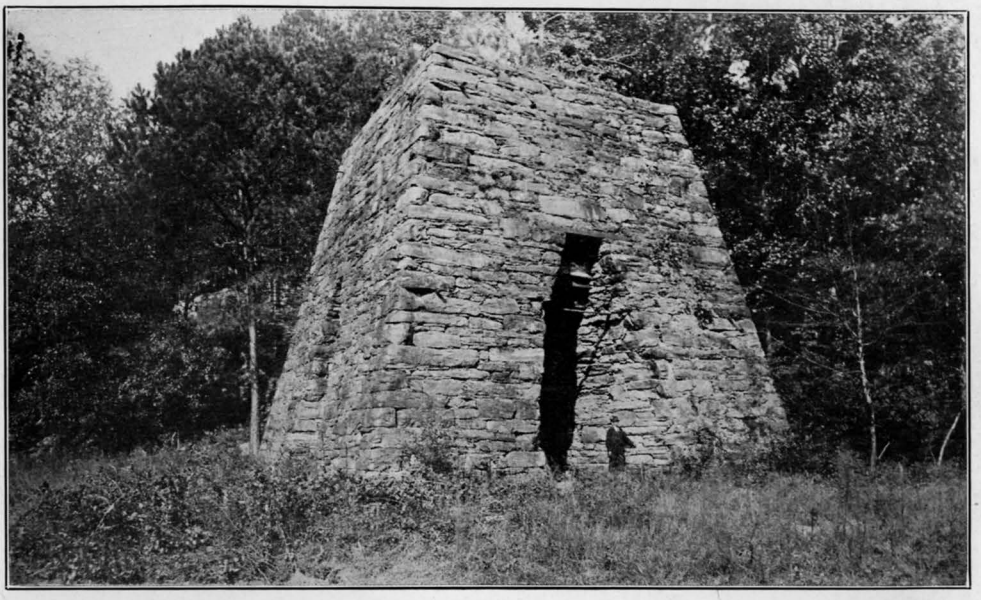
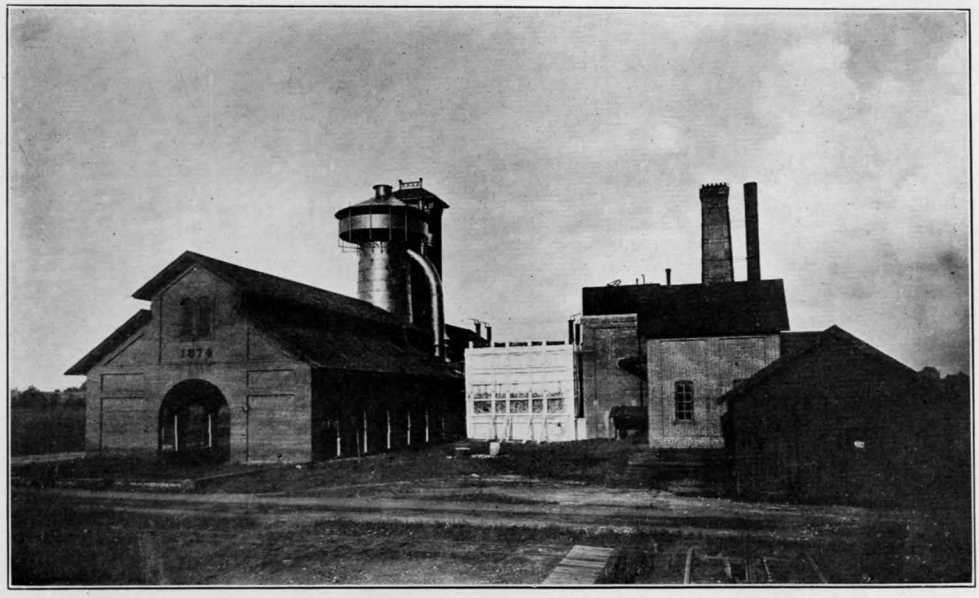


A. STACK OF OLD FURNACE ON THE ETOWAH RIVER NEAR CARTERSVILLE.



B. OLD IRON FURNACE, CEDARTOWN, POLK COUNTY.

GEOLOGICAL SURVEY OF GEORGIA

S. W. McCALLIE, State Geologist

BULLETIN NO. 41

IRON ORE DEPOSITS

OF

GEORGIA

BY

R. H. HASELTINE

Assistant State Geologist

1924

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ATLANTA, GA.

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OF THE

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LETTER OF TRANSMITTAL

GEOLOGICAL SURVEY OF GEORGIA,

ATLANTA, October 17, 1924.

To His Excellency, CLIFFORD M. WALKER, Governor and President of the Advisory Board of the Geological Survey of Georgia.

SIR: I have the honor to transmit herewith the report of Mr. R. H. Haseltine, Assistant State Geologist, on the Iron Ore Deposits of Georgia, to be published as Bulletin No. 41 of this Survey.

This is the third report so far issued by this department on the Iron Ore Deposits of Georgia. The first report, Bulletin No. 10, Iron Ore Deposits of Polk, Bartow and Floyd Counties, was published in 1900 and the second, entitled the Fossil Iron Ore Deposits of Georgia, published in 1908. This report includes a review of the ore deposits described in the former reports, brings them up to date and describes all other known deposits of the State that are supposed to be of commercial importance.

Very respectfully,

S. W. MCCALLIE,

State Geologist.

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INTRODUCTION

NATURE OF THE REPORT AND THE SOURCE OF THE DATA

This report is intended to give a general outline and description of the occurrence and nature of the iron ores found in Georgia. The data used in the report are mainly from the author's field notes collected in 1923 and from the unpublished notes of J. P. D. Hull, formerly, Assistant State Geologist. Free use also has been made of the data found in the following bulletins published by the Survey: Fossil Iron Ores of Georgia, The Pyrite Deposits of Georgia, and the Brown Ores of Polk, Floyd and Bartow counties. The main part of the report is devoted to brown or limonite ores, as these are the ores that have so far been most extensively worked.

HISTORY OF IRON ORE-MINING IN GEORGIA

Iron ore mining in Georgia began probably about 1840. At that time a blast furnace was erected on Stamp Creek in Bartow County. By 1853 it is reported that five such furnaces were in operation in the county, the ore, limonite or brown hematite, being taken from deposits in the vicinity or picked up from cultivated fields. These were all charcoal furnaces with a capacity of 2 to 4 tons per day. The remains of these old furnaces are still to be seen on Stamp Creek and on the Etowah River.

A somewhat detailed account of furnace operations in Bartow County has been kindly furnished by Col. Geo. H. Aubrey of Cartersville. He states that eight furnaces and two bloomeries were operated in the county at different times and for different periods. The most important furnace, probably, was known as the Bartow Furnace, located at Bartow station on the Western and Atlantic Railroad, between Emerson and Allatoona. It was originally promoted,

before the Civil War, by I. D. McDaniel, father of former Governor Henry McDaniel, and was last operated by Hugh McNeil, of Chattanooga, in the seventies.

Another furnace was operated before the war on Allatoona Creek, a short distance above its mouth, on what is now the Etowah property. The builder and operator of the furnace are not known. It was in ruins in 1875. Governor Joseph E. Brown and Robert L. Rogers operated a furnace at Rogers station on the Western and Atlantic Railroad after the war and until about 1880 when it was shut down. A short distance below the Rogers station furnace, on Pettit's Creek, a furnace was operated for a limited period between 1870 and 1880 by Lewis Tumlin, T. J. Lyon and a Mr. Curtin.

On the head waters of Stamp Creek, Bear Mountain furnace was operated by B. J. Poole for a number of years after the Civil War, making a fine grade of hollow ware as well as pig iron. About 2 miles below Bear Mountain furnace, on the same creek, was the Diamond furnace, operated in the seventies, first by W. H. Styles, and then by Williard P. Ward of New York. Ward, a graduate of the School of Mines at Potsdam, was a skilled metallurgist, and on that little sandrock furnace, made probably the first spiegeleisen ever manufactured in the South. It came out in small bars which were broken up and shipped in nail kegs. Cartersville, the nearest shipping point, was 12 miles away. About 3 miles below the Diamond furnace, on the same creek, was the Lewis furnace. It was never operated to any great extent.

Still farther down on Stamp Creek, about 2 miles from its mouth, on the Etowah property, was one of Mark A. Cooper's furnaces, which was operated for a short time in the seventies for the manufacture of hollow ware. The old stack is standing at the present time. On the Etowah River, 4 miles below the above furnace-site, stand the remains of the second Etowah furnace. This was in blast during the Civil War and supplied the rolling mill at the Mark A. Cooper plant on the bank of the Etowah River.

With the exception of the last named and the Bartow furnace these were all small stacks with a capacity of 2½ to 4 tons per day.

However, that small tonnage represented considerable money, as the price of pig iron ranged from $50 to $75 per ton.

There were two bloomeries in Bartow County, both on Allatoona Creek. One was located near its mouth and was run by a Dr. Memmler, while the other was located opposite Allatoona station and was owned and operated by T. C. Moore.

After Sherman's invasion of Georgia, all the furnaces in Bartow County were left in ruins, and no effort was made to rebuild until about 1870 when a few were again put in blast and operated for a short time. The iron industry, however, never regained its former importance.

In 1863 the Empire State Coal and Mining Company was organized with a view of manufacturing iron for the Confederate Government, under a contract amounting to $8,000,000. Six furnaces were to be erected, but before the completion of the first one the Union army gained possession of this part of the state, which made further work impossible. The furnace above referred to, known as the Phoenix Furnace, was located on the west side of Lookout Creek, Dade County, about 3 miles south of Trenton. It had a capacity of 20 tons per day. The stack is still standing in a fair state of preservation.

In 1865 the Cherokee Furnace was built by Dr. J. H. McLean of Louisville, Ky. and Mr. Brown of Philadelphia, Pa. It was located on the east side of the Alabama Great Southern Railroad, 1 mile north of Trenton, Dade County, and about half a mile east of the western line of the fossil-ore outcropping. It was constructed for a 40-ton furnace, but is said to have never been very successful.

Also during the War three small forges, or bloomeries, are known to have been in operation and are said to have supplied the Confederate Government with iron. One of these forges was located near Alexander, Burke County, one at Sweetwater, McDuffie County, and the other on Shoal Creek about 6 miles west of Canton, Cherokee County. The last named forge is still to be seen in a fair state of preservation. About the same time small forges or bloomeries were operated on the Conasauga River, Murray County, near the Georgia-Tenn-

essee line, in Madison County and possibly at other points in North Georgia.

In 1874 the Rising Fawn furnace was erected by a company of New York capitalists. It was located 1 mile east of Rising Fawn station on the Alabama Great Southern Railroad, 26 miles southwest of Chattanooga. The daily capacity of the furnace was 50 tons.

The New York Company operated the furnace but a short time when it went into the hands of a receiver. A few months after the appointment of a receiver, the furnace was purchased by the Walker Iron and Coal Company, Governor Joseph E. Brown and J. C. Warner being the principal stockholders. Under the management of this new company the furnace was operated quite successfully for four or five years, when Mr. Warner disposed of his interest, after which the company changed its name to the Georgia Mining and Manufacturing Company. Under this management the furnace was enlarged to a 100-ton furnace and operated quite successfully until 1896, when it was closed and remained idle until February, 1903. Subsequently the furnace passed into the hands of the Georgia Iron and Coal Company, which Company enlarged it to a 225-ton furnace. It was then continuously operated, up to a few years ago, with the exception of from June, 1905 to January 6, 1906.

About the time of the closing down of the Bartow County furnaces in the seventies, the Cherokee Furnace at Cedartown and the Etna Furnace in Etna Valley, Polk County, went into blast. These were both modern, hotblast charcoal furnaces, the former having a capacity of 50 tons and the latter 25 tons per day.

Later two furnaces were put in operation in Floyd County, one at Rome and the other at Hermitage. Each of the above named furnaces were operated for a time with considerable energy, especially the one at Rome, which was only recently shut down. The two furnaces consumed daily about 100 tons of ore. About the same time the Rome furnace was operated a 50-ton furnace was also in blast at Tallapoosa, Haralson County.

No furnaces are at present operated in the State. The last one

to shut down was the Rome furnace which discontinued operations in 1910 (?).

The following figures taken from the Mineral Statistics of the U. S. Geological Survey, show the production of pig iron per year from 1881 to 1911.

Pig Iron Produced in Georgia, 1881-1911

Year	Short tons	Year	Short tons
1881	37,404	1898	13,762
1882	42,440	1899	17,835
1883	45,364	1900	28,984
1884	42,655	1901	27,333b
1885	32,924	1902	32,315b
1886	46,490	1903	75,602
1887	40,947	1905	38,699c
1888	39,397	1906	92,599c
1891	49,858	1907	26,173c
1892	9,950	1909	26,072c
1893	36,675	1910	14,725c
1897	17,092a	1911	1,200c

a. Georgia and North Carolina.
b. Georgia alone.
c. Georgia and Texas- 3 furnaces in Ga. and one in Texas.

GENERAL CHARACTER OF THE ORES

The iron ores that have been mined in Georgia are red hematite and brown hematite. Magnetite is known to occur at several localities in the crystalline area, but no actual mining has ever been done. On several properties a short distance north of Marietta, Cobb County, there is a good surface show of excellent ore, but the quantity is unproved.

Bog ore occurs only in small deposits and probably will never be a commercial factor in production of iron.

At one time red hematite (fossil ore) was produced in considerable quantities in Dade, Walker, Chattooga, Whitfield and Catoosa counties, but with the closing down of the furnaces in the State, production practically ceased. At present, perhaps half a dozen small strippings are being made altogether, in these counties. The ore is used chiefly for paint.

Brown hematite or limonite has always been an important ore. It has been mined for more than three-fourths of a century, 20 year

before the Civil War the industry apparently being inaugurated. It has increased steadily in importance until today it is one of the important sources of the mineral wealth of the State. With the modern methods of mining and consequent increase in production, furnaces should be rebuilt within the State. These furnaces would constitute a home industry and would encourage the opening up of deposits now idle because of the excessive freight rates to furnaces out of the State.

The geological associations of the four above named ores are as different as their physical and chemical characteristics. The bog ore is found mainly as surface accumulations in bogs and swamps; the limonites occur (1) in the crystalline area in schists and gneisses, (2) in the Paleozoic area in association with the Weisner quartzite, Knox dolomite and Chickamauga limestone, (3) in the Coastal Plain in Cretaceous and Tertiary formations; the hematite or fossil ores are associated with the shales, sandstone and limestones of the Rockwood formation, Upper Silurian in age; magnetite is found widely distributed in the igneous and metamorphic rocks of the Crystalline area.

Each of the ores is discussed in some detail in the following pages. The bog ores and brown ores, derived from pyrites, are included under the chapter on limonites and described very briefly.

PART I.

LIMONITE ORES

GENERAL STATEMENT

The methods of mining, occurrence, origin, etc. of the limonites in Polk, Bartow and Floyd counties were considered in Bull. No. 10-A, issued by the Geological Survey of Georgia. In enlarging the scope of this report, therefore, the greatest amount of space will be devoted to descriptions of the individual deposits. A full discussion of the geology and topography of the counties, or the origin of the ores would be largely a repetition of facts stated in other reports. Hence, it is only necessary to present a general outline of these topics. The chief purpose is to set forth the probable economic importance of the limonite deposits and review briefly their scientific aspects.

PRODUCTION

During the last 30 years over 3,000,000 tons of limonite ore have been produced in Georgia. The bulk of this ore came from Polk and Bartow counties where workable deposits are widely distributed. It is said that the Grady Mine at Grady, Polk County, alone produced 1,000,000 tons of ore. Besides these large mines there are innumerable small deposits that have been worked. The ore is usually of high grade and easily mined, both factors of primary importance in economic exploitation. The deposits elsewhere in the state have never been particularly successful, though a considerable tonnage has been produced. Many of these deposits would yield a good income were it not for the long haul to the furnace. In such cases the freight rates take up most of the profit. Most of the ore, outside of Polk and Bartow counties, has come from Fannin, Gilmer, Gordon and Cherokee counties.

Below is a table showing the production of limonite from 1893 to 1922. The figures for 1894 to 1900 are not available.

Limonite Produced in Georgia, 1893-1922

Year	Tons	Year	Tons
1893	138,221a	1912	134,637
1900	259,863a	1913	96,160
1901	215,599bc	1914	55,886
1902	216,242a	1915	99,196
1903	318,804	1916	146,302
1905	155,434	1917	124,735
1906	305,624	1918	149,882
1907	337,229	1919	71,224
1908	319,812	1920	65,717
1909	211,495	1921	4,547
1910	263,554	1922	221,260c
1911	188,734		

a. Georgia and North Carolina.
b. Georgia and North Carolina and South Carolina.
c. Hematite and Limonite.

DEPOSITS OF THE PALEOZOIC AREA

GEOLOGY OF THE AREA AND DISTRIBUTION OF ORES

The term, Paleozoic area, as used here, embraces the extreme northwestern section of the state, including practically all of 10 counties. The underlying rocks are non-crystalline and range in age from Cambrian to Carboniferous. The area lies partly in the Appalachian Valley and partly in the Cumberland Plateau. The oldest rocks occur, in general, in the southeastern part while the youngest ones are exposed on tops of hills and mountains in the northwestern corner. They consist of sandstones, shales, and limestones which in the Appalachian Valley have been folded and faulted more or less and dip at high angles, while on the plateau they are only slightly folded and give rise to a characteristic physiography.

The ore deposits of most importance are found in five counties, namely, Polk, Bartow, Floyd, Gordon and Whitfield. In the first three counties mentioned the ores are associated mainly with Cambrian quartzites (Weisner formation) and the Knox dolomite of Cambrian-Silurian age, while in the other two counties the deposits occur chiefly near the contact of the Fort Payne chert and Floyd shale of Carboniferous age or in the Conasauga shale of the Cambrian age.

As a general thing the deposits associated with the Knox formation also occur near or at the contact with the overlying Chickamauga

limestone. Likewise the deposits in the quartzite areas are found largely near quartzite contacts with slates, schists or limestones.

ORIGIN[1]

The ores found in association with the Knox dolomite and Chickamauga limestone are regarded as having been deposited originally in swamps near the contact between the two formations. Subsequently, upon the uplifting of the region, which is supposed to have taken place at the end of the Tertiary period, these swamps were drained, and the "blankets" of iron ore left behind resisted erosion, causing the formation of the low round-topped hills now containing the ore deposits. Furthermore, the irregular form of the deposits and their characteristic occurrence in pockets and leads, is explained by the weathering of the underlying limestones, whereby they are carried off in solution, giving rise to a broken or pitted surface. The ores then adjust themselves to this surface which readily accounts for their mode of occurrence. The deposits in the Cedartown District have largely resulted from this process of deposition and rearrangement.

In the Cartersville area the majority of the ore bodies are found in or near fault fissures, opened, apparently, at the time of the deformation of the region at the end of the Paleozoic. The ore was deposited probably from iron solutions which may have originated directly above the point of deposition or have come from a considerable distance and from some depth. Concentration of ore has taken place, also, wherever some impervious bed, like a quartzite, is underlain by a limestone or slate.

The important deposits of Whitfield and Gordon counties, those in Redwine Cove and Sugar Valley, apparently are genetically connected with a rather large fault extending southward along the east side of Chattoogata Mountain and across Gordon County.

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1. Hayes, C. W., Geological Relations of the Iron Ores in the Cartersville district. T. A. I. M. E. 1900, pp. 9-11.
Hayes, C. W. and Eckel E. C., Iron Ores of the Cartersville district, U. S. Geol. Survey Bull. 213, 1903, p. 240.
McCallie, S. W., Iron Ores of Polk, Bartow & Floyd Counties, Georgia Geol. Survey Bull. 10-A, p. 19

DESCRIPTION OF INDIVIDUAL DEPOSITS

BARTOW COUNTY

TENNESSEE COAL, IRON AND RAILROAD COMPANY PROPERTY

The Tennessee Coal, Iron and Railroad Company of Birmingham owns about 1,500 acres in the 4th district, 3d. section and in the 21st. district, 2d. section of Bartow County. Included in this property are the lots formerly belonging to the Bartow Furnace Company, from which many tons of iron ore and a considerable amount of manganese have been taken. The bulk of the iron ore came from lots 903, 899, 970, 4th district, located about 1 mile south of Emerson on the Western and Atlantic Railroad. Most of the ore was mined prior to 1900, but since then a few new openings have been made and considerable ore taken from the old cuts. The spur track from Emerson to the Pumpkinvine Creek deposits was removed in 1906.

Ore-bank No. 1, lot 970, is located about a quarter of a mile south of the railroad, on the south side of a prominent wooded quartzite ridge. This side of the ridge has been excavated by an open-cut for a distance of about 400 yards and to a depth of approximately 50 feet. This huge open-cut ranges from 50 feet to 100 feet in width. It should be regarded perhaps as made up of two separate excavations, for entries were made from the east end and west end of the ridge. The faces of the two cuts are about 50 feet apart. The ore apparently occurs in the form of large pockets, or irregular masses and as a bedded deposit overlain by quartzite. It is mostly in the form of angular gravel and concretions, often filled with clay. Large masses of ferruginous material, consisting largely of silica are found with the ore.

The property is under lease to the Southern Leasing Company of Cartersville at the present time. The ore has not been mined regularly. A little hand-mining was being done at the time of the writer's visit, and about 16 tons of ore per day were being hauled to the railroad siding at Bartow. The ore, which brought $2.25 on board of cars, was shipped to LaFollette, Tenn. There is apparently a considerable amount of ore still remaining in the deposit, and by reason

of its favorable location the project of mining it is an attractive one from an economic standpoint. No figures are available to show the total output of the mine, but it evidently amounts to many thousand tons. The following is an analysis of a sample of ore taken from the above described ore-bank:

Analysis of Ore from Ore-bank No. 1

Moisture at 100°C	1.40
Loss on ignition	11.80
Soda (Na_2O)	.24
Potash (K_2O)	.26
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	2.66
Ferric oxide (Fe_2O_3)	71.42
Ferrous oxide (FeO)	.00
Manganous oxide (MnO)	4.93
Titanium dioxide (TiO_2)	.00
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.66
Silica (SiO_2)	6.36
Nickel (Ni)	trace
Cobalt (Co)	trace
Total	99.73
Metallic iron (Fe)	50.00
Sulphur (S)	.00
Phosphorus (P)	.289

Ore-bank No. 2, lot 899, is located on the opposite side of the Western and Atlantic Railroad from the above excavation. It is a huge open-cut, about 325 yards long, 100 feet to 400 feet wide, and about 70 feet deep, extending north-south approximately. It is very irregular in shape due to the following-up of the richer portions of the ore. No mining has been done here for about 15 years. The same deposit of ore, however, was worked two years ago in a cut immediately south of the one just described. This excavation is about 70 feet deep, 200 feet long, and 20 feet to 40 feet wide. Operations were carried on under the supervision of B. C. Sloan of the Southern Leasing Company.

The equipment consisted of a Thew No. 0 steam shovel, and an inclined track to the 2-log washer on the south edge of the cut. This washer was run by a 40-horsepower electric motor and had a daily capacity of 50 tons. The washed ore was run directly into the car.

It is said that work ceased because of the lack of ore. At the time of the writer's visit a small adit was being driven in the head of the cut towards the excavation first described, with the hope of finding more ore. About 100 yards south of this excavation, on the opposite side of the railroad, is a cut from which 35,000 tons of ore were taken before the deposit was exhausted. The ore was of the same nature as in the other banks and evidently was one of the series of "pockets" found in this vicinity.

Ore-bank No. 3, lot 902, is located on a low ridge, about a quarter of a mile southeast of ore-bank No. 2. It has not been worked for several years and being much fallen in, little can be said as to the occurrence of the ore. It apparently occurs mostly as gravel and nodules in the red and yellow clays and is intimately associated with quartzite, as shown by the three quartzite outcrops in the bottom of the pit. The excavation is about 450 feet long, 225 feet wide, and 30 feet deep. The total production is not known.[1]

ETOWAH DEVELOPMENT COMPANY PROPERTY

The Etowah Development Company of Cartersville, O. T. Peeples, President, and R. S. Munford, General Manager, owns several thousand acres of land in the 4th and 5th districts, 3d. section, and in the 21st. district, 2d. section of Bartow County. This property is exceedingly rich in minerals. Some of the largest deposits of limonite and manganese in the state are found on the property. Most of the deposits have been idle for some years, with the exception of a little hand-mining at intervals. However, in most cases the ore is by no means exhausted, the shut-down being due to other causes. The Company at present is working the old Crow-bank described below. Also, some manganese is being mined by lessees of the property.

The Crow Ore-bank[2], locally known as the Iron Hill Mine, is located on lot 728, 21st. district, 2 miles northeast of Allatoona.

[1]Since the writer's examination of these properties in April, a new washer has been constructed across the railroad from the one at ore-bank No. 2. A new excavation has been started about 100 yards east of the public road near this washer, and ore is being shipped in considerable quantity. It is expected that the quality of the ore will improve considerably with increase in depth. It occurs as gravel and varying sized boulders in the red and yellow clay, or decayed slate.

[2]Bull. 10-A, p. 141.

The workings consist of a huge open-cut extending northeast into a low ridge at an elevation of about 100 feet above the valley of Allatoona Creek. This excavation is about 275 yards long, from 18 feet to 50 feet in width, and about 50 feet in depth. It was worked for a time in 1917, 1919, 1920, when a new washer was installed. In the early part of 1923 operations were resumed under the direction of B. C. Sloan.

A sample from one of the cars about to be shipped, gave the analysis below:

Analysis of Ore. Iron Hill Mine

Moisture at 100°C	2.30
Loss on ignition	12.40
Soda (Na_2O)	.25
Potash (K_2O)	.50
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	1.59
Ferric oxide (Fe_2O_3)	71.01
Ferrous oxide (FeO)	.00
Manganous oxide (MnO)	.89
Titanium dioxide (TiO_2)	trace
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	4.22
Carbon dioxide (CO_2)	.00
Silica (SiO_2)	7.22
Total	100.38
Metallic iron (Fe)	49.71
Sulphur (S)	.00
Phosphorus (P)	1.84

The equipment at the Crow bank consists of a 4-log washer, three steam shovels, three dinkey engines and a small locomotive for the line connecting the mine with the Western and Atlantic Railroad at a point about 1 mile northwest of Allatoona. The washer is run by a 45-horse-power steam engine. The cut is at the same level as the washer. The ore is hauled directly from the mine, dumped into the washer, and carried to the cars by the picking belt.

At the time of the writer's visit, 40 men were employed and about 4 cars of ore per day were being shipped. Some of the ore went to Rockwood, and LaFollette, Tenn., and the rest to Gadsden, Ala.

The ore occurs as gravel and "dornick" ore, in a large irregular vein between a hanging wall of granitoid gneiss and a foot wall

of mica schist. The depth to which the ore extends is not known. The deposit was apparently formed by the circulation of chalybeate waters along the contact between the gneiss and schist. The ore body dips to the southeast. There seems to be a large amount of ore available in this deposit.

The Allatoona Ore-bank, is located on lot 729, 21st. district, immediately northeast of the Crow bank. It has not been worked since 1902 when operations ceased because of the threatening aspect of the walls of the cut. The face of the excavation is but a short distance from the face of the Crow bank. A "squeeze" in the deposit is thought to occur at this point. The cut is about 100 yards long, 50 feet wide, and 70 feet deep. The nature of the deposit is identical with that of the Crow bank, described above.

The Wheeler Ore-bank, lot 648, 21st. district, was last worked in 1915-1916 by the LaFollette Coal and Iron Company of LaFollette, Tenn. About 23,000 tons of ore were produced by this company. The Wheeler ore-bank has been one of the most extensively exploited brown iron mines in Bartow County, for a full description of which see Bulletin No. 10, Iron Ores of Polk, Bartow and Floyd Counties.

Lot 575, 21st. dist. The Etowah Development Company shipped 31,625 tons of ore from this mine, and the LaFollette Coal and Iron Company 42,500 tons, during the period 1907-1914. There has been no mining since that time. The workings, which consist of four open-cuts, are located on the east side of a quartzite ridge about three-quarters of a mile northeast of the Wheeler bank. The largest opening is about 100 yards long, 50 feet wide, and 60 feet deep.

R. B. SATTERFIELD PROPERTY

Leachman and Johnsey now have under lease this property, lot 259, 4th dist. It is located about 2 miles northeast of Cartersville on the Rowland Springs road near a spur of Pine Mountain, and but a short distance east of the old tramway leading to Rowland Springs. The work done here so far is in the nature of prospecting. A small excavation has been made on top of the ridge, exposing some excellent ore in the form of gravel and "dornicks".

Iridescent, geodal, honeycomb, and other types of ore are to be seen in the yellow clay. The prospect is rather inaccessible at the present time, as the old tramway was removed some years ago and there is no wagon road to the property. Water for a small washer could be obtained from a branch to Pettit Creek a quarter of a mile to the westward.

A sample of ore collected by the writer gave the following analysis.

Analysis of Ore. Lot 259, 4th District

Moisture at 100°C	.80
Loss on ignition	9.00
Soda (Na_2O)	.40
Potash (K_2O)	.52
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	4.60
Ferric oxide (Fe_2O_3)	73.16
Ferrous oxide (FeO)	.00
Manganous oxide (MnO)	.29
Titanium dioxide (TiO_2)	trace
Sulphur (S)	.00
Phosphorus pentoxide (P_2O_5)	.63
Silica (SiO_2)	10.82
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	100.22
Metallic iron (Fe)	51.21
Phosphorus (P)	.27

Lot 114, 4th district. This lot, now also leased by P. C. Leachman and A. L. Johnsey, is located about 3 miles northeast of Cartersville on the Cartersville-Rowland Springs public road. The ore is being taken from a small open-cut, about 200 yards north of the road. The ore occurs as gravel and "dornicks" in the brownish-yellow clay and is apparently overlain by quartzite. It is to be seen in quite a variety of forms, including needle, geodal, and iridescent types. The ore is mined by pick and shovel and hauled to Cartersville where it is shipped to LaFollette, Tenn. and to the Central Coal and Iron Company, Holt, Ala. Two Ford trucks and seven men were employed at the time of the writer's examination. The ore is said to average 50 percent metallic iron in carload lots. There is promise of a considerable deposit of ore on this property. Water sufficient to furnish a small washer may be obtained from a nearby

branch. The following is an analysis of a sample of ore taken from the lot:

Analysis of Ore from Lot 114, 4th District

Moisture at 100°C	.72
Loss on ignition	9.88
Soda (Na_2O)	.60
Potash (K_2O)	.30
Lime (CaO)	.00
Magnesia (MgO)	.35
Alumina (Al_2O_3)	1.50
Ferric oxide (Fe_2O_3)	81.60
Ferrous oxide (FeO)	.00
Manganous oxide (MnO)	.44
Titanium dioxide (TiO_2)	trace
Phosphorus pentoxide (P_2O_5)	.98
Silica (SiO_2)	3.92
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	100.29
Metallic iron (Fe)	56.81
Sulphur (S)	.01
Phosphorus (P)	.42

J. J. BENNETT PROPERTY

This property, lot 296, 22d. district, is owned by the Fidelity Loan and Trust Company of Rome, Ga. and is located about 3 miles north of the Sugar Hill deposits. P. F. Renfroe and W. J. Moore of Cartersville mined iron ore here in the early part of 1923. The excavation runs N. 45°W. and is about 100 feet long, 15 feet to 20 feet wide, and 25 feet deep. Gravel and "dornick" ore of good grade occur in white and yellow clay, mixed with flint nodules. The deposit is located on a hillslope and judging from the amount of float ore, it is of considerable extent.

The following is an analysis of a sample of the ore:

Analysis of Ore. Bennett Property

Moisture at 100°C	.28
Loss on ignition	8.98
Soda (Na_2O)	trace
Potash (K_2O)	.04
Lime (CaO)	.00
Magnesia (MgO)	.03
Alumina (Al_2O_3)	4.27
Ferric oxide (Fe_2O_3)	76.63
Ferrous oxide (FeO)	.00
Manganous oxide (MnO)	.00
Titanium dioxide (TiO_2)	.00
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.18
Silica (SiO_2)	9.38
Cobalt (Co)	.00
Nickel (Ni)	.00
Total	99.79
Metallic iron (Fe)	53.64
Sulphur (S)	.00
Phosphorus (P)	.07

J. A. VAUGHN PROPERTY

This property, lot 268, 22d. district, is located about 2 miles south of White station on the Tennessee road. Manganiferous iron ore is being mined here three-quarters of a mile east of the Vaughn home. The excavation is on the summit of a small knoll in a cultivated field and was opened about 2 years ago, since which time it has been worked only intermittently. At one time a 2-log washer was used but this is now out of repair and the deposit is worked by dry mining. The ore is low grade, running, it is said, about 35 per cent to 40 per cent iron and 15 per cent manganese. The ore occurs as pockets of gravel ore and as large "dornicks" in the reddish-yellow clay. There is no exposure of quartzite in place, but fragments of the rock are to be seen mixed with the ore. Most of the ore is hauled to Cartersville, a distance of about 7 miles, and shipped to the Republic Iron and Steel Company of Birmingham. Some of it is also shipped from Wyvern and White, stations on the Louisville and Nashville Railroad. At the time of our visit thirteen teams and two trucks were used to transport the ore to the railroad.

J. B. MAHON PROPERTY

The J. B. Mahon property is located at Rydal, a station on the Louisville and Nashville Railroad about 15 miles north of Carters-

ville. Less than a quarter of a mile east of the station, on lot 291, 22d. dist., iron ore is being mined on a small scale. Work has been carried on but a short while. The open-cut is located at the base on the south side of a low, round-topped hill. The ore occurs as "dornicks" and as fine gravel material in the weathered schist, or clay. It is very hard and difficult to mine. There has been no testing of sufficient extent to indicate the size of the deposit, but the float ore is rather abundantly scattered over the hillside. The ore is screened, as too little was known concerning the extent of the deposit to justify constructing a washer. Water may be obtained from Little Pine Log Creek, 1 mile to the east. The ore is being shipped to Rock Run, Ala.

The geological relations of the deposit are well brought out by exposures of limestone and shale in the railroad cut just south of the station. Here there is a tightly squeezed fold, the shale overlying the limestone. There are no exposures of rock on the hill upon which the mine is located, but evidently the shale caps the hill. The ore deposit was probably formed near the contact of the limestone and shale by downward percolating chalybeate waters.

A sample of ore from the face of the pit on the Mahon property gave the following analysis:

Analysis of Ore. Mahon Property

Moisture at 100°C	.76
Loss on ignition	9.94
Soda (Na_2O)	.94
Potash (K_2O)	1.39
Lime (CaO)	.00
Magnesia (MgO)	trace
Alumina (Al_2O_3)	8.59
Ferric oxide (Fe_2O_3)	56.14
Ferrous oxide (FeO)	.00
Manganous oxide (MnO)	.84
Titanium dioxide (TiO_2)	.72
Sulphur Trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.19
Silica (SiO_2)	19.22
Nickel (Ni)	trace
Cobalt (Co)	trace
Total	98.73
Metallic iron (Fe)	39.30
Phosphorus (P)	.08

JAMES DYSERT PROPERTY

The Dysert property, lot 317, 22d. district, is 2 miles north of White station on the Tennessee road. In 1919, a Mr. Butts of Atlanta mined considerable ore on the property, a short distance west of the public road, above referred to.

The ore occurs as a more or less definite body striking nearly due north. It is indicated at the surface by some high-grade float and some highly silicious fragments inclosing small, sharp pieces of quartz. The ore-bearing zone seems to be about 30 feet in width, with a footwall of variegated clay slate. No sandstone or quartzite is present and the sand impurities are scarce. The ore is massive, often occurring in large honeycomb boulders.

The ore-body has been prospected to a depth of 30 feet and good ore was found at this level. The deposit extends about a quarter of a mile along the strike, judging from the results obtained by prospecting.

The equipment of the mine included a steam pump, steam engine for the hoist, a double-log washer, short picking belt, short incline track, and a side dump car. The ore was shipped to LaFollette, Tenn. and Rock Run, Ala. It ran 48-50 percent in metallic iron and low in phosphorus and silica.

Considerable manganiferous iron also occurs on the property, and in the early part of 1923 two small open-cuts were made about 75 yards west of the public road, and a short distance southeast of the above described mine. The ore occurs chiefly as "dornicks" in the decayed slate. The individual dornicks often weigh a 100 pounds or more and are made up largely of honeycomb, iridescent, and needle ores. There is very little gravel ore. Fragments of high-grade ore also are scattered over an area of more than an acre, and several shallow test wells all reveal the same grade of material. It is apparent that the mine is not a washer proposition and this fact, together with the location and grade of the ore, is such as to make the prospect a promising one. The ore is shipped to Rock Run, Ala., where it is said to bring $4.00 per ton.

H. GOODE PROPERTY

Lot 321, 22d. district, 2d. sec., is owned by H. Goode of Rydal, and located half a mile northeast of Rydal station. It joins the Mahon property on the north. No prospecting for ore has been done here, but a considerable acreage on the summit and slopes of a broad, low ridge has a good surface show. The ore is rather impure, however, and of a lower grade than that on the Mahon property. The Goode property is well located for working, but the extent and quality of the deposit are doubtful.

The analyses below show the character of the ore.

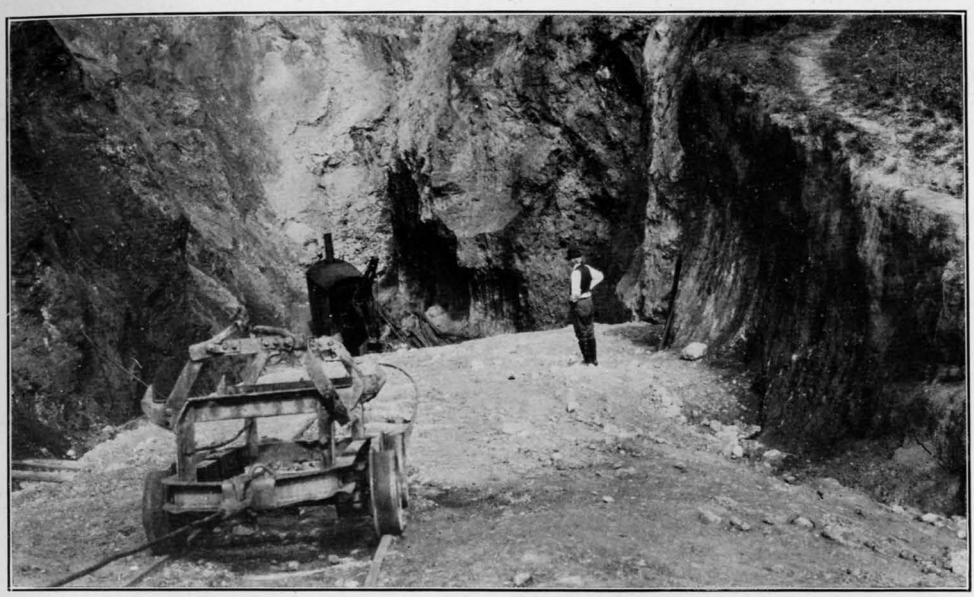
Analyses of Manganiferous Iron Ore. Goode Property

CONSTITUENTS	1	2
Moisture at 100°C	1.06	.68
Loss on ignition	11.20	8.40
Ferric oxide (Fe_2O_3)	54.57	55.07
Manganous oxide (MnO)	12.07	4.72
Phosphorus pentoxide (P_2O_5)	.89	.49
Silica (SiO_2)	14.33	27.72
Total	94.12	97.08
Metallic iron (Fe)	38.20	38.55
Sulphur (S)	.00	.00
Phosphorus (P)	.39	.21
Manganese (Mn)	9.35	3.66

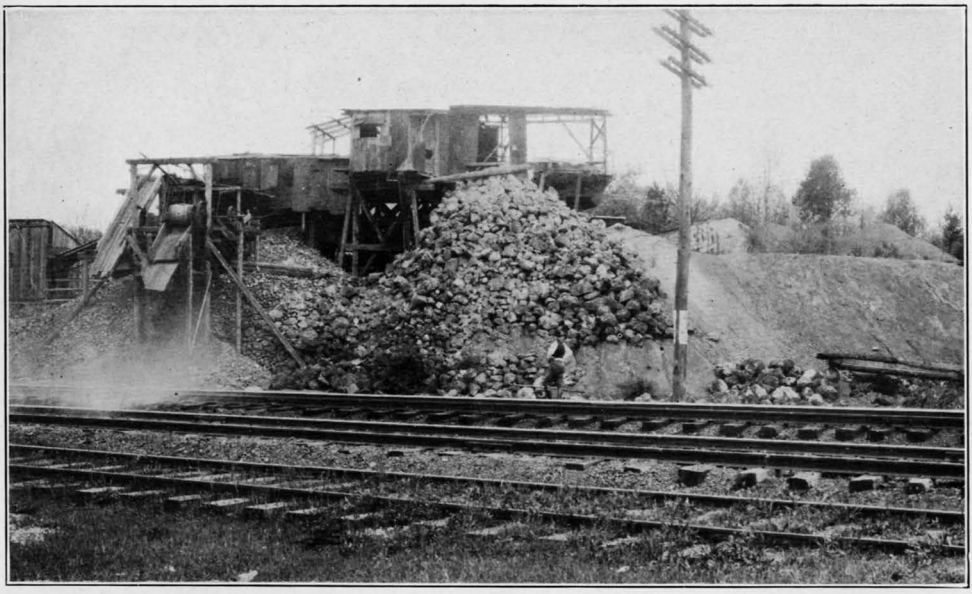
J. R. LEWIS PROPERTY

This property includes lots 9, 22, 23 in the 16th dist., and is jointly owned by the Lewis, Howard, Gaines and Freeman estates S. I. Sheats of Kingston also owns one-eighth of the mineral rights in the property. It is located 2½ miles southwest of Adairsville on the summit and western slope of a broad ridge extending approximately north-south.

In the northwest corner of lot 9, two small open-cuts have been recently opened up by J. R. Leachman and T. J. Garrett lessees of of the property. One of the cuts is located a short distance south of the Rome public road on the summit of the ridge. It was only a small excavation at the time of the writer's visit. The ore occurs chiefly as "dornicks" in the yellow clay. It is of very good grade—



A. OPEN CUT, ETOWAH FURNACE COMPANY, MINE NO. 2, NEAR EMERSON, BARTOW COUNTY.



B. ORE WASHER NEAR OLD BARTOW FURNACE, EMERSON, BARTOW COUNTY.

geodal, iridescent, needle, and other ores being abundant. Also, what appeared to be a bedded "vein" was seen in the face of the cut. This was about 6 feet thick and was called a "sheet" by the miners. The ore is broken up by picks and crow-bars and then screened. Considerable dirt is thus removed, but there is much good ore lost in the process. On the east slope of the ridge near the public road, two small open-cuts were put down in testing for ore. Some of the ore was screened and shipped. At the time of the writer's visit six teams were hauling the ore to Adairsville where it is shipped to the Bon Air Coal and Iron Company furnace in Tennessee.

An average sample of the ore gave the following analysis:

Analysis of Ore. Lot 9

Moisture at 100°C	1.26
Loss on ignition	10.26
Soda (Na_2O)	.37
Potash (K_2O)	.44
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	3.88
Ferric oxide (Fe_2O_3)	69.12
Ferrous oxide (FeO)	.00
Manganous oxide (MnO)	1.50
Titanium dioxide (TiO_2)	.27
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.17
Silica (SiO_2)	12.40
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	99.67
Metallic iron (Fe)	48.38
Sulphur (S)	.00
Phosphorus (P)	.07

About a quarter of a mile west of the first described pit there is another pit which had just been opened up at the time of the writer's visit. Analyses of the ore made for Mr. Leachman indicate that it is of lower grade than that at the first excavation.

P. E. ALFORD PROPERTY

The Alford property, lot 324, 17th district, 3d. section, is located about 5 miles southwest of Kingston. P. F. Renfroe of Cartersville had recently leased the land and had begun mining operations. A shallow open-cut had been dug on the north side of a low hill, about

100 yards south of the public road. The ore apparently occurs as a bedded deposit dipping gently to the north. It is nearly flat, and mining consists of removing the overburden much after the fashion of the methods employed in stripping the fossil-ore beds. The ore is of very good grade. A number of prospect wells have been dug in the vicinity and the deposit seems to be of considerable extent. It was planned to haul the ore across the river to a siding on the Seaboard railroad, a distance of approximately 2 miles.

A sample of the ore gave the following analysis:

Analysis of Ore. P. E. Alford Property

Moisture at 100°C	1.20
Loss on ignition	11.40
Soda (Na_2O)	trace
Potash (K_2O)	trace
Lime (CaO)	trace
Magnesia (MgO)	trace
Alumina (Al_2O_3)	1.86
Ferric oxide (Fe_2O_3)	79.60
Ferrous oxide (FeO)	.00
Manganous oxide (FeO)	.50
Titanium dioxide (TiO_2)	trace
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.20
Silica (SiO_2)	5.10
Cobalt (Co)	.00
Nickel (Ni)	.00
Total	99.86
Metallic iron (Fe)	55.70
Sulphur (S)	.00
Phosphorus (P)	.08

W. C. WALTON PROPERTY

The Walton property is located about 1 mile northwest of Cartersville. Several test pits have been dug on the property and some years ago a small amount of ore was shipped from it. At the intersection of lot lines 196, 197 and 237, 4th dist., 200 yards west of the Walton home there are three shallow pits. These pits, which are near a small tributary of Pettit Creek, were too superficial and caved-in to give much information as to the nature of the deposit. A few small piles of ore taken from the pits was the only ore to be seen. Across the branch to the northwest some float ore is observed on the side of the hill. The ore occurs in several varieties, including

needle, and geodal "dornicks." The property is well located for working, being convenient to the railroad and also near water for washing. An average sample of the ore taken from each of the pits gave the following analysis:

Analysis of Ore. Walton Property

Moisture at 100°C	3.12
Loss on ignition	12.74
Soda (Na_2O)	.16
Potash (K_2O)	.58
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	.84
Ferric oxide (Fe_2O_3)	71.50
Ferrous oxide (FeO)	.00
Manganous oxide (MnO)	.83
Titanium dioxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.28
Silica (SiO_2)	9.62
Nickel (Ni)	trace
Cobalt (Co)	trace
Total	100.03
Metallic iron (Fe)	50.05
Sulphur (S)	.00
Phosphorus (P)	.122

ANDERSON AND BISHOP PROPERTY

N. C. Anderson, of Adairsville, owns lots 39 and 52, 16th district. O. B. Bishop, also of Adairsville, and Mr. Anderson own jointly lot 38, 16th district. These three adjoining lots are located about 3 miles southwest of Adairsville and 1 mile west of the Adairsville-Kingston public road. The property lies on the western slope of the ridge upon which Leachman and Garrett were mining on lot 9, 16th district, at the time of the writer's visit.

Two shallow test pits had been dug on the south side of lot 39, near a small branch. The ore occurs as irregular fragments and "dornicks" in the yellow soil. Much of it is cherty and slaty, but there also occurs considerable good ore. It is found at the surface but test wells might show it to extend in depth. In the center of the lot, 200 yards north of the above pits, there is a small open-cut from which a car of ore was shipped in 1910. The ore is seen as varying sized fragments in the clay walls of the pit. Fifty yards west of this excavation there is another shallow pit exposing the

same type of ore. In the southeast corner of the lot, near a branch, considerable good ore is scattered over the hillslope.

Some mining was done on lot 52 about 10 years ago. The ore is of fair quality but of unknown extent. Ore fragments mixed with chert are scattered over a small area on the north side of the lot.

Two shallow open-cuts have been put down near the southeast corner of lot 38 on a hillslope, immediately west of the small branch flowing southward through the property. An excellent grade of ore in the form of "dornicks" and gravel has been mined here. Some of the larger boulders weigh more than a 100 pounds. The ore occurs in yellow residual clay. Chert and ore fragments are abundantly scattered over the hillslope. From the surface show it seems that there is a considerable deposit of ore on the property. Although the Western and Atlantic Railroad is but 1 mile to the east the nearest shipping point, however, is Linwood, 2 miles to the south. Water for a washer could be pumped from Connesena Creek, which is only about 1 mile away.

Analyses of Ores. Bishop Prroperty

CONSTITUENTS	1	2	3	4	5
Moisture at 100°C	2.34	1.10	.62	1.48	.86
Loss on ignition	6.68	8.76	9.52	7.18	10.94
Soda (Na_2O)	trace				
Potash (K_2O)	trace				
Lime (CaO)	.00				
Magnesia (MgO)	.00				
Alumina (Al_2O_3)	3.05				
Ferric oxide (Fe_2O_3)	82.65	60.60	63.80	79.54	77.12
Ferrous oxide (FeO)					
Manganous oxide (MnO)	.50	.12	.12	.18	.18
Titanium dioxide (TiO_2)	trace				
Sulphur trioxide (SO_3)	.00	.00			
Phosphorus pentoxide (P_2O_5)	.20				
Silica (SiO_2)	4.80	28.26a	23.72a	9.98a	9.02a
Nickel (Ni)	trace				
Cobalt (Co)	trace				
Total	100.22	98.84	97.78	98.34	98.12
Metallic iron (Fe)	57.80	42.42	44.66	55.66	53.98
Sulphur (S)			.03	.00	.12
Phosphorus (P)	.09	.15	.04	.08	.00

1. Sample from Lot 38. Southeast corner
2. Sample from Lot 38.
3. Sample from Lot 39.
4. Sample from Lot 39.
5. Sample from Lot 52.

a. Insoluble.

Lot 53 of this property, known as the Howard property, joins the above lots on the southwest. In 1874 a limited amount of mining was done on this lot but very little ore was shipped. Recently some prospecting has been done. The ore is of the same nature as that on the Anderson and Bishop property but apparently is not very extensive.

L. I. SUTTON PROPERTY

This property, lot 104, 15th district, is located 2 miles southwest of Adairsville, and 1½ miles east of the Rome-Adairsville public road. There has been no prospecting on the property but the surface show is rather extensive. A quarter of a mile north of the Sutton home, on the north side of a broad, low ridge, "dornicks" and gravel ore are spread over about two acres of ground in limited quantity. Some of the ore is of good grade and some poor. Slate and quartz fragments are mixed with the ore in varying quantities.

Adairsville is the nearest shipping point, necessitating a haul of at least 2 miles. The roads are of the ordinary dirt type and somewhat hilly.

An analysis of the ore is given below.

Analysis of Ore. Sutton Property

Moisture at 100°C	1.42
Loss on ignition	10.92
Soda (Na_2O)	.50
Potash (K_2O)	.65
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	2.34
Ferric oxide (Fe_2O_3)	71.00
Manganous oxide (MnO)	1.20
Titanium dioxide (TiO_2)	.54
Sulphur (S)	.00
Phosphorus pentoxide (P_2O_5)	.11
Silica (SiO_2)	11.20
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	99.88
Metallic iron (Fe)	49.70
Sulphur (S)	.00
Phosphorus (P)	.04

MUMFORD MINE[1]

Notes on this property made in 1907 by S. W. McCallie, State Geologist, show that at that time mining had been carried on by the Etowah Development Company for about a year and a half. It was estimated that 100,000 tons of ore had been shipped during this period. A 4-log washer was located on the Etowah river about 1½ miles from the mine, and the daily output was 150 tons. The rest of the equipment consisted of a steam shovel and two dinkey-engines. The ore was shipped to Dayton, Tennessee. The property has not been mined for several years.

GUYTON ORE BANK[2]

Notes on the Guyton property made about 15 years ago show that the daily output then was 2 to 6 cars. Four double-log washers had been erected. A steam shovel and wagons were used in mining and conveying the ore to the washers. At the present time only a little dry mining is being done. The old steam shovel and remains of one of the washers are to be seen on the north side of the mine.

A. D. GREENFIELD PROPERTY

A. D. Greenfield of Atlanta owns several hundred acres near Kingston. Brown ore was mined on lot 218, 16th dist., in 1918. A washer was erected and preparations made for operating on a large scale. However work was carried on but a short while as the ore was too low grade for use in the furnace.

CONNER ORE BANK[3]

The Conner Ore bank, lot 181, 22d. district, located half a mile northeast of White's crossing was last mined about eight years ago by the Georgia Iron and Coal Company. It is owned by the Georgia Mineral Company of Atlanta at present.

BIG MOUNTAIN ORE-BANK

This mine, which is half a mile east of the Conner bank, was dry mined a year and a half ago. The excavation is now caved in and

1. S. W. McCallie, State Geol. Surv. Bull. 10-A. p. 149.
2. S. W. McCallie, State Geol. Surv. Bull. 10-A. p. 146.
3. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 154.

little ore is to be seen. The property belongs to the Georgia Mineral Company.

C. M. JONES PROPERTY[1]

The C. M. Jones property is located on Pumpkinvine Creek, about 2 miles southeast of Emerson. The cuts designated as No. 1 and No. 2 in Bull. 10-A and located on lots 1040 and 1050 respectively, were worked last about 15 years ago. A double-log washer and a steam shovel were used in the operations. The work of the steam-shovel was not very satisfactory because of the heavy overburden.

The daily output was about 60 tons. At present both cuts are caved in and only a few remains of the old washer equipment are seen.

MINOR PROSPECTS

By including certain properties under this heading it is not the intention of the writer to condemn them necessarily as unpromising prospects. In most cases definite information is lacking, due generally to insufficient prospecting. The point should be emphasized that limonite ore does not necessarily increase in iron content with increase in depth, nor does a large surface show always point to a large deposit of ore. Many of the properties described below which have rather poor surface indications may yet prove of economic value.

Lot 99, 4th dist.—Some dry mining has been done on this lot by W. C. Satterfield of Center. At the time of the writer's visit two or three cars per week were being loaded at Wyvern, on the Louisville and Nashville railroad. The ore is said to run 45 per cent metallic iron.

Lot 46, 4th dist.—A little dry-mining was being done on the east half of this lot by R. B. Northey of Cartersville.

Lot 29, 4th dist.—J. R. Leachman of Cartersville recently shipped some ore from this lot. It is said to have been of excellent quality.

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1. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 110

Lot 615, 4th dist.—This lot is owned by P. M. Mansfield, Cartersville. About 100 yards southeast of the Mansfield home there is a shallow open-cut from which about 2 cars of ore were shipped in 1921. It is said to have run 50 per cent in metallic iron. The ore is massive and associated with quartzite. The deposit is apparently limited in size. A quarter of a mile southeast of the above named cut on the edge of the cultivated field there is another excavation from which 7 cars of ore are said to have been shipped some years ago. The ore is reported to have been of fair grade.

Lot 471, 4th dist.—J. M. Knight of Cartersville owns this property, which also includes lots 472, 538 and 537, 4th dist. Two cars of brown iron ore and 2 cars of manganiferous iron ore were shipped from here in 1920 to Birmingham.

Lot 58, 17th dist.—This lot is owned by A. S. Dunn of Taylorsville and is reported to have considerable surface ore of good quality.

Lots 30, 31, 32, 33, 17th dist.—This property is owned by G. B. Hulme of Kingston. He reports good ore on the property which is located near the railroad and a creek with an ample supply of water.

Lot 70, 16th dist.—The lot is known as the J. E. Bray property. A little prospecting has been done for iron and manganese.

POLK COUNTY

A great part of the total limonite production of Georgia has come from Polk County. Some of the largest mines in the state are located near Cedartown. Elsewhere throughout the county lesser deposits have been extensively worked. The value of the Polk County iron ores was not fully recognized until about 1900, but since then they have produced a large output. The deposits are nearer furnaces than any others in the state. The ores are generally of excellent quality, and the geological associations are such that they are easily mined. At present operations are confined mainly to the Cedartown district.

WOODSTOCK OPERATING CORPORATION PROPERTY

The Woodstock Operating Corporation are lessees of the Woodstock Iron and Steel Corporation with offices at Anniston, Ala. The

property includes all of lots 665, 704 and 708, 2d. district and parts of lots 664, 666, 703, 705, 707, and 734, 2d. district, all located a short distance west of Cedartown. The company also carries on mining on lots 253 and 234, 17th district, at Fearing in the Etna Valley district. Most of the ore now mined in the Cedartown district comes from this company's holdings.

Woodstock Mine.—The Woodstock mine (Mine No. 1) is located on lot 665, 2d. district, about 1 mile west of Cedartown. It has been worked almost continuously for more than 20 years, and the excavations cover many acres of the ore-bearing ridge. A series of huge open-cuts have been made on the west and south sides of the ridge from which thousands of tons of ore have been taken. The ore occurs in the form of nodules, pebbles, "pots" and large irregular masses, distributed throughout vari-colored clays. Large white clay "horses" are rather characteristic of the deposit. In the bottom of one of the cuts on the south side of the ridge limestone outcrops. It probably is the Chickamauga limestone. The contact between this formation and the Knox dolomite is indicated on the geologic map of the area as being at about this point.

The mine equipment consists of one steam shovel, No. 145, two dinkey-engines, and four 2-log washers, run by a 90-horse power steam engine. Water is being pumped from Cedar Creek, 1 mile to the east. The mine is connected with the Seaboard railroad by a spur track about three quarters of a mile long. At the time of the writer's visit 25 men were employed, and 1 or more cars of ore per day were being shipped to the LaFollette Coal and Iron Company, LaFollette, Tenn. There is evidently a large tonnage of ore still in the deposit, but the greater part of the ore has no doubt been worked out.

Thirteen analyses of the ore furnished by H. E. Lucas, Supt., averaged 48.85 per cent metallic iron. The poorest sample ran 46 per cent and the best 57.40 per cent.

Mine No. 2—Mine No. 2 is located on lots 734 and 707[1], about 1 mile northeast of the Woodstock mine. The washer has been erected in the southwest corner of lot 734, practically on the line

1. See fig. 1.

between lot 734 and lot 707, and half a mile north of the public road. The workings include the old Cherokee mine described in Bull. 10-A, State Geological Survey, and extend to the northwestward on to lot 708, the T. N. Pace property. A series of large open-cuts have been made on the slopes of this broad, low ridge, upon which the Ledbetter mine, hereafter to be described, is also located. These excavations range up to 50 feet in depth, and have yielded a large tonnage of ore. The ore occurs as gravel, distributed throughout the red surface clay, and as massive boulder ore in the underlying vari-colored clays.

At the time of the writer's visit ore was being mined on lot 708 about half a mile northwest of the washer. Only the red surface clay which carries a large amount of good gravel ore was being hauled to the washer. A steam shovel, No. 60, and two dinkey-engines were used in the operations. The mine is at a higher level than the washer and a "set-back" in the track was necessary before the engines could make the grade. The ore "lead" lies between two large, white, clay "horses" and extends over on to the Ledbetter property.

The 4-log washer is run by a 90-horse power steam engine. The water is pumped from Cedar Creek. The red surface clay is easily washed from the ore, and a high-grade product is turned out. It is said to never run less than 50 per cent metallic iron. Five analyses were

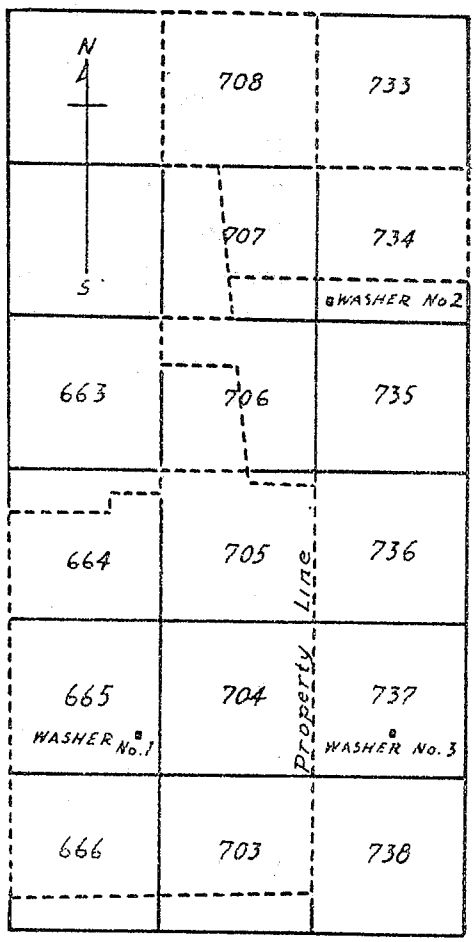

Fig 1. Sketch map of property of Woodstock Operating Corporation, Polk County.

submitted by Mr. Lucas and the average was 53.13 per cent. The ore from lot 708 is said to be higher in phosphorus content than that on lots 734 and 707. It is safe to say that, although the "cream" of the ore is probably gone, there is yet a large amount of good ore in the deposit.

Mine No. 3.—Mine No. 3 is located on lot 737 less than 1 mile south of Mine No. 2. It includes part of the old Peek ore-banks. The property is leased from the Cedartown Cotton Export Corporation. The workings are made up of several large open-cuts which are but a short distance from the branch railroad to Mine No. 2. A new washer was being erected at the time of the writer's visit. The water supply is Cedar Creek, three fourths of a mile distant.

ETNA MINE[1]

This mine is located on lot 253, 17th district, about half a mile southwest of Etna, a station on the Southern railroad. The property is owned by the Barnsdall Corporation of New York, which owns altogether over 10,000 acres in Polk County. The lot in question is leased to the Woodstock Operating Corporation, which is mining ore here at present.

The ore is being taken from the west slope of what is known locally as Battle Ridge. It occurs as gravel in the red surface clay, forming a "blanket" deposit conforming to the slope of the ridge. The thickness of this "blanket" varies considerably, the maximum being about 15 feet. Besides the gravel ore there is a large amount of good sized ore fragments mixed with it, which run high in iron content. Mining consists simply of stripping off the surface material and running it through a washer where the red clay is easily separated from the ore. For mining operation the company uses a 35-ton Vulcan steam shovel, two dinkey engines, and a 4-log washer. The washer is located at the west end of the ridge, and at present washes 50-75 tons of ore per day. The water is pumped a distance of 6 miles from Little Cedar Creek to a large open-cut, which serves as a reservoir, 200 yards northwest of the washer. It is then pumped to a

1. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 83.

tank on the summit of the ridge, from which it flows down a flume to the washer. The ore is dumped into this flume and is carried to the "logs". A 60-horse power steam engine is used for pumping. To date over 15,000 tons of ore have been mined. It is expected that operations will start shortly on lot 234. The ore is shipped from Fearing, a siding on the Southern railroad, just below Etna. A spur track runs up to the mine, a distance of about 1 mile.

An analysis of the ore furnished by the Woodstock Company was as follows:

Metallic iron (Fe)	48 to 50
Phosphorus (P)	.35 to .50
Manganese (Mn)	.5 to 1.5

LEDBETTER MINE[1]

The Ledbetter mine includes parts of lots 661, 662, and 665, 2d district. It has been worked at intervals for many years and the excavations cover an area of over 50 acres. The property is owned by W. M. Larey of Birmingham, and is in charge of T. J. Young, a tenant. A few years ago the Woodstock Operating Corporation worked the property for about three years. The remains of the 4-log washer are still to be seen. At present a little dry-mining is being carried on by Mr. Young. The spur track to the Seaboard railroad is in use and the cars are loaded at the mine.

There is probably a considerable amount of ore in the Ledbetter mine at greater depths; however the most of it that can be easily mined is in a large measure exhausted.

REED MINE[2]

The Reed mine, lots 639 and 640, 2d. district, is located about 2½ miles northwest of Cedartown, and owned by the Cedartown Iron Company. In 1920-21 the mine was leased by the Rock Run Furnace Company which produced a large amount of ore. Since that time the mine has been idle. The area of the workings covers about 10 acres, and probably 300,000 tons of ore have been taken from the deposit. It has been estimated that there are still 100,000

1. S. W. McCallie, State Geol. Serv. Bull. 10-A, pp. 30–35.
2. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 41.

tons available, mostly in the form of gravel ore in the red surface clay. The large "pockets" are regarded in a measure exhausted.

W. J. RICHARDSON PROPERTY

W. J. Richardson owns lots 278, 297, 298, 516, and 565, 2d. district. The property is located a short distance southwest of the Reed mine above described. About 15 years ago Mr. Richardson mined 3,000-4,000 tons of ore in an open-cut on lot 565. The excavation is on the east side of a low, gently sloping hill, about 100 yards east of the Richardson residence.

During the past year new cuts were opened on the hill from which about 9 cars of ore were shipped to Rock Run and Gadsden, Ala. The ore is of the same general character as that found at the Reed mine. There is considerable gravel ore in the surface clay while at greater depths massive and "pot" ore occurs. These "pot" ores often contain a considerable amount of pyrite mixed with a grayish clay. A small amount of ore, ferruginous limestone, and hematite fragments occur on the surface. The deposit seems to be of considerable extent.

Samples of the ore collected by the writer gave the following analyses:

Analyses of Ore. Richardson Property

CONSTITUENTS	1	2
Moisture at 100°C	.54	.75
Loss on ignition	10.80	8.51
Soda (Na_2O)	.60	----------
Potash (K_2O)	.40	----------
Lime (CaO)	.39	----------
Magnesia (MgO)	trace	----------
Alumina (Al_2O_3)	9.00	----------
Ferric oxide (Fe_2O_3)	66.88	74.51
Manganous oxide (MnO)	1.57	.00
Titanium dioxide (TiO_2)	.54	----------
Sulphur trioxide (SO_3)	.00	.05
Phosphorus pentoxide (P_2O_5)	.35	.25
Silica (SiO_2)	8.88	15.07
Nickel (Ni)	trace	----------
Cobalt (Co)	trace	----------
Total	99.95	99.14
Metallic iron (Fe)	46.82	52.16
Phosphorus (P)	.15	.15
Sulphur (S)	.00	.02

1. Sample collected by writer.
2. Sample sent to office by Mr. Richardson.

R. H. JONES PROPERTY

R. H. Jones of Cedartown owns lots 560, 561, 520, 521, 487, and the southeast half of lot 488, all of the 2d. district, located about 3 miles west of Cedartown, and three-fourths of a mile south of the Cedartown-Priors public road. Ore occurs on all of these lots, but the best prospects for workable deposits are on lots 487 and 488. About 10 years ago, 5,000-6,000 tons of ore were mined on lot 487. The open-cuts from which this ore was taken, together with the prospect pits on lot 488, are located on the east slope and summit of a hill at an elevation of about 150 feet above the general level of the surrounding country. The hill which is now under cultivation has a thick mantle of deep-red clay soil carrying a large amount of gravel and "dornick" ore. The occurrence of the ore is similar to that at the Reed mine. A few deep prospect-wells had been put down on the property but at the time of the writer's visit they were so caved in that the vertical extent of the ore could not be determined. The shallow open-cuts have much good ore in their walls which could be easily mined. On the west slope of the hill considerable chert float occurs, but small cross cuts reveal a good grade of ore also, much of which is of the honey-comb type.

It is said that a mining company planned to begin operations on this property just before the World War. A washer was to have been built on the north side of the hill and water was to have been obtained, either by damming up the little creek in the valley or by pumping it from Big Cedar Creek, a distance of about 1¼ miles. With the advent of the war, however, nothing was done. The prospect for a workable deposit of ore on this property is promising.

A sample of ore collected by the writer from lot 488 gave the following analysis:

Analysis of Ore. Jones Property

Moisture at 100°C	1.32
Loss on ignition	10.78
Soda (Na_2O)	trace
Potash (K_2O)	trace
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	6.88
Ferric oxide (Fe_2O_3)	66.52
Manganous oxide (MnO)	1.58
Titanium dioxide (TiO_2)	.18
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	1.32
Silica (SiO_2)	11.52
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	100.00
Metallic iron (Fe)	46.56
Sulphur (S)	.00
Phosphorus (P)	5.74

EDMESON PROPERTY[1]

Samuel Edmeson of Cedartown owns lot 916, 2d. district. Extensive mining has not been carried on here for some years. At present a little dry-mining is being done by Mr. Edmeson. He describes the deposit as being a sinuous "blanket" formation, 100 feet wide and 1200 feet long. The clay overburden is about 15 feet thick. The ore is said to average 53 per cent metallic iron and 0.13 per cent phosphorus. The property is well located for economic mining.

Mr. Edmeson also worked at the same time the Fairfield property (Pool Bank) on lot 988, half a mile east of the above ore-bank.

J. O. WADDELL PROPERTY[2]

This property was worked in 1922 by Robert Davis of Cedartown, who shipped 18 cars of ore. The surface show of ore covers an area of about 75 acres. A short distance south of the old mansion two openings had been recently made by Mr. Davis and a very fine grade of wash-ore, which seemed to occur in considerable quantity, was being mined. A spring in the immediate vicinity furnishes an abundant supply of water for a washer. A partial analysis of the ore furnished by Mr. Davis shows it to carry 52.3 per cent metallic iron and 0.13 per cent phosphorus.

1. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 39.
2. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 48.

WRAY MINE[1]

The Wray mine embraces parts of lots 190, 191, 192, 1st. district. The main excavation, however, is near the west boundary of lot 191. It is about 40 feet deep, 100 feet long, and 125 feet wide, and now half filled with water. A washer was located at one time on lot 192, near the public road.

The property is now owned by the Appalachian Marble Company, Knoxville, Tenn. It was worked last in 1912-13 by the Independent Iron Company. The ore is said to have run from 45 to 51 per cent metallic iron and about 8,000 to 10,000 tons per year were shipped to Rock Run, Ala., the Citico furnace, Chattanooga, and to Cedartown and to Rome. Water was pumped from Lime Branch, against a "head" pressure of 289 feet.

HICKS PROPERTY[2]

Dr. H. A. Hicks of Cedartown owns lot 193, 1st. district. The property was worked by C. H. Graves about 12 years ago, the ore being washed at the Wray Mine. The ore is somewhat siliceous.

GRAVES PROPERTY[2]

C. H. Graves owns lots 188 and 189, 1st. district. Sterling Young and Mr. Graves mined ore here some years ago and shipped it from Young's station. The open-cut, which is now overgrown by trees and bushes, is about 300 feet long, 200 feet wide, and 15 feet deep.

HIGHTOWER PROPERTY[3]

This property, lot 1118, 2d. district, is owned by E. D. Hightower of Young's station. About 7 years ago 300 cars of ore were shipped from the property. It is said to have run from 45 to 52 per cent metallic iron, and to have been high in phosphorus. The open-cut, which is about 175 feet long, 10-30 feet in depth and 225 feet in width, is located about half a mile northwest of Young's station. Operations are said to have been discontinued on account of the low prices received for ore.

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1. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 71.
2. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 73.
3. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 70.

PEEK PROPERTY[1]

Dr. C. W. Peek of Cedartown owns lots 1189, 1254, and 1330, 21st. district. The mineral rights in lots 1189 and 1254 belong to The Cedartown Iron Company. There has been no mining here for some years. The workings consist of a broad, deep open-cut located on lot 1254, about 2 miles northeast of Young's station and a quarter of a mile north of the Young's station-Grady public road. Several vertical shafts have been sunk in the bottom of the excavation. Considerable hematite is mixed with the limonite. The chief difficulty in working the property arises from the scarcity of water for washing the ore.

There is considerable surface ore of good quality on lot 1330. Ferruginous limestone fragments were observed, also.

The character of the ore on the Peek property is indicated by the following analyses:

Analyses of Ore. Peek Property

CONSTITUENTS	1	2
Moisture at 100°C	.20	.76
Loss on ignition	9.78	11.48
Soda (Na_2O)	.20	.25
Potash (K_2O)	.25	.20
Lime (CaO)	.00	.00
Magnesia (MgO)	.00	.00
Alumina (Al_2O_3)	6.82	7.06
Ferric oxide (Fe_2O_3)	75.10	72.75
Manganous oxide (MnO)	.76	trace
Titanium dioxide (TiO)	.36	.00
Sulphur trioxide (SO_3)	.00	.00
Phosphorus pentoxide (P_2O_5)	.87	1.15
Silica (SiO_2)	5.30	5.22
Cobalt (Co)	trace	----------
Nickel (Ni)	trace	----------
Total	99.64	98.87
Metallic iron (Fe)	52.57	50.93
Sulphur (S)	.00	.00
Phosphorus (P)	.37	.50

CURTIS PROPERTY

Allen Curtis of Cedartown owns lot 1255, 21st. district, adjoining the Peek property on the west. About 15 years ago a Mr. High-

1. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 67.

tower worked the property to a limited extent, and later Robert Davis mined some ore here. There are two shallow open-cuts, located about 100 yards apart. The ore is of the same character as that found on the Peek property.

Reese T. Curtis owns the property northwest of lot 1255. Some surface ore occurs on this property.

Analysis of ore from the two properties are given below:

Analyses of Ore. Curtis Property.

CONSTITUENTS	1	2
Moisture at 100°C	.34	.56
Loss on ignition	10.10	12.12
Soda (Na_2O)	trace	trace
Potash (K_2O)	trace	trace
Lime (CaO)	.00	.00
Magnesia (MgO)	.00	.00
Alumina (Al_2O_3)	7.30	2.44
Ferric oxide (Fe_2O_3)	72.76	81.54
Manganous oxide (MnO)	.98	.34
Titanium dioxide (TiO_2)	.54	.36
Sulphur trioxide (SO_3)	.23	.00
Phosphorus pentoxide (P_2O_5)	.39	.06
Silica (SiO_2)	7.26	3.08
Cobalt (Co)	trace	.00
Nickel (Ni)	trace	.00
Total	99.90	100.50
Metallic iron (Fe)	50.93	57.06
Sulphur (S)	.10	.00
Phosphorus (P)	.11	.02

HENDERSON PROPERTY[1]

A. Y. Henderson of Young's station owns this property, lot 1190, 2d district. The workings consist of four small open-cuts located about 300 yards east of the Cedartown-Young's station public road, and three-quarters of a mile west of Young's station. About five years ago 75 cars of ore were shipped to Rock Run, Ala., and to the Dayton Coal and Iron Co., Dayton, Tenn. Two years ago two cars of ore were shipped. The ore in the deposit is not apparently exhausted. Considerable float occurs on the lot.

A sample of the ore collected by the writer, analyzed as follows:

1. See Bull. 10-A, p. 70.

Analysis of Ore. Henderson Property

Moisture at 100°C	1.16
Loss on ignition	6.86
Soda (Na_2O)	.85
Potash (K_2O)	.30
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	2.41
Ferric oxide (Fe_2O_3)	70.00
Manganous oxide (MnO)	.18
Titanium dioxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.08
Phosphorus pentoxide (P_2O_5)	.98
Carbon dioxide (CO_2)	.00
Silica (SiO_2)	16.92
Total	100.10
Metallic iron (Fe)	49.00
Sulphur (S)	.03
Phosphorus (P)	.42

PULASKI COAL AND IRON COMPANY PROPERTY

The Pulaski Coal and Iron Company, Pulaski, Va., owns what was formerly known as the Central Mining Company property[1]. No mining has been carried on here since 1919.

The workings consist mainly of huge, shallow open-cuts covering nearly all of lots 879 and 898, 21st. district. The red surface clay is rich in iron ore but mining to any depth was not undertaken except in one or two places. On lot 898 there is an open-cut about 600 feet long, 400 feet wide and 45 feet deep, from which it is said that 50,000 tons of ore were taken in 1915. Altogether, about 150,000 tons of ore are said to have been shipped to Pulaski, Va., during this last period of operation. Some of it ran as low as 38 percent in metallic iron, and all of it was rather high in phosphorus. The surface ore carried considerable hematite.

The mining equipment on the property was quite complete. The 4-log washer, cone-screen, etc., together with the 125-horsepower steam engine, were enclosed in a well built shed, making a neat, compact plant. Steam shovels and dinkey-engines were used in mining the ore. A spur track connected the workings with the Seaboard Air Line Railway at Grady. A large boarding house was built, to

1. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 60.

gether with many houses for workmen with families. At present only the washer plant is being kept in repair. A few of the houses for workmen are also occupied. The spur track is in fair condition, but it is possible that new ties would have to be put down.

An average sample of ore from lots 879 and 898 analyzed as follows:

Analysis of Ore. Pulaski Coal & Iron Company Property

Moisture at 100°C	.98
Loss on ignition	9.82
Soda (Na_2O)	.25
Potash (K_2O)	.48
Lime (CaO)	.80
Magnesia (MgO)	.14
Alumina (Al_2O_3)	2.49
Ferric oxide (Fe_2O_3)	73.07
Manganous oxide (MnO)	1.00
Titanium dioxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.56
Silica (SiO_2)	10.00
Nickel (Ni)	trace
Cobalt (Co)	trace
Total	99.95
Metallic iron (Fe)	51.15
Sulphur (S)	.00
Phosphorus (P)	.24

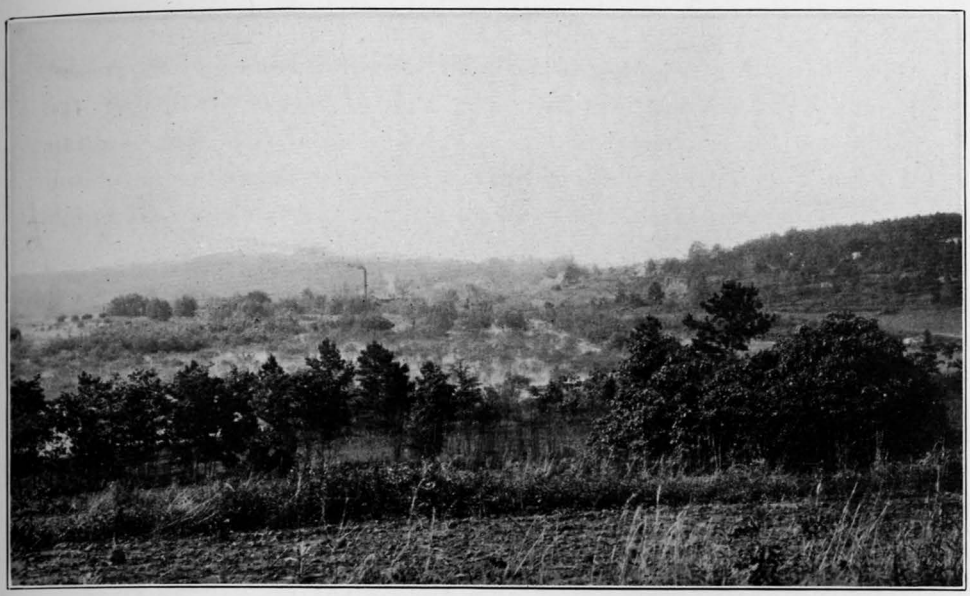
BALDWIN PROPERTY

The Pulaski Coal and Iron Company owns the mineral rights in 162 acres of this property, situated about 4 miles south of Fish on the Fish-Young's station public road. It has been prospected to a considerable extent by the Pulaski Company, but is not regarded as a promising project. The ore is high in phosphorus content and similar in other respects to that on the Company's property at Grady. Lack of water and transportation facilities would be the main drawbacks in developing the property. The company owns eight lots in the vicinity of Long's station, also.

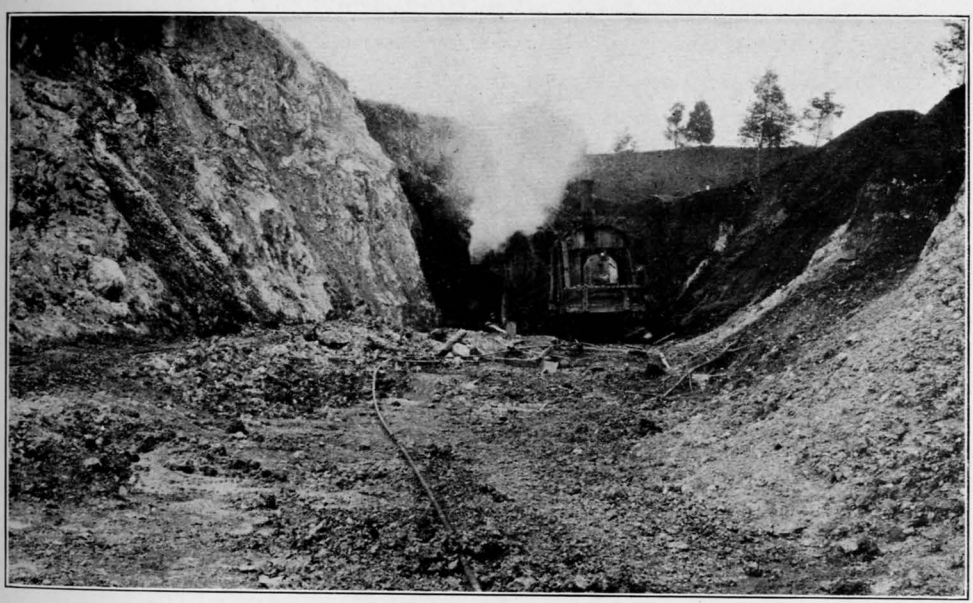
J. WATTS RANDALL PROPERTY[1]

The Randall property includes lots 1239, 1240, 1241, 1242, 1276 and 1278, 21st. district. Mining has been confined to lot 1241. In 1917 Randall shipped 105 cars of ore to Anniston, Ala. In December

1. S. W. McCallie, State Geol. Surv. Bull. 10-A, pp. 68-70.



A. GENERAL VIEW OF OPERATIONS AT IRON HILL MINE NEAR ALLATOONA, BARTOW COUNTY.



B. OPEN CUT AT IRON HILL, NEAR EMERSON, BARTOW COUNTY.

1922 operations were resumed and 13 cars of ore were shipped to LaFollette, Tenn. and Rock Run, Ala. The ore is reported to have brought from $2.75 to $3.50 per ton. There is considerable ore in sight at the mine. Surface ore in varying amounts is to be found on lots 1239, 1240 and 1241. A branch railroad to the property was torn up many years ago.

RICHARD GAMMON PROPERTY

The Gammon property, which includes parts of lots 449, 451 and 452, 21st. district, is located about 2 miles northwest of Grady. Some years ago about 16 cars of ore were shipped from the property to the furnace at Gadsden, Ala. Half of this amount came from two small open cuts on lots 452 and 459, and the balance was picked up from the surface on the same lots. At this time two or three small prospect pits were also dug.

A large acreage has more or less float in the form of needle, stalactitic, iridescent and "pot" ores occurring in the red surface clay, either as small, irregular fragments or boulders up to 8 inches in diameter. A branch road 3½ miles long connects the property with the Seaboard Air Line Railroad. Water for a washer can be pumped from Fish Creek, 3½ miles to the east, or possibly a connection with the pump line at Grady might be made. Not enough prospecting has been done on the property to enable one to accurately estimate the quantity of ore present; however there seems to be a considerable amount of workable ore.

Three samples collected by the writer gave the following analyses:

Analyses of Iron Ore. Gammon Property

CONSTITUENTS	1	2	3
Moisture at 100°C	0.24	0.66	0.08
Loss on ignition	9.04	10.30	11.48
Lime (CaO)	0.08	trace	0.04
Magnesia (MgO)	0.14	trace	0.06
Alumina (Al_2O_3)	9.23	3.29	4.79
Ferric oxide (Fe_2O_3)	73.49	78.90	75.95
Manganous oxide (MnO)	trace	0.38	trace
Titanium dioxide (TiO_2)	trace	0.72	trace
Sulphur trioxide (SO_3)	.00	.00	.00
Phosphorus pentoxide (P_2O_5)	0.29	0.29	0.34
Silica (SiO_2)	7.22	6.92	6.96
Total	99.73	101.46	99.70
Metallic iron (Fe)	51.44	55.20	53.17
Phosphorus (P)	0.12	0.12	0.14

1. Lot 453, 21st. district.
2. Lot 452, 21st. district.
3. Lot 449, 21st. district.

GREENFIELD PROPERTY[1]

A. D. Greenfield of Atlanta owns the surface and mineral rights in 130 acres including parts of lots 1022, 1023, 1050, 1051 and 1052, all in the 21st. district, Polk County. The property is located 2 miles southeast of Fish.

Prospecting for brown ore has been carried on quite extensively on lots 1052 and 1051. A series of small cuts have been dug on the eastern slope and summit of a low, wooded ridge, with a general north-south trend. The ridge is but a short distance east of the public road from Fish to Young's station. Immediately south of this ridge, across a small branch, is another ridge of about the same height and trend. A number of prospect pits have been dug on the north end of this ridge. The ore occurs as varying sized fragments in the yellow residual clay, overlying the Rockmart slates. It is of much the same character as the ore at Grady. There is float ore over a large area, also.

About eight years ago ore was raised on the property and shipped to Pulaski, Va., and Rock Run, Ala. It is said to have averaged

1. S. W. McCallie, State Geol. Surv. Bull. 10-A, pp. 68-70.

48 per cent metallic iron. Water for a washer could be pumped from Fish Creek at Fish, a distance of about 1¾ miles. There appears to be a considerable deposit of good ore on the Greenfield property.

The analyses below indicate the character of the ore:

Analyses of Ore. Greenfield Property

CONSTITUENTS	1	2	3	4	5	6
Moisture at 100°C	1.52	4.62	2.96	2.08	3.94	0.44
Loss on ignition	10.64	10.30	10.70	9.60	10.74	7.86
Soda (Na_2O)	0.37	0.40	0.29	0.70	0.40	0.65
Potash (K_2O)	0.40	0.42	0.22	1.00	0.32	0.55
Lime (CaO)	.00	.00	.00	.00	.00	.00
Magnesia (MgO)	.00	.00	.00	.00	.00	0.62
Alumina (Al_2O_3)	6.70	6.44	1.41	6.73	3.02	2.76
Ferric oxide (Fe_2O_3)	58.20	54.86	66.46	60.97	72.61	58.01
Manganous oxide (MnO)	trace	trace	trace	trace	trace	1.02
Titanium dioxide (TiO_2)	0.18	0.18	trace	0.18	trace	0.36
Sulphur trioxide (SO_3)	.00	.00	.00	.00	.00	.00
Phosphorus pentoxide(P_2O_5)	2.22	2.74	4.57	0.56	2.93	3.05
Silica (SiO_2)	19.80	19.94	12.24	17.96	5.80	24.46
Cobalt (Co)						trace
Nickel (Ni)						trace
Total	100.03	99.90	98.85	99.78	99.76	99.78
Metallic iron (Fe)	40.74	38.40	46.56	42.68	50.83	38.60
Sulphur (S)	.00	.00	.00	.00	.00	.00
Phosphorus (P)	0.96	1.19	1.99	.24	1.28	1.32

1. Sample from south side of north ridge, immediately north of small branch.
2. Average sample from pits along east side of north ridge.
3. Sample from cut 200 yards north of small branch.
4. Sample from test-well in "bottom" land east of ridge.
5. Sample of ore from cut immediately south of small branch.
6. Sample from cut on east side of north ridge.

OREMONT PROPERTY[1]

A washer was operated on this property in 1907 by the Lacey-Buke Iron Company. After a short period of working the company went into bankruptcy, and the property was bought by the Southern Steel Company. This company also worked the mine for a while. A double log washer was used and the daily output was about 125 tons. A steam shovel could not be used as the pockets of ore were too small. Furthermore, it is reported that some trouble was experienced in keeping the grade of ore up to the requirements. The ore was shipped mainly to the company's furnace at Treestville, Ala.

1. S. W. McCallie, State Geol. Surv. Bull. 10-A, pp. 90-95.

In 1912-14 Brad Tatum of Cartersville, also operated a small washer on the property. At present Sydney Simmons of Cave Spring is dry-mining there. It is said that few cars of the ore run below 46 per cent metallic iron, and that some "screenings" run as high as 51 per cent. The ore is shipped to LaFollette, Tenn., Alabama City and Rock Run, Ala. It is likely that the old ore banks are nearly worked out, the readily accessible ore at least, being largely exhausted.

Near the south boundary of the property there is a considerable area, now under water, which is said to have good ore prospects. An old artesian well, sunk on the property to a depth of 180 feet, is reported to have encountered ore its entire depth. Part of the area covered by water is owned by Judge J. A. Wright, Rome, Ga.

WOOD PROPERTY[1]

The Wood Property (lots 58 and 88, 17th dist.) was operated last in 1920. The workings consist of a large open cut near the top of an oval-shaped hill. About 75,000 tons of ore have been taken from the mine. It is now owned by the Cedartown Iron Company.

THE ALABAMA COMPANY PROPERTY[2]

This property which includes nearly 2,000 acres, is located in the vicinity of Hematite and Oremont in the northwestern part of Polk County. Most of the ore produced has carried varying percentages of manganese, and mining on a large scale was carried on during the World War. At present no ore is being mined. About three years ago some brown ore was raised on lot 69, 17th district. The cuts from which the ore was taken are located a quarter of a mile east of the public road from Oremont to the property. One of these is at the edge of a cultivated field. Good ore was struck to a depth of 30 feet. A short distance east of this pit there is a larger excavation from which 30 cars of ore were shipped. The ore ran about 48 per cent metallic iron, low in manganese, and about 0.16 per cent phosphorus. There is a surface show over an area of about 2 acres, and it is likely that there are several thousand tons of ore in

1. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 89-90.
2. State Geol. Surv. Bull. 35, p. 157.

the deposit. The workings are a quarter of a mile from a creek and half a mile from the Southern Railway. Water could also be obtained from the big reservoir 1 mile to the southwest. This reservoir is at a sufficiently high level so that a pump would not be needed.

On lot 140, 17th dist., many open cuts have been made and a large amount of ore shipped in past years. A small washer was used, and a tramline connected the workings to the railroad at Oremont. The analyses below were obtained from C. R. Sheffield who was in charge of the property:

Analyses of Ore. Lot 140

	Iron (Fe)	Manganese (Mn)	Insolubles	Phosphorus (P)
I	.83	42.8	18.50	----------
II	.94	47.4	14.00	----------
III	8.20	35.8	24.40	----------
IV	5.60	39.93	16.60	----------
V	10.40	32.10	22.75	.24
VI	4.82	31.66	----------	----------

SHORT PROPERTY[1]

C. B. and H. H. Short own lot 571, 2d. district, formerly known as the McMeekin property, located about 4 miles northwest of Cedartown. Several cars of ore were mined here in 1920 from an open cut beside the public road near the Short residence. The cut is now caved in to a great extent but still considerable ore is to be seen in its walls. There is some float ore scattered over a small area. The property is about 2½ miles from the branch railroad leading to the Ledbetter mine. Water for a washer could be pumped from a nearby creek.

Mrs. E. B. Short owns lots 570 and 511, 2d. district, formerly known as the Nancy Crocker property.[2] No work has been done here for many years and the old cuts are, in a large measure, filled up. Two samples of ore taken from this property gave the following analyses:

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1. S. W. McCallie, State Geol. Surv. Bull. 10-A, pp. 49-50.
2. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 50.

Analyses of Iron Ore. Short Property

CONSTITUENTS	1	2
Moisture at 100°C	1.02	0.32
Loss on ignition	11.60	10.00
Soda (Na_2O)	.60	.12
Potash (K_2O)	.30	.16
Lime (CaO)	.00	.00
Magnesia (MgO)	.00	.00
Alumina (Al_2O_3)	trace	.59
Ferric oxide (Fe_2O_3)	81.74	79.63
Ferrous oxide (FeO)		
Manganous oxide (MnO)	trace	trace
Titanium dioxide (TiO_2)	trace	.00
Sulphur trioxide (SO_3)	.00	.00
Phosphorus pentoxide (P_2O_5)	.66	.15
Silica (SiO_2)	4.48	9.70
Total	100.40	100.67
Metallic iron (Fe)	57.22	55.78
Sulphur (S)	.00	.00
Phosphorus (P)	.290	.06

1. Sample from lot 571.
2. Sample from lot 570.

B. F. WEAVER PROPERTY

The Weaver property, lots 355, 294, 356, 2d. district, is located about 5 miles southeast of Cave Spring. In the Fall of 1922 brown ore was mined on lot 355. The pits are on the north side of a low ridge, 100 yards from a small branch and only a short distance from the Weaver residence. Three cars of ore were shipped to Rock Run, Ala. The ore occurs chiefly as gravel in the residual clay though a few "dornicks" also are to be seen. Ferruginous chert fragments are more or less mixed with the ore. The surface show of ore on the hillslope covers a considerable area. There is promise of a good deposit of ore on the property, but the long haul to the railroad is a serious handicap to its development.

A sample of the ore collected by the writer analyzed as follows:

Analysis of Ore. Weaver Property

Moisture at 100°C	0.36
Loss on ignition	10.48
Soda (Na_2O)	0.09
Potash (K_2O)	0.18
Lime (CaO)	.00
Magnesia (MgO)	trace
Alumina (Al_2O_3)	3.50
Ferric oxide (Fe_2O)	80.09
Manganous oxide (MnO)	trace
Titanium dioxide (TiO_2)	0.36
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	0.15
Silica (SiO_2)	4.38
Total	99.59
Metallic iron (Fe)	56.06
Sulphur (S)	.00
Phosphorus (P)	0.06

WATTS PROPERTY

This property is now owned by the Robert Campbell estate. Sydney Simmons of Cave Spring mined ore here intermittently between 1901-1903 and 1906-1918. Considerable ore of good grade is to be seen in the old cuts. For a full description of this property see Bulletin 10-A, pp. 52-54, State Geological Survey of Georgia.

BEN HUNT PROPERTY[1]

Sydney Simmons operated a washer on this property in 1907-08, and also did some dry-mining. More than 8,000 tons of ore were shipped from the open cut located on a hillside near the public road. There is apparently no great amount of ore left in the deposit.

GARRETT PROPERTY

G. A. Garrett owns lot 684, 21st. district, located on the Rockmart-Aragon public road. A small prospect pit was made beside the road some 15 years ago and about six years after a limited amount of ore was shipped. Considerable silica and chert occur with the ore, which is found as "pockets" in the surface clay.

A sample of the ore gave the following analysis:

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1. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 51.

Analysis of Ore. Garrett Property

Moisture at 100°C	1.78
Loss on ignition	9.32
Soda (Na_2O)	0.40
Potash (K_2O)	0.30
Lime (CaO)	.00
Magnesia (MgO)	0.06
Alumina (Al_2O_3)	3.22
Ferric oxide (Fe_2O_3)	74.14
Manganous oxide (MnO)	trace
Titanium dioxide (TiO_2)	0.36
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.19
Silica (SiO_2)	10.18
Total	99.95
Metallic iron (Fe)	51.99
Sulphur (S)	.00
Phosphorus (P)	0.08

BROWN PROPERTY

R. L. Brown of Rockmart owns lot 733, 18th district, located 3 miles east of Rockmart, and a quarter of a mile north of the Southern Railway. No prospecting has been done, but a limited amount of pebble ore and a few "dornicks" are scattered over the hillslope near the Brown residence. The surface ore is more plentiful on lot 732.

F. L. CLARK PROPERTY

The Clark property consists of lot 715, 21st. district, 3 miles west of Rockmart and a quarter of a mile north of the Seaboard Air Line Railway. It has on it a small open cut from which ore was shipped about 20 years ago. The ore seems to be made up largely of hematite and is of good grade. However, the extent of the deposit is doubtful. Lots 619 and 639, 21st. district also have a limited show of ore. The analysis of a sample of the ore gave the following result:

Analysis of Ore. Clark Property

Moisture at 100°C	1.24
Loss on ignition	7.66
Soda (Na_2O)	.40
Potash (K_2O)	.56
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	6.20
Ferric oxide (Fe_2O_3)	71.36
Manganous oxide (MnO)	2.92
Titanium dioxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.31
Phosphorus pentoxide (P_2O_5)	.08
Silica (SiO_2)	8.52
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	99.61
Metallic iron (Fe)	49.95
Sulphur (S)	.18
Phosphorus (P)	.04

EZZELL PROPERTY

J. C. Ezzell owns several lots in the 20th district of Polk County, 3 lots in the 19th district, Haralson County, and 3 lots in the 19th district, Paulding County. The property is located about 8 miles south of Rockmart. In the southwest corner of lot 697, 20th district, Haralson County, an adit 20 feet long was driven into the hillside near Wircher Creek. The country rock is a ferruginous mica schist. Pyrites was found in considerable quantity at the face of the adit. Any limonite found at the surface would naturally be supposed to have originated from the pyrites, as gossan ore. On lot 712, 20th district, Haralson County, a small pit was dug some years ago, a quarter of a mile west of the adit above referred to. A sample of the ore was collected by the writer, the analysis being given below:

Analysis of Ore. Lot 712

Moisture at 100°C	1.56
Loss on ignition	9.98
Soda (Na_2O)	.30
Potash (K_2O)	.10
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	4.26
Ferric oxide (Fe_2O_3)	66.06
Ferrous oxide (FeO)	-----
Manganous oxide (MnO)	1.16
Titanium dioxide (TiO_2)	.27
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	2.49
Carbon dioxide (CO_2)	-----
Silica (SiO_2)	13.42
Copper (Cu)	trace
Total	99.90
Metallic iron (Fe)	46.34
Sulphur (S)	.00
Phosphorus (P)	1.07

J. J. GOSS PROPERTY

This property, lot 152, 18th district, on which a small amount of prospecting has been done, is located three-quarters of a mile south of Euharlee Creek, and half a mile north of the Seaboard Air Line Railway. Only one pit is to be seen on the property from which the ore was taken. There is a considerable amount of ferruginous mica schist, pebble ore, and small "dornicks" scattered over the wooded hillside. The property is well located for working, but there is nothing by which the quantity of ore present may be estimated. Lots 209, 225, 280, 297, 18th district, of the Goss Property have a limited amount of surface ore.

An analysis of ore from the prospect pit is here given:

Analysis of Ore. Lot 152

Moisture at 100°C	.66
Loss on ignition	12.34
Soda (Na_2O)	trace
Potash (K_2O)	trace
Lime (CaO)	.10
Magnesia (MgO)	.65
Alumina (Al_2O_3)	4.60
Ferric oxide (Fe_2O_3)	74.83
Ferrous oxide (FeO)	.00
Manganous oxide (MnO)	1.76
Titanium dioxide (TiO_2)	trace
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	1.51
Silica (SiO_2)	3.68
Cobalt (Co)	trace
Nickel (Ni)	.09
Total	100.22
Metallic iron (Fe)	52.38
Sulphur (S)	.00
Phosphorus (P)	.652

PATTERSON PROPERTY

Mrs. Sally Patterson of Rockmart owns 30 acres in lot 937, 18th district. The property is located about 1 mile from Rockmart on the Rockmart-Dallas public road. About a quarter of an acre of ground near the Patterson residence has a surface show of ore. Two test wells are said to have been sunk on the property but neither penetrated completely the so-called "pocket" of ore. The extent of the deposit is doubtful. A sample of the ore gave the following analysis:

Analysis of Ore. Patterson Property

Moisture at 100°C	1.50
Loss on ignition	10.00
Soda (Na_2O)	.50
Potash (K_2O)	.60
Lime (CaO)	.00
Magnesia (MgO)	.57
Alumina (Al_2O_3)	8.40
Ferric oxide (Fe_2O_3)	53.67
Manganous oxide (MnO)	1.94
Titanium dioxide (TiO_2)	.18
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.75
Silica (SiO_2)	21.68
Copper (Cu)	trace
Total	99.79
Metallic iron (Fe)	37.57
Sulphur (S)	.00
Phosphorus (P)	.326

BREWSTER PROPERTY[1]

This property, located about 1 mile north of Esom Hill, is owned by J. M. Garvin of Rock Run, Ala. A series of pits and small open-cuts have been made here on the east slope and summit of a ridge. A very good grade of ore is to be seen in the walls of the cuts, and a considerable amount of float is spread over an area of approximately 30 acres. The Georgia-Alabama state line runs along the summit of the ridge on which the ore is found. The Tecumseh Iron Company opened up the ridge near its summit on the Alabama side, built a washer and mined as far as the State line. The remains of the washer are still seen.

Apparently there is a large deposit of ore on the Brewster property. Its excellent location makes it a promising project.

BLACK ROCK MINE[2]

This ore bank is located on lots 43 and 106, 21st. district. The former lot is owned by J. J. Bennet and the latter by Mrs. Mattie Salmon. The mine was last worked in 1907 by the Tecumseh Iron Company. About 1 car of ore per day was shipped from a siding on the Southern Railroad, half a mile distant. The ore was not washed or screened and much fine material was lost.

SHACKLEFORD ORE-BANK

Molly Tumlin (colored) owns lot 163, 21st. district, located about 1 mile southwest of Byrd. On the summit of a low ridge, a quarter of a mile west of the public road from Cedartown to Byrd, there is an open-cut about 100 feet long, 20 feet wide, and 15 feet deep. A Mr. Shackelford mined ore here some years ago, hence the name. A small amount of fair grade ore is on the dump-pile. A surface show occurs over a small area of the hillslope.

H. J. BRADSHAW PROPERTY

The Bradshaw property, consisting of about 3,000 acres, is located near Seney. A mile east of Seney on the summit of a low ridge and near the public road, there is a small prospect pit dug by a Mr.

1. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 75.
2. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 103.

Shackelford more than 20 years ago. The pit is near an old bauxite mine. The ore is massive, and rather silicious. A small amount of float occurs.

FLOYD COUNTY

No limonite ore is being mined in Floyd County at present. Nearly all of the ore-banks described in Bulletin 10-A have been idle since the publication of that report. In most cases the lack of water for ore washing, and the distance from the railroad have been the main factors preventing development of the deposits. By reason of the improvement of highways in recent years, however, there are a number of deposits which might now be worked at a profit.

M. F. MINTER PROPERTY[1]

The Minter property, lot 13, 23d. district, is located half a mile south of Reeseburg. Many years ago extensive prospecting was carried on by a Cartersville company. In recent years a small amount of ore was shipped to Rock Run, Ala. The ore is massive and occurs with considerable chert. It appears to be in limited quantity.

B. G. FORRESTER PROPERTY

This property, lots 150 and 151, 22d. district, is located about three-quarters of a mile east of Silver Creek. Gravel ore and "dornicks" occur here in the dark-red surface clays. The best prospect is near an old bauxite mine, a quarter of a mile northeast of the Forrester residence, on the summit of a ridge. A small prospect pit reveals ore of fair grade. It is low in phosphorus apparently and quite free from mechanical impurities. The deposit is probably of no great content.

T. R. RICH PROPERTY

The Rich property, lot 151, 23d. district, joins the Forrester property on the east. Some years ago a small prospect pit was dug on the summit of a cherty hill northeast of the Rich residence. Little gravel ore occurs, but "dornicks" often weighing 50 pounds are more or less abundant. The ore is of good quality, but apparently is pres-

1. S. W. McCallie, State Geol. Surv. Bull. 10-A, p. 185.

ent only in limited quantities. On the opposite side of the valley there is another pit made years ago. The ore at this point is rather low grade.

A sample of the ore from the first pit analyzed as follows:

Analysis of Ore. Rich Property

Moisture at 100°C	.52
Loss on ignition	10.34
Soda (Na_2O)	.22
Potash (K_2O)	trace
Lime (CaO)	.00
Magnesia (MgO)	trace
Alumina (Al_2O_3)	4.84
Ferric oxide (Fe_2O_3)	81.62
Manganous oxide (MnO)	.24
Titanium dioxide (TiO_2)	trace
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.43
Silica (SiO_2)	1.68
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	99.89
Metallic iron (Fe)	57.27
Sulphur (S)	.00
Phosphorus (P)	.18

T. H. PEEK PROPERTY

This property, lot 15, 22d. district, is located near Silver Creek. A small amount of ore was shipped years ago from a pit on a cherty hillside, a quarter of a mile southeast of the junction of the Alabama road and Rockmart pike.

SAMUEL JOHNSON PROPERTY

The Johnson property, lot 111, 22d. district, is located about 1 mile from Lindale on the Spring Creek road. A limited amount of prospecting has been done on this lot on the west side of a high hill, east of the public road. The ore is silicious.

Another part of the Johnson property is on lot 177, 22d. district, 2½ miles east of Lindale along the Spring Creek road. About 10 years ago a few shallow pits were dug on the east side of a high hill, about a quarter of a mile north of the public road. The ore is of fair grade. Some needle and "pot" ore occur. The float ore is of low grade. The analysis below indicates the character of the ore:

Analysis of Ore. Lot 177

Moisture at 100°C	.90
Loss on ignition	9.58
Soda (Na_2O)	.50
Potash (K_2O)	.65
Lime (CaO)	.00
Magnesia (MgO)	.08
Alumina (Al_2O_3)	2.46
Ferric oxide (Fe_2O_3)	79.60
Manganous oxide (MnO)	trace
Titanium dioxide (TiO_2)	.00
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.30
Silica (SiO_2)	5.80
Total	99.87
Metallic iron (Fe)	55.72
Sulphur (S)	.00
Phosphorus (P)	.13

J. H. HARRIS PROPERTY[1]

Lot 277, 4th district, formerly owned by J. H. Harris, is located about 8 miles south of Rome at the southern end of Horseleg Mountain. About 17 years ago the property was prospected to a limited extent. Three open cuts were dug near the public road. From 10 to 75 tons of good massive ore were taken from the cut nearest the road. The other two excavations were smaller and did not reveal as good grade of ore. A large amount of chert was seen on the hillslope.

JOHN DAVIS PROPERTY

This property, consisting of 360 acres, is located in Big Texas Valley, about 8 miles southwest of Armuchee. On that part of the property known as the "home place", a limited amount of prospecting was carried on some years ago. The pits are on the summit and east side of a low foothill of Rocky Mountain, a quarter of a mile south of the public road. They are very superficial and reveal little concerning the extent of the deposit. The ore is brecciated and silicious largely. It occurs apparently near the contact between the Floyd shale and the Bangor limestone.

The mineral interest in lot 18, 5th district is also owned by the John Davis estate. The lot is about 2 miles southwest of the "home-

1. Information from notes made in 1907, by S. W. McCallie, State Geologist.

place" and near Fouche. About 18 years ago an open-cut was made on the north side of a low hill at the north base of Rocky Mountain, and a short distance south of the public road. The cut was dry-mined, off and on, until about three years ago, and 20 cars of ore were shipped, altogether. The excavation is caved in so that little ore is seen in its walls, but several large "dornicks" occur in the bottom. Fragments of fossiliferous sandstone were found. The fossils were crinoid and bryozoan remains.

A short distance from the above cut, on the slope of the main mountain, several other pits were dug and a small amount of ore produced.

The surface show on the property is limited, and further prospecting alone will give an idea as to the tonnage reserve. The distance from a railroad will be one of the main drawbacks to the development of the property. Water may be obtained from Heath Creek about half a mile to the southeastward.

Samples of ore from the Davis property analyzed as follows:

Analyses of Ore. Davis Property

CONSTITUENTS	1	2
Moisture at 100°C	2.56	2.46
Loss on ignition	11.52	10.80
Soda (Na_2O)	.32	.40
Potash (K_2O)	.40	.25
Lime (CaO)	.00	.00
Magnesia (MgO)	.18	.08
Alumina (Al_2O_3)	5.76	7.54
Ferric oxide (Fe_2O_3)	43.19	73.49
Manganous oxide (MnO)	22.54	.40
Titanium dioxide (TiO_2)	.54	.36
Sulphur trioxide (SO_3)	.05	trace
Phosphorus pentoxide (P_2O_5)	1.73	4.05
Silica (SiO_2)	11.14	6.14
Cobalt (Co)	trace	trace
Nickel (Ni)	trace	trace
Arsenic (As)	.04	----------
Antimony (Sb)	.00	----------
Tin (Sn)	.00	----------
Total	99.97	----------
Metallic iron (Fe)	30.23	51.44
Sulphur (S)	.05	trace
Phosphorus (P)	.76	1.74

T. E. LANGLEY PROPERTY

The Langley property includes part of lot 111, 22d. district. B. L. Fitch of Utica, N. Y., mined ore here about 15 years ago and shipped it to Rock Run, Ala. One of the pits is located a quarter of a mile west of the Langley residence at the base of the north side of a high hill. The pit is about 50 feet long, 20 feet wide and 20 feet deep, and so much caved in that no ore is to be seen except a small pile of screenings.

Another pit of about the same size located 50 yards to the south shows some massive ore of fair quality in its walls.

OTHER PROSPECTS IN FLOYD COUNTY

Other brown iron ore occurs on the following properties: O. W. Anderson, lots 299 and 300, 24th district; C. H. Rush, Lot 14, 21st. district. Also J. T. Wallace property, lot 47; J. D. Washington property, lots 47 and 48; T. T. Pullen property, Lots 50, 85, 831 and 897; J. V. Lemaster property, Lots 62 and 103; J. D. Erwin property, Lots 84 and 97; and T. S. Burkhalter property, Lot 50.

The last named properties are all in the 22d. district.

CHATTOOGA COUNTY

SHROPSHIRE PROPERTY

Miss Beulah Shropshire of Summerville, owns lots 186 and 189, 5th district, 4th section, located about 6 miles southeast of Summerville, near Cheney. A small prospect pit was dug on lot 186, and an interesting type of ore revealed. Large numbers of brachiopod fossils occur in the ore, which make it rather closely resemble the fossiliferous hematites. The pit is not large enough to show anything very definite about the extent of the ore which appears to occur in a sort of blanket or sheet formation. The float is limited in quantity. Analysis of the ore is reported to have shown a metallic iron content of 51 per cent. A short distance westward of the above prospect, limestone bearing the same species of fossils is said to outcrop. This would seem to indicate that the ore is probably a local replacement of limestone.

Col. Wesley Shropshire of Summerville owns lot 16, 6th district, on which occurs a low grade ore. The lot is within the corporate limits of Summerville and the ore is to be seen near an old chert quarry.

J. M. BELLAH PROPERTY

Judge Bellah of Summerville owns lot 87, 6th district. The property is located 1 mile east of Summerville on a ridge with a trend parallel to Taylor's Ridge. About 12 years ago a car of ore was shipped to Chattanooga from a small open-cut on the summit of the ridge. Needle, "pot", and iridescent types of ore are seen on the dump. The pit is caved in, but some ore is visible in its walls. Small "dornicks" of good ore are scattered over a limited area of the ridge. A sample of the ore gave the following analysis:

Analysis of Ore. Lot 82, 5th District. Bellah Property

Moisture at 100°C	1.32
Loss on ignition	12.46
Soda (Na_2O)	trace
Potash (K_2O)	trace
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	3.55
Ferric oxide (Fe_2O_3)	77.60
Manganous oxide (MnO)	trace
Titanium dioxide (TiO_2)	.18
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	1.10
Silica (SiO_2)	3.92
Total	100.13
Metallic iron (Fe)	54.32
Sulphur (S)	.00
Phosphorus (P)	.479

G. W. AGNEW PROPERTY

The Agnew property, lot 186, 13th district, is 1½ miles east of Menlo. A few shallow prospect pits were dug some years ago on the east side of a low ridge, a quarter of a mile west of the Menlo-LaFayette public road. A good grade of ore occurs in the dark-red surface clay, in the form of pebbles, irregular fragments and geodes. There is also considerable float. A sample of the ore gave the following analysis:

Analysis of Ore. Agnew Property

Moisture at 100°C	.68
Loss on ignition	11.38
Soda (Na_2O)	.45
Potash (K_2O)	trace
Lime (CaO)	.20
Magnesia (MgO)	.04
Alumina (Al_2O_3)	1.31
Ferric oxide (Fe_2O_3)	77.79
Manganous oxide (MnO)	3.14
Titanium dioxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.28
Silica (SiO_2)	3.58
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	99.21
Metallic iron (Fe)	54.45
Sulphur (S)	.00
Phosphorus (P)	.12

J. M. CRAWFORD PROPERTY

The Crawford property, lot 214, 5th district, is about 4 miles southwest of Gore. There is a small outcropping of brown ore on a low ridge near the public road. The ore is of fair quality, but apparently of limited extent. No effort has been made to prospect the property.

WALKER COUNTY

RICHARDSON PROPERTY

Mrs. Lecie L. Richardson of LaFayette owns lot 59, 7th district, located 2 miles east of LaFayette on the LaFayette-Villanow public road. About 12 years ago a small open-cut was made here on the east side of a wooded chert ridge, a quarter of a mile north of the road, from which cut two cars of ore were shipped to LaFayette, Tenn. The ore is of good quality though mixed with considerable slaty material. A few large "dornicks" of silicious ore were seen on the slope of the ridge. The ore "lead" outcrops on several other properties in the vicinity, among them the Fielding property. The following is an analysis of a sample of ore from the Richardson property:

Analysis of Ore. Richardson Property

Moisture at 100°C	1.10
Loss on ignition	10.64
Soda (Na_2O)	.42
Potash (K_2O)	.62
Lime (CaO)	.00
Magnesia (MgO)	trace
Alumina (Al_2O_3)	1.88
Ferric oxide (Fe_2O_3)	69.36
Manganous oxide (MnO)	trace
Sulphur trioxide (SO_3)	.00
Titanium dioxide (TiO_2)	.00
Phosphorus pentoxide (P_2O_5)	1.36
Silica (SiO_2)	14.26
Total	99.64
Metallic iron (Fe)	48.55
Sulphur (S)	.00
Phosphorus (P)	.55

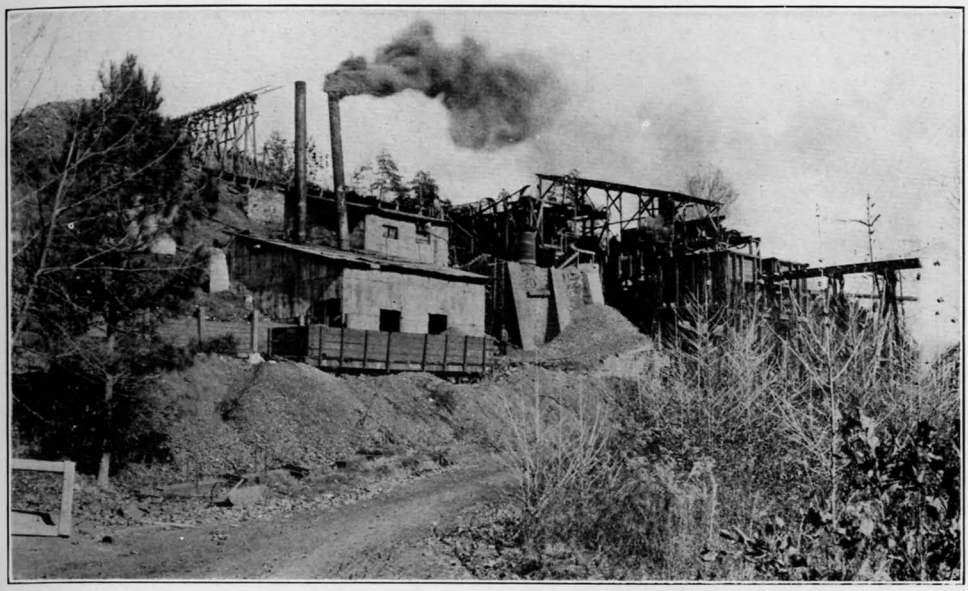
VEALER PROPERTY

Lot 238, 8th district, located 4 miles northeast of LaFayette, is owned by Mrs. Nancy Vealer. D. M. Watts of LaFayette prospected the property to a limited extent, immediately east of the old LaFayette-Ringgold public road. Considerable ore with chert occurs here. A small amount of surface ore occurs also on the Vealer property, lot 194, 8th district.

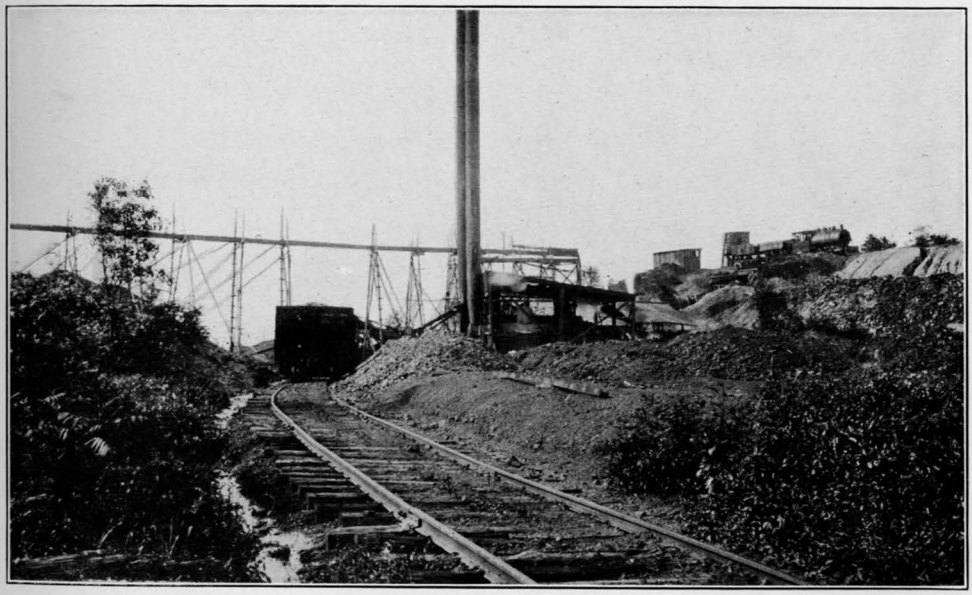
A sample of ore from lot 238 gave the following analysis:

Analysis of Ore. Lot 238

Moisture at 100°C	1.24
Loss on ignition	10.02
Soda (Na_2O)	.45
Potash (K_2O)	.09
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	2.00
Ferric oxide (Fe_2O_3)	77.60
Manganous oxide (MnO)	trace
Titanium dioxide (TiO_2)	0.18
Sulphur trioxide (SO_3)	trace
Phosphorus pentoxide (P_2O_5)	.37
Silica (SiO_2)	7.98
Total	99.93
Metallic iron (Fe)	54.33
Sulphur (S)	trace
Phosphorus (P)	.16



A. MATHEWS IRON & STEEL COMPANY WASHING PLANT, 2 MILES EAST CARTERSVILLE, BARTOW COUNTY.



B. WASHER AND TIPPLE, WOODSTOCK MINE NO. 1, NEAR CEDARTOWN, POLK COUNTY.

SUGAR VALLEY LAND COMPANY PROPERTY

Lot 199, 26th district, belonged formerly to the Sugar Valley Land Company. The property is in the southeast corner of Walker County on one of the narrow ridges forming a part of the southern extension of Mill Creek Mountain. A few prospect pits on the summit reveal a good grade of ore. Float is also rather abundant on the western slope. Near the middle of the lot, east of and at an elevation of 90 feet above the road there are two or three exposures of massive ore of considerable thickness. Apparently there is a workable deposit of ore here. The following analysis shows the grade of the massive ore:

Analysis of Ore. Lot 199

Moisture at 100°C	.70
Loss on ignition	10.78
Insolubles	4.35
Manganese (Mn)	.24
Metallic iron (Fe)	32.82
Sulphur (S)	.00
Phosphorus (P)	.24
Silica (SiO_2)	29.54

JOSEPH TAPP PROPERTY

The Tapp property, lot 15, 8th district, is about 3 miles northeast of LaFayette on the Dalton-LaFayette public road. A quarter of a mile south of the road on the west slope of a low chert ridge, siliceous limonite occurs in limited quantity. There has been no prospecting, with the exception of one or two superficial pits. A sample of the ore gave the following analysis:

Analysis of Ore. Tapp Property

Moisture at 100°C	1.46
Loss on ignition	5.46
Soda (Na_2O)	.10
Potash (K_2O)	trace
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	6.10
Ferric oxide (Fe_2O_3)	77.39
Manganous oxide (MnO)	trace
Titanium dioxide (TiO_2)	0.18
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.33
Silica (SiO_2)	8.80
Total	99.82
Metallic iron (Fe)	54.12
Sulphur (S)	.00
Phosphorus (P)	.14

CATOOSA COUNTY

No deposits of brown ore in workable quantities are known to occur in Catoosa County. Considerable ferruginous sandstone and shale are found on the slopes of Taylor's and Dick's Ridges and some prospecting has been done on the Dowling property near McCutcheon but no merchantable ore was found in quantities. The hematite ore of this county is described under fossil ores.

WHITFIELD COUNTY

Although but a small amount of brown iron ore has been mined in Whitfield County there are a number of promising prospects. The ores as a whole are of good quality, the lack of transportation generally being the main drawback in development.

SAPP PROPERTY

Lot 105, 13th district, 3d. section, belongs to W. M. Sapp of Dalton. The property is on the west slope of Chattoogata Mountain near a tributary of Swamp Creek, in the northern part of Redwine Cove, and 3 miles northwest of Carbondale. Ferruginous sandstone and chert float occur in limited quantity on the slope of the ridge. Apparently there is no deposit of commercial importance.

WISCONSIN-GEORGIA COAL AND IRON COMPANY PROPERTY

Lots 37, 72 and 73, 13th district, located 6 miles northwest of Carbondale in Redwine Cove, are owned by the Wisconsin-Georgia Coal and Iron Company of Chicago, Ill. The workings are on lot 73 on the west slope of what is called locally Middle Mountain.

Ore has been mined in four places. The southernmost excavation is about 30 feet long, 40 feet wide, and 8-10 feet deep. Low-grade ore was exposed. A short distance from this cut a blast hole revealed about 4 feet of light-grayish brown stratified clay, striking due north, approximately, and dipping about 30 degrees to the east. The clay is underlain by 7 feet of ore-bearing clay with sandstone lenses. Some of the ore is of excellent quality.

About 150 yards north of the above cut is the "incline cut", so-called because of the incline track leading to the ore-bin. The open-

ing is 6-10 feet deep, 10-15 feet wide, and 30-40 feet long, extending northeast into the hillside, at an elevation of about 60 feet above the branch. Numerous "shots" have been put down in the bottom of the cut and excellent ore revealed. A "shot" put down near the cut to a depth of 32 feet exposed ore of first-class quality. The ore seems to occur in massive boulders in the residual clay.

A small opening 150 feet northwest of the "incline cut" shows a continuation of the ore-body. Blasting also has exposed an excellent grade of ore to a depth of over 10 feet. The ore is generally massive, with small cavities often having a lining of amorphous silica. Finely mammillary surfaces with brilliant colors appear.

Another excavation a short distance northwest of the above cut shows a further continuation of the deposit. No prospecting farther along the strike of the ore-body has been done, but surface shows indicate its extension for some distance, 150 yards at least. The deposit is evidently a large one.

The above described excavations were made about 1918. A loading bin and incline track were built for handling the ore, and the road put in good shape. It was planned to haul the ore to Carbondale with motor trucks. However, no ore was shipped.

The LaFollette Coal and Iron Company prospected lots 72 and 73. Ore was found on both lots, but nothing can be said as to the quantity available.

At present Newton Fryar of Chattanooga is lessee of the property and is shipping a small amount of ore from the "incline cut." A 10-horsepower gasoline engine is used to haul the cars from the loading bin to the mine, a distance of about 250 feet. It is planned to hydraulic-mine the ore later. A Fordson tractor is used to haul the ore-trucks to Carbondale where the ore is shipped to Rock Run.

The long haul to the railroad and lack of water will hinder development of this property.

The analysis below indicates the character of the ore. The sample, however, is not a fair average of the ore shipped.

Analysis of Ore. Wisconsin-Georgia Coal & Iron Company Property

Moisture at 100°C	1.00
Loss on ignition	9.27
Insolubles	3.00
Manganese (Mn)	.34
Metallic iron (Fe)	32.94
Sulphur (S)	.02
Phosphorus (P)	.207

H. T. REDWINE PROPERTY

This property, lot 211, 13th district, is 1 mile southwest of Carbondale. It is owned by the First National Bank of Dalton. About 20 years ago 2 cars of ore were shipped from the lot, and four years ago 2 more cars were shipped to LaFollette, Tenn. The ore was taken from a series of open-cuts located on the southwest slope of a low hill. In one of these cuts 2 feet of excellent ore underlie the yellowish clay loam. A small amount of manganese was observed and there is also considerable gravel ore. The "lead", as indicated by float, extends to the northeast onto lot 184, and has a width apparently of about 50 yards.

The property is half a mile north of Swamp Creek from which water for a washer could be obtained. The indications for a workable deposit of ore are promising.

J. M. REDWINE PROPERTY

The J. M. Redwine property, lot 178, 13th district, is in Redwine Cove, 2½ miles northwest of Carbondale. H. S. Houston owns the mineral interests in five acres of the lot, upon which considerable nodular ore of excellent grade occurs in the red surface clay. Some years ago a prospect well 50 feet deep was dug. It is now caved in and nothing is known as to what depth the ore extended.

G. W. Redwine owns lot 147 which joins lot 178 on the north. Several shallow prospect pits have been dug on a hill immediately east of the public road. Some of the ore is of good quality, but most of it is rather siliceous. A few fragments of hematite were observed.

Lots 43 and 44, 13th district, owned by J. E. Sailor are reported to have an outcropping of ore.

H. S HOUSTON PROPERTY

Lot 104, 13th district, is about 6 miles south-southwest of Dalton on the Carbondale-Dalton public road. On the summit of a wooded hill, immediately east of Chattoogata Mountain, prospecting for iron ore was carried on some years ago. Options on a right-of-way to the Southern railroad were taken, also. The pits are superficial and a low-grade ore is revealed. There is very little float on the slopes of the hill, and the deposit apparently is a small one.

A sample of the ore collected by the writer analyzed as follows:

Analysis of Ore. Houston Property

Moisture at 100°C	1.12
Loss on ignition	8.28
Soda (Na_2O)	.40
Potash (K_2O)	trace
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	1.21
Ferric oxide (Fe_2O_3)	53.67
Manganous oxide (MnO)	trace
Titanium dioxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	2.92
Silica (SiO_2)	32.10
Total	100.06
Metallic iron (Fe)	32.57
Sulphur (S)	.00
Phosphorus (P)	1.26

Lot 113, south of lot 104, is owned by Col. Martin of Dalton. A limited amount of prospecting has been done on this lot.

C. J. HAMILTON PROPERTY

C. J. Hamilton of Cohutta owns lot 65, 11th district, located about 2 miles west of Cohutta in the northern part of the county. This property was owned formerly by the Wisconsin-Georgia Coal and Iron Company, which made rather extensive developments. The workings consist of a large open-cut 230 feet long, 40-50 feet wide, and 8-15 feet deep, extending northeast into a low hill, and a smaller cut a short distance to the westward.

The most pronounced feature of the deposit is the large quantity of chert occurring with the ore. A chert bed about 6 feet thick, underlain by a thin mantle of yellowish-gray clay, was observed in

one of the walls of the larger cut. Ferruginous chert and impure ore occur as float over a small area. Evidently the ore is a replacement of a chert formation. Nodules of chert of varying sizes show replacement of iron oxide along their concentric layers. A considerable amount of slickensided, dense hematite is also found in more or less quantity.

The mine has been idle for some years, the shut-down being due to the poor quality of the ore. The mining equipment included a portable jaw-crusher and an iron rotary screen, 3 feet in diameter, 15 feet long, with one-half inch holes at one end and three-fourths inch holes at the other end.

The following analysis shows the character of the ore:

Analysis of Ore. Hamilton Property

Moisture at 100°C	1.20
Loss on ignition	7.78
Insolubles	6.11
Manganese (Mn)	.82
Metallic iron (Fe)	37.44
Sulphur (S)	.00
Phosphorus (P)	.06
Silica (SiO_2)	29.57

A. B. CRAWFORD PROPERTY

Lot 3, 12th district, is 1 mile northeast of Tunnel Hill. A few small prospect pits, dug some 30 years ago, are seen on the south slope of a low hill, half a mile east of the public road. The ore is of poor grade, being largely cherty and brecciated. A small amount of manganese was observed. The deposit is apparently of no commercial importance.

Low-grade ore fragments were seen on lot 148, 11th district, owned by F. M. Epps, and on lot 78, 12th district, located 1½ miles southeast of Tunnel Hill.

THE CROW PROPERTY

This property, lot 6, 12th district, is about 2 miles northwest of Waring. The mineral interest in the property is owned in part by Miss Kate Hamilton of Dalton.

Brown ore fragments occur abundantly along the slopes of one of the wooded, quartzite foothills east of Rocky Face Mountain.

About 100 yards northwest of an old sawmill site and a quarter of a mile west of the public road, there are two or three small open-cuts. In one of them a bedded "vein" of ore, 4 feet in thickness is exposed, striking north and dipping 45 degrees to the westward. The ore is of fair quality. The "lead", indicated by float, extends to the northwest for over 100 yards. Slickensided hematite fragments occur.

Apparently there is a considerable deposit of fair grade ore on the Crow property. Water for a washer could be obtained from a nearby creek.

The analysis below shows the character of the ore in the bedded "vein."

Analysis of Ore. Crow Property

Moisture at 100°C	.63
Loss on ignition	6.30
Insolubles	9.86
Manganese (Mn)	.24
Metallic iron (Fe)	45.74
Sulphur (S)	.00
Phosphorus (P)	.03
Silica (SiO_2)	36.54

GORDON COUNTY

LAFOLLETTE COAL AND IRON COMPANY PROPERTY

The LaFollette Coal and Iron Company, LaFollette, Tenn., owns about 1,000 acres in the 25th and 26th districts, located about 2 miles west of Sugar Valley. The property belonged formerly to the Sugar Valley Company of Oshkosh, Wisconsin.

The first mining on this property was begun on lot 20, 25th district in 1912 by a Birmingham company, of which A. J. Bowron, Jr. was the President. Hand-mining was carried on until 1915, during which time a large amount of ore was produced. A steam shovel was used in 1915 for a short time. In 1917 the Hilley-Norrell Mining Company took over the mine and operated it until the spring of 1918, when it closed down because of labor shortage. It is reported that over 55,000 tons of ore were taken from lot 20.

The Sugar Valley Land Company mined over 65,000 tons of ore from lot 91, 25th district. The average metallic iron content was reported to be a little over 49.50 per cent.

From 1918 to 1922 this property was worked by the LaFollette company, the amount of ore produced being given below.

The southernmost cut on the property is on lot 91 and is known as the Old Alabama or South Hill cut. It is but a short distance south of the washer-site. The maximum depth is 80 feet, the maximum width 500 feet, and the length is about 200 feet. Ore of excellent quality is seen in the walls and bottom of the cut.

About 100 feet north of the Old Alabama cut is the Alabama cut. The excavation is somewhat smaller than the one referred to above. The over-burden consists of about 6 feet of yellowish clay, containing chert and slate fragments. The ore is of very high grade and remarkably free from mechanical impurities.

About 200 feet north of the Alabama cut is the so-called Cincinnati cut. It is about 300 feet long, 200 feet wide, and 100 feet deep in places. It is now partly filled with water, but excellent ore is said to be found in the bottom. The ore was exceptionally free from mechanical impurities, though it was washed before shipping.

Half a mile north of the washer-site is the Loomis cut. This is a more recent excavation on one of the low foothills skirting Horn Mountain. The original prospect pits showed a good grade of gravel and lump ore, and it was thought that the whole hill was one large deposit. However, further development with a steam shovel showed that no ore occurred on the east slope. The deposit trends to the northward toward the Old Loomis mine. Considerable excellent ore is to be seen in the openings.

About two years ago a new excavation was made on lot 307 by local parties. It is about a quarter of mile northeast of the end of the old tram line on the east slope of a wooded hill. The cut is a small one, but 91 tons of ore were taken from it. There are large boulders of first-class ore in the walls and bottom of the cut. Massive slickensided hematite fragments were seen, also.

The LaFollette company opened up a small cut about a quarter of a mile north of the Loomis cut. The tramline was extended to it and a steam shovel moved up, but work was carried on but one day.

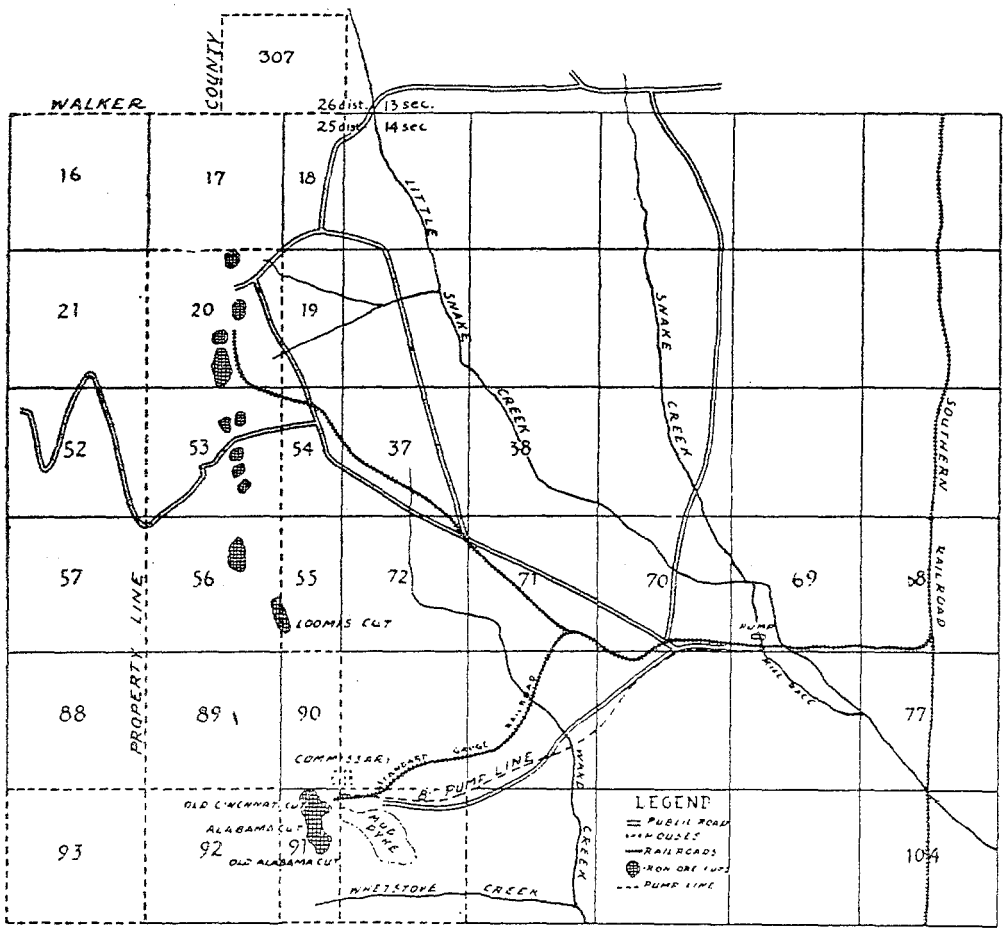


Fig. 2. Sketch map of LaFollete Coal and Iron Company, Sugar Hill, Gordon County. (J. P. D. Hull).

The ore on this property occurs generally in fragments in the residual clays, and in more or less continuous massive bodies, replacing shale and slate which form in part the low foothills at the eastern base of Horn Mountain. These hills are 20-100 feet high, rounded and elongated north-south. They are formed of shale and decomposed sandstone.

The equipment used by the LaFollette Company was a complete one, as shown below:

4 2-log washers.
2 Picking belts.
2 75-horsepower steam engines.
2 100-horsepower boilers.
2.7 miles of 1-8 inch cast iron pump line.
2 8 x 10 inch pumps and 80-horsepower boiler.
2.7 miles of standard gauge railroad.
1 50-ton locomotive.
3 Steam shovels.
4 Dinkey-engines.
2 miles of narrow gauge track from washer to cuts.
40 Dump cars.
1 Combined store, office building and warehouse.
30 Tenant houses.
1 Boarding house.
1 Rooming house.

At the time of the writer's visit the mines had been idle for about two years. The branch-railroad track was being taken up and preparation made for complete abandonment of the property. It is said that the pockets of ore were too small for economic mining.

The following figures, furnished by L. C. Crewe, General Manager of the LaFollette Company, show the production and character of the ores from 1918 to 1922 inclusive:

Iron Ore Production 1918-1922, inclusive

Year	Gross tons	Fe-212°	Insolubles	Manganese
1918 (June to December)	16,184	48.65	12.84	.75
1919	11,036	48.54	13.25	.72
1920	11,185	44.82	18.62	.66
1921	725			
1922	264	48.28	15.12	.68

COPLIN AND MILLER PROPERTY

Coplin and Miller of Calhoun own lot 255, 13th district, known as the "Copeland tract", and located about 2 miles northwest of Hill City, a station on the Southern railroad. An area of about 10

acres on a low wooded hill has been prospected by fifty or more small pits and open-cuts. Ore of widely varying grade has been exposed. Some of it is fine gravel material of good quality, some massive and also of good grade, while some is siliceous and cherty. The gravel ore includes a large amount of magnetic particles, which frequently carry fossil remnants of brachiopods, crinoids, bryozoa, and gastropods. There is a considerable surface show of gravel ore and larger fragments on the tract. A graded mule-tram line, long since torn up, formerly connected the property to the railroad at Hill City. The LaFollette Coal and Iron Company once proposed to build a narrow gauge line to the property, also. Apparently there is considerable ore still in this deposit. Water for a washer can be pumped from Snake Creek, three-quarters of a mile to the westward.

A sample of the surface ore analyzed as follows:

Analysis of Ore. Lot 255

Moisture at 100°C	1.08
Loss on ignition	8.09
Insolubles	6.19
Manganese (Mn)	.89
Metallic iron (Fe)	37.19
Sulphur (S)	.00
Phosphorus (P)	.235
Silica (SiO_2)	23.40

SUGAR VALLEY LAND COMPANY PROPERTY

The Sugar Valley Land Company owned formerly lot 182, 14th district, located about 2½ miles northwest of Oostanaula. About 15 years ago 18-20 cars of ore were shipped from the property. The old open-cuts are on one of the small eastern foothills of Horn Mountain. They reveal the ore deposit to be about 35 yards long and probably over 100 feet wide. The cuts have a maximum depth of 15 feet, and from the solid ore in the bottoms of some of them it seems that the ore goes to a considerable depth; on the whole the ore is of good grade. The property was dry mined and the ore hauled to a siding on the railroad, three-quarters of a mile distant. Water for a small washer could be obtained from a series of springs 200 yards north of the deposit.

L. M. WHITE PROPERTY

Lot 183, 14th district, owned by L. M. White, has been prospected to a small extent. About 10 years ago 30 tons of surface ore were shipped from the property. The deposit is apparently an extension of the ore on lot 182.

C. J. HORD PROPERTY

Lots 288, 255 and 253, 14th district are about 1 mile west of Oostanaula on the eastern slope and summit of Horn Mountain. About 100 prospect pits, ranging from 3 feet to 40 feet in depth, have been dug on the property, chiefly on the west side. The ore is associated with slate and chert which chiefly make up the ridge. What is termed locally "gravel" ore occurs. It is somewhat slaty and occurs in limited quantities. There is only a small amount of good ore seen and it is doubtful whether high grade ore occurs in quantity. The following analysis from lot 288 shows the character of the ore:

Analysis of Ore. Hord Property

Metallic iron (Fe)	39.32
Sulphur (S)	.00
Phosphorus (P)	.587
Silica (SiO_2)	22.60

The M. H. Bowen property, lot 254, near by, also shows some surface ore.

BURNS PROPERTY

J. C. and J. W. Burns of Curryville, own lot 195, 25th district, 3 miles north of Rocky Creek. Limonite occurs here as a cement in chert and sandstone breccia. The latter is often fossiliferous. The steep western slope of Horn Mountain has a thick mantle of this low-grade ore. A small amount of good ore is mixed with the poorer material.

This property was optioned for oil at one time.

C. S. BRYAN PROPERTY

C. S. Bryan of Calhoun owns lot 287, 14th district, which is located 2 miles southwest of Oostanaula. About 1880 two or three shallow prospect pits were dug on this property on the east slope

of Horn Mountain. Perhaps 2 tons of good ore are piled up near the main pit, which is about 5 feet deep and 6 feet in diameter. Crinoid fossils occur in some of the silicious fragments. The deposit seems to be of limited extent.

C. H. SCOTT PROPERTY

About seven years ago 2 cars of ore were shipped from this property, lot 54, 15th district, 3 miles east of Plainville. The old cuts and pits are on the north side of the Plainville-Adairsville public road near the summit of a low hill. The ore occurs in massive vesicular fragments of varying sizes in the yellow soil, mixed with chert. The iron also shows evidence of having filled fractures in dolomite.

JULIAN F. HURT PROPERTY

A prospect pit was dug years ago on lot 42, 24th district, 1 mile east of Oakman. The excavation is on the west slope of a wooded ridge and about 20 feet in depth. Only low grade ore was exposed.

PITTMAN PROPERTY

The Pittman property, lot 257, 24th district, is 1½ miles southeast of Ranger. A very limited amount of prospecting was done here some years ago. The old pits are now largely filled up. Fragments of fair grade ore, mixed with yellow slate fragments, were seen on the west slope of a low hill near a country road, leading to the property from the highway a quarter of a mile south of Ranger.

L. P. BYRD PROPERTY

Lot 77, 23d district, is immediately east of Fairmount. About seven years ago 35 cars of ore were shipped from an open-cut on the west slope of a hill near the Byrd home. The ore occurs associated with a gray slate, and is of good quality.

The following partial analysis shows the character of the ore:

Analysis of Ore. Byrd Property

Silica (SiO_2)	16.65
Metallic iron (Fe)	48.12
Sulphur (S)	.00
Phosphorus (P)	.95

H. M. SHELLHORSE PROPERTY

The Shellhorse property, lot 103, 23d. district, is 1 mile east of Fairmount. On the east slope of the main wooded ridge, a quarter of a mile south of the public road, a small pit exposes a low grade ore, consisting chiefly of ferruginous slate and sandstone.

TATE PROPERTY

Mrs. E. G. Tate of Fairmount owns lot 76, 3d. district. Fragments of good ore occur along the hillslope immediately west of Fairmount station. It is said to be a charcoal furnace ore. Lot 78 also owned by Mrs. Tate also has a limited amount of float ore.

MURRAY COUNTY

FOUTS PROPERTY

R. C. Fouts owns about 100 acres, lot 162, 27th district, 1¾ miles northeast of Doogan. The property was leased by the Southern Manganese Corporation of Birmingham in 1918, but no mining was done.

About a quarter of a mile north of the Fouts residence and on the east slope of Iron Mountain there is a small prospect pit. This was first opened up about 15 years ago and it has been enlarged from time to time until the ore-body is quite well exposed. The ore occurs in a "vein" about 2 feet thick, with a quartzite hanging wall. The footwall is indefinite, but appears to be a detrital yellowish clay or loam. The "vein" strikes about N. 40°E. and dips N. 45°W.

Besides the above pit there are two or three smaller pits along the strike of the deposit for a distance of 150 feet all of which shows some ore.

The ore as a whole is of good quality but it is doubtful if it occurs in commercial quantities.

An analysis of the ore is given below:

Analysis of Ore. Fouts Property

Moisture at 100°C	.50
Loss on ignition	11.40
Insolubles	1.08
Manganese (Mn)	1.80
Metallic iron (Fe)	55.33
Sulphur (S)	.17
Phosphorus (P)	.52
Silica (SiO_2)	4.45

F. M. POWELL PROPERTY[1]

F. M. Powell of Atlanta owns lots 236 and 237, 27th district, located about 2½ miles east of Cisco, a station on the Louisville and Nashville Railroad. The property extends from a point about 1 mile northeast of Doogan Mountain to within half a mile of the Georgia-Tennessee line. The ore deposits are on the summit and slopes of a narrow quartzite ridge.

The country rocks are slates and quartzites dipping to the southeast. There are many exposures of iron ore, which extend in a general northeast-southwest direction. Two rather well defined deposits of ore have been opened up, running nearly parallel with each other, and about half a mile apart. The southern deposit has been more extensively worked than the one farther north.

On the east side of the property about a quarter of a mile from the northern boundary of lot 237, ore outcrops and a shaft 12 feet deep was sunk upon it. Large boulders of ore were encountered. A quarter of a mile southwest from the above shaft another ore outcropping occurs.

The southern deposit of ore is exposed near the eastern boundary line of lot 237, immediately north of a clearing. A shaft 15 feet deep sunk here shows several feet of solid ore. Southwest of this shaft several prospect pits have been dug, all showing good ore. Nearby a tunnel 150 feet long is to be seen driven into the ridge where good ore was encountered. About 300 yards southwest of the tunnel a shaft 50 feet deep was sunk, which is said to have penetrated 39 feet of solid iron ore and a foot of manganese. Near the bottom of this shaft considerable silica was encountered, tho the deposit seems to continue to greater depths. A small cross-cut dug at the head of the shaft exposed ore over a distance of 40 feet. A short distance southwest of this shaft, ore of low grade again outcrops. Near the southern boundary of lot 237 is to be seen another shaft sunk many years ago for copper.

Lot 236 has a few exposures of ore, usually of low grade. Near the line between lots 236 and 237, a shaft has been sunk on the east

1. State Geol. Surv. Bull. 35, p. 199.

side of the ridge. Here the ore seems to be somewhat slaty and siliceous.

The analyses given below all show that the ore on the Powell property is of good quality. However, it has always been a question as to whether or not the ore deposit is sufficiently extensive to warrant the outlay necessary for development. Before the property can be operated on a large scale it will probably be necessary to build a line of road connecting the property of the Connasauga Lumber Company's road or construct an areal tram to Cisco and load direct on the Louisville and Nashville main line. Either project would be an expensive undertaking.

Analyses of Ore. Powell Property

CONSTITUENTS	1	2	3	4	5	6	7	8
Moisture at 100°C	.62	3.24	-----	-----	-----	-----	-----	-----
Loss on ignition	10.20	11.30	-----	-----	-----	-----	-----	-----
Soda (Na_2O)	-----	.40	-----	-----	-----	-----	-----	-----
Potash (K_2O)	-----	.28	-----	-----	-----	-----	-----	-----
Lime (CaO)	-----	.00	-----	-----	-----	-----	-----	-----
Magnesia (MgO)	-----	.00	-----	-----	-----	-----	-----	-----
Alumina (Al_2O_3)	-----	6.15	-----	-----	-----	-----	-----	-----
Ferric oxide (Fe_2O_3)	-----	61.14	-----	-----	-----	-----	-----	-----
Manganous oxide (MnO)	-----	10.22	-----	-----	-----	-----	-----	-----
Titanium dioxide (TiO_2)	-----	.54	-----	-----	-----	-----	-----	-----
Sulphur trioxide (SO_3)	-----	.00	-----	-----	-----	-----	-----	-----
Phosphorus pentoxide (P_2O_5)	-----	2.32	-----	-----	-----	-----	-----	-----
Silica (SiO_2)	20.35	4.16	6.26	12.07	8.82	9.42	10.55	30.11
Cobalt (Co)	trace	-----	-----	-----	-----	-----	-----	-----
Nickel (Ni)	-----	trace	-----	-----	-----	-----	-----	-----
Total	-----	99.75	-----	-----	-----	-----	-----	-----
Metallic iron (Fe)	44.00	42.80	55.51	50.27	49.82	50.25	53.46	33.89
Manganese (Mn)	1.62	7.87	.34	.78	4.08	.60	.20	11.03
Sulphur (S)	.14	.00	trace	.00	.00	trace	trace	.00
Phosphorus (P)	.57	1.00	.68	.58	1.38	.78	.72	.44
Insolubles	3.77	-----	-----	-----	-----	-----	-----	-----

1. Sample of ferruginous quartzite from lot 237, collected by J. P. D. Hull.
2. Average sample of ore from lot 237, collected by writer.
3. Sample of ore from shaft near north boundary of lot 237. Collected by Dr. Everhart in 1914.
4. Sample of ore outcrop a quarter of a mile southeast of above shaft. Collected by Dr. Everhart.
5. and 6. Ore from shaft near eastern boundary of lot 237. Collected by Dr. Everhart in 1914.
7. Ore from prospect pits 300 yards southwest of above shaft. Collected by Dr. Everhart in 1914
8. Analysis of sample from shaft southwest of old tunnel. Collected by Dr. Everhart in 1914.

F. M. KENDRICKS PROPERTY

F. M. Kendricks of Cisco and Charles King of Chatsworth, own the mineral interests in lots 239 and 240, 27th district, located 2½ miles east of Cisco.

An extensive exposure of ferruginous quartzite occurs on lot 239, about a quarter of a mile northwest of the public road. Portions of the material appear to have a high metallic iron content, but most of it is of inferior grade.

Fragments of fair grade ore are exposed in a small cut beside the public road near the H. Langford residence on lot 240.

A sample of the ferruginous quartzite on lot 239 analyzed as follows:

Analysis of Ore. Lot 239

Moisture at 100°C	1.12
Loss on ignition	9.06
Soda (Na_2O)	.64
Potash (K_2O)	.52
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	8.01
Ferric oxide (Fe_2O_3)	50.37
Manganous oxide (MnO)	.42
Titanium dioxide (TiO_2)	.54
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	1.96
Silica (SiO_2)	27.04
Cobalt (Co)	.00
Nickel (Ni)	.00
Total	99.68
Metallic iron (Fe)	35.26
Sulphur (S)	.00
Phosphorus (P)	.84

MILNE PROPERTY

Watt Milne of Chattanooga owns lot 304, 27th district. A shaft and a tunnel were dug on the property in a search for copper about the time of the opening-up of the Ducktown deposits. The shaft is in a ridge gap about a quarter of a mile north of the peak known as Rocky Face. It is approximately 60 feet deep, and evidently nothing but very low grade ore was encountered. The material on the dump is chiefly slate fragments, white quartzite, and quartzite with more or less iron stain.

The tunnel is 120 feet farther down the slope to the westward. It extends into the ridge in an easterly direction for about 200 feet, through brownish weathered slate. On the dump at the mouth of the tunnel a few fragments of ferruginous quartzite were seen. Apparently there is no ore in any quantity on the property.

ROSS PROPERTY

John Ross of Tennga owns the southeast quarter of lot 305, 27th district. On the western slope of Peaky Top Mountain considerable float ore occurs at an elevation of about 1,250 feet above sea level. Also, a vein of ore 4 feet thick outcrops. It underlies a grayish quartzite, strikes nearly due north and dips about 40 degrees to the eastward. The upper half of the vein is composed of poor grade ore, the lower half of good grade ore.

The property is rather inaccessible and the quantity of ore present is doubtful.

J. R. HARRIS PROPERTY

Lot 163, 10th district, is owned jointly by the J. R. Harris heirs. The property is 2 miles south of Cisco and east of the Louisville and Nashville Railroad. The LaFollette Coal and Iron Company prospected it about 10 years ago.

The workings consist of a large number of pits, cross-cuts and shafts of depths varying from 3 to 40 feet, on the western slope of a prominent ridge, half a mile from the railroad. The openings are in unconsolidated material mainly, but in the numerous gullies the relation of the country rocks is revealed. Quartzite and conglomerate outcrop at higher elevations, and are underlain by slate. Along the contact considerable iron oxide has been deposited. The ore from the excavations is chiefly of rather low grade, being silicious and slaty. Only a small amount of high grade ore was seen. It is not apparent that a commercial body of ore occurs.

Lot 164, 10th district, owned by the J. R. Harris heirs and C. Plemons of Crandall, was also prospected by the LaFollette Coal and Iron Company. The pits are on the west slope of the ridge, three-quarters of a mile southeast of Fairy on the Louisville and

Nashville Railroad. Only a small amount of ore in the reddish soil was exposed by these workings, but the surface show covers several acres.

The ore is of widely varying quality. A sample of the float analyzed as follows:

Analysis of Ore. Lot 164

Moisture at 100°C	1.90
Loss on ignition	13.20
Insolubles	2.69
Manganese (Mn)	.34
Metallic iron (Fe)	48.06
Sulphur (S)	.31
Phosphorus (P)	.659
Silica (SiO_2)	9.25

LaFOLLETTE COAL AND IRON COMPANY PROPERTY

This Company owns 100 acres in lots 160 and 161, 10th district, half a mile southeast of Fairy.

Several cross-cuts and shafts have been dug on lot 161 on the eastern slope and summit of a small ridge at the western base of the mountain. Considerable good ore was exposed, but the most of it is only of fair quality. Development of the property is said to have been stopped by the failure to get a right-of-way for waste water.

Lot 160 has also been prospected rather extensively near its east line by a series of pits, two of which are 30 feet in depth. Some very good ore has been exposed, which is mixed with ferruginous quartzite and slate in greater or less quantity. The promise of a workable deposit on this lot is more encouraging than that on lot 161.

Lots 128 and 129, owned in part by M. M. Howell, join the LaFollette Company property on the north. Float ore in limited quantity occurs on both of the lots. Lot 172, 27th district, also owned by M. M. Howell, is reported to have a surface show of good ore.

McCORD PROPERTY

Lot 153, 10th district, 1 mile west of Temple Grove, is owned by Joseph A. McCord of Atlanta. The property is in a gently rolling to level area characterized by outcroppings of dolomite and shale. Brown ore fragments varying from an inch to a foot in thickness

are quite widely distributed in the red clay soil. The ore is of good quality generally, but nothing can be said as to its extent.

The Dr. T. W. Colvard property, consisting of nearly 2,000 acres, joins the McCord property. In a grove about a quarter of a mile west of the Colvard residence, fragments of fair grade ore and chert occur. There has been no prospecting. The G. W. Bryant property, immediately west of the McCord property, also has a small amount of surface ore.

POTEET PROPERTY

J. M. Poteet and Willie Dunn of Crandall own the surface and mineral rights in 150 acres of lot 306, 10th district, the mineral rights in the remaining 10 acres of the lot and in 60 acres of lot 271. The property is about 1 mile east-northeast of Crandall, a station on the Louisville and Nashville Railroad.

About seven years ago the Rich Mountain Mining Company of Chatsworth prospected the property (lot 306) and shipped about a car of ore. The old pits are on the north bank of Mill Creek on the road to Beardtown. They are from 30 to 60 feet higher than the level of the stream. Good ore was revealed in them. The creek also has washed away the north bank, forming a vertical wall of clay and slate. Large boulders of ore were exposed. Limestone outcrops on the hillside at an elevation of about 40 feet above the creek.

Further prospecting is necessary before anything definite may be said concerning the extent of this deposit.

Analysis of Ore. Lot 306

Moisture at 100°C	2.51
Loss on ignition	9.53
Insolubles	13.24
Manganese (Mn)	.32
Metallic iron (Fe)	29.32
Sulphur (S)	.16
Phosphorus (P)	.51

HICKEY PROPERTY

Mrs. Samuel Hickey of Chatsworth, owns part of lot 203, 26th district, 2½ miles southeast of Crandall. In 1916 the Rich Mountain Mining Company leased and worked the property on a small

scale. A dozen or more open-cuts and a tunnel were opened on the north and southwest slopes of the ridge immediately east of the Hassler Mill-Crandall public road. These excavations are now largely filled with earth and little can be said as to the occurrence of the ore. Judging from fragments on the piles it seems to be associated with a yellowish-brown slate. This slate is pyritiferous, and much of the iron stain is due to the alteration of this mineral.

About 6 cars of ore were shipped from the property before operations ceased. The cost of mining was said to be too high to admit of economic production.

A sample of the ore analyzed as follows:

Analysis of Ore. Hickey Property

Moisture at 100°C	1.90
Loss on ignition	7.96
Insolubles	7.51
Manganese (Mn)	.81
Metallic iron (Fe)	32.60
Sulphur (S)	.19
Phosphorus (P)	.41
Silica (SiO_2)	32.90

Other properties in this vicinity having a show of ore are the R. L. Swanson, C. L. Terry, and Gregory properties.

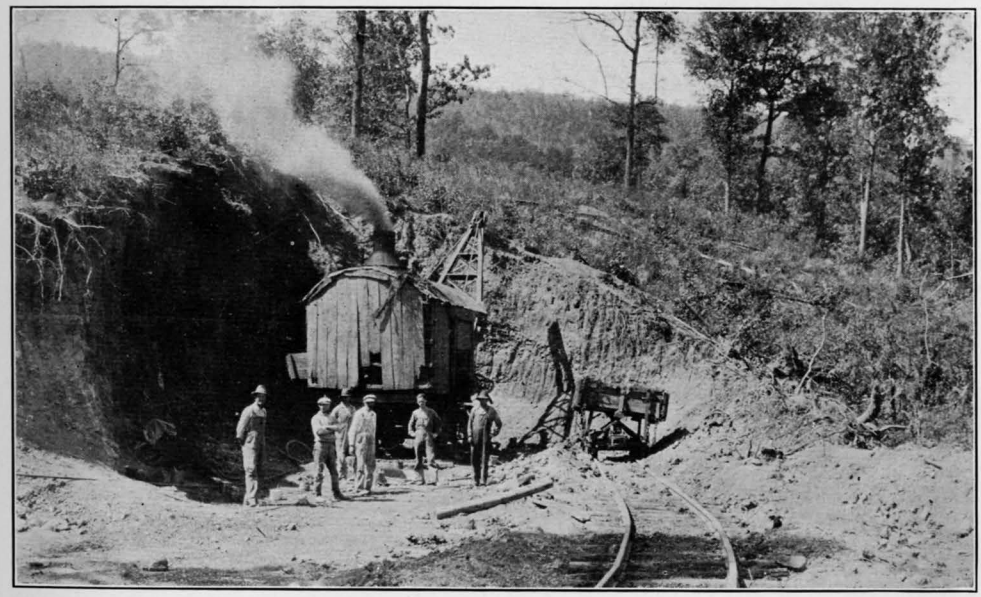
R. H. O'NEAL PROPERTY

The LaFollette Coal and Iron Company prospected lot 19, 26th district, 2 miles southeast of Crandall. About 18 tons of ore were shipped from an open-cut on the north slope of a hill, half a mile west of the Hassler Mill-Crandall public road. The ore ranged from 30 to 45 percent metallic iron. It is associated with slate. The float ore is limited in quantity.

J. E. LOVE PROPERTY

The Love property, lot 93, 9th district, is a short distance southeast of Eton. A small open-cut has been made on the western slope of a ridge immediately east of the public road. About 3 tons of good ore lie on the ground near the excavation. A large part of the ore carries considerable manganese. Silica is the chief mechanical impurity.

A. OPEN CUT, CHEROKEE MINE NEAR CEDARTOWN, POLK COUNTY.



B. NEW LOOMIS CUT, LAFOLLETTE COAL & IRON COMPANY PROPERTY NEAR SUGAR VALLEY, GORDON COUNTY.

The walls of the cut are badly slumped, and little can be said as to the nature of the deposit. Ore fragments are scattered along the hillside for a distance of several hundred yards, and a few shallow prospect pits were dug many years ago. Fragments of quartzite bearing pyrites were observed.

J. H. KEITH PROPERTY

In 1917 W. M. Graham of Chatsworth worked lot 57, 9th district, three quarters of a mile northeast of Eton. The two excavations, each about 50 feet long, 6-10 feet deep, and 15 feet wide, are on the western slope of a wooded ridge and only at a slight elevation above Mill Creek Valley. The walls of the cuts are caved in. The ore occurs apparently in yellowish-gray, residual soil. Fragments of slate more or less replaced by black iron oxide and encrusted with highly colored limonite are common. Small crystals of barite were seen.

A small amount of ore lies on the dump at present. About 6 cars altogether have been shipped from the mine.

MRS. W. R. DAVIS PROPERTY

Lot 64, 9th district, is a quarter of a mile southeast of Fashion. Ferruginous sandstone occurs here in considerable quantities. Some years ago a pit was dug and the rock used for building chimneys. On a little knoll beside a branch of Pinhook Creek sandstone fragments cemented by hematite and limonite occur in some abundance. A short distance east of this knoll limestone outcrops.

J. W. COFFEY PROPERTY

Lot 84, 9th district, is about 1¼ miles west of Eton. On the south side of the public road in a cultivated field, fragments of high grade ore occur in considerable quantity. Water-worn quartz pebbles and fragments of slate are also rather abundant.

JESSE JACKSON PROPERTY

A good grade of limonite ore, occurring in dark-red residual soil, is found on the Jackson property, half a mile south of Eton, near the Louisville and Nashville Railroad. Geodes with highly colored

interiors, together with smaller fragments, make up the bulk of the ore. Some low-grade material also occurs.

JOHN JOHNSON PROPERTY

Lot 270, 10th district, is about 1 mile northeast of Crandall. A limited amount of prospecting has been done along the foothills of the main ridge east of the valley. Fair grade ore and chert were exposed. A small amount of float occurs.

The J. W. Hayes property, lot 271, joins the Johnson property on the south. A prospect pit 300 yards southeast of the Hayes residence reveals a somewhat slaty limonite ore, together with some spongy appearing hematite. The ore outcrops in the public road a short distance north of the pit.

W. R. RYMER PROPERTY

Lot 233, 10th district, is on the Crandall-Cisco public road, 1 mile south of Fairy. A few prospect pits have been dug at the base of a ridge half a mile east of the Louisville and Nashville Railroad. The ore is of the same character as that found on other properties in this district.

JAMES BUTLER PROPERTY

The Butler property, lot 40, 25th district, is southeast of Ramhurst. In 1917 a prospect pit about 4 feet deep was dug on a hillside immediately east of the public road. The ore is low grade, being a replacement of slate chiefly, though samples were reported to show an iron content of 45 per cent.

DEPOSITS OF THE METAMORPHOSED PALEOZOIC AREA

GENERAL STATEMENT

The metamorphic Paleozoic area includes an irregular belt of rocks separating the Paleozoic area from the Crystalline area. Its greatest width, about 40 miles, is along the northern border of the state in Fannin County. The narrowest part of the belt is near Allatoona, Bartow County, where the distance across it is less than 2 miles. From this point to the southwestward the belt gradually

increases in width reaching a maximum of 20 miles along the Alabama-Georgia line. In addition to this belt another much narrower one, composed of rocks of the same character, known as the Brevard schist, extends from the South Carolina boundary across the southeast corner of Habersham County into Campbell County, southwest of Atlanta.

Several extensive deposits of brown ore are found in the larger belt, including the deposit of Iron Hill, northeast of Allatoona, which was described with mines of the Paleozoic area. The ores have been exploited also on a considerable scale in Gilmer and Fannin counties. The important marble quarries of the state are confined to this belt in Pickens County.

GENERAL GEOLOGY AND CHARACTER OF ROCKS ASSOCIATED WITH ORES

The area under discussion is separated from the Paleozoic belt by the Cartersville fault. This is a long fault entering Georgia in Murray County near Tennga on the Louisville and Nashville Railroad from which point it parallels the railroad a short distance west of it to Cartersville and thence into Alabama by the way of Rockmart and Esom Hill. The fault is marked by an almost continuous line of bluffs which rise 100 feet or more above the valley which lies to the west. From Cartersville northward to the state boundary the Louisville and Nashville Railroad runs in the rather broad valley only a short distance west of the fault. The eastern limit of the metamorphic belt passes east of the towns of Blue Ridge, Ellijay, Jasper, Canton and Buchanan, and is not marked by any striking topographic feature.

The rocks of the belt, sometimes spoken of as the Ocoee series, are considered as lower Cambrian in age, by reason of their relation to less altered, fossiliferous rocks to the north, whose age is known. In portions of Fannin and Gilmer counties these rocks have been carefully studied by LaForge[1] and others both with regard to character and structure, and have been divided into the following formations:

[1] LaForge, Laurence and Phalen, W. C., Ellijay Folio, U. S. Geol. Survey, 1913.

Nottely Quartzite: White quartzite.
Murphy Marble: White and blue marble.
Valleytown Formation: Biotite and Ottrelite schists.
Brasstown Schist: Banded slate and Ottrelite schist.
Tusquitee Quartzite: Fine-grained white quartzite.
Nantahala Slate: Banded black graphitic slate and garnet staurolite schist.
Great Smoky Formation: Graywacke, quartzite and mica schist.

Dikes of igneous rocks occasionally intrude these formations at certain points. A large granite mass, the Corbin granite which is well exposed, in parts of Cherokee and Bartow Counties, is also in the metamorphic belt.

A few ore deposits of some importance occur outside of Fannin and Gilmer counties, especially in Cherokee near Canton, but the rocks associated with the ores have never been definitely correlated with those farther north. In the Ellijay quadrangle are several deposits of brown ore which have been mined. These are all located along a lead which extends into North Carolina where the deposits have been described in detail by Bayley.[1]

In Georgia the ores are associated with the Murphy marble, the Valleytown formation, the Brasstown schist, the Tusquitee quartzite and the Nantahala slate, as is the case in North Carolina. In North Carolina, however, important ore bodies have been found

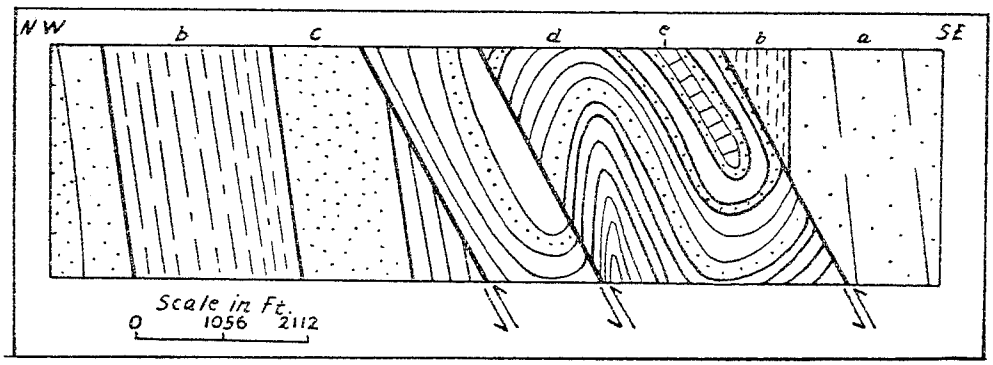


Fig. 3.—Northwest-southeast section across longitudinal valley near Blue Ridge, Fannin County.

a. Great Smoky formation. b. Nantahala slate. c. Tusquitee quartzite. d. Valleytown formation. e. Murphy marble.

[1] Bayley, W. S., Brown Hematite Ores of western North Carolina, U. S. G. S. Bull. 735, Part 1, 1922.

in the Andrews schist, but this formation is lacking apparently in Georgia. The above named formations occupy a trough in the Great Smoky formation, which coincides with a so-called longitudinal valley extending from Culberson by the way of Blue Ridge, Ellijay, Jasper, and Tate to Canton. The formations have been folded and faulted until the structure is very complicated, especially at the north end of the valley. The general dip of the beds is 60°-75° SE and the strike northeast-southwest. The faults follow the trend of the folds and are of the overthrust type, with the thrusting force coming from the southeast or east. The main faults, such as the Whitestone and Murphy, can be traced for long distances, being marked by residual material from veins of quartz and limonite. As will be shown later these faults are largely responsible for the accumulation of the ore in commercial quantities in certain localities.

ORIGIN AND AGE OF ORES

After the deformation of the region, which is supposed to have taken place at the end of the Paleozoic era, the process of deposition of the ores began. The source of the iron was probably the iron-bearing minerals such as pyrites, ottrelite, and garnets of the surrounding rocks, together with other ferruginous material of unknown character. During the carving of the peneplains of the Mesozoic and Cenozoic eras the Paleozoic rocks must have yielded a great part of their iron content to surface waters, which percolated downward. These waters would naturally seek those channels offering the least resistance to flowage, and for this reason the formation of deposits in the area under discussion is easily understood. The best channels for mineralized waters were no doubt along fault planes, for here would be large fissures and innumerable smaller ones which would permit the passage of ferruginous solution; hence, some of the most profitable ore-bodies are associated with the Murphy and Whitestone faults. Likewise, the character of the rocks is an important factor. Calcareous schists, such as the Valleytown and Brasstown formations offer abundant channels to the solutions because of their texture and pronounced schistosity. Deposits are not confined to any par-

ticular horizon in these formations for this reason, but the larger bodies of ore would be found at the contacts of the schists with impervious beds, like quartzites or marbles.

The deposits first formed must have been near the surface, but with continued erosion the ore-bearing zone was lowered until it reached its present level. Bayley[1] is of the opinion that in Cherokee County, North Carolina, this did not occur earlier than the time of development of a Tertiary peneplain and therefore the deposits have been lain down since then. It seems likely that the same is true in the Georgia belt which is an extension of that in Cherokee County.

FANNIN COUNTY

BRYANT PROPERTY

The Bryant property, lot 66, 7th district, is 3½ miles southwest of Blue Ridge along the Blue Ridge-Ellijay public road. Brown ore has been exposed in two small open-cuts on a hillslope but a short distance west of the Louisville and Nashville Railroad. One of these excavations discloses a vein of fair grade ore 3 or 4 feet in thickness, lying in a micaceous slate which dips at a high angle to the southeast. There is also considerable float strewn over the hillside.

Another small opening on the eastern side of the railroad exposes siliceous and slaty ore of limited extent apparently.

MARGARET ROBINSON PROPERTY

This property is 2½ miles southeast of Blue Ridge along the Louisville and Nashville Railroad. It was prospected about 25 years ago and a limited amount of ore shipped. The workings originally consisted of two open cuts and a shaft situated on a steep hillslope near the railroad. They are now well filled with fallen earth and little ore is exposed. The ore in the larger cut seems to occur in pockets in the highly metamorphosed slates and also in the form of a laminated vein some 3 feet in thickness. It is a manganiferous ore apparently. Little float is seen on the hillside.

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1. Op. Cit. p. 162.

McKINNEY MINE[1]

The McKinney mine is situated on lot 298, 8th district, less than half a mile south of the Blue Ridge station and but a few rods west of the Louisville and Nashville Railroad. It was opened in 1900 and worked for a few months. About 150 cars of ore were shipped to Middleboro, Ky. The ore is reported to have ranged from 37

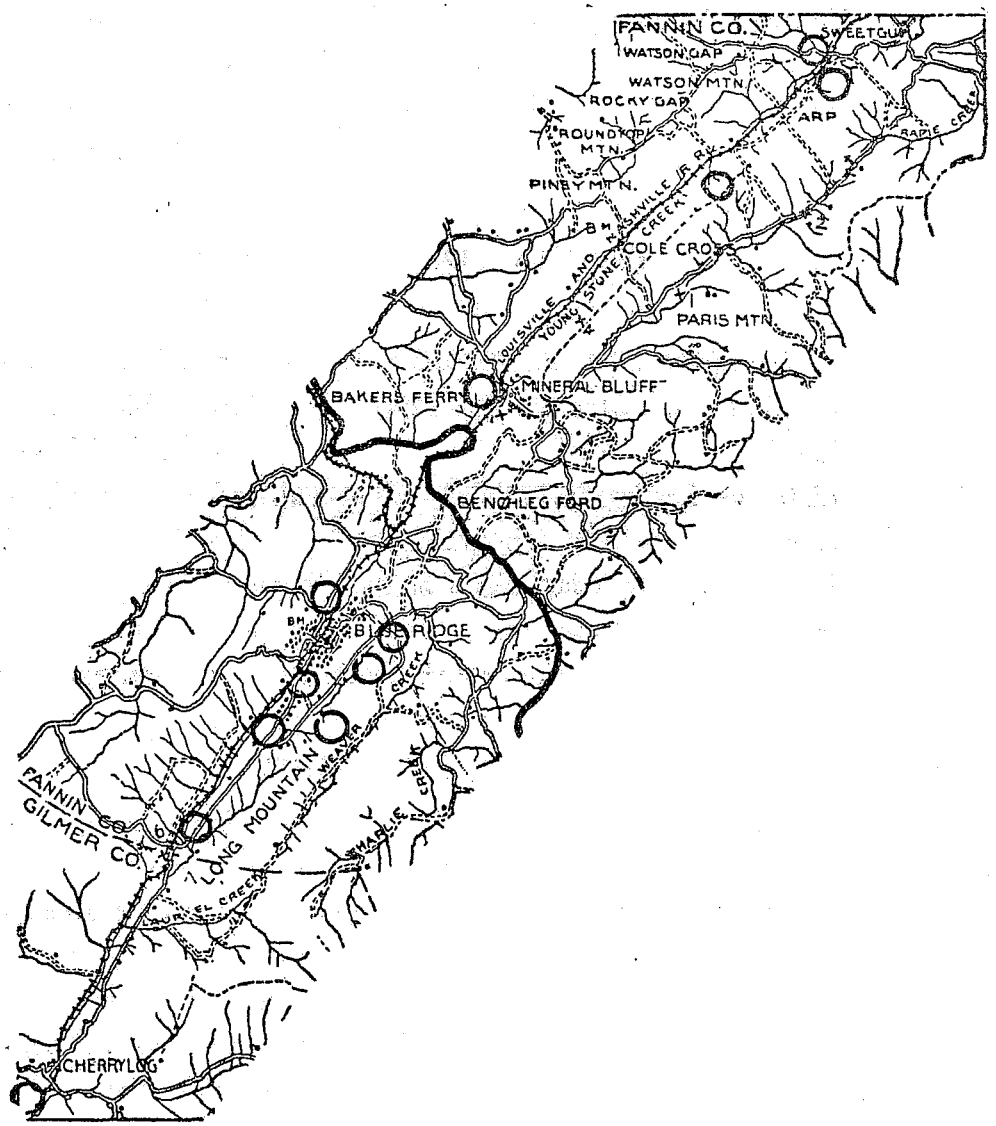

Fig. 4.—Sketch map of part of Fannin and Gilmer Counties showing distribution of iron ore. The circles indicate the locations of main ore deposits.

1. State Geol. Survey Bull. No. 35, p. 202.

to 55 per cent metallic iron. In 1917 A. G. Betts, of Asheville, N. C. shipped about 15 cars of manganiferous iron ore to Ensley, Ala. A washer was not used and much low grade material was mixed with the ore. In 1918 The Cherokee Mining Co. of Salisbury, N. C., worked the deposit for manganese. The ore was hand-washed and about 19 cars were shipped to Ensley, Ala. After this Company ceased operations, Michael McKinney of Blue Ridge shipped 4 cars of brown ore to the LaFollette Coal and Iron Company. The ore ran about 50 per cent metallic iron, though it was not washed.

The workings at the McKinney mine consist of an open cut about 200 feet long, 25 feet deep, and 50 feet wide, extending north-northeast into the low hill. On the east side of this cut near its face is a vertical shaft about 60 feet deep, now inaccessible. At the bottom of the shaft two drifts were driven, one to the northeast for about 40 feet, and one to the southwest for 80 feet. From the face of the former drift another short shaft extends to the southeast for 8 feet. From the latter, or southwest shaft, two drifts have been driven to the southeast about 20 feet. These two drifts are reported to have penetrated an ore vein consisting of 5 feet of manganese overlain by about 18 feet of good brown ore. Practically all the ore mined in recent years has come from this shaft. Most of the work in the cut was done about the time of the opening of the deposit.

No extensive equipment was ever used in mining here. It was planned to put up a washing outfit consisting of a small iron log washer and 10-horse power gasoline engine, but operations ceased before anything was done. The ore was washed by hand. The water was brought to the mine from a small branch, about 700 feet away, by a flume. The ore was dumped into a flat-bottomed trough about 16 feet long, through which the water flowed directly from the flume. The lighter mechanical impurities were washed away, and the ore left behind was shovelled into wagons and hauled to the cars.

The shaft was equipped with an elevator, or "skip" run by a steam engine. The ore was hauled by hand from this skip to the dump in small tram cars. It was then wheeled to the washer platform and dumped into the trough.

The McKinney mine is exceedingly well located for economic exploitation, but the deposit is apparently of limited extent. It seems that there is considerably more manganese present than brown ore.

L. B. CRAWFORD ESTATE

This property includes lot 297, 8th district, which joins lot 298 on the west. In 1918 A. W. Ellis worked the property for manganese immediately west of the railroad, about 200 yards southeast of the McKinney mine. The workings consist of a shallow open cut extending northeast parallel to the railroad for about 200 feet in which three prospect wells about 25 feet deep have been sunk. Also, near the south end of the cut a shaft 40 feet deep was sunk, and immediately south of this shaft a short adit was driven. In the last named opening a 2-foot vein of good brown ore was exposed, together with fragments of ore in the residual clay. Manganese is associated with the limonite, but apparently in no great quantity. A car of the ore was recently shipped to LaFollette, Tenn., and was rejected. A considerable amount of the mineral, wavellite, is associated with the ores. The openings on the Crawford property are inaccessible at present so that very little ore is exposed. The deposit seems to be of no commercial value.

GEORGIA BAPTIST ASSEMBLY PROPERTY

This property includes parts of lots 313, 314, 316 and all of lot 315 in the 8th district, 2d. section, and is immediately south of Blue Ridge. W. L. Cutts, President of the Mary P. Willingham School at Blue Ridge, has charge of the property. The ore "lead" extends in a northeast-southwest direction across lot 314. It has been exposed in a series of open-cuts on the eastern slope of the low ridge immediately east of Blue Ridge. The southernmost cut is about 220 feet long, 10 feet wide and 6-8 feet deep, extending northeast. In the north end of the excavation 6 feet of good ore is exposed. About 100 feet farther along the "lead" is a somewhat larger cut, which shows little ore. Still farther in the same direction are a series of shallow prospect pits and another open-cut, also trending to the

northeast. A long narrow cut extends to the south-east from the south end of this opening. Brown ore is exposed in the larger excavation with a foot-wall of purplish weathered schist and a hanging-wall of residual clay and yellowish decayed schist. The ore occurs as small lumps and as thin layers interbedded with the schist.

The ore on the whole is of good quality. Some hematite and manganiferous iron occur, and the impurities such as chert and quartz are scarce. The ore is a replacement, apparently, of the Valleytown formation. The property was dry mined in 1918 by the Cherokee Mining Company and 100 cars of ore are reported to have been shipped.

An average sample from the southernmost cut gave the following partial analysis:

Analysis of Ore. Lot 314

Moisture at 100°C	2.22
Loss on ignition	8.74
Metallic iron (Fe)	44.92
Sulphur (S)	.12
Phosphorus (P)	.07
Insolubles	2.80
Manganese (Mn)	.65
Silica (SiO_2)	17.59

GLOVER PROPERTY

The iron "lead" exposed on the above property extends to the northeast on to the C. C. Glover property adjoining lots 299 and 300, 8th district, The mineral interests in these two lots belong to the Jenkins Bros., of Benton, Tenn.

The most recently worked opening is an open-cut on the north side of a small eastward flowing branch of Weaver Creek beside an old road and at the eastern base of the ridge. It is badly slumped, but some good brown ore and manganese wad are exposed. The formation underlying the ore-body is apparently a bluish-black talcose schist while the overlying rock is quartzite.

About 200 yards southwest from this excavation on the east side of the old road extending along the foot of the ridge, is a cut 250 feet long, 10-15 feet wide and 10-12 feet deep. It is now largely filled, but some good ore is to be seen at the edge of the opening.

A sample of ore from the first-described cut gave this partial analysis:

Analysis of Ore. Lot 299

Moisture at 100°C	.61
Loss on ignition	12.84
Metallic iron (Fe)	52.84
Sulphur (S)	.26
Phosphorus (P)	.146
Insolubles	2.55
Manganese (Mn)	1.14
Silica (SiO_2)	5.74

GRANT PLOWMAN PROPERTY

The Plowman property, lot 278, 8th district, joins the Glover property on the north. It has been prospected by an open-cut about 120 feet long, 10-12 feet deep, and 4-6 feet wide, which trends to the northeast along what appears to be a "lead" of ore west of the one exposed on the Glover lot. The ore occurs in well defined layers between a foot-wall of bluish-gray talcose schist and a hanging-wall of weathered, fine-grained gray quartzite. The general strike of the formations is about N. 30°E. and dip S. 80°E. The ore-vein is about 5 feet thick and represents a replacement of schist, by iron bearing solutions. Joint and fracture planes filled with iron ore are prominent in the quartzite.

About a car of ore was taken from the cut in 1918. Nearly 200 feet northeast of this opening a small stripping was made, but little ore was exposed.

A sample of the ore on the pile at the south edge of the cut gave this analysis:

Sample of Ore. Lot 278

Moisture at 100°C	.84
Loss on ignition	10.04
Metallic iron (Fe)	40.14
Sulphur (S)	.20
Phosphorus (P)	.21
Insolubles	10.16
Manganese (Mn)	.97
Silica (SiO_2)	16.33

I. F. GRIFFIN PROPERTY

J. M. Silvey of Culberson, N. C., owns the mineral rights and I. G. Griffin of Blue Ridge, the surface rights in lot 277, 8th dis-

trict. The property joins the Plowman lot on the east and is about a mile east of Blue Ridge. The ore "lead" exposed on the Glover property also outcrops on lot 277. Several open-cuts and pits have been opened on a low ridge about 200 yards south of the Blue Ridge-Morganton public road. The work was done many years ago and no definite ore-body is now exposed. Fragments of low grade ore are scattered over the hillslope in the vicinity. Farther down the eastern slope of the hill are outcrops of ferruginous silicious rocks similar to those associated with the Shady limestone and the iron ores of the Cartersville district.

Some of the ore found on this lot is of good quality, but most of it is slaty and siliceous. It appears to be in limited quantity.

W. H. DODD PROPERTY

The Dodd property, lots 10 and 11, 7th district, is about a mile south of Blue Ridge station and along the western foothills of Long Mountain.

Two open-cuts have been made on lot 10. The northern one is about 175 feet long, 20 feet wide, and 10 feet deep, trending northeast. The cut was made some years ago but little ore is seen except a few lumps of schistose material, some of which is of fair grade. Immediately southeast of this excavation is another of about the same size. A small amount of fair grade ore is seen here in the weathered yellow schist or clay.

In addition to these two openings there are several prospect pits farther southeast along the "lead".

About 11 cars of ore were shipped from this property in 1918 by a company from Murphy, N. C.

J. Y. ALLEN PROPERTY

A small prospect pit was dug in 1918 on lot 279, 8th district, about 100 yards west of the water tank, a short distance northeast of the depot at Blue Ridge. The opening is now filled with earth, but a small amount of good brown ore and manganiferous iron ore is seen in the open field. The deposit is apparently on the same "lead" as the McKinney mine.

W. L. CONLEY PROPERTY

The Conley property, lot 265, 8th district, is about 1½ miles northeast of Blue Ridge, and three-quarters of a mile north of the Blue Ridge-Morganton highway. It is on the same ore "lead" as the Glover and Georgia Baptist Assembly properties.

Before the Civil War considerable mining was done here and ore used in the Hemptown forge near Morganton. In 1917 William Dickey of Mineral Bluff and I. G. Griffin of Blue Ridge, shipped 14 cars of ore to LaFollette, Tenn., and the following year P. W. Clark of White, Ga., shipped 6 more cars.

At present the property is leased to J. H. White of White, Ga., and Henry Lumpkin of Cartersville, who are preparing to carry on rather extensive mining.

The main excavation is a broad open-cut on the southeast side of a prominent hill. It is about 200 feet wide, 30 feet long, and 25 feet deep at its face, with a trend to the northeast along the "lead". The ore bearing zone consisting of yellow residual clay, ore and barren rock fragments is at least 75 feet wide at this point, and there is every indication that it will be found considerably wider. The ore occurs as varying sized fragments and geodes abundantly distributed throughout this clay. Some of it is of excellent grade, while some is rather slaty and silicious. The average metallic iron content will lie between 46 and 48 per cent probably, after washing.

The equipment consists of a single log washer operated by a 40-horsepower steam engine. Water is pumped from Weaver Creek a short distance to the east. The ore is scraped directly into the washer from the cut and passes over the picking belt into the wagons.

To the northeast of the mine on the summit of the hill are several shallow pits which indicate a continuation of the deposit in that direction. About a quarter of a mile southwest of the washer another small cut has been made beside the road at the base of the ridge. The ore seems to be of better grade than that in the first described deposit. The nature of its occurrence however is practically the same.

The deposit of ore on the Conley property is evidently of considerable extent and has greater promise than any other in the vicinity of Blue Ridge.

The analyses below indicate the character of the ores:

Analyses of Ore. Conley Property

CONSTITUENTS	1	2	3
Moisture at 100°C	1.58	1.16	1.54
Loss on ignition	11.04	10.12	10.67
Soda (Na_2O)	trace	trace	----------
Potash (K_2O)	trace	trace	----------
Lime (CaO)	.00	.00	----------
Magnesia (MgO)	.02	.00	----------
Alumina (Al_2O_3)	.72	4.17	----------
Ferric oxide (Fe_2O_3)	81.33	67.22	----------
Manganous oxide (MnO)	.30	.36	----------
Titanium dioxide (TiO_2)	.36	.72	----------
Sulphur trioxide (SO_3)	.00	.00	----------
Phosphorus pentoxide (P_2O_5)	2.27	1.85	----------
Silica (SiO_2)	2.40	14.44	16.93
Nickel (Ni)	trace	.06	----------
Cobalt (Co)	trace	trace	----------
Total	100.02	100.10	----------
Metallic iron (Fe)	56.93	47.06	36.44
Sulphur (S)	.00	.00	.35
Phosphorus (P)	.99	.83	.37
Insolubles	----------	----------	14.45
Manganese	----------	----------	1.47

1. Analysis of ore from small open-cut, a quarter of a mile southwest of the main workings.
2. Ore from washer-cut, part of it washed and part as taken from the mine.
3. Sample collected by J. P. D. Hull, formerly Asst. State Geologist, from the main excavation.

OWENBY PROPERTY

I. C. Owenby of Culberson, N. C., owns part of lot 11, 8th district, 1st. section, about a mile east of Sweetgum, Ga., a station on the Murphy branch of the Louisville and Nashville Railroad. The property was prospected in 1917 by J. M. Silvey and D. M. Marvin, but no ore was shipped. The largest opening is on the south side of the Sweetgum-Jonica Gap road. An ore body about 7 feet thick is exposed, lying in a much weathered ferruginous mica schist. The ore is chiefly of poor quality. Some of it is manganiferous and

most of the ore mined was of this character. On the north side of the road, northeast along the strike of the ore lead, is a small pit showing a limited amount of ore of varying quality. The lead is indidicated by a small amount of good float ore.

Iron stained schist with lenses of brown ore outcrops at different places on the lot, but there is nothing by which to judge the extent of these deposits.

A sample from the stock pile at the larger cut analyzes as follows:

Analysis of Ore. Lot 11

Moisture at 100°C	.60
Loss on ignition	10.82
Metallic iron (Fe)	46.64
Sulphur (S)	.08
Phosphorus (P)	.37
Insolubles	5.43
Manganese (Mn)	2.61
Silica (SiO_2)	12.54

A small amount of ore is also seen on lot 12 to the east of the above described property.

SILVEY PROPERTY

J. M. Silvey of Culberson, N. C., owns lots 9 and 10, 8th district, a mile northeast of Sweetgum, along the North Carolina-Georgia state line.

Lot 10 has been prospected by a small open-cut exposing about 2 feet of fair grade limonite and 5 feet of ferruginous schist. A small amount of stalactitic manganese of good quality is associated with the ore.

About 150 feet west of this opening is an outcropping of ore in a road-cut. High grade massive limonite, mixed with poorer material, is exposed. A selected sample showed a metallic iron content of 52 per cent. The thickness of the "vein" is very indefinite, but it probably is a foot or more.

On lot 9 in a road cut about 100 yards west of the Silvey residence is an exposure of weathered carbonaceous slate 50 feet or more in width containing limonite ore. In the middle of this formation is a "vein" of brown ore 2 feet thick, striking, with the rock formations, N45°E., and dipping S.E60°-65°. The ore is of good quality and mixed with considerable manganese wad.

A sample of ore from lot 10 gives the following analysis, which is probably hardly representative as the deposit was not exposed to any extent:

Analysis of Ore. Lot 10

Moisture at 100°C	.89
Loss on ignition	9.84
Metallic iron (Fe)	45.07
Sulphur (S)	.17
Phosphorus (P)	.48
Insolubles	5.58
Manganese (Mn)	.98
Silica (SiO_2)	18.28

HEATON PROPERTY

J. M. Heaton of Mineral Bluff owns the land and mineral interests in 40 acres of lot 231, 8th district, and in 10 acres of lot 201, 8th district.

In the northeast corner of lot 231, a mile southeast of Mineral Bluff, several prospect pits have been opened on the west side of a small stream flowing southwest of Toccoa River. Brown ore of good grade is here exposed in a vein 1½ feet thick in a yellowish schist underlying the Murphy marble. Float occurs along the strike of the ore "vein" for half a mile, but it is not known whether the deposit is continuous over the entire distance.

On lot 201 near the Heaton residence is an open-cut, now nearly filled with debris, from which a car of ore was shipped five or six years ago. In the north end of the cut 4 feet of fair grade ore occurs as thin layers and masses in the yellow residual soil, or clay.

An average sample of ore exposed in the cut gave this partial analysis:

Analysis of Ore. Lot 201

Moisture at 100°C	1.26
Loss on ignition	9.47
Metallic iron (Fe)	37.20
Sulphur (S)	.14
Phosphorus (P)	.28
Insolubles	8.95
Manganese (Mn)	.24
Silica (SiO_2)	24.27

COLLINS PROPERTY

W. L. Collins owns part of lot 30, 8th district, a quarter of a mile northeast of Sweetgum. On this property a short distance east of

the Culberson public road is an old pit put down more than 50 years ago. A small amount of good brown ore is seen in its walls but nothing can be said as to its extent. No surface outcrops were seen.

A sample of the ore was analyzed with the following results:

Analysis of Ore. Lot 30

Moisture at 100°C	1.64
Loss on ignition	12.41
Metallic iron (Fe)	49.78
Sulphur (S)	.17
Phosphorus (P)	.65
Insolubles	2.88
Manganese (Mn)	2.12
Silica (SiO_2)	7.34

MINE NO. 20

The Ducktown copper ore belt extends southwest across the Tennessee line and into Georgia for a distance of some miles. This belt can be readily traced on the surface by the outcroppings of gossan, a porous iron ore formed from the copper ores by oxidation and a leaching process. When the gossan extends to considerable depth it is mined and shipped as an iron ore. The high grade gossan is very porous and of a blue to purplish red color, consisting mainly of a mixture of hematite and limonite.

One of the larger openings for copper along this belt in Georgia is Mine No. 20 on lot 20, 9th district, 2d. section, 3 miles southwest of Copperhill, Tenn. About 6 feet of gossan ore is exposed in the main shaft of the mine near the office. It is porous and silicious with a rusty red to brownish color. About 75 feet west of the shaft the same ore is exposed in the driveway with a thickness of about 6 feet. To the northeast along the ore belt little gossan is seen, which is to be expected, as only silicious and calcareous ore occurs in that part of the mine. The best show of gossan is southwest of the main shaft. Several prospect shafts have here exposed it in some quantity. It is to be doubted, however, whether the ore is present in amounts sufficient to warrant extensive working.

A sample from the shaft immediately northwest of the main shaft gave this analysis:

Analysis of Gossan. Lot 20

Moisture at 100°C	.98
Loss on ignition	9.70
Insolubles	4.57
Manganese (Mn)	.24
Metallic iron (Fe)	41.68
Sulphur (S)	.22
Phosphorus (P)	.256
Silica (SiO_2)	22.27

MOBILE MINE[1]

The Mobile mine is about 1 mile south of Mine No. 20 and on lot 59, 9th district. The gossan here is limited in quantity and generally of poor grade. A few bands of high grade gossan were observed in one of the old shafts, associated with quartz in the form of small veins and stringers. Apparently there is no workable deposit of limonite ore on the property.

S. W. DUNN PROPERTY

Some prospecting for limonite has been done on lot 87, 9th district, half a mile west of Pierceville. It was thought that the Ducktown copper belt passed through the property. A shallow pit was dug on the west slope of a hill east of the Dunn residence, and a few layers of good ore were exposed. Above the opening, ledges of pyritiferous quartzose mica schist stand out rather boldly.

It does not seem probable that any of the gossan prospects along this belt will ever prove of commercial importance. Apparently the deposit at Mine No. 20 offers the most encouraging hope.

DILLIARD PROPERTY

J. P. Dilliard Estate is 2½ miles north of Mineral Bluff and west of the Louisville and Nashville Railroad. About a year ago two wagon loads of ore were taken from a small open-cut on this property on the south side of a prominent ridge and half a mile south of the Dilliard residence. Some of the ore is of good grade, but most of it is schistose and of little value. North of the ridge in the cultivated fields a few fragments of excellent manganese ore were seen.

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1. State Geol Surv. Bull. 33, pp. 210-215.

HIGDON PROPERTY

S. H. Higdon owns lot 239, 9th district, about 10 miles northwest of Blue Ridge. The Mount Pisgah copper prospect is situated on this lot[1] and on the north and south sides of the mountain a fair grade gossan ore occurs in limited quantity. There are also small exposures of impure ore on the Monroe Davenport property, lot 182, 9th district, and the McKinney property, lot 228, 9th district, both in the vicinity of Higdon's Store.

LOT 302, 8TH DISTRICT

This lot is about a mile southeast of Blue Ridge. Iron ore occurs here on the eastern slope of a ridge half a mile from Weaver Creek, in a small open cut made many years ago. The ore which seems to be in considerable abundance and of fair grade, is associated with quartz in the residual clays. The float is rather abundant, and the deposit is evidently of some extent. To the northeast of this exposure are other outcroppings along the sides of the ridge, but the ore is usually too silicious to be of commercial value.

CURTIS PROPERTY

There is a small exposure of ore beside the public road on lot 245, 8th district, about a mile northwest of Blue Ridge. The ore is chiefly limonite and occurs in the residual clays. A small excavation on the hill-slope exposes little ore in place. The deposit is apparently of no great extent.

LOT 248, 8TH DISTRICT

Iron ore is exposed on this lot in a small branch a short distance west of the public road. The "vein" or ore body appears to be about 10 feet thick and composed of massive limonite of fair quality. There has been no prospecting and the extent of the deposit is unknown.

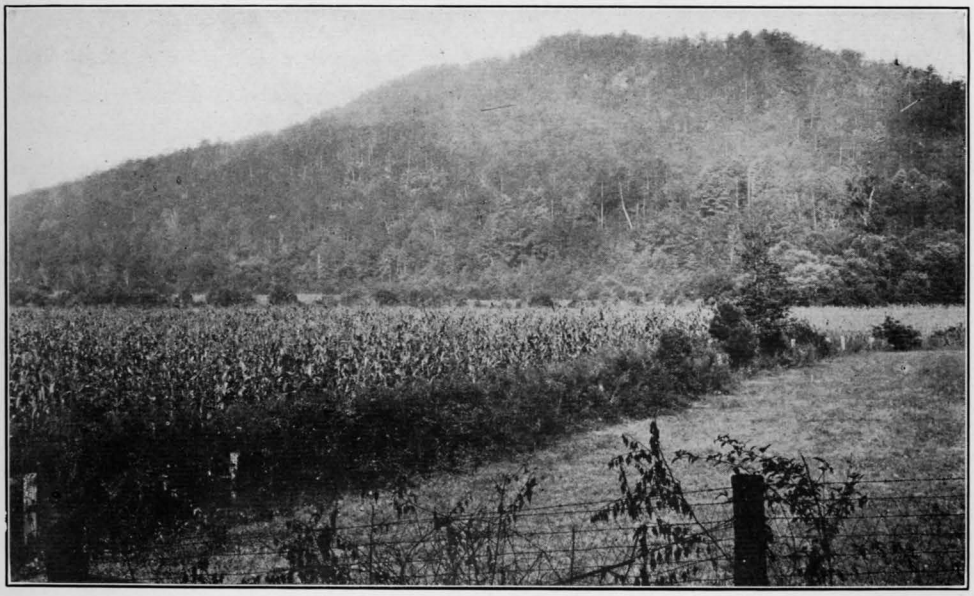
GILMER COUNTY

ELLIJAY MINING COMPANY'S PROPERTY

This property includes lots 84, 85 and 60 in the 11th district, 2d. section and is located on the north bank of Cartecay River, half

1. State Geol. Surv. Bull. No. 33, pp. 218-220.

A. OPEN CUT W. M. SCOTT PROPERTY, EAST ELLIJAY, GILMER COUNTY.



B. IRON MOUNTAIN NEAR JUNCTION OF CONASAUGA AND JACKS RIVER, ALACULSY VALLEY MURRAY COUNTY.

a mile southeast of the Louisville and Nashville railroad station at Ellijay. The controlling mineral rights in the three lots are held by W. M. Scott of Atlanta.

The property was known some years ago as the Buck-Fuller property, and prior to the Civil War was prospected for copper. The old workings consist of a tunnel 175 feet long extending southwest into the hillside on the northeast part of lot 84, and a shaft 80 feet deep. Subsequent to the prospecting above referred to no work of any consequence was done on the property until 1918 when it was leased to J. W. Clayton of Atlanta, who mined and shipped considerable ore but finally abandoned the workings. In the early part of 1923 the mine was again put in operation by one of its chief owners, Dr. Wright of Detroit, Michigan, and operated for some months when it was finally shut down. The workings are confined mainly to lot 84 on the south side of a prominent ridge with a general northeast-southwest trend, and only a few hundred feet from the Cartecay River. The largest excavation is an open cut, located about 70 feet above the river. It is about 300 feet long, 20-40 feet wide, and in places 45 feet deep. The trend of the cut is N. 35°E. At the entrance to this cut is an incline shaft about 60 feet deep, dipping to the northeast at an angle of about 40 degrees, and equipped with a track and car for hoisting the ore. The bottom of the tunnel is about 80 feet lower than the ground at the surface. The ore "lead" was encountered at this depth where much good ore is to be seen both in the walls and bottom of the tunnel. A churn-drill hole put down at the end of the tunnel was said to have encountered ore to a depth of 30 feet. A short distance northwest of this tunnel is a small open cut, extending northwestward into the hill-slope across the strike of the "iron lead". About 3½ feet of very carbonaceous slate, together with a small amount of ore, is exposed.

The ore on this property is of good grade, though high in phosphorus. The metallic iron content averages about 50 per cent, while the phosphorus content is over 2 per cent. The ore also carries a small amount of manganese. The mineral wavellite, a phosphate

of aluminum, is sometimes to be seen in cavities and between the layers of the schist.

The ore occurs in fairly well defined veins of varying thickness in the quartzose schist. Judging from outcrops of ore the "lead", or limonite bearing zone, is 80 feet or more in width, and extends across the northwest corner of lot 85 onto lot 60. Outcrops of ferruginous schist in a small stream in East Ellijay and in road cuts on the Ellijay-Yukon road indicate that the "lead" continues to the southwest. Evidently there is a considerable deposit of ore on the property. It has an excellent location for economic mining and under good management should prove a profitable source of income to its owners. The one drawback to the project is the long haul to the furnace. The ore must be shipped to LaFollette, Tenn., which makes a high freight rate. A branch of the Louisville and Nashville railroad, constructed for the Shippen Bros. Lumber Company, extends to within less than a half mile of the mine. The equipment at the mine is as follows:

1 Steam shovel with track.
Boiler and steam engine.
1 Double log washer.
6 Wooden side-dump cars.
1 Picking belt.
1 3-cell jig,
Pump, pipe line, etc.

The following analyses show the chemical composition of the ore of the Ellijay Mining Company's property:

Analyses of Ore. Ellijay Mine

CONSTITUENTS	1	2	3	4	5	6	7	8
Moisture at 100°C	2.56	1.64	2.14	.23	3.08	.98	2.45	2.18
Loss on ignition	9.86	10.60	9.52	------	11.24	11.01	11.48	10.04
Soda (Na_2O)	trace	trace	------	.36	------	------	.22	trace
Potash (K_2O)	trace	trace	------	.77	------	------	.45	trace
Lime (CaO)	.00	.54	------	------	------	------	.00	.36
Magnesia (MgO)	trace	trace	------	------	------	------	.00	trace
Alumina (Al_2O_3)	5.81	3.25	------	------	------	------	2.50	.92
Ferric oxide (Fe_2O_3)	61.93	71.84	64.41	------	72.12	------	75.96	69.76
Manganous oxide (MnO)	2.48	2.06	------	------	------	------	trace	.44
Titanium dioxide (TiO_2)	.72	.27	------	------	trace	------	trace	.45
Sulphur trioxide (SO_3)	.00	.00	trace	------	trace	------	.00	.00
Phosphorus pentoxide(P_2O_5)	4.30	2.84	2.00	------	4.66	------	4.33	2.29
Silica (SiO_2)	12.08	7.32	19.53	10.35	6.83	28.69	2.78	13.38
Cobalt (Co)	trace	trace	------	------	------	------	------	trace
Nickel (Ni)	trace	trace	------	------	------	------	------	trace
Total	99.74	100.36	------	------	------	------	100.17	99.82
Metallic iron (Fe)	43.34	50.29	45.08	46.28	50.48	33.58	53.17	48.83
Sulphur (S)	.00	.00	trace	------	trace	.08	.00	.00
Phosphorus (P)	2.48	1.22	1.69	2.59	2.66	1.22	1.89	1.95
Manganese (Mn)	------	------	.60	------	1.28	.57	------	------

1. Analysis of ore from southeast side of main excavation on lot 85.
2. Sample from small open-cut on north side of lot 85.
3. Analysis of ore sent to Survey office by W. M. Chester.
4. Sample collected by B. M. Hall in 1918.
5. Sample of ore analyzed for W. M. Chester.
6. Average sample of ore in loading bin. Collected in 1919 by J. P. D. Hull.
7. Analysis of ore from incline shaft.
8. Ore from head of tunnel.

HALEY PROPERTY

Miss Haley of Macon owns the surface rights in lot 304, 10th district, 2nd. section, 3½ miles northeast of Ellijay. The mineral interests belong to the Shippen Bros., Ellijay. The property lies on the summit and slopes of Iron Mountain, immediately east of Northcutt station on the Louisville and Nashville Railroad. Little Turniptown Creek flows at the southern base of this mountain.

The property is said to have been worked for iron ore as early as 1861, when 40 tons were hauled to the furnace on Cartecay River near Ellijay. The iron made from this ore is reported to have been of excellent quality. No further effort was made to work the deposit until the completion of the Atlanta, Knoxville and Nashville Railroad some 35 years ago. About this time George R. Eagar, a

railroad contractor, prospected the property considerably but shipped no ore. In 1867 Mr. Hamilton of Dalton sunk a shaft for gold to a depth of 104 feet on the summit of the mountain. This shaft is still seen though obscured by debris. In 1900 J. M. McKinney and others of Blue Ridge worked the property and shipped 30 cars of ore to Middleboro, Ky.

The deposit was mined last in 1917-'18 by W. H. Patterson of Atlanta, who shipped about 12 cars of ore.

The workings consist of open-cuts and pits on the eastern slope of the mountain at heights ranging from 40 to 100 feet above the valley. One of the largest and most recently worked cuts extends into the northeast side of the hill across the strike of the formations. The brown ore exposed is about 20 feet thick, occurring with silicious masses. The quality is variable, grading from first class mammillary and geodal ore down to highly silicious material. About a ton of ore is to be seen on the dump.

On the summit of the mountain at its southern extremity are two small cuts revealing a low grade ore. There are several other small excavations along the eastern slope of the mountain which expose the same type of ore. The "lead" extends to the northeast about 300 yards, as shown by float.

The ore apparently occurs at or near the contact of the Valleytown and Brasstown formations.

The property is well located for economic mining, but it is doubtful if there is any great quantity of commercial ore.

A sample of ore from the largest excavation gave this analysis:

Analysis of Ore. Haley Property

Moisture at 100°C	.95
Loss on ignition	10.74
Insolubles	3.95
Manganese (Mn)	1.47
Metallic iron (Fe)	41.34
Sulphur (S)	.22
Phosphorus (P)	1.17

J. A. RAY PROPERTY

The Ray property, lot 310, 10th district, is about 1½ miles southwest of Iron Mountain. W. A. Cox of Ellijay owns the mineral

interests in the lot. The "iron lead" crosses the property, ore being exposed in the public road cut about a quarter of a mile east of the railroad. High grade fragments of limonite occur in the red surface clay, for about 150 feet along the road. In the woods a short distance north of the road a similar type of ore is seen. Only a few shallow pits have been dug.

Boulders and smaller fragments of impure ore are seen on the J. H. Ray property which joins the J. A. Ray lot.

MRS. WILL ROLSTON PROPERTY

Mrs. Will Rolston of Atlanta owns lot 252, 7th district. Iron ore occurs on this lot about a quarter of a mile west of Whitepath, a station on the Louisville and Nashville Railroad. A small open-cut was made here many years ago on the summit of a narrow ridge having a northeast-southwest trend. A small amount of slate and schistose ore appears in the walls of the cut, indicating that the deposit is probably a replacement of slate and schist. Considerable "pot" ore is scattered over the slopes of the ridge.

W. A. DAVIS PROPERTY

Lot 253, 7th district, has been prospected for manganese quite extensively.[1] Also, limonite is known to occur in some quantity. About 300 yards north of the hotel at Whitepath and immediately west of the public road are two open cuts from which about a car of ore was shipped to LaFollette, Tenn. The ore is a replacement of a quartzose schist, and the deposit exposed is over 6 feet wide. A sample of this ore analyzed as follows:

Analysis of Ore. Lot 253

Moisture at 100°C	2.50
Loss on ignition	13.55
Insolubles	5.99
Manganese (Mn)	1.63
Metallic iron (Fe)	40.14
Sulphur (S)	.26
Phosphorus (P)	.81

SEARCY PROPERTY[2]

W. H. Searcy owns both surface and mineral rights in lots 215, and 219, 7th district, and the mineral rights only in part or all of

1. State Geol. Surv. Bull. No. 35, p. 205.
2. State Geol. Surv. Bull. No. 35, p. 204.

several other lots in the vicinity. The property is a short distance southwest of Cherrylog on the Ellijay-Blue Ridge public road.

Extensive prospecting for manganese and limonite ores has been carried out on the property in recent years and as early as 1900. The greater part of the ore found is either manganese or manganiferous iron and it seems that the chief value of the property lies in the manganese ore rather than the limonite ore. The prospecting has been confined chiefly to lot 215, and the pits are on the eastern and western sides of the railroad.

Those pits on the extreme western side of the lot expose ore on what is known as the west "vein". It is about half a mile west of the Louisville and Nashville Railroad and on the eastern slope of a low ridge. Two or three small cross-cuts reveal manganese ore, associated with schist and a considerable amount of excellent limonite in the form of "pots", and slaty fragments with needle-ore encrustations. The "vein" outcrops farther to the northeast on lots 182 and 183. The most extensive workings are on the "middle vein", a few rods west of the railroad and the Searcy residence. Several open cuts and a vertical shaft have been opened along the "lead." The first work was done here about 25 years ago by McKinney and Long, who shipped 20 cars or so of brown ore to Middleboro, Ky. In 1916 George Dismukes shipped 2 cars of manganese, samples of which had a metallic content of 50 per cent. In 1917 Rollin Dickery of North Carolina shipped 10 cars of brown ore. W. H. Searcy also has shipped 1 car and mined several more, which are reported to have run 45 per cent in iron and low in phosphorus.

The northernmost cut is about 50 feet long, 10-20 feet wide and 12-15 feet deep. It extends northeast along the strike of the "lead". About 100 feet south of this excavation is another one of nearly the same size, but with an additional entrance, 70 feet long, extending westward into the hillside. Between these two cuts a shaft was once sunk to a depth of 60 feet and it is said that good ore was exposed all the way to its bottom. Farther to the southward for 100 yards or more considerable float of varying quality is seen.

The ore "vein" strikes about N10°E and dips steeply to the southeast. It will average 9 feet or more in thickness. The ore is both massive and laminated and is apparently a replacement of the silicious schist. Manganese and manganiferous iron seem to occur chiefly in the lower part of the ore body. About 2 cars of ore of all grades lie on the dump at the entrance to the northernmost cut. The brown ore is of good quality, easily mined and could be readily washed. The chief mechanical impurities are silica and schist fragments.

The "east vein" lies about 300 yards east of the public road. A quarter of a mile south of the Searcy residence, it has been exposed by a prospect shaft at the base of the ridge, 16 feet deep and about 18 feet square. A drill hole in the bottom of the shaft is said to have indicated the continuation of the ore in depth. The shaft is now nearly filled with water, but large and small fragments of ore are seen in its exposed walls. A car or so of good massive ore is on the dump. In addition to this shaft a shallow opening was made farther up on the hillslope on lot 214, but only silicious ore was revealed. This is said by Mr. Searcy to be another "lead."

The Searcy property is very well located for economic working, both with respect to transportation and water supply, but it is not apparent that a very large tonnage of ore is present. More extensive prospecting may show this view to be erroneous, but it seems that the veins forming the deposit are of too little extent to warrant a large outlay of capital.

The analyses of the ore indicate their great variation in quality and character. Some of them carry nickel and a small amount of cobalt, a fact which may make the ores of great value at some future date.

Analyses of Ore. Searcy Property

CONSTITUENTS	1	2	3	4	5	6	7
Moisture at 100°C	.46	3.63	1.50	1.04	.94	4.58	1.70
Loss on ignition	11.54	11.78	11.33	10.76	10.44	9.72	12.44
Soda (Na_2O)	trace	.62	.04	trace	trace	1.46	.55
Potash (K_2O)	trace	.32	trace	trace	trace	.44	.67
Lime (CaO)	.68	.00	.00	1.26	.00	.00	.24
Magnesia (MgO)	.08	.00	.00	.00	.04	.00	.16
Alumina (Al_2O_3)	2.97	6.84	.52	4.09	8.50	9.05	4.80
Ferric oxide (Fe_2O_3)	80.92	51.30	80.94	73.90	58.28	58.63	10.93
Manganous oxide (MnO)	.28	17.07	.88	2.16	6.50	.30	60.39
Titanium dioxide (TiO_2)	.18	.72	.54	.50	.72	.27	.45
Sulphur trioxide (SO_3)	.00	.00	.00	.00	.00	.00	.00
Phosphorus pentoxide (P_2O_5)	.37	.92	2.26	2.56	.72	1.77	.42
Silica (SiO_2)	2.30	7.12	2.22	4.70	13.84	13.64	6.32
Nickel oxide (NiO)	trace	trace	.15	trace	trace	trace	.08
Cobalt oxide (CoO)	trace	trace	trace	trace	trace	trace	.64
Total	99.78	100.32	100.38	100.97	99.98	99.86	99.79
Metallic iron (Fe)	56.64	35.91	56.06	51.73	40.80	41.04	7.63
Sulphur (S)	.00	.00	.00	.00	.00	.00	.00
Phosphorus (P)	.16	.40	.98	1.11	.31	.77	43.50

1. Analysis of brown ore from northernmost cut on middle vein, lot 215.
2. Manganiferous iron ore from lot 219.
3. Limonite from west vein, lot 215.
4. Analysis of ore from walls of shaft on east vein, lot 215.
5. Manganiferous iron ore from northernmost cut on middle vein, lot 215.
6. Schistose ore from pit on hillslope, lot 214.
7. Manganese ore from northernmost cut on lot 215, middle vein.

The J. C. Searcy property, lot 183, 7th district, has been prospected to a limited extent. The middle "vein" is exposed in two or three small pits about 50 yards west of the railroad at Searcy station, a quarter of a mile southwest of Cherrylog.

E. B. GRIFFIN PROPERTY

Lot 141, 7th district, is 1 mile northeast of Cherrylog and is traversed by the Blue Ridge public road. Ore is found on this lot in considerable quantity on a hillslope near a small branch some 300 yards east of the Louisville and Nashville Railroad. It occurs as float, and is also exposed in a small cut originally 3 feet deep. The thickness of the ore was reported to be 3 feet. It has a laminated structure and is probably a replacement of schist of the Valleytown formation. The property is well located for economic working.

On the west side of Cherrylog Creek on the same property a small amount of surface ore is seen. It probably originates from the oxidation of pyrites found in the slate formation.

J. W. WISHON PROPERTY

Lots 67 and 78, 7th district, are 3½ miles southwest of Blue Ridge along the Blue Ridge-Ellijay public road. The property has been prospected for manganese in a number of places. On lot 67 near the Wishon residence are several shallow pits dug in 1917-'18 by the Cherokee Mining Company. High grade manganese occurs in the yellowish residual clay, as soft amorphous wad and stalactitic pyrolusite. Pure limonite and manganiferous limonite occur in limited quantity.

At the line between the two lots, a few rods west of the railroad, are some cross-cuts and a short tunnel made in the search for manganese. The grade of the ore revealed is excellent, but there seems to be but little likelihood of a large deposit.

A. J. PINSON PROPERTY

The Pinson property is about half a mile southwest of Whitepath station. A quarter of a mile west of the railroad on this property are a number of prospect pits, exposing a small amount of manganiferous iron ore of fair quality. The main excavation consists of a cross cut about 200 yards southwest of the Pinson residence near the top of a little hill. It is 30 feet long, 15 feet wide and 8-10 feet deep. It extends across the strike of the formations and exposes 2 feet of ferruginous schist and interbedded silicious brown ore, overlain by 6 feet of black foliated schist. It is questionable whether commercial ore is to be found here in working quantities.

T. W. CRAIGO PROPERTY

T. W. Craigo owns lot 119, 11th district, 1½ miles southeast of Ellijay on the Ellijay-Yukon public road. At the summit of a low wooded ridge near the west line of the lot, and a quarter of a mile east of the Louisville and Nashville Railroad, is a shallow prospect pit exposing slaty and silicious ore, together with a considerable amount of needle and stalactitic ore of excellent quality. The pit

is too superficial to give any idea of the extent of the deposit, but float occurs over a half an acre or more of the hillside. Northeast of this prospect in a depression a small amount of float is observed. It is said that ore was mined here for use in the old furnace at East Ellijay.

A small amount of low grade ore occurs also on lot 120, a short distance east of the Ellijay-Yukon road and on lot 134.

A sample of ore from lot 119, gave the following partial analysis:

Analysis of Ore. Lot 119

Phosphorus (P)	1.37
Iron (Fe)	51.71
Silica (SiO_2)	10.00

W. H. ELLER PROPERTY

The heirs of W. H. Eller own parts of lots 135, 190, 171, and 154, 11th district, about 2½ miles south of Ellijay and half a mile east of the railroad. Several shallow pits have been opened on lot 171 along the eastern slope of a low ridge, west of Bradley Creek. The ore is a mixture of high and low grade, the mechanical impurities being iron-stained schist and quartz. A considerable quantity of float occurs.

There has been some prospecting on lot 154 which seems to show a better grade of ore and a larger quantity. The deposit is on a hillslope near Bradley Creek.

The analyses of the ore from the different lots are here given:

Analyses of Ore. Eller Property

CONSTITUENTS	1	2	3
Moisture at 100°C	1.38	.64	----------
Loss on ignition	10.38	11.19	----------
Soda (Na_2O)	trace	.25	----------
Potash (K_2O)	trace	.35	----------
Lime (CaO)	.42	.00	----------
Magnesia (MgO)	trace	.04	----------
Alumina (Al_2O_3)	1.85	4.92	----------
Ferric oxide (Fe_2O_3)	71.67	59.62	78.96
Manganous oxide (MnO)	3.99	5.68	----------
Sulphur trioxide (SO_3)	.00	.72	----------
Phosphorus pentoxide (P_2O_5)	2.08	2.72	2.60
Nickel oxide (NiO)	trace	.15	----------
Cobalt oxide (CoO)	trace	.06	----------
Silica (SiO_2)	8.56	14.06	2.73
Total	100.33	100.40	----------
Metallic iron (Fe)	50.17	41.73	55.27
Sulphur (S)	.00	.00	----------
Phosphorus (P)	.90	1.84	1.13

1. Analysis of ore from lot 154. Collected by writer.
2. Ore from lot 171. Collected by writer.
3. Sample from lot 135, sent to Survey office by R. E. Watson of Atlanta.

STEMBRIDGE PROPERTY

J. E. Stembridge owns 80 acres in the north half of lot 208, 11th district, at Ella Gap station, 4½ miles southeast of Ellijay. On the east slope of a low hill, immediately southeast of the station, a small amount of float ore of fair quality occurs. The ore is chiefly a slate replacement. Several fragments of granular cherty material similar to the cherty remnants of the Shady limestone at Cartersville may be seen mixed with the ore. The deposit is apparently of limited extent.

A picked sample analyzed as follows:

Analysis of Ore. Stembridge Property

Moisture at 100°C	.76
Loss on ignition	11.86
Soda (Na_2O)	trace
Potash (K_2O)	trace
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	.54
Ferric oxide (Fe_2O_3)	78.66
Manganous oxide (MnO)	1.62
Titanium dioxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.94
Silica (SiO_2)	5.72
Nickel oxide (NiO)	trace
Cobalt oxide (CoO)	trace
Total	100.46
Metallic iron (Fe)	55.06
Sulphur (S)	.00
Phosphorus (P)	.40

GEORGIA-TIOGA IRON COMPANY'S MINE

This property, lot 260, 11th district, is at Tioga station on the Louisville and Nashville Railroad, 6 miles southwest of Ellijay. H. A. Fields of Atlanta owns the surface and mineral rights in 145 acres of the lot on the west side of the railroad, while the remainder, which is east of the railroad, is owned by V. G. Staten of Decatur, Ga. The property was worked first before the Civil War and a small amount of ore hauled to the furnace at Ellijay.

The Georgia-Tioga Iron Company was organized about 1912 by Mr. Leaper. Dr. E. R. Watkins of Ellijay was Vice-President of this company. A large steam shovel and washing plant were installed, but mining ceased shortly, due to the lack of funds. Something like 150 cars of ore were shipped altogether. After the shutdown the equipment was moved to the mine of the Cartecay Iron Company near Ellijay.

The workings are but a short distance west of the railroad and Talona Creek. They consist of two large open-cuts, one small cut, and several prospect pits. (See fig. 5) The westernmost excavation, or the "west cut", is about 350 feet long, 40-100 feet wide, and 30 feet deep. It has been mined at three different levels so that the northern rim is approximately 80 feet higher than the bottom of the cut at its entrance. However, it is only 30 feet deep at its face. The thickness of the ore-body is about 30 feet, but it is not composed entirely of workable ore. Much ferruginous chert and siliceous material occur. The deposit strikes nearly due north and dips to the southeast apparently.

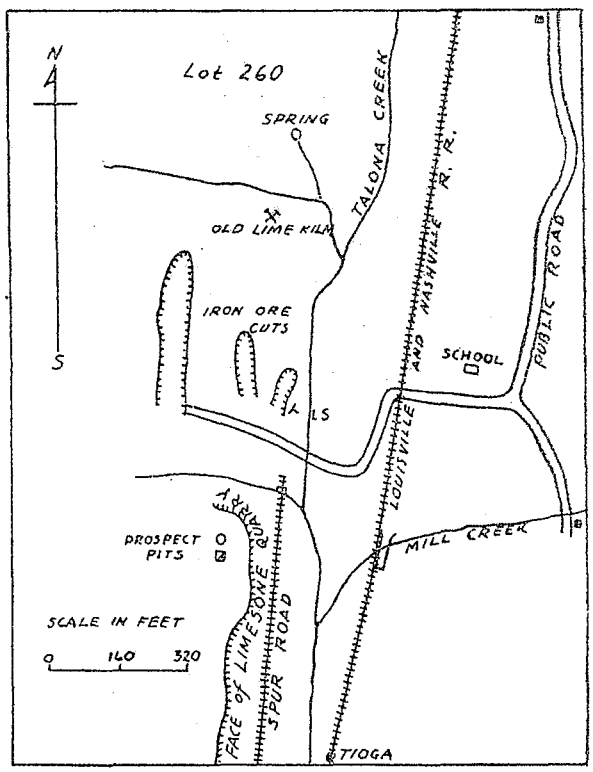


Fig. 5. Sketch map of Ga. Tioga Iron Company's mine at Tioga, Gilmer Co. Ga. (J. P. D. Hull)

Immediately east of this opening is the "east cut", which is about 150 feet long, 30 feet wide and 15-20 feet deep. Prospecting between these two excavations seems to indicate that they are on the same deposit.

The small cut on the east side of the above opening exposes no ore, except for ferruginous chert. The Murphy marble outcrops in the bottom of the cut.

A short distance south of these workings, across a small branch of Talona Creek, the Murphy marble is boldly exposed in a large open-cut at the eastern base of a prominent ridge. The marble was quarried about 1910 and shipped to Copperhill, Tenn., for use in the furnaces as a flux.[1] A small amount of limonite and ferruginous chert occurs with the marble. On the summit of the ridge, not far from the face of the cut, or quarry, are several pits and crosscuts exposing low grade silicious ore, chiefly in irregular masses.

A sample from lot 260 gave the analysis below which represents approximately the average grade of the ore.

Analysis of Ore. Lot 260

Moisture at 100°C	.06
Loss on ignition	9.76
Metallic iron (Fe)	42.04
Sulphur (S)	.18
Phosphorus (P)	.16
Insolubles	2.39
Manganese (Mn)	.48
Silica (SiO_2)	27.10

Q. A. BRADLEY PROPERTY

On lot 281, a short distance south of the marble quarry described above are several open-cuts at the base of the ridge, exposing limonite ore of varying grade. About a carload of ore is seen on the dump, but none was ever shipped.

The ore "lead" continues to the southeastward, being exposed chiefly by float. A few superficial pits have been dug here and there. Some of the properties along the "lead" are:

B. L. Hensley property, lot 296, 11th district.
J. R. Simmons property, lots 317 and 318, 11th district.
Olin Griffith property, lot 109, 12th district.
Levi Griffith property, lot 144, 12th district.
William Goble property, lot 142, 12th district.

J. R. KINCAIDE PROPERTY

The Kincaide property, lots 315, and 316, 6th district, is 12 miles east of Ellijay along one of the tributaries of Cartecay River. On both of these lots but a short distance south of the Kincaide residence and on a hillslope magnetic iron ore occurs as veins in pegmatite. At one point an excavation only a foot or so in depth shows

[1] T. Poole Maynard, State Geol. Surv. Bull. 27.

the nature of the occurrence of the ore. The deposit is probably of little economic importance.

PICKENS COUNTY

J. W. GAY PROPERTY

This property, lot 172, 13th district, 2d section, owned formerly by Mrs. S. M. Davis, is about 8½ miles southwest of Jasper.

There is quite an exposure of ore on the lot near the point of a small ridge only a few rods from a tributary of Sharp Mountain Creek, and 200 yards west of the public road. The ore is seen in a small open-cut in the form of an irregular "vein" walled by pyritiferous, quartzitic schist. The pyrite is probably the source of the limonite. In the red soil overlying the deposit are fragments of foliated carbonaceous schist.

A picked sample of the ore gave this analysis:

Analysis of Ore. Gay Property

Moisture at 100°C	2.00
Loss on ignition	11.50
Insolubles	1.13
Metallic iron (Fe)	51.96
Sulphur (S)	.16
Phosphorus (P)	.67

HUGH A. TATUM PROPERTY

A prospect pit about 6 feet deep was dug many years ago on the top of a ridge on lot 131, 13th district. A large amount of silicious ore is shown interlaminated with a slate. It seems to be of no commercial value.

S. C. TATE ESTATE

There is an extensive outcrop of ore on lot 132, 13th district, near Tate Mineral Spring. The ore occurs chiefly upon the slopes of a narrow ravine. On the western slope are two or three small open-cuts from which a limited amount of ore is said to have been taken before the Civil War to supply the furnaces in operation on Stamp Creek, Bartow County. These cuts are now nearly filled with debris and no ore is seen in place. On the eastern slope are also a few pits.

The ore is very silicious, and huge boulders of ferruginous sandstone are common. The deposit is evidently of considerable extent, but the quality of the ore is such as to discourage development.

ALDRED PROPERTY

M. W. and J. S. Aldred of Jasper own the mineral interests in lots 133, 134, 135, 136, 155 and 156, 13th district, in the vicinity of Tate Mineral Spring. On lot 133, a short distance from the spring and near a small branch at the foot of a hill are two open-cuts now almost completely filled with earth. On the dump beside the cuts is a large amount of white quartz carrying perhaps 15 percent of pyrites, mostly in the form of crystals. The quartz vein is reported to be 3 feet in thickness, and as dipping steeply to the southwest. The wall rock is apparently a graphitic slate with thin quartz partings. A limited amount of silicious limonite also occurs.

GARTRELL PROPERTY

J. R. Gartrell owns the surface rights and half the mineral interests in 140 acres of lot 115, 12th district, 2½ miles northwest of Talking Rock. Limonite ore fragments of low grade are seen on this property west of the public road on a hillslope 40-50 feet higher than a small branch. Magnetic and specular hematite also occur here.

A. M. DARNELL PROPERTY

This property, lot 103, 4th district, is about half a mile southeast of Marble Hill Post Office. On the summit of a hill at the head of Rich Creek Valley ore fragments of varying quality and size occur in the dark-red soil, resulting from the weathering of hornblende gneiss. Outcrops of this rock are seen on the hillslope. Waterworn quartz pebbles occur in the soil at an elevation of about 1,500 feet.

An analysis of this ore is given below:

Analysis of Ore. Darnell Property

Moisture at 100°C	.81
Loss on ignition	11.12
Insolubles	2.05
Manganese (Mn)	.33
Metallic iron (Fe)	49.23
Sulphur (S)	.10
Phosphorus (P)	.66
Silica (SiO_2)	9.20

W. J. HOGAN PROPERTY

Lot 87 joins lot 103 on the northwest, and is near the junction of Rich Creek and the east branch of Long Swamp Creek. A vein of ore 4 feet thick is reported to have been exposed in the bed of Rich Creek at one time. An old pit now filled with debris is to be seen near the creek, and a small amount of good ore is exposed. A carload of this ore is said to have been shipped.

A sample collected from the surface along the Creek analyzed as follows:

Analysis of Ore. Hogan Property.

Moisture at 100°C	1.51
Loss on ignition	11.49
Insolubles	5.22
Manganese (Mn)	.41
Metallic iron (Fe)	46.36
Sulphur (S)	.18
Phosphorus (P)	.35
Silica (SiO_2)	10.58

KIRK PROPERTY

J. C. Kirk owns about 1,000 acres 4 miles northwest of Jasper. On lot 242, 12th district, ferruginous sandstone and some good limonite ore occur at the top of a wooded hill a short distance northeast of the Kirk residence. There has been no prospecting and most of the ore is of but little value. Limonite fragments, pseudomorphs after pyrite, are rather abundant in the road ditch.

MARSHALL GOSS PROPERTY

There is a limited exposure of ore on lot 219 (?), 4th district, in an old open-cut on a steep hillside about a quarter of a mile east of Long Swamp Creek. The opening is 8-10 feet deep and the ore was mined for the forge on Sharp Mountain Creek. It occurs in thin layers in mica schist and is of good quality, though probably of limited extent. Little or no float ore is to be seen on the surface.

Half a mile northwest of the above prospect is another cut on a gently sloping hillside, exposing a small amount of silicious ore. The float is limited in quantity.

CHEROKEE COUNTY

CHATTAHOOCHEE IRON ORE PROPERTY

This property now owned or controlled by H. Clay Hollister of Grand Rapids, Mich., comprises an area of several hundred acres. It consists of the following lots owned in fee simple: 119, and 98 of the 14th district, and mineral rights on lots 121, 122, 124, 125, 126, 22d. district and lots 12, 62, 83, 134, 155, 170, 191, 14th district. The property is situated 2 miles northwest of Canton, and a mile north of the Etowah River. It extends in a general east-west direction, along what is known as the Chattahoochee Iron Lead. A large amount of prospecting has been done on the property, but it is undeveloped at present. Recently the Virginia Iron Coal and Coke Company, Roanoke, Va., leased the property and prospected it quite extensively.

The most extensive prospects occur on lot 98, extending from its eastern to its western boundary. Shafts, strippings and small cross-cuts have been opened on both sides of the old roadway. Most all of these excavations show more or less ore. Near the central part of the lot on the eastern slope of a rather steep hill an ore vein has been exposed by a stripping about 50 feet wide and 70 feet long. The vein is about 2½ feet thick and composed of massive vesicular ore of good quality. It strikes N.80°W. and dips to the south.

In this stripping, near the base of the hill, and back a short distance from a small branch, a drift has been driven along the strike of the ore body for a distance of 80 feet. About 20 feet from the face of the excavation are two tunnels driven in opposite directions, each approximately 20 feet long. A small amount of good ore was taken from the openings by the Virginia Iron Coal and Coke Company. The vein is clearly exposed, with a footwall of bluish-gray mica schist and a hanging wall of decomposed schist or clay.

On the top of the hill two small open-cuts were made recently, and some excellent ore taken from them. The vein is not definitely exposed. The residual soil is of a dark reddish color which is not commonly found along the "lead", the overburden generally being

of a yellowish or grayish color. This mantle is about 3 feet thick.

On the west side of the hill, near its summit, is an old pit 15 feet deep and 50 feet in diameter. The walls are slumped and the ore is not exposed. Fragments of ore, however, occur on the dump, together with considerable ferruginous schist. The red clay overburden is a striking feature of this prospect. About 150 feet west of the above pit is a tunnel 12 feet long, extending eastward into the hill. The ore is limonite with some fragments having an unusually dark somewhat purplish color and a vesicular texture, not commonly seen in the ore along the "lead." A hundred yards or so northwest of this tunnel are prominent outcrops of quartzitic mica schist, striking about N.45°E. and dipping S.35°E. Farther to the north the schist becomes garnetiferous.

Lot 119. A short distance northwest of the intersection of a road running east-west along the summit of a ridge and the old road following the ore "lead" there is a small stripping and a shaft 20 feet in depth. They are largely obscured and little can be said as to the geologic relationship and character of the ore.

About a quarter of a mile west of the above prospects, near the head of a small branch, are many other strippings, shafts, open-cuts, and adits, most of them on the eastern and western slopes of a low hill. Several of them were dug recently by the Virginia Iron, Coal and Coke Company, but the majority were

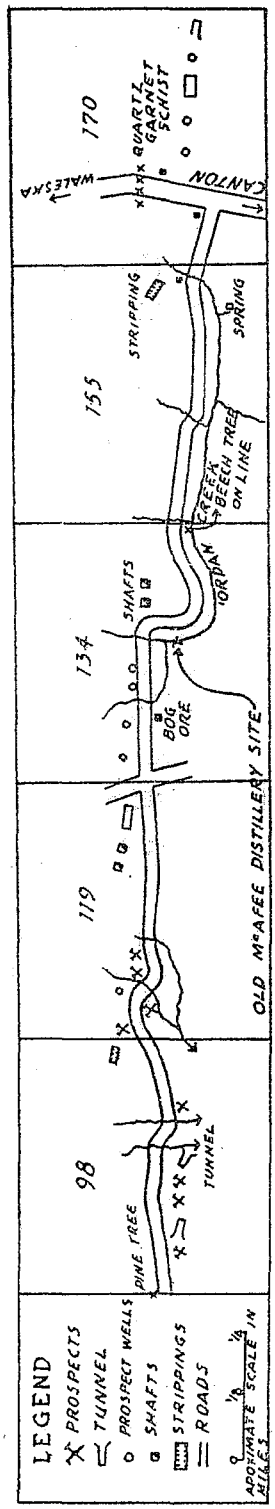


Fig. 6. Sketch map showing main ore prospects along Chattahoochee Iron Lead. (J. P. D. Hull.)

opened in 1894 and 1895. It is said that 100 tons of the ore were shipped at that time to the furnaces in Birmingham.

Most of these openings are too obscured to reveal much concerning the nature of the ore or the thickness of the vein, but there is one exception. On the summit of the low hill west of the small branch is a shallow open cut extending along the strike of the lead. Apparently two separate veins are here exposed, each about 2 feet in thickness. A shaft about 8 feet in depth has been made and the character of the ore well revealed. Concretionary nodules of iron oxide at times 4 or 5 inches in diameter occur in the yellow micaceous residual clay, resulting from the weathering of the mica schist, the country rock. These may be hollow, containing clay, or may be solid. A sample collected by the writer showed a metallic iron content of 48.89 per cent and a phosphorus content of .8 per cent. From notes made previously on the property, it seems that there are at least three distinct "veins", each varying greatly in width, and all more or less magnetic. Probably these "veins" were formed partly by the deposition of limonite in fissures from downward percolating waters, and by the alteration of magnetite.

In addition, the lot has been prospected recently to the west line by numerous pits and cuts. Only a small quantity of ore was exposed.

Lot 155—About 20 years ago a stripping 60 feet long and 15 feet wide was made on the point of a low ridge a quarter of a mile west of the Canton-Waleska public road. On the west side of the stripping a shaft 40 feet deep was sunk. Both of these openings are now much fallen in, however it is seen that the country rock is a mica schist with sericitic phases, striking about N.30°W. and dipping steeply to the southwest. The ore is of varying quality. Some of it occurs as small "pots" with iridescent encrustations, while much of it is slaty and of a somewhat impure grade. Ferruginous schist occurs in abundance.

About a quarter of a mile southwest of the above prospect a garnetiferous mica schist is exposed in a stream bed. It strikes N.75°W. and dips steeply to the northeast. Apparently this schist overlies

the ore-body and was probably a source of much of the limonite. The hillslopes are characterized by a great abundance of garnets in places.

Lot 134—The old McAfee distillery site is near the eastern line of this lot. Garnetiferous mica schist outcrops in the stream bed, and an exposure of limestone is seen on the east bank of the creek at this point.

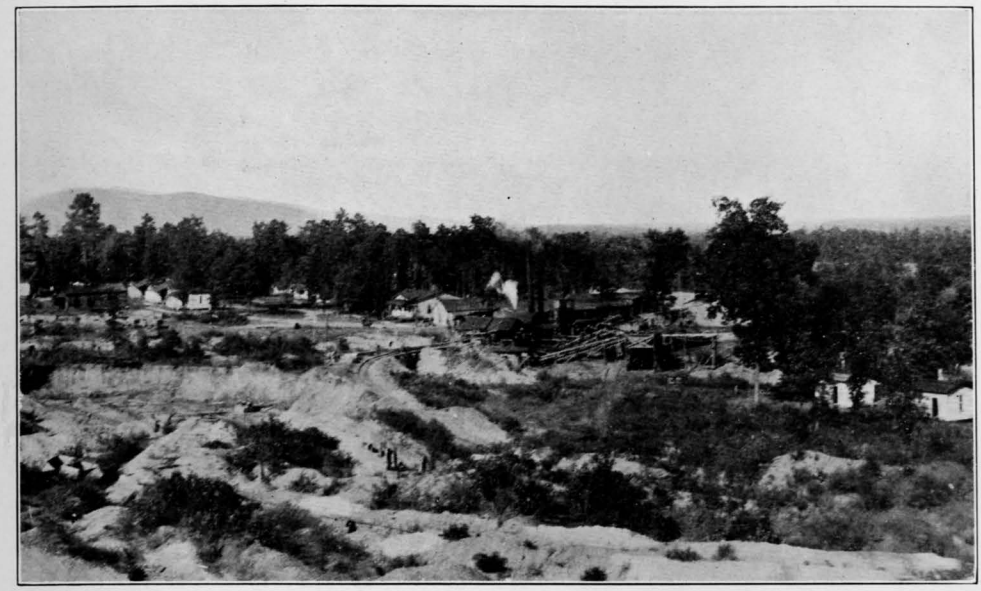
A quarter of a mile west of the distillery site impure bog ore is exposed in the old road following the iron "lead". A drill hole several inches in diameter is seen, together with a shaft half filled with water. Several test pits and cross-cuts made by the Virginia Iron, Coal and Coke Company north of the road reveal no ore of consequence. There is no evidence that the deposit is of commercial value.

The analyses below show that the ore on the Chattahoochee Iron Ore Property is of good grade, being comparatively low in phosphorus and high in metallic iron content. The prospect of a large tonnage of ore, however, does not appear to be so promising as that given in some of the private reports on the property.

Analyses of Ore. Chattahoochee Iron Ore Property

CONSTITUENTS	1	2	3	4	5	6	7	8	9	10
Moisture at 100°C	1.16	1.20	.98	1.23	3.29	1.21	.82	.83	.40	.42
Loss on ignition	11.14	9.91	5.60	5.38	10.49	8.29	8.90	3.70	10.31	9.40
Soda (Na_2O)	trace	-----	-----	-----	-----	-----	-----	-----	-----	-----
Potash (K_2O)	trace	-----	-----	-----	-----	-----	-----	-----	-----	-----
Lime (CaO)	.00	.00	-----	-----	-----	-----	-----	-----	.52	.42
Magnesia (MgO)	.25	-----	-----	-----	-----	-----	-----	-----	.11	.06
Alumina (Al_2O_3)	.97	-----	-----	-----	-----	-----	-----	-----	2.87	2.30
Ferric oxide (Fe_2O_3)	69.70	-----	-----	-----	-----	-----	-----	-----	71.89	64.34
Manganous oxide (MnO)	.35	-----	.18	.36	.36	.45	.30	.36	.50	.08
Silica (SiO_2)	14.76	10.15	18.65	37.75	13.58	12.64	-----	2.27	11.81	22.73
Titanium dioxide (TiO_2)	-----	-----	.36	.40	-----	trace	-----	-----	-----	-----
Total	98.33	21.26	25.77	45.12	27.72	22.59	9.02	7.16	98.41	99.75
Metallic iron	48.79	52.40	44.20	30.40	48.00	54.11	35.56	64.00	50.32	45.03
Sulphur (S)	-----	.08	.06	.18	.18	trace	.18	.15	.03	.05
Phosphorus (P)	.73	.70	.36	.43	.70	.39	.84	.40	1.76	.18

1. Analysis of sample of ore from prospect on lot 155, 14th district, at point of low ridge, a quarter of a mile west of Canton-Waleska road.
2. Average sample of ore from stock pile on west side of lot 119, where there has been the most extensive prospecting on lead.



A. GENERAL VIEW LAFOLLETTE COAL & IRON COMPANY PLANT NEAR SUGAR HILL, GORDON COUNTY.

B. OPEN CUT CHEROKEE MINING COMPANY, BLUE RIDGE, FANNIN COUNTY.

3. Sample taken across 6 feet of decomposed magnetic ore, exposed in cut on west side of hill at same location from which No. 2 was taken.
4. Analysis of magnetic schist from tunnel on lot 98.
5. A picked sample of ore from stockpile at mouth of tunnel on lot 98.
6. Average sample of ore from exposure in tunnel.
7. Analysis of fragment of ore from west side of hill into which tunnel was extended.
8. Sample of ore from stock pile near entrance to open cut on west side of above hill.
9. Sample of ore from lot 98, collected by S. W. McCallie, some years ago.
10. Ore from lot 119, collected by S. W. McCallie some years ago.

The "lead" extends to the westward through lots 83 and 63, as shown by surface outcroppings.

J. C. JOHNSON PROPERTY

Ore occurs on this property, lot 61, 14th district, on the south side of a wooded hill near an old fish pond, three quarters of a mile northeast of the Johnson residence. A pit 3 feet deep shows a massive, vesicular ore mixed with schist. The float is not abundant, and is made up largely of quartz boulders.

In the western central part of lot 50, 14th district, is a prospect pit 3 feet deep, dug in the early sixties. It reveals nothing concerning the occurrence of the ore, which is quite silicious, judging from a few fragments seen on the dump. The country rock is a garnetiferous mica schist.

Near the southwest corner of lot 49 on the north side of a deep ravine 200 feet east of Shoal Creek is a shallow prospect pit, together with several smaller openings. About 1½ feet of fair grade brown ore is here exposed, with walls of bluish-gray slaty schist, striking N.30°E. and dipping S.25°E. The schist is pyritiferous and is apparently the source of the limonite as it has the appearance of a gossan.

Other properties along the Chattahoochee Iron Lead farther westward are as follows:

W. C. HULSEY PROPERTY

W. C. Hulsey owns the surface rights and A. B. Coggins of Canton, the mineral rights in lot 24, 14th district. There are two or three outcroppings of ore in shallow pits on this lot, all on the steep hillslope, 300 yards east of Shoal Creek. The ore found is porous and apparently limited in quantity. There is but little surface show.

A short distance from these exposures on the opposite side of the creek is the stack of an old furnace constructed during the Civil War. Apparently the ore from the above prospect was to be used, but the furnace was never put in blast.

D. C. KEITH PROPERTY

This property, lot 170, 14th district, is located about 2 miles north of Canton, near the Canton-Waleska public road. Considerable prospecting was done on the lot some years ago and only recently additional prospecting was done by the Virginia Iron, Coal and Coke Company. About 140 feet east of the public road is a prospect well 20 feet in depth, where foliated carbonaceous schist together with a few ore fragments is to be seen. Further to the east about 500 feet a second pit is to be seen. Neither of these excavations seem to have encountered any well defined ore-body. Still further to the east only a short distance from the last mentioned well is a small stripping on the west slope of a low hill, where very good black, massive ore is exposed. Other pits and tunnels occur on the property but none show ore in commercial quantity.

EVANS PROPERTY

This property, lot 58, 14th district, located 7 miles southeast of Canton, is jointly owned by G. W. Evans, Mayhugh and Farmer.

On the southwest slope of a hill is to be seen an old prospect pit, now largely filled with earth. Black, mammillary ore of excellent quality is to be seen on the dump. Ferruginous schist fragments also occur. Both ore and schist are scattered over the hill-slope in considerable quantity. It is reported that a drill-hole near the pit exposed ore to a depth of 40 feet. South of the branch traversing the property on the slopes and summit of a hill some float ore is seen. A pit also on the top of the hill exposed a small amount of good ore and some ferruginous schist. Quartz fragments, often iron stained, are abundant. A picked sample of the ore from the south side of the branch gave this analysis:

Analysis of Ore. Lot 58

Moisture at 100°C	1.87
Loss on ignition	11.33
Metallic iron (Fe)	53.06
Sulphur (S)	.14
Phosphorus (P)	1.99
Manganous oxide (MnO)	.54
Silica (SiO_2)	3.31

JAMES MAYHUGH PROPERTY

This property, lot 23, 22d. district, is a quarter of a mile east of Sutallee. A short distance south of the cross roads limonite fragments of varying quality occur as float in the woods beside the road. About half a mile east of the cross-roads the same type of ore outcrops on the south side of a small branch. Gray foliated schist and the Wilhite(?) slate are exposed in this branch.

S. M. NELSON PROPERTY

The Nelson property, lot 64, 14th district, 3 miles south of Waleska, has a limited amount of float ore. Fragments of fair grade limonite and iron-stained schist are seen in the dark red top-soil on the summit and slopes of a low hill, a short distance north of the public road. No prospecting has been done and it is questionable whether the ore occurs in quantity.

S. M. INMAN PROPERTY

The surface rights in 154 acres of lot 150, 14th district, are owned by C. M. Tippens. The mineral interests in the property are held by the S. M. Inman estate, Atlanta. The lot is 5½ miles northwest of Canton on the Canton-Sharptop road.

In the early part of 1918 the property was prospected by W. P. Larramore of Montezuma, agent of the Inman estate. A cross-cut 2-6 feet deep, 4 feet wide and 85 feet long was opened on the summit of a bare knoll, half a mile west of the public road. It extends at right angles to the strike of the "lead", which is nearly due east, and reveals high grade nodular ore and low grade material, largely ferruginous schist, in the dark reddish soil. A pit 200 feet east of here reveals a large amount of schistose and micaceous ore. Float occurs over an area of about 3 acres.

J. A. CAGLE PROPERTY

Lot 139, 14th district, joins the Tippens property on the west. The mineral interests in 40 acres on the east side of the lot belong to Jefferson Keater of Waleska. Several cross-cuts and pits near the eastern boundary of the lot expose ore of varying grade, together with mica schist. A small amount of magnetic particles occur. The "lead" does not appear to extend farther to the eastward. A creek furnishing an ample supply of water for a washer flows through the property.

S. M. INMAN ESTATE

The Inman Estate holds the surface and mineral rights in the north half of lot 149, 14th district, and in all of lot 148, 14th district. The property is immediately north of the Tippens property.

W. P. Larramore prospected lot 148 in 1918. The main excavation is near the center of the lot, a quarter of a mile west of the public road. It is an open-cut about 12 feet wide, 9 feet deep, and 30 feet long, extending southward into the hillslopes. At least 6 feet of light-brownish colored vesicular ore is exposed. The ore outcrops along the hillside to the northeast for a distance of 250 feet or more.

A short distance southwest of the cut is a small pit revealing some excellent ore. A drill hole put down to a depth of 60 feet between the above excavations is reported to have exposed ore all the way down.

An analysis of ore from the open-cut is here given:

Analysis of Ore. Lot 148

Moisture at 100°C	.90
Loss on ignition	15.48
Metallic iron (Fe)	55.57
Sulphur (S)	.16
Phosphorus (P)	.52
Manganous oxide (MnO)	.24
Silica (SiO_2)	3.81

G. P. McFARLAND PROPERTY

The heirs of G. P. McFarland own the land and mineral interests in lot 221, 14th district, 2 miles west of Gober, a station on the Louisville and Nashville Railroad. The lot has been prospected by sev-

eral cross-cuts, 30-40 feet long and 3-4 feet deep, and by shafts averaging 20 feet in depth. Part of the work was done many years ago, and part more recently by Dr. T. Poole Maynard. Apparently the ore-body is about 3 feet thick and has a northeast-southwest trend.

The quality of the ore is variable. Some of it appears to have a metallic iron content of 40 to 50 percent while much of it is silicious and slaty. In the northeast corner of the lot is a vein of magnetic ore 2 feet in thickness. The shallow pit revealing the ore is now caved in, but thin fragments of the ore are scattered over the surface of the ground. It is rather silicious and probably of no commercial value.

WILLIAM WORLEY PROPERTY

Lot 220 joins the G. P. McFarland lot (221) on the north, and is traversed by the same ore "lead" as that on the McFarland property though the surface indications are not so abundant. The magnetic "vein" occurring on lot 221 is also found on the Worley property, and in addition there is another "vein" outcropping in a road cut half a mile to the northward. This vein is about 10 inches thick and dips steeply to the southwest. The country rock is a garnetiferous mica schist.

J. H. BREEDLOVE PROPERTY

Lot 249 lies east of lot 220. It has been prospected by three small cross-cuts and two or three shafts. The ore occurs as large masses in the soil and as gravel strewn about the surface. The schistose character of the ore is pronounced, and evidently it is a replacement of mica schist.

An ample supply of water for a washer may be had from the creek a quarter of a mile distant. There is probably a considerable amount of fair grade ore on the Breedlove property.

The ore "lead" also outcrops on lots 255 and 256, the mineral interest of which belongs in part to L. S. Webb of Atlanta.

G. I. TEASLEY PROPERTY

The Teasley property, lot 261, 14th district, is half a mile west of Keithsburg, on the Canton-Ballground public road. In the north-

west corner of the lot immediately south of the old Canton-Ballground road is a tunnel, now inaccessible, extending northeast into the hillside. No ore is here to be seen. On the south side of the small branch flowing at the foot of the hill is an old pit 10-12 feet deep. To the westward along the slope for some distance float ore of good and bad quality occurs.

The stream above referred to has cut a rather deep channel and exposes a much contorted schist. A zone of which about 50 feet in width exposes several layers of limonitic schist and ore ranging from 1 inch to 12 inches in thickness. The zone is overlain apparently by a gray slate and underlain by variegated schist and slate. The strike is about N50°E and the dip is to the southeast.

JAMES HIGGINS PROPERTY

The Higgins property, lot 281, 14th district, is half a mile northeast of Keithsburg. The ore found on this lot is confined to the eastern side of a low gently sloping ridge.

There are three excavations only a short distance apart along a north-south line. The one farthest to the south is a tunnel now inaccessible and the one farthest to the north is also a tunnel. Neither of these openings revealed ore as they are apparently not on the "lead" which extends northeast-southwest. The middle excavation is an open-cut with a maximum depth of 10 feet. A considerable amount of ore is on the dump. It is of good quality and more or less magnetic. The walls of the cut are slumped and the thickness of the ore body is not clearly shown. However, it seems to be about 7 feet.

JAMES M. QUARLES PROPERTY

Lot 289, 3d. district, is half a mile west of Gober. A short distance north of the public road along the ridge are several shallow cross-cuts and pits. Very little ore is to be seen in them. The surface has a limited amount of ferruginous schist float.

ANDREW SATTERFIELD PROPERTY

Three or four prospect pits have been opened on lot 62 (?), 3d. district, on the eastern slope of the wooded ridge, a quarter of a mile southeast of the railroad station at Ballground. The largest exca-

vation is about 15 feet deep, and exposes some high grade ore. Most of it, however, is silicious and slaty.

L. L. SPENCE PROPERTY

The Spence property, lot 337, 4th district, is located half a mile northwest of the Ballground station. The ore occurs on the summit and slope of a low hill as float extending about an acre. It is also seen in a shallow pit on the top of the hill. Some of the ore is high grade, but on the whole it is only of fair quality. It is reported that during the Civil War ore was mined here to supply a small forge, operated on Sharp Mountain Creek, 2 miles west of Ballground.

The property is well located for economic mining.

GRADY HOLBERT PROPERTY

About 30 years ago Moor and Walker of Canton, Ga., prospected lot 259, 4th district, then in the possession of Mrs. Alice Holbert. The property is 2½ miles northeast of Ballground on the lower road to Nelson. The workings, situated half a mile west of this road on a hillslope, consist of three shallow pits, only a short distance apart. These are now caved in and reveal little ore in place.

In general the ore is silicious and slaty, but a small amount of excellent ore also occurs. The float is abundant over about an acre of the hillslope. In the bottom of one of the pits ferruginous schist is exposed, dipping about S53°E and striking N20°E.

It is said that a large amount of surface ore was taken from this property for use in the forge on Sharp Mountain Creek. The iron was especially desirable for making horseshoe nails.

MINOR PROSPECTS

In addition to the various properties here described the following lots in Cherokee County are also known to have on them more or less ore: Lots 270, 301 and 302 of the 4th district; lots 83, 202, 233, and 290 of the 14th district; lot 86, 15th district; and lots 128 and 124 of the 22d. district.

But little or no prospecting has been done on any of these lots.

DEPOSITS OF THE CRYSTALLINE AREA

CHARACTER OF THE ROCKS AND ASSOCIATED ORES

A more complete discussion of the rocks making up the crystalline area is found in other bulletins of this Survey. Hence, only a general review statement will be made here.

The oldest formation is regarded as the Carolina gneiss which makes up a large part of the area. It has been studied in detail in the Ellijay quadrangle[1], but the correlation with rocks of similar character in other quadrangles has never been definitely established. The formation includes such types of rocks as mica, gneiss, garnet-cyanite gneiss, mica schist, and conglomerates. Dikes of granitic material and pegmatite are common, also.

The Roan gneiss is probably not much younger in age than the Carolina gneiss, judging from metamorphism. It consists mainly of hornblende schist, hornblende gneiss, and schistose diorite, together with bodies of pegmatite. The whole formation occurs as a series of "sheets" or lenses enclosed in the Carolina gneiss and is regarded as being of igneous origin. However, it is entirely possible that some of the formation resulted from the intense metamorphism of sedimentary beds, such as impure limestone or calcareous shale. The Roan gneiss belts are of interest and importance, due to the fact that the pyrite and gold deposits of the crystalline area are generally associated with them.

Granite masses, varying widely in areal extent, are found in the Crystalline belt. Their relative ages differ greatly, as evidenced by the degree of metamorphism, and they range probably from the Pre-Cambrian to late Paleozoic. Besides the granites there are many other types of intrusives, such as pegmatites and diabases.

Brown ore has never been exploited on a commercial scale in the Crystalline area. Many years ago the ore was used locally in places in small forges, and there has been more or less prospecting in different localities, but no development of any extent has ever

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1. LaForge, Laurence and Phalen, W. C., Geologic Atlas of the United States, Ellijay Folio, No. 187, U. S. Geol. Survey, 1913.

taken place. Apparently the deposits result chiefly from the alteration of either magnetite or pyrite, both accessory minerals in metamorphic and igneous rocks. There is little promise that large deposits of limonite will ever be opened, but in certain localities the ore seems abundant enough to warrant working on a small scale.

UNION COUNTY

The known prospects in Union County are too inaccessible at present to justify any extensive development. No railroads traverse the county, and the roughness of the topography makes the construction of highways and the subsequent haulage, an item of expense such as only large deposits of ore would warrant. Such deposits do not seem to occur.

COFFEY PROPERTY

A. S. Coffey owns lots 3 and 4, 10th district, 2d. section, 7 miles southwest of Blairsville and 1½ miles north of the Blue Ridge-Blairsville public road. About the time of the Civil War, probably dur- the Ducktown Copper "boom", lot 3 was prospected on a small scale for copper. The outlines of a few old pits apparently no more than 2 or 3 feet deep originally, are seen on the summit and slopes of a ridge, a short distance east of Young Cane Creek. No ore occurs in place, but fragments are scattered over the surface. The ore is apparently a gossan, for it is reddish brown in color, markedly porous, and light weight. Much of the ore is schistose and silicious in character.

Recently a small cut was opened in a branch in a narrow ravine a quarter of a mile west of the Coffey residence. Gold is said to have been panned at this point and it was hoped that a vein might be found. Only pyritiferous talcose schist was exposed however. On lot 4, about 200 yards northeast of the Coffey residence a few old pits sunk for copper are seen. The ore is of low grade and limited in quantity.

The nearest shipping point to the Coffey property is Blue Ridge, Fannin County, 14 miles to the westward on the Louisville and Nashville Railroad. A selected sample of the ore from the surface of the ridge on lot 3, gave the following analysis:

Analysis of Ore. Coffey Property

Moisture at 100°C	.46
Loss on ignition	10.59
Soda (Na_2O)	.50
Potash (K_2O)	.30
Lime (CaO)	.08
Magnesia (MgO)	trace
Alumina (Al_2O_3)	4.66
Ferric oxide (Fe_2O_3)	72.12
Manganous oxide (MnO)	.42
Titanium dioxide (TiO_2)	.00
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.49
Silica (SiO_2)	6.52
Nickel (Ni)	trace
Cobalt (Co)	trace
Total	96.14
Metallic iron (Fe)	50.28
Sulphur (S)	.00
Phosphorus (P)	.21

T. S. CANDLER PROPERTY

Lots 315 and 316, 9th district, 1st. section, are about 3 miles southwest of Blairsville near Pleasant Grove church. Before the Civil War a limited amount of iron ore was mined on lot 315, and used at the forge on Hemptown Creek. At the same time some of the ore was hauled to Ducktown. The ore is reported to have been of good quality. The excavations, now nearly obscured by debris, are on the slope of what is locally known as Iron Mountain. Evidently the ore was a mixture of pyrite, probably some pyrrhotite, and gossan. Nothing definite can be said as to the extent of the deposit.

TOWNS COUNTY

There are less than half a dozen known deposits of brown ore in Towns County, all of which are in the vicinity of Hiawassee. Although there are no well-defined pyrite belts in the County, two prospects give promise of becoming commercially important when means of transportation are at hand. The nearest shipping point is Murphy, N. C., 30 miles to the northwestward. The gossan at these two deposits is of good grade and apparently present in some quantity. Besides these deposits there is a manganese-manganiferous iron prospect and several properties with a surface show.

J. MILES BERRONG PROPERTY[1]

Lot 196, 18th district, 1st. section, is 4 miles southeast of Hiawassee, and half a mile north of the peak known as Buck Knob. Limonite gossan in some quantity is scattered over several acres of the west slope of a ridge at an elevation of about 2,000 feet. In an open-cut now partly filled with earth, a vein of gossan about 10 feet thick is exposed, with walls of decomposed schist. The vein appears to be widening with depth. The ore is comparatively free from mechanical impurities and would make a good furnace ore.

IVEY MOUNT PROSPECT

Low grade silicious gossan occurs in limited quantity on lot 157, 18th district, 2 miles southeast of Hiwassee, on the eastern slope of Ivey Mount. Three shafts and two tunnels, now inaccessible, were opened on the property. It is reported that the ore was used as a source of copper during the Civil War, but judging from samples seen on the dump it is chiefly pyrite occurring in quartz and quartz-mica schist. Possibly the ore carried copperas, a sulphate of iron, which might account for the use of the word copper in describing the ore.

W. H. McCONNELL ESTATE

The W. H. McConnell estate owns the mineral interests and C. F. McConnell the surface rights in lot 89, 17th district, 1st. section. The property is 2 miles northwest of Hiwassee near the head of a small creek flowing northeast to Hiwassee River, a mile and a half distant. A small amount of manganese ore was shipped from this prospect some years ago. The pits are now caved or filled with water and no ore is seen in place. On the dump are lumps of manganese, and manganiferous iron, while a considerable quantity of hornblende gneiss is scattered over the hillslope.

The extent of the deposit on the McConnell property is unknown and there is no data available from which a reliable estimate could be made. A sample of the iron ore collected by the writer, shows a fair metallic iron content. It is interesting to note that nearly 1½

1. State Geol. Surv. Bull. 33, p. 207.

per cent of metallic zinc was found in this sample, together with traces of nickel and cobalt. The analysis of the ore gives the following results:

Analysis of Ore. Lot 89

Moisture at 100°C	1.98
Loss on ignition	9.38
Soda (Na_2O)	.50
Potash (K_2O)	.42
Lime (CaO)	.12
Magnesia (MgO)	.00
Alumina (Al_2O_3)	trace
Ferric oxide (Fe_2O_3)	65.50
Manganous oxide (MnO)	.48
Titanium dioxide (TiO_2)	.18
Sulphur trioxide (SO_3)	.08
Phosphorus pentoxide (P_2O_5)	1.94
Silica (SiO_2)	17.84
Zinc oxide (ZnO)	1.88
Nickel (Ni)	trace
Cobalt (Co)	trace
Total	100.30
Metallic iron (Fe)	45.86
Sulphur (S)	.08
Phosphorus (P)	.84
Zinc (Zn)	1.47

Silicious manganiferous iron ore occurs on lot 54, 17th district, 1½ miles northwest of Hiwassee and owned by A. N. McConnell. Samples of the ore were shown the writer by Mr. McConnell who said that the samples came from an area of swampy land on the lot. The property of John Gregory adjoining lot 54 is also reported to have a limited quantity of surface ore.

RABUN COUNTY

No commercial deposits of brown ore are known to occur in Rabun County. It is reported by J. A. Reynolds, County surveyor, that in running out lot boundaries the magnetic needle often refuses to function, indicating the presence of magnetic ore. This is not unusual, however, as prominent belts of basic rocks occur in the county and magnetite is a common accessory mineral in rocks of such character.

Within the corporate limits of Clayton, half a mile southwest of the court house an impure variety of limonite is seen in the road

ditch. It is silicious and schistose, and a replacement of mica schist apparently.

HABERSHAM COUNTY

PIEDMONT FARMS PROPERTY

Limonite ore may occur in commercial quantity only on one property, so far as known, in Habersham County. This property, lot 73, 10th district, is known as the Piedmont Farms property and is owned by Piedmont College at Demorest. Ore is to be seen on this property a half a mile east of the railroad station at Demorest where an iron lead crosses the public road. Fragments of varying grade ore are scattered along in the road ditch and on both sides of the highway in the cultivated fields. The country rock is a mica schist, a local representative of the Brevard schist, striking about N65°E and dipping S20°E. The ore occurs as fracture fillings and layers in the schist associated with more or less quartz. Often the quartz grains are a quarter of an inch in diameter, and cemented together by iron oxide, forming a sort of breccia. These exposures are on the south slope of a prominent hill, and judging from the areal extent of the float a fair sized deposit of ore occurs.

It is reported that ochre was mined many years ago on lot 79, 10th district, and that iron ore was raised from the same lot for use in an old forge.

A sample oft he ore from lot 73 was analyzed with the following results:

Analysis of Ore. Lot 73

Moisture at 100°C	.74
Loss on ignition	11.82
Soda (Na_2O)	1.00
Potash (K_2O)	1.09
Lime (CaO)	.00
Magnesia (MgO)	trace
Alumina (Al_2O_3)	5.11
Ferric oxide (Fe_2O_3)	63.05
Ferrous oxide (FeO)	trace
Manganous oxide (MnO)	trace
Titanium dioxide (TiO_2)	.72
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	2.27
Silica (SiO_2)	13.70
Total	99.50
Metallic iron (Fe)	44.14
Sulphur (S)	.00
Phosphorus (P)	.99

LUMPKIN COUNTY

Limonite resulting from the alteration of pyrites occurs in some quantity in two or three places in Lumpkin County. The Creighton-Dahlonega pyrites belt crosses the southeastern part of the county and the most prominent exposures of the brown ore are along this belt. At present the deposits are unfavorably located for economic working due to their distance from a railroad and the long haul to a furnace.

As far as known no commercial deposits of limonite of the types other than gossan occur in this county.

CHESTATEE PYRITE MINE[1]

This mine, owned by the Chestatee and Chemical Corporation, is located 6 miles east of Dahlonega on the south side of Chestatee River, 1¾ miles below its junction with Testnatee Creek. The main vein of pyrites is indicated at the surface by outcrops of gossan extending in a northeast direction for a distance of 3,500 feet or more. Numerous prospect pits and cuts have been dug along the line of cropping. The quality of the gossan is excellent in many places, showing little silica and other mechanical impurities. The best grade of ore is vesicular, spongy and of uniform quality, running more than 50 per cent metallic iron. Iridescent coatings on fragments of the ore are common. The larger part of the limonite, however, is of only fair grade. It is silicious and schistose, being mixed with a considerable amount of iron stained mica schist. The depth to which the gossan extends is probably between 30 and 50 feet.

There is evidently a considerable tonnage of gossan ore on this property which may prove of value in the future.

Southwest of the Chestatee mine for a distance of 2 miles there are varying quantities of gossan at intervals.

STANDARD GOLD MINING COMPANY PROPERTY

There is a small exposure of gossan on lot 612, 12th district, 3½ miles west of Dahlonega near the Dahlonega-Ellijay road. In a

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1. State Geol. Surv. Bull. 33, pp. 182-198.

prospect pit about 4 feet of vesicular, reddish-brown material occurs made up of good quality gossan and pyrite-bearing schist, each in alternating layers 5-6 inches in thickness. Much of the gossan exhibits the colors of iridescent limonite. The strike of the ore-bearing formation is N60°E and the dip S60°E. In 1917, on the south side of the road, a churn drill hole was sunk to a depth of 72 feet. Several quartz veins a foot or more in thickness were encountered, and pyrites was said to have been panned all the way from the drill dust.

To the southwest of the above prospect pit the "lead" is indicated by float and reddish-colored soil for some distance. It is reported that 9 tons of limonite ore were taken from a pit at one point here some years ago.

SPALDING COUNTY

Spalding County lies in the crystalline belt about 50 miles south of Atlanta. The Carolina gneiss and the Roan gneiss, together with granite and granite gneiss, underlie the county. Brown ore croppings are known to occur, but there has been no prospecting and the extent of the deposits is uncertain.

WALKER PROPERTY

Professor J. Henry Walker, head of the agriculture school at Monroe, owns a large tract of land at Griffin, the county seat of Spalding County. The property lies on the south side of the town, partly within the corporate limits and along the Macon highway.

Low grade iron ore occurs in considerable abundance on the summit and slope of the low ridge upon which the Walker residence, which is on the south end of Hill Street, is situated. Small fragments an eighth of an inch in diameter or less, and large, dark colored masses sometimes weighing 100 pounds are scattered over the surface. In the shallow road-cut at the top of the hill the "iron formation" is exposed, striking S70°W and dipping S45°E. It is a garnetiferous hornblende gneiss belonging, probably, to the Roan gneiss series. Small amounts of magnetite often altered to limonite occur in the rock, and analyses show that considerable manganese is also present.

The last named mineral probably originated from the garnets, which also accounts for part of the iron content of the so called ore.

A quarter of a mile south of this point on top of a cultivated hill and east of the public road the ore forms a rather thick mantle on an acre or more. Some of the fragments are of excellent quality. Still farther along the highway are exposures of ferruginous mica schist, and a limited quantity of needle ore was also observed.

There are no means of estimating the quantity of ore on the Walker property. Apparently, however, only a small amount of workable ore occurs. The following analysis indicates that the greater part of it is of too low grade for commercial use.

Analysis of Ore. Walker Property

Moisture at 100°C	2.94
Loss on ignition	4.86
Soda (Na_2O)	trace
Potash (K_2O)	trace
Lime (CaO)	1.74
Magnesia (MgO)	1.14
Alumina (Al_2O_3)	17.47
Ferric oxide (Fe_2O_3)	34.29
Manganous oxide (MnO)	7.60
Titanium dioxide (TiO_2)	.54
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	1.20
Silica (SiO_2)	28.70
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	100.48
Metallic iron (Fe)	23.98
Sulphur (S)	.00
Phosphorus (P)	.52
Manganese (Mn)	5.89

A sample of rock from within the city limits of Griffin was sent to the office of the Geological Survey for analysis, and the results showed the rock to be of much the same character as the so called ore on the Walker property, both being apparently different phases of the same formation.

The analysis is given below:

Analysis of Rock from City Limits of Griffin

Moisture at 100°C	1.34
Loss on ignition	6.64
Soda (Na_2O)	.06
Potash (K_2O)	.06
Lime (CaO)	.00
Magnesia (MgO)	.20
Alumina (Al_2O_3)	18.36
Ferric oxide (Fe_2O_3)	19.17
Ferrous oxide (FeO)	.12
Manganous oxide (MnO)	7.15
Titanium dioxide (TiO_2)	.92
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.53
Silica (SiO_2)	45.24
Chromium (Cr)	.00
Total	99.79
Metallic iron (Fe)	13.42
Sulphur (S)	.00
Phosphorus (P)	.22

The iron "lead" exposed on the Walker property extends to the southwest in the direction of Zebulon, Pike County. At intervals the float is quite abundant. On the B. Slade property, 5½ miles northeast of Zebulon a considerable amount of varying grade ore is seen in the cultivated fields along the Atlanta-Macon highway. Some of the ore apparently contains as much as 45 per cent metallic iron and is free from mechanical impurities other than a negligible amount of quartz. The property of J. H. Shackelford, joining the Slade land, has also a limited quantity of surface ore. The soil is of a light reddish color, due to the presence of iron oxide leached from the country rock.

PIKE COUNTY

Pike County joins Spalding County on the south. There are a number of exposures of fair grade limonite ore in the vicinity of Zebulon, the county seat, and a limited amount of prospecting was carried on at one point. The deposits are generally well located for economic working, but the cost of getting the ore to furnaces would be excessive as it would have to be transported over two or more railroads.

W. M. HARTLEY PROPERTY

The Hartley property, lot 219, 8th district, is 2 miles south of Zebulon, along the Zebulon-Thomaston public road. Fragments of ore of varying quality are abundantly scattered over the gentle hillslope on the west side of the road. The area thus covered includes several acres and extends as far as a small branch east of and running parallel to the Central of Georgia Railroad. West of the track and on the summit of a prominent ridge is a small cropping of ore. Lots 220, 221 and 222 also have surface indications of limonite.

The ore occurs as small magnetic particles and as lumps and masses often a foot or more in diameter. It is of the same character as the ore found on the Walker property in Spalding County. The iron content is low and the manganese rather high. The analysis given indicates the character of the ore in a sample picked at random. A selected sample would give a better analysis undoubtedly, but it would not be representative.

Analysis of Ore. Hartley Property

Moisture at 100°C	1.98
Loss on ignition	5.10
Soda (Na_2O)	trace
Potash (K_2O)	trace
Lime (CaO)	2.92
Magnesia (MgO)	1.32
Alumina (Al_2O_3)	12.57
Ferric oxide (Fe_2O_3)	25.02
Manganous oxide (MnO)	8.58
Titanium dioxide (TiO_2)	.72
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	1.91
Silica (SiO_2)	39.66
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	99.78
Metallic iron (Fe)	17.51
Sulphur (S)	.00
Phosphorus (P)	.83
Manganese (Mn)	6.65

E. B. LYLES PROPERTY

This property is about half a mile south of the Hartley property. At the foot of a low hill immediately south of the Lyles residence and in a road cut is an exposure of biotite gneiss. Some 3 feet of this formation is distinctly ferruginous. Limonite occurs as a stain

on quartz grains and as a fracture filling in the rock. Some of the material has a decided spongy appearance. The strike of the formation is N35°E and the dip steep to the southeast.

R. I. BECKEM PROPERTY

The Beckem property, lot 198, 8th district, lies on the summit and slopes of a broad ridge about a quarter of a mile east of the public road and 2 miles south of Zebulon. The lot joins the Hartley property on the east.

Several acres of the open field are mantled by a mixture of good and bad ore fragments, quartz boulders, and feldspar masses. The better grade of ore apparently would run 40 per cent in metallic iron and more or less manganese, as is common with the ores in this locality. A few shallow pits have been dug and some ore gathered in piles here and there. At one time parties from Birmingham attempted to option the property together with several others nearby.

The "lead" of ore exposed on the Hartley and other properties south of Zebulon extends to the northeast and is prominently revealed by surface croppings along the Barnesville road east of Zebulon. Half a mile from the latter place near the top of a large hill are exposures of weathered biotite gneiss in the road cut. The weathering of the rock has given rise to a deposition of considerable magnetite float in the ditches, together with more or less biotite mica. At the summit of the hill in the cultivated fields of the Roger Dunn property the ore outcrops in some quantity. It possesses the same characteristics as the ore on the Hartley property, having a fair iron content and varying amounts of manganese.

About 1¾ miles east of Zebulon, also on the Barnesville road, biotite gneiss and ore fragments are scattered over several acres on both sides of the highway. Small magnetic particles are abundant. Some of the larger ore fragments upon examination with the hand-lens are seen to have minute glazed cavities. The residual ore is of a rather deep-reddish color.

UPSON COUNTY

Upson County joins Pike County on the south. No large exposures of ore are known to occur in the county, the outcroppings being of small areal extent and the ore of only fair quality.

J. H. HOYLE PROPERTY

The Hoyle property includes 700 acres of land in the 15th district, west of Thomaston, the county-seat. On the western slope of King's Mountain, a prominent topographic feature on the property, a limited quantity of fair grade brown ore fragments were observed. Investigation failed to reveal the source of the ore. No prospect pits or other excavations were seen on the property. Both the east and west slopes of King's Mountain are mantled with quartz and gneiss fragments.

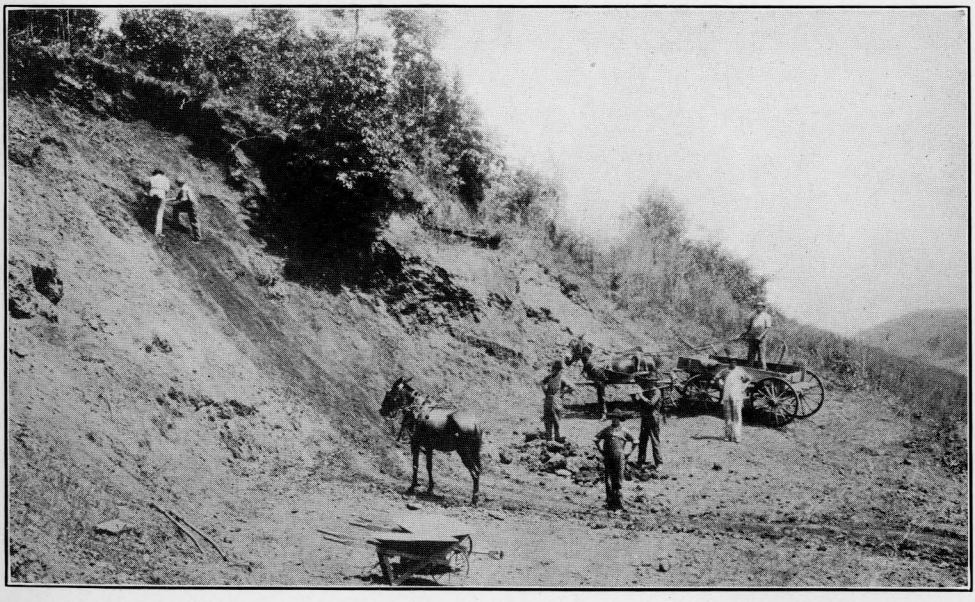
MONROE COUNTY

There is one prominent exposure of limonite ore in the extreme south-western corner of this county near the eastern boundary of Upson County. Other outcroppings have been reported from time to time elsewhere in Monroe county but they seem to be apparently of little importance.

U. S. FULLER PROPERTY

U. S. Fuller owns lots 112 and 126, 11th district, 1 mile northwest of Culloden along the Fort Valley-Thomaston highway. Several acres on lot 126 have a large amount of good ore on the surface. The most prominent outcropping is on a gentle rise between the road and the tracks of the Macon and Birmingham, and Southern Railroads, which here run parallel to each other and only a short distance apart. The former railway is not in operation at present. The ore occurs as varying sized fragments in a deep red residual soil now under cultivation. Much of the ore is of excellent quality, though some is schistose and carries more or less silica. Rock exposures are scarce, but evidently schist and gneiss are the chief types underlying the area. There has been no prospecting and nothing can be said as to the extent of the deposit. It seems likely that the ore oc-

A. GENERAL VIEW OF CHEROKEE MINING COMPANY'S DEVELOPMENT, BLUE RIDGE, FANNIN COUNTY.



B. BROWN IRON ORE MINING, CONLEY PROPERTY, NEAR BLUE RIDGE, FANNIN COUNTY.

curs only in the red residual soil and extends to no great depth. It, however, is of considerable linear extent.

A sample of the better grade of ore analyzed as follows. It is an excellent ore in every particular.

Analysis of Ore. Fuller Property

Moisture at 100°C	2.34
Loss on ignition	10.78
Soda (Na_2O)	.20
Potash (K_2O)	.16
Lime (CaO)	.00
Magnesia (MgO)	.14
Alumina (Al_2O_3)	.86
Ferric oxide (Fe_2O_3)	76.50
Manganous oxide (MnO)	.08
Titanium dioxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.09
Silica (SiO_2)	9.46
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	100.97
Metallic iron (Fe)	53.55
Sulphur (S)	.00
Phosphorus (P)	.03

MERIWETHER COUNTY

Meriwether County joins Pike County on the west. Several outcroppings of brown ore have been noted in the county in the vicinity of Warm Springs and Chalybeate Springs. Considerable mining has been done near the latter place in recent years.

The greater part of the county is underlain by the Carolina and the Roan gneisses; granite and quartzite also occur. In the vicinity of Warm Springs and also near Chalybeate Springs quartzite or sandstone is especially well developed.

G. B. GRANT PROPERTY

The Grant property, lot 46, Chalybeate district, is in a gap of Pine Mountain about three quarters of a mile south of Chalybeate station near the Atlanta, Birmingham and Atlantic Railroad. Iron ore is said to have been first discovered on this property during the Civil War and a man named Walker had a contract to supply the Confederate Government with iron. About 12 years ago Morse and Company of Tennessee opened up the deposit but shipped no ore.

The first real mining was done in 1916, by a Boston Company, which erected a washer and constructed a spur track about a quarter of a mile long connecting the mine with the A. B. & A. Railroad. Work was carried on at intervals for about a year, and 18-20 cars of ore were shipped to Gadsden, Birmingham and Anniston, Ala., when mining operations were discontinued.

The workings are immediately west of a small branch on the eastern slope of Pine Mountain which here abruptly swings from an east-west trend to the south. The elevation is about 800 feet above sea level.

The ore was taken from a bowl shaped open-cut about 50 feet long, 25 feet wide and 15 feet deep. The walls of the excavation are now badly slumped and overgrown by small trees and bushes. Nevertheless, a solid formation of ore about 6 feet in thickness is exposed on the south side of the cut. It is impossible to tell anything definite as to the extent. It is reported that ore was struck in the bottom of the cut so it seems likely that the total thickness is much greater than 6 feet. Mica schist is exposed in the north wall of the cut.

The ore is of varying grade and its most striking feature is its extreme hardness. In collecting a sample it was necessary to break off small pieces at a time from the larger masses. Some of the ore is quite pure and iridescent mammillary and stalactitic types also occur. Much of it, on the other hand, is silicious and slaty. A small clay "horse", probably formed by the alteration of feldspar in a pegmatite dike, was seen in the north wall of the cut.

Besides this main excavation there are several prospect wells and cuts now caved and showing little ore. The surface ore consists of large boulders and masses scattered over approximately half an acre. Only a few remains of the old washer are to be seen and the spur track has been removed.

The nature of the deposit is not clear. Along the west wall of a cut made in building the spur track a white, very coarse grained quartzite outcrops, striking nearly due north and dipping to the southeast. The mine is but a short distance to the eastward and

as stated above mica schist is exposed here. From the relation of these two formations it seems that the ore was deposited from downward circulating waters in fractures or fissures of unknown extent in the schist, near the contact with the quartzite. Judging from the topography at this point the formations appear to have been "squeezed" or bent into a V-shaped fold. It is possible, therefore, that the gap in the mountain marks the location of a fault, in which case the ore deposit would be classed as a fault deposit.

The analyses below indicate a good grade of ore. In actual mining the ore would probably run about 48 per cent in car load lots, as impure ore is mixed with the better grade product.

Analyses of Ore. Grant Properly

CONSTITUENTS	1	2	3
Moisture at 100°C	.52	1.26	0.91
Loss on ignition	10.34	9.52	----------
Soda (Na_2O)	.22	.45	----------
Potash (K_2O)	trace	.40	----------
Lime (CaO)	.00	.00	----------
Magnesia (MgO)	trace	.00	----------
Alumina (Al_2O_3)	4.84	6.38	----------
Ferric oxide (Fe_2O_3)	81.62	69.29	----------
Manganous oxide (MnO)	.24	trace	----------
Titanium dioxide (TiO_2)	trace	.00	----------
Sulphur trioxide (SO_3)	.00	.00	.00
Phosphorus pentoxide (P_2O_5)	.43	.17	----------
Silica (SiO_2)	1.68	11.98	6.34
Cobalt (Co)	trace	----------	----------
Nickel (Ni)	trace	----------	----------
Total	99.89	99.45	----------
Metallic iron (Fe)	57.13	48.50	55.14
Sulphur (S)	.00	.00	.00
Phosphorus (P)	0.18	0.07	.68

1. Analysis of sample from south and west walls of cut.
2. Sample of the lower grade ore in the cut.
3. Analysis of sample from the property collected in 1917 by G. B. Grant.

CHARLES L. DAVIS PROPERTY

The Davis property, lot 120, 2d. district, is along Cascade branch and the old Chipley-Warm Springs road, half a mile southeast of the Warm Springs Hotel. Brown ore is exposed near the branch in a low lying tract of land extending for nearly half a mile southward

to Pine Mountain. This area is underlain by material closely resembling the sands and clays of the Alum Bluff formation of Miocene age. Massive quartzite is exposed on the property along the road towards Warm Springs.

The ore occurs in the form of boulders some of which are 4-5 feet in diameter. The larger boulders are rather silicious, but the smaller masses are quite free from impurities. No prospecting has been done on the property. The deposit is probably of limited extent.

J. FRANK SMITH PROPERTY

Lot 55, 2d. district, is 2½ miles west of Bullochville in an area of rather rough topography. About 150 yards northwest of the Smith residence and north of the public road, fragments of excellent grade limonite ore are found on the gentle hillslope over an area of half an acre or more. These fragments are generally 2 to 3 inches in diameter and often rounded by water action. Some are hollow and upon being broken open expose highly colored surfaces or needle and finely stalactitic ore. Fragments of schistose ore are also seen, together with some quartz masses.

On the south side of the lot in a broad open valley are exposures of highly ferruginous sandstone or quartzite and considerable float of the same material. It is too silicious for commercial ore.

Samples of ore from the outcrops near the Smith residence analyzed as follows. It will be noted that sample No. 2 of them has a high phosphorus content and 1 per cent of lime. Probably the accessory mineral is apatite, a phosphate of lime, which may also carry a considerable amount of manganese.

Analyses of Ore. Smith Property

CONSTITUENTS	1	2
Moisture at 100°C	1.18	1.10
Loss on ignition	10.32	11.18
Soda (Na_2O)	.60	.32
Potash (K_2O)	.40	.18
Lime (CaO)	.00	1.00
Magnesia (MgO)	trace	trace
Alumina (Al_2O_3)	5.02	2.87
Ferric oxide (Fe_2O_3)	75.38	76.29
Manganous oxide (MnO)	trace	1.02
Titanium dioxide (TiO_2)	trace	.54
Sulphur trioxide (SO_3)	.00	.00
Phosphorus pentoxide (P_2O_5)	.12	3.00
Silica (SiO_2)	7.02	2.40
Cobalt (Co)	----------	trace
Nickel (Ni)	----------	trace
Total	100.04	99.90
Metallic iron (Fe)	52.77	53.40
Sulphur (S)	.00	.00
Phosphorus (P)	0.05	1.29

HARRIS COUNTY

Harris County joins Meriwether County on the southwest. Pine Mountain extends across the county from the northeast corner to the southwest corner. The only known exposure of brown ore is east of Hamilton, the county seat.

DUKE ESTATE

The E. K. Duke estate, lots 122 and 135, 21st. district, is situated about 2 miles east of Hamilton on the Hamilton-Oak Mountain station public road on the Southern Railroad.

The first exposure of ore examined on the Duke property is located on the summit of a broad low hill over which the public road passes. On both sides of this road ore fragments varying from small pebbles up to those 6 inches in diameter are scattered over a considerable area. The general trend of the ore belt seems to be northwest towards Oak Mountain, a ridge running a little north of east from near Hamilton into Talbot County. The ore is clearly a replacement of mica schist. The fragments are dark reddish in

color, micaceous, silicious and schistose in character. A small amount of good ore is seen but it is always mixed with low grade slaty material.

About half a mile southeast of this point a short distance south of the public road, considerable float is again seen in the cultivated fields. The ore is generally of rather poor quality, though fragments of fair grade limonite may be picked up here and there. Near the J. N. Duke residence at this place a well was sunk in 1907 in a search for pyrites by Henderson Hallman of Atlanta. It is reported that at a depth of 21 feet a 2-foot vein of pyrites was struck.

GOSSAN ORES

So far as known the limonite ores found in the remaining counties in the Paleozoic and the semi-crystalline areas are mainly gossan ores, that is, ores that have originated from the weathering of pyrite and pyrrhotite ores. The high grade gossan ore is very porous and of a blue to purplish red color, being made up chiefly of a mixture of limonite and hematite. Magnetite is present sometimes in small quantities.

At the Reeds Mountain pyrite mine in Carroll County, gossan was at one time mined and shipped on a small scale, but elsewhere the ore has not been regarded as of commercial promise.

HARALSON COUNTY

The northwestern half of Haralson County lies in the crystalline area, and the southeastern half in the semi-crystalline area, or the area of metamorphosed Paleozoic rocks. The county includes parts of two pyrites belts[1], along which frequently occur more or less extensive exposures of brown iron ore in the form of gossan. Three of the more promising prospects of this kind of ore are here described.

TALLAPOOSA MINE

The Tallapoosa pyrite mine is on lot 932, 20th district, 3d. section, 3 miles northwest of Draketown. The mine is the only one in

1. State Geol. Surv. Bull. 33, pp. 62-89.

the Draketown district to have produced on a commercial scale. The ore body is a bedded vein deposit conforming to the strike and dip of the country rock, and is indicated at the surface by a fair grade gossan ore. The gossan outcrop has been prospected at intervals by pits and small cuts for about 400 yards. A short distance southeast of the opened vein gossan again occurs for 100 yards or more in a direction parallel to that of the main deposit. There is no record of the depth to which the gossan at this mine extends.

T. R. KING PROPERTY

The King property, lot 852, 19th district, is about 3 miles north of Draketown, along the Buchanan-Dallas public road. About two years ago a vein of magnetic iron ore was opened up on the property in a cultivated field, a short distance west of the King residence. It has been exposed along its strike (S.60°W.), and is about 3 feet thick with a rather steep dip to the southeast.

A considerable amount of good limonite ore was taken from this prospect in addition to the magnetic ore. It resembles a gossan ore rather closely, though only a small amount of pyrite occurs in the schist. Gossan ore in some quantity occurs on the surface of the cultivated field in the immediate vicinity. This is to be expected however, for the property lies in a pyrite belt. Northwest of this prospect pyrite was mined on a small scale some years ago. Three cars of ore have been shipped to Birmingham from the King property. The prospect for a workable deposit of brown iron ore is not very encouraging.

The following analysis of the ore from the magnetic vein indicates that probably the magnetite has largely altered to hematite and limonite.

Analysis of Ore. King Property

Moisture at 100°C.	.14
Loss on ignition	3.64
Soda (Na_2O)	trace
Potash (K_2O)	trace
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	5.85
Ferric oxide (Fe_2O_3)	86.45
Manganous oxide (MnO)	trace
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.42
Silica (SiO_2)	3.76
Total	100.26
Metallic iron (Fe)	60.52
Sulphur (S)	.00
Phosphorus (P)	.18

PAULDING COUNTY[1]

Like Haralson, Paulding County lies partly in the Crystalline area and partly in the Metamorphic area. It includes two pyrite belts, the larger one being known as the Paulding County belt which extends from the central part of the county across the eastern boundary into Cobb County. Gossan iron ore in more or less quantity is found along the two belts.

SWIFT AND COMPANY PROPERTY

This property is 1 mile east of Draketown. Good gossan ore in the form of large masses and small fragments are seen at the head of the old shaft and in the adjacent field on lot 1198, 19th district. The ore is reddish-brown in color, vesicular and often magnetic. The float is particularly abundant to the northeast and east of the shaft. Were it not for the somewhat inaccessible location of the deposit, the ore apparently might be worked at a profit.

A complete analysis of some ore from the dump at the head of the shaft is here given:

1. State Geol. Surv. Bull. 33, pp. 99-136.

Analysis of Ore. Lot 1198

Moisture at 100°C	2.20
Loss on ignition	12.64
Soda (Na_2O)	.14
Potash (K_2O)	.20
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	6.64
Ferric oxide (Fe_2O_3)	60.40
Ferrous oxide (FeO)	.43
Manganous oxide (MnO)	trace
Titanium dioxide (TiO_2)	.54
Sulphur trioxide (SO_3)	1.54
Phosphorus pentoxide (P_2O_5)	.23
Silica (SiO_2)	15.02
Total	99.98
Metallic iron (Fe)	42.58
Sulphur (S)	.62
Phosphorus (P)	.10

RUSH-BANKS PROSPECT

The Rush-Banks pyrite prospect is on lot 189, 19th district, 3d section, 9 miles west of Dallas. Gossan ore was first discovered and prospected here about 50 years ago. The deposit is made up mainly of two parallel bodies or veins, about 60 feet apart. The larger vein ranges from 3 to 7 feet in thickness. Gossan ore of varying quality extends to a depth of about 20 feet at one place. The areal extent is limited apparently.

LITTLE BOB MINE

This mine is on lot 625, 2d. district, 3d. section, about 3 miles northwest of Hiram. The ore body as exposed by underground workings is of considerable extent, but the gossan outcrops are rather limited. However, at the main shaft the oxidized product is 25 feet in thickness and of fair grade. In a cut along the spur track to the mine from the Seaboard Air Line Railroad, some gossan is seen in small quantity. A short distance southwest of the main shaft the ore is also exposed in a shallow prospect pit.

CARROLL COUNTY[1]

Carroll County lies entirely in the crystalline area of the Piedmont plateau. Brown ore is found in more or less quantity, associa-

1. State Geol. Surv. Bull. 33, pp. 31-62.

ted with the various pyrite deposits, and, therefore, the prospects are discussed here instead of with deposits of the Crystalline area.

REEDS MOUNTAIN MINE

The Reeds Mountain property includes part of lot 246, 7th district, 5th section, Haralson County, and lot 259, 7th district, 5th section, Carroll County. It is 1½ miles southeast of Bremen on the Chattanooga-Griffin branch of the Central of Georgia Railroad. The property has produced both pyrites and gossan ore in some quantity. About 1900 it is reported that 100 cars of the latter were shipped. The so called "middle vein", has the best surface indications apparently and some good ore was exposed in a small pit a short distance southwest of shaft No. 2, which is about 75 feet from the railroad. The float is found along the strike of the vein at intervals for about 800 yards. An open cut 300 feet long and 10 feet deep is seen, extending from the railroad to some distance beyond shaft No. 2. The merchantable ore is 10 feet in thickness. There are too little data to permit of anything like an accurate estimate of the iron ore still to be found in this deposit.

DOUGLAS COUNTY

Douglas County is included entirely in the crystalline area, the prevailing rock being a granitic gneiss. In addition to a few isolated prospects the main pyrite deposits are in the Villa Rica belt which enters the north-western corner of the county. The so called Villa Rica mine is apparently the only deposit of commercial promise.

VILLA RICA MINE

The Villa Rica mine is 3 miles northeast of Villa Rica and is owned by the Virginia-Carolina Chemical Company. The gossan outcrops are rather large in areal extent, but the ore has never been mined. In a shallow cut along the spur track, a short distance west of the plant, 10 feet of good gossan is exposed. It is quite porous and is of a dark reddish-brown color. Some of it is rather silicious, but nevertheless much of it is of a fair grade. The float ore extends to the southwest for about a quarter of a mile. It is particularly abund-

ant on the west side of the public road in a cultivated field near the plant. The ore is massive and quite free from mechanical impurities. About half a mile east of the mine a limited amount of gossan ore and magnetite is also to be seen.

The character of the ore in the railroad cut near the plant is shown by the following analysis:

Analysis of Gossan. Villa Rica Mine

Moisture at 100°C	3.12
Loss on ignition	12.62
Soda (Na_2O)	.40
Potash (K_2O)	.36
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	2.92
Ferric oxide (Fe_2O_3)	73.93
Ferrous oxide (FeO)	.50
Manganous oxide (MnO)	.86
Titanium dioxide (TiO_2)	.18
Sulphur trioxide (SO_3)	2.03
Phosphorus pentoxide (P_2O_5)	.25
Silica (SiO_2)	3.00
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	100.17
Metallic iron (Fe)	51.75
Sulphur (S)	.81
Phosphorus (P)	.11

DEPOSITS OF THE COASTAL PLAIN[1]

DISTRIBUTION AND NATURE OF THE ORES

Brown iron ore occurs at numerous points in a belt, approximately 40 miles in width, extending along the Fall Line from Columbus to Augusta, a distance of about 200 miles. There has never been any prospecting on a scale large enough to show the size of the various deposits, and consequently it cannot be definitely stated that commercial ore bodies exist.

The ores are associated chiefly with the sediments of Cretaceous or Eocene age, though a few outcroppings were noted in areas underlain by the Alum Bluff formation of the Miocene age. The

[1] For a description of the geology of the Coastal Plain, see State Geol. Surv. Bull. 26, 1911.

surface exposures often cover several acres. The ore occurs in the form of concretions, nodules and irregular fragments of all sizes distributed throughout the superficial reddish soil or gray sand.

The ores are often more or less silicious, consisting of sand grains cemented by iron oxide. These grains also serve as nuclei for the small concretions which frequently make up a larger mass of ore. The phosphorus content is generally low, and available analyses show no carbon dioxide present, indicating that none of the iron is in the form of carbonate. Elsewhere in the Coastal Plain, especially in Maryland, carbonate ores are found occurring in the form of concretions resembling those typical of the Georgia ores.

DESCRIPTION OF INDIVIDUAL DEPOSITS

STEWART COUNTY

Stewart County is on the east side of the Chattahoochee River about 20 miles south of Columbus. It is underlain by the sands, clays, marls and limestones of the Ripley formation of the Upper Cretaceous age, and the Midway formation, the basal member of the Eocene formation.[1] It also lies in the Fall Line Hills division of the Coastal Plain, and is characterized by "red hills". The soil in these "red hills" is a reddish sandy loam which results from the weathering of the underlying formation.

Deep gullies, known as "washes" and "caves", are typically developed west and north of Lumpkin, the county-seat. These are often near brown ore exposures and clearly reveal to what depth the ore extends.

There are a number of limonite outcroppings in the county of considerable superficial extent. There has, however, been little or no prospecting done and therefore nothing very definite can be stated as to the commercial importance of the deposits.

TROY WOODS PROPERTY

The Woods property, lot 79, 24th district, is 5 miles north of Richland along the Columbus-Richland highway and the Seaboard

1. State Geol Surv. Bull. 26.

Air Line Railroad. Brown ore of good quality is exposed in the walls of the road cut directly in front of the Woods residence and on the western slope of a low red hill nearby. The main exposure is about 50 feet from the railroad and evidently on the right-of-way. No ore occurs in a rather well defined horizontal bed. In the east wall of the cut the bed is apparently about 2 feet in thickness and it is exposed for a distance of about 300 feet. At the north end of the cut is a rather large wash exposing the red top soil which enclosed the ore bed and the underlying white sandy clay. This surface soil is about 15 feet thick at this point. In the west wall of the cut the ore appears to be more than 2 feet in thickness and to extend below the level of the road.

The ore bed is not a solid formation, but is made up of irregular fragments and varying sized "pots". These "pots" or geodal shells are often found to contain loose sand or clay, and iridescent limonite frequently encrusts their interiors. As a rule they are dull black on the inside. The ore is generally rather silicious, though some very good samples are seen. Fossil imprints were observed on some of the ore fragments.

The surface ore is abundant. West of the railroad on a rather steep hillslope large boulders and smaller masses of varying grade ore are scattered over a considerable area. At one point a very ferruginous sand outcrops, which has yielded much silicious float. Small slaty particles carrying magnetite are mixed with the silicious and better grade ore. On the east side of the public road the float is abundant for a distance of a quarter of a mile or more to the north. In places it is so thickly scattered over the ground as to interfere with cultivation.

Apparently the deposit on the Woods property is of considerable horizontal extent, but of shallow depth. The nature of the occurrence of the ore would necessitate, for working, the use of a washer and steam-shovel. There has been no prospecting to show what percentage of the surface material would be commercial ore.

A selected sample of the ore exposed in the road cut analyzed as follows:

Analysis of Ore. Woods Property

Moisture at 100°C	3.02
Loss on ignition	10.92
Soda (Na_2O)	.78
Potash (K_2O)	.21
Lime (CaO)	.26
Magnesia (MgO)	trace
Alumina (Al_2O_3)	1.81
Ferric oxide (Fe_2O_3)	78.19
Ferrous oxide (FeO)	1.02
Manganous oxide (MnO)	.54
Titanium dioxide (TiO_2)	.00
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	1.66
Silica (SiO_2)	1.30
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	99.71
Metallic iron (Fe)	54.73
Sulphur (S)	.00
Phosphorus (P)	.72

The same type of ore as that on the Troy Woods property is found on lots 82 and 83, 24th district, 4 miles north of Richland along the Seaboard Railroad. The ore occurs as float over several acres of a gently sloping ridge. It is reported that in digging a well on the summit of the ridge a 5-foot bed of ore was struck at a depth of 20 feet. In a large excavation on this railroad the ore is exposed in a 2-foot bed, composed of "pots" and irregular masses of varying grade limonite. Some of the ore shows imprints of fossils, such as oysters, indicating that the ore is a replacement of limestone.

W. G. HOLLOMAN PROPERTY

The ore found on the Woods property occurs in like abundance on the Holloman property which includes lots 17, 47, 48 and 49, 24th district. The property is situated immediately south-southwest of Brooklyn, a station on the Seaboard Railroad, about 7 miles north of Richland. The area is underlain by the sands and clays of the Upper Cretaceous.

On lot 48 west of the Holloman residence ore fragments and silicious masses are scattered over the summit and slopes of a considerable area of a broad, partly cultivated ridge. Deep gullies to the north and southwest of the ridge expose no ore, which indicates

that the deposit is superficial. The property was examined by Dr. F. H. H. Calhoun, a geologist for the Seaboard Railroad, who was of the opinion that the only profitable way of working the deposit would be by picking up and shipping the better grade ore, which appears on the surface. The red top-soil apparently does not carry a sufficient amount of the ore to warrant the construction of a washer.

A sample of ore collected from lot 48 by W. G. Holloman analyzed as follows:

Analysis of Ore. Holloman Property

Moisture at 100°C	1.48
Silica (SiO_2)	7.40
Total	
Metallic iron (Fe)	52.70
Sulphur (S)	.00
Phosphorus (P)	.20

The ore-"lead" continues to the north-northeast from the Holloman property and is well exposed on several lots of land on both sides of the railroad. The best outcrops perhaps, are on the following properties: E. P. Pearson property, lots 14 and 20, 32d. district, C. A. Stevens estate, lot 21, 32d. district and T. P. Burgen property, which joins the W. G. Holloman land on the north.

The ore is invariably found on the slopes of more or less prominent hills and ridges. The red soil of the bottom lands does not seem to carry any ore.

Along the main highway from Richland to Lumpkin large amounts of small magnetic pebbles occur at intervals on the surface of the ground. They are apparently water worn and have originated from larger masses. As an iron ore they are of little or no value, owing to the high percentage of silica.

J. G. WILLIAMSON PROPERTY

There is a considerable exposure of limonite ore on the Williamson property, lot 70, 24th district, 7 miles west of Lumpkin along the Lumpkin-Florence public road. Several acres west of the road and on a broad gently-sloping ridge are mantled with a rather thick cover-

ing of ore of variable grade. The small magnetic silicious particles are quite abundant and impure slaty ore fragments occur in more or less quantity. The merchantable ore is generally in the form of crusts, resulting apparently from the breaking up of geodes. A reddish colored slaty material encrusted with black limonite and probably some goethite, constitutes these ore fragments. Often the limonite is distinctly laminated like needle ore, or exhibits the bright "peacock" colors of iridescent limonite. Immediately east of the public road above referred to, is a huge gulley or wash but no ore is here exposed. The red surface soil will apparently average approximately 15 feet in thickness.

On lot 68, 24th district, belonging to J. T. Humble, ferruginous sandstone and low grade brown ore occur in some quantity in the cultivated fields along the Lumpkin-Florence highway. Very little commercial ore is mixed with these impure products. Large masses of silicious material weighing 50 pounds or more are seen in road cuts in the vicinity. The ore on these two last named properties occurs near the base of the Midway formation.

MARION COUNTY

Marion County lies along the Fall Line Hills, to the northeast of Stewart County. No deposits of brown ore of any extent are known, though there are several outcroppings. The county is characterized by large areas of exceedingly sandy soil.

Small magnetic fragments are quite plentiful on the ground about the Court House at Buena Vista, and in the streets. About 1 mile east of Buena Vista on the Valdosta road is a contact apparently between the Midway formation of the Eocene and the Upper Cretaceous. The line of demarkation is indicated clearly by thin limonitic layers in a stained clay. Along the roadside 2 miles east of town the silicious limonitic float is also abundant.

The following properties on the Buena Vista-Richland road have varying amounts of surface ferruginous material:

R. E. Clemens property—This property is 1 mile south of Buena Vista. Magnetic pebbles and silicious masses are seen in the cultivated fields in some quantity. There is very little ore of good grade.

The property is quite well located for working as the Central of Georgia Railroad is only a short distance away.

W. R. Upton property—The Upton property is 11 miles southwest of Buena Vista in a hilly section, a considerable part of which is wooded. On the eastern slope of a ridge near the Upton residence an acre or more of the surface is thinly mantled with ferruginous material and some good limonite ore. The latter occurs in the form of the usual crusts or layers and as irregular, silicious masses.

On the Jessie Rogers property, 3 miles southeast of Buena Vista and along the Buena Vista-Ellaville highway a large amount of magnetic pebbles occur in the cultivated fields. They are so plentiful that they may be scraped up by the handful. Such material is quite commonly found in varying quantities all along this road in both Marion and Schley Counties.

A sample of the ore from the Rogers property, collected by the writer, gave the following analysis:

Analysis of Pebble Ore. Rogers Property

Moisture at 100°C	1.34
Loss on ignition	6.88
Soda (Na_2O)	.55
Potash (K_2O)	.14
Lime (CaO)	.36
Magnesia (MgO)	.00
Alumina (Al_2O_3)	17.38
Ferric oxide (Fe_2O_3)	42.95
Ferrous oxide (FeO)	1.48
Manganous oxide (MnO)	.24
Titanium dioxide (TiO_2)	.54
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.24
Silica (SiO_2)	27.00
Nickel (Ni)	trace
Cobalt (Co)	trace
Total	99.10
Metallic iron (Fe)	31.21
Sulphur (S)	.00
Phosphorus (P)	.10

SUMTER COUNTY

No extensive deposits of brown ore are known in this county. Near Cobb Station, 18 miles southeast of Americus, large fragments of ferruginous chert occur on the Humble property. Also, a small amount of silicious pebbles containing magnetite are scattered over the surface. This part of the county is underlain by the Vicksburg formation of the Oligocene age.

SCHLEY COUNTY

Schley County borders Sumter County on the north. Only one extensive outcropping of ore is known, which is described below:

REES LAND COMPANY PROPERTY

This property includes lots 150, 178 and 179, 29th district, Macon County, and lots 187 and 188, 29th district, Schley County. The outcroppings of ore are apparently on lot 188, 2½ miles northeast of LaCross, a station on the Central of Georgia Railroad. About four years ago some prospecting for iron ore was done here on the south slope of a wooded hill, half a mile east of the LaCross-Montezuma public road. A few shallow pits were dug, but only a low grade silicious ore was exposed, judging from the few fragments scattered about the ground near the excavations.

Three samples of the ore were sent to the Survey for analysis by Mr. Rees. Two of them were of fair quality, while the third was of excellent grade. The partial analyses are given below:

Analyses of Ore. Rees Property

CONSTITUENTS	1	2	3
Moisture at 100°C	2.27	4.21	2.23
Alumina (Al_2O_3)	13.90	14.54	----------
Ferric oxide (Fe_2O_3)	53.76	35.04	----------
Manganous oxide (MnO)	0.18	0.16	----------
Silica (SiO_2) & insoluble	16.50	30.05	10.03
Total	----------	----------	----------
Metallic iron (Fe)	37.63	23.53	52.19
Sulphur (S)	----------	----------	.03
Phosphorus (P)	----------	----------	.25

MACON COUNTY

No commercial deposits of brown ore are known to occur in Macon County. The small magnetic particles so abundant in some of the other counties mentioned above are also seen in this county in more or less quantity. Along the Ellaville-Montezuma highway this type of ferruginous material, ferruginous chert and sandstone, are scattered over the surface at various points.

About 7 miles east of Montezuma on the Montezuma-Byromville road there is a large amount of the small magnetic silicious particles, mixed with flint and stained sandstone fragments. The fields along the road for three quarters of a mile or more, partly in Macon County and partly in Dooly County, are mantled with this low grade limonitic material.

A quarter of a mile south of Marshalville on the property owned by Richard Hardy and W. L. McKinsey there is an exposure of impure brown ore in a public road cut and considerable float in the adjacent fields. The ore occurs in place as thin silicious limonitic layers and crusts near the base of the red residual soil. Some of it is of fair quality, but the greater part is quite silicious.

A few fragments have a dull black luster, are laminated, and are probably a mixture of limonite and goethite or turgite.

HOUSTON COUNTY

Limited quantities of impure brown ore have been observed in Houston County at one or two localities. The deposits appear to have little or no commercial value.

About 5 miles southeast of Fort Valley a considerable amount of small ferruginous sandstone fragments and limonitic layers occur along the roadside near the Perry branch of the Southern Railroad. The soil is a gray colored sandy clay, and is under cultivation. Farther to the southeast towards Perry the same sort of ferruginous material is seen constantly in the road cuts and open fields.

PULASKI COUNTY

Pulaski County lies about 30 miles south-southeast of Macon. The sediments underlying the county are largely Oligocene of Vicks-

burg age, which when weathered often rise to red argillaceous sands, containing fragments of flint and small concretions of iron oxide. In three or four localities a considerable amount of limonite ore of merchantable quality is found. The ore is apparently of some areal extent, but probably is confined to relatively shallow depths.

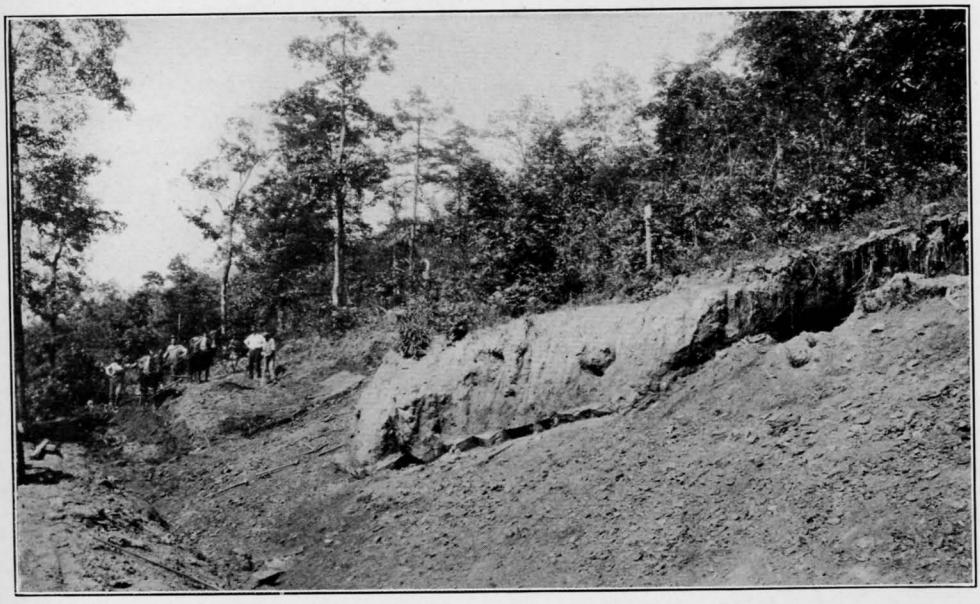
JOHN F. HENDLEY PROPERTY

The Hendley property, lot 20, 5th district, is 10 miles south of Hawkinsville along the Hawkinsville-Blue Spring public road. A small tributary of the Ocmulgee River, known locally as Ten-mile Creek, flows through the property in a general southeastward direction. On a broad gently-sloping partly-wooded ridge immediately south of this creek is a considerable amount of brown ore fragments and large fossiliferous flint masses, scattered over several acres. About four years ago a small prospect pit was dug on the slope of the ridge not far from the Creek, which exposed a number of dornicks of very good limonite ore together with fragments of silicious and flinty material. No shipment of ore was made at the time, so far as known. The ore occurs in the deep red residual soil of the Vicksburg formation. The walls of the pit contain small irregular fragments and "pots" of limonite, which may be of fibrous needle ore or simply sand grains cemented together by black and brown iron oxide. At this point the ore forms approximately 30-40 per cent of the material that would be run through the washer. It is not likely, however, that this ratio exists over any great area.

At present the property is not well located for economic working. Hawkinsville would be the nearest shipping point, necessitating a haul of about 10 miles. However, the railroad is but 3 miles distant by airline and a siding could be built in case the deposit was proved to be large enough to justify such an outlay. An abundant water supply is handy.

A sample of the ore from the cut was analyzed and found to be of excellent character, the metallic iron content being high and the phosphorus low. A sample of the ore collected by the writer gave the following analysis:

A. FOSSIL IRON ORE UNDERGROUND MINING, ESTELLE, WALKER COUNTY.



B. FOSSIL IRON ORE STRIPPING, TATE & EVANS PROPERTY, 8 MILES EAST LAFAYETTE, WALKER COUNTY.

Analysis of Ore. Hendley Property

Moisture at 100°C	1.66
Loss on ignition	11.44
Soda (Na_2O)	trace
Potash (K_2O)	trace
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	6.09
Ferric oxide (Fe_2O_3)	76.22
Manganous oxide (MnO)	.64
Titanium dioxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.17
Silica (SiO_2)	3.58
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	100.16
Metallic iron (Fe)	53.35
Sulphur (S)	.00
Phosphorus (P)	.06

PATE PROPERTY

R. O. Pate owns lot 166, 4th district, 3 miles south of Hawkinsville along the Hawkinsville-Cordele road. There is an exposure of brown ore on this lot, half a mile west of the road on the south slope of a hill near Big Creek. About 20 years ago a shallow stripping was made here, but no trace of it is seen at present. A few large pieces of ore occur on the slope together with ferruginous chert and fossiliferous flint masses. The pieces of ore are made up of low grade silicious material and some needle ore. The underlying formation is of the Vicksburg age and the ore is of the same general character as that found on the Hendley property. An analysis of the ore is here given:

Analysis of Ore. Pate Property

Moisture at 100°C	1.34
Loss on ignition	12.14
Soda (Na_2O)	trace
Potash (K_2O)	trace
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	trace
Ferric oxide (Fe_2O_3)	80.09
Manganous oxide (MnO)	.40
Titanium dioxide (TiO_2)	.45
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.12
Silica (SiO_2)	5.74
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	100.28
Metallic iron (Fe)	56.06
Sulphur (S)	.00
Phosphorus (P)	.05

E. C. SMITH PROPERTY

Lot 210, 20th district, is 5 miles east of Hawkinsville and along the McRae-Hawkinsville highway. Half a mile north of this road near an old cabin, iron ore was taken from a well some years ago. It is reported to have run 50 per cent in metallic iron. Fossiliferous flint and a small amount of iron stained silicious pebbles are found at various places in the fields, but little real ore. However, as the underlying formation is the same as that on the other properties described above (Vicksburg) it is probable that more or less of the ore also occurs here.

E. D. DUGAN PROPERTY

The Dugan property, lots 130 and 131, 4th district, is 6 miles southwest of Hawkinsville at Fleming's Bridge. On the summit of the hill sloping gently eastward to a good sized creek and on both sides of the public road, is a considerable quantity of brown ore in the form of dornicks of all sizes and of widely varying grade. The surface of several acres are characterized by the presence of this ore. The property has never been prospected and the extent of the deposit is unknown. The ore is apparently a weathered product from the Vicksburg formation, and is therefore likely confined to

shallow depths. It is of considerable areal extent, judging from the float.

BURKE COUNTY

There are several exposures of brown ore in the vicinity of Waynesboro, the county seat of Burke County. Many years ago some of this ore was mined on a small scale. It is associated apparently with the sands of the Claiborne formation, which underlie the greater part of the county.

JOHN E. McELMURRAY PROPERTY

This property is 8 miles southeast of Waynesboro along Sandy Run Creek. For some time during the Civil War ore was mined on the property to supply a small forge in operation 2 miles south of Alexander. No great amount of ore appears to have been mined judging from the amount of slag to be seen at the old forge. In addition to the forge here referred to another forge is said to have been operated, by General Taylor about 2 miles northwest of Waynesboro, many years before the former was constructed. There are no traces of this forge at present. The best exposure of the ore is on the right bank of Sandy Run Creek, near the 8-mile post of the Waynesboro-Hatcher's Mill road. The ore here forms a low bluff, 150 feet or more in length and 25 feet high. It consists of large masses or boulders, often of huge size, with a sort of concretionary structure. They are made up chiefly of sand grains cemented together by black or brown iron oxide. Some of the smaller rounded fragments frequently have loose clay within followed by a thin layer of needle ore.

In addition to this bold exposure of the ore, small fragments and masses often 6 inches in diameter are found here and there in the cultivated fields along the creek. Apparently the amount of high grade ore on the property is not large, nevertheless if it was thoroughly prospected it might show more ore than is now apparent. The nearest shipping point to the McElmurray property is Old Church station on the Savannah and Atlanta Railroad, about 2 miles to the southwest.

The following analyses indicate the character of the ore exposed along the creek:

Analyses of Ore. McElmurray Property

CONSTITUENTS	1	2	3	4
Moisture at 100°C	3.20	.98	.74	1.02
Loss on ignition	10.18	10.95	8.29	8.28
Soda (Na_2O)	trace			
Potash (K_2O)	trace			
Lime (CaO)	.00	.10	.01	
Magnesia (MgO)	trace	.12	.01	.04
Alumina (Al_2O_3)	4.82	.26	.60	.98
Ferric oxide (Fe_2O_3)	72.00	73.28	62.68	66.86
Manganous oxide (MnO)	.40	.04	.03	.05
Titanium dioxide (TiO_2)	.18	.00	.00	
Sulphur trioxide (SO_3)	.00	trace	.00	trace
Phosphorus pentoxide (P_2O_5)	.81	.65	.58	.74
Silica (SiO_2)	7.94	13.96	27.41	22.30
Cobalt (Co)	trace			
Nickel (Ni)	trace			
Total	99.53	100.34	100.35	100.27
Metallic iron (Fe)	50.40	51.30	43.88	46.80
Sulphur (S)	.00	trace	.00	trace
Phosphorus (P)	.34	.28	.25	.32

1. Analysis of brown ore collected by writer.
2. Sample collected by S. W. McCallie, State Geologist, in 1907.
3. Sample collected by S. W. McCallie, State Geologist, in 1907.
4. Sample collected by S. W. McCallie, State Geologist, in 1907.

On the old T. J. McElmurray property which joins the J. F. McElmurray property is also an exposure of the same type of ore. About three quarters of a mile northwest of the first described outcropping and on the south side of Fitz Branch, are some excavations of long standing from which ore was mined for the forge above referred to. The ore is often found in "pots" and is of excellent quality. Apparently several tons were taken from these openings.

Immediately south of the J. F. McElmurray property on what used to be known as the Norton property, ore was also mined for the old forge at Alexander. The ore was taken from an open-cut about 50 feet long and 5 feet deep situated near Sand Run Creek. At present it is caved, and the ore seen is of the same character as that found elsewhere in the vicinity. Masses of chert containing fossil sea-urchins and nummulites were observed near the cut.

Along the south bank of McIntosh Creek on the Pauper Farm, 1 mile south of Waynesboro, a few fragments of excellent limonite were seen. Small silicious pebbles containing magnetite occur in some quantity at this point. There were no indications of a commercial deposit.

In the Central of Georgia Railroad cut, 1 mile north of Waynesboro is an exposure of red residual soil containing a few limonite fragments of good grade. An analysis of a selected sample is given. The E. E. Chance property lies along the railroad at this point, and the ore is designated as coming from this land.

Analysis of Ore. Chance Property

Moisture at 100°C	.20
Loss on ignition	12.52
Soda (Na_2O)	.18
Potash (K_2O)	.46
Lime (CaO)	.00
Magnesia (MgO)	trace
Alumina (Al_2O_3)	6.00
Ferric oxide (Fe_2O_3)	71.38
Manganous oxide (MnO)	trace
Titanium dioxide (TiO_2)	.72
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.19
Silica (SiO_2)	8.26
Total	99.91
Metallic iron (Fe)	49.96
Sulphur (S)	.00
Phosphorus (P)	.08

At several points north and northeast of Waynesboro, small amounts of limonite ore may be found, but there is little promise of commercial deposits. Cuts along the railroads and public highways afford the best means for studying the occurrence of the ore. It is evident that the limonite is a weathering product of the sands or sandy limestones of the Claiborne formation.

RICHMOND COUNTY

Richmond County joins Burke County on the north, lying partly in the Crystalline area and partly in the Coastal Plain. A deposit of brown ore has been found in the southern part of the county which appears to be of considerable extent and of fair quality. The ore is associated with the sands of the Claiborne formation.

F. G. MERTON PROPERTY

The Merton property is 13 miles south of Augusta, near, and on the west side of the Augusta-Savannah highway. The topography at this point is somewhat hilly and the surface is mantled usually by a heavy bed of sand, which is well exposed in the road cuts.

The outcropping of iron ore on the Merton property is opposite the "13-mile" post on the highway. It is first noticed along the roadside where large masses of somewhat silicious limonite occur, together with crusts of black iron oxide. Several acres have these surface indications of brown ore. About 400 yards west of the road is a small hill or "knob", 200-300 feet in circumference, and about 40 feet high. This "knob", seems to be made up of a solid mass of limonite. The ore outcrops at the top of the hill in the form of large boulders, apparently weathered from the main mass. The slope is covered with a mantle of small fragments.

The better grade of ore has a spongy appearance, is dark red or black in color, and quite free from silica. Often it has a distinct pisolitic structure like bauxite ore. The poorer product is largely sand cemented by red iron oxide.

The ore was apparently formed from iron bearing solutions percolating through the sands. Small sand particles probably often served as nuclei about which the oxide was deposited, giving rise to the peculiar bauxite structure of some of the ore. The large "pots" so characteristic of brown ore are probably formed in the same general way as these little pellets.

The extent of this deposit on the Merton property is not definitely known as there is no evidence to show the depth to which it extends. Water for washing the ore can be obtained from a creek about half a mile to the north, which is approximately 250 feet below the ore outcropping. The nearest shipping point is McBean on the Central of Georgia Railroad about 6 miles to the south.

An analysis of the ore is given below. The rather high percentage of alumina is probably due to the presence of a small amount of clay, which often is seen in the interiors of the small pellets of ore and large geodes.

Analysis of Ore. Merton Property

Moisture at 100°C	2.60
Loss on ignition	10.60
Soda (Na_2O)	.60
Potash (K_2O)	.80
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	11.24
Ferric oxide (Fe_2O_3)	63.10
Manganous oxide (MnO)	trace
Titanium dioxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.58
Silica (SiO_2)	9.62
Total	99.50
Metallic iron (Fe)	44.17
Sulphur (S)	.00
Phosphorus (P)	.25

COLUMBIA COUNTY

Columbia County joins Richmond County on the northwest and is all underlain by Crystalline rocks with the exception of a narrow belt of Cretaceous sediments along the southwestern boundary. It is in the latter belt that the known deposits of brown ore occur. The formations consist mainly of clays and sands. The most promising outcrops of ore are in the vicinity of Grovetown on the Georgia Railroad.

MRS. L. A. PASCHAL PROPERTY

This property is about 2½ miles southwest of Grovetown in a hilly section. The ore occurs on an elevation locally known as the Iron Knob. This is a hill about 50 feet high with an area of about 100 acres. The slopes and broad summit of this hill are thickly mantled with ferruginous sandstone fragments and boulders, sometimes 2 feet in diameter. The boulders are frequently hollow, containing a pure white clay and crusted with black iron oxide. The greater part of the ore is low grade, being composed of sand grains cemented with the limonite.

A 22-foot prospect well sunk on the summit of the hill was reported to have been dug in solid ore. It is apparent that the deposit is a large one, however the quality of the ore seems in general too

low in metallic iron to be profitably worked. An analysis made for the owner of the property showed a metallic iron content of 36 per cent, and a sample collected by the writer analyzed 22.54.

Analyses of Ore. Paschal Property

CONSTITUENTS	1	2
Moisture at 100°C	.52	2.72
Loss on ignition	10.40	8.96
Soda (Na_2O)	.08	----------
Potash (K_2O)	.07	----------
Lime (CaO)	.00	.00
Magnesia (MgO)	.13	.10
Alumina (Al_2O_3)	25.91	21.24
Ferric oxide (Fe_2O_3)	32.20	40.31
Ferrous oxide (FeO)	----------	.12
Manganous oxide (MnO)	trace	.00
Titanium dioxide (TiO_2)	.96	1.08
Sulphur trioxide (SO_3)	trace	.08
Phosphorus pentoxide (P_2O_5)	.09	.17
Silica (SiO_2)	29.00	24.43
Total	99.36	99.21
Metallic iron (Fe)	22.54	28.27
Sulphur (S)	trace	.08
Phosphorus (P)	.03	.17
Copper (Co)	----------	.00

1. Sample of ore collected from Paschal property by the writer.
2. Ore from Iron Knob sent to office of Survey by H. S. Paschal of Harlem.

LEE WARD PROPERTY

The Ward property joins the Paschal property on the east. Surface ore in considerable abundance is found on several acres in a broad open field about the Ward residence. The ore is similar to that found on the Paschal property, but much of it is of better grade. Large "pots" with needle ore encrustations are commonly seen, together with small fragments with highly colored glazed surfaces. There has been no prospecting.

An analysis of the ore is given below. The sample, it will be noted, contained traces of nickel and cobalt.

Analysis of Ore. Ward Property

Moisture at 100°C	.62
Loss on ignition	7.38
Soda (Na_2O)	.22
Potash (K_2O)	.18
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	14.97
Ferric oxide (Fe_2O_3)	55.95
Manganous oxide (MnO)	.28
Titanium dioxide (TiO_2)	.90
Sulphur trioxide (SO_3)	.25
Phosphorus pentoxide (P_2O_5)	.08
Silica (SiO_2)	19.30
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	100.13
Less oxygen	.15
Total	99.98
Metallic iron (Fe)	39.19
Sulphur (S)	.10
Phosphorus (P)	.03

R. R. VALTON PROPERTY

This property lies about half a mile northeast of the Ward property, and on the opposite side of the broad valley. An outcropping of ferruginous sandstone and fair grade ore is seen here near the public road on the side of a hill at an altitude of about 150 feet above the general level of the valley. Large masses, often 3 feet or more in diameter and evidently once a part of a much larger body of ore, are exposed on the hillslope. The smaller fragments formed by weathering are scattered over an acre or more.

The ore is made up of small irregular quartz fragments or sand grains cemented by black and red iron oxide. A few brightly-colored crusts and fragments of hollow concretions occur, but most of the ore is very silicious. It could hardly be worked profitably at present.

It is said that the ore on the properties in this vicinity, especially the Paschal property, was used in a forge at Sweetwater during the Civil War. The ore containing much clay serves as a good paint, and is used locally for this purpose. It also makes an excellent surfacing for roads and it is thus quite extensively used along the main highways.

McDUFFIE COUNTY

McDuffie County is bound on the east by Columbia County, the southern portion of McDuffie County being covered by the Cretaceous sediments of the Coastal Plain, mostly sands and clays. These sediments have weathered and given rise to a large amount of iron ore float, which may be found practically all the way across the County along the line between the Coastal Plain formations and the older rocks of the Crystalline area. It is said that some of the ore was used during the Civil War in a forge at Sweetwater near Thomson, the county-seat. Undoubtedly the ore could be used in a furnace, though the silica content is rather high. At times considerable clay is mixed with the ore and when this occurs the ocherous material makes a fair paint. Much of the iron appears to be in the form of hematite which imparts a dark red color to the fragments. The ore is similar to that described above as occurring near Grovetown, Columbia County.

About 3 miles south of Deering, a station on the Georgia Railroad, is what is known as Iron Hill. This is a partially wooded hill sloping down to the public road with easy gradient. Its name is derived from the fact that a large quantity of iron ore fragments are scattered over its surface. Several tons may be picked up from the ground. Much of it is quite low grade, and suitable only for paint or road material. A short distance to the east of the hill are outcrops of granite beside the road and in the field. Evidently this is an "island" of crystalline rocks surrounded by the sediments of the Coastal Plain. A deposit of ore with any depth could not be expected. This granite occurs half a mile south of Deering where large boulders of the rock are seen along the road.

About 2 miles east of Harlem on the Atlanta-Augusta highway huge slabs of ferruginous sandstone occur. These slabs have been dug from the enclosing sands or clay during the construction of the road. They are made up of big and little grains of quartz cemented together by iron oxide. Also, pebbles a quarter of an inch in diameter have been made a part of ferruginous layers resembling a con-

glomerate in texture. All of the material contains too little iron to be of commercial value.

Considerable of this iron bearing material is found in the vicinity of Thomson. On Mrs. I. E. Farmer's property, 1 mile south of Thomson, several acres are characterized by the float and underlying stained clays. Several prospect wells have been dug, but little ore was found beneath the surface.

A sample of the float analyzed as follows:

Analysis of Ore. Farmer Property

Moisture at 100°C	.75
Loss on ignition	10.26
Soda (Na_2O)	trace
Potash (K_2O)	trace
Lime (CaO)	.38
Magnesia (MgO)	.00
Alumina (Al_2O_3)	26.56
Ferric oxide (Fe_2O_3)	35.50
Manganous oxide (MnO)	.52
Titanium dioxide (TiO)	.92
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.06
Silica (SiO_2)	25.44
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	100.39
Metallic iron (Fe)	28.45
Sulphur (S)	.00
Phosphorus (P)	.02

PART II.

FOSSIL ORES[1]

DISTRIBUTION

The fossil iron ores, or the so-called Clinton ores, occur in but four counties in Georgia. These counties, namely, Dade, Walker, Catoosa and Chattooga, are all situated in the extreme northwestern part of the state.

The first three counties enumerated are located along the Georgia-Tennessee line, only a few miles south of Chattanooga. Topographically speaking all of Dade and part of Walker lie in the Cumberland Plateau area and Catoosa and Chattooga in the Appalachian Valley area.

The ores of Dade County have a line of outcropping totalling nearly 50 miles in length. In Lookout Valley there are two exposures, extending approximately parallel with each other on opposite sides of the valley, the one along the eastern foothills of Lookout Mountain and the other along a minor ridge at the base of Sand Mountain. The total length of this line of outcroppings is about 40 miles. In Johnson's Crook are also two other parallel lines of ore outcroppings. The eastern one, approximately 7 miles in length, is along the base of Lookout Mountain, while the western one, about half as long, occurs at the base of Fox Mountain.

The fossil ores in Walker County form one continuous line of outcroppings, about 50 miles in length, with the exception of a fault break near Flintstone. This line extends from the Georgia-Tennessee boundary southwest along the base of Lookout Mountain to the head of McLamore Cove, where it turns sharply to the northeast, following the western foothills of Pigeon Mountain, to its north-

[1]. For a complete discussion of these ores, see Bull. 17, Geological Survey of Georgia, 1908. The information given here is largely a resume of this report

ern extremity. It again swings abruptly to the southwest and continues through the western part of both Walker and Chattooga Counties to the Alabama-Georgia line near Menlo. Other outcroppings in Chattooga County occur along Gaylor's and Taylor's ridges and Dirtseller Mountain.

The most eastern outcroppings of the fossil ores of importance are found along the slope of Taylor's Ridge. This ridge, known in Tennessee as White Oak Mountain, enters Georgia at a point a few miles north of Ringgold, and extends southeastward across Catoosa, Walker and Chattooga Counties, nearly to the Alabama-state line, a distance of about 50 miles. The ore beds occur along the eastern slope of the ridge practically throughout its entire length.

The total length of all the lines of outcroppings in the four counties is approximately 175 miles.

GEOLOGY AND MANNER OF OCCURRENCE

The fossil iron ores occur in stratified beds varying from a few inches to several feet in thickness, and are associated with the Rockwood formation. This formation which is the uppermost member of the Silurian, consists of sandstone and shales together with thin layers of limestone. The sandstones make up a considerable part of Chattoogata and Horn Mountains in Whitfield and Gordon Counties respectively, but are not well developed in association with the fossil ores, except along Taylor's Ridge. The ores are interbedded chiefly with shales, near the center of the formation.

The rocks of the region in which the fossil ores occur have been compressed into a series of parallel folds which often result in faults of some magnitude. It is characteristic that the ridges traversing the area are invariably synclinal and therefore the ore-beds all dip toward the axis of the ridge.

NATURE OF THE ORES

To a short depth below the surface the fossil ores weather and lose much of their calcium carbonate content, thereby becoming what is known commercially as soft ore. The remaining part of the beds

or the unweathered portion is termed hard ore. The latter as the name implies is hard and compact.

The ores consist chiefly of iron oxide in the form of small oolitic particles or of casts of fossils, made up largely of fragments of bryozoa and crinoid stems. These casts often form a large part of the ore.

ORIGIN

There have been two main theories of the origin of the fossil ores —the sedimentary theory and the replacement theory. The former supposes the iron to be an original constituent of the ore bed, being deposited along with the calcareous material, while the latter regards the iron of more recent origin, having been leached from the overlying shales, and subsequently deposited in the calcareous beds beneath by replacement. At the time the previous bulletin on the ores was issued by the Survey both of these theories had their supporters. However, in recent years microscopic investigations have tended to show that the sedimentary theory is the more plausible of the two. It is interesting to note the opinion of Lingren.[1] He regards the iron as having been deposited in shallow bays, in which coral reefs flourished. The detritus of older fossiliferous limestone was spread out over the floors of these bays and at times, also masses of fine wasted material rich in hematite, from the deep mantle of decayed rock of adjacent tropical land areas, was swept into them. The water discharged from the land contained ferrous bicarbonate. In this mud, agitated by the waves, numerous and complicated reactions were taking place. Calcite oolites and shales were replaced by siderite or iron carbonate which almost at once oxidized to hematite. In the deeper water glauconite was laid down probably and it may have been also largely altered to hematite. Lindgren in support of his theory, points out that today hematite mud is spread out over a large area of shallow coral reef on the south side of Molakai, Hawaiian Islands. Briefly, it seems probable that the deposits are of sedimentary origin, but not likely to have been

1. Lindgren, W., Mineral Deposits, 1st. edition, 1913, p. 250.

laid down by one process solely. It is reasonable to believe that the iron resulted in part from the alteration of glauconite and in part from the oxidation of the carbonate, brought from the rocks of the ancient land surface.

PRODUCTION

Hematite has never been exploited on a very large scale in Georgia. While the furnaces were active in the State, a considerable tonnage was produced, but the industry has by no means been fully developed. The peak of production was reached in 1903, when 124,648 tons of ore were mined. Since that time there has been a gradual falling off in the production. The decline was rather sharp up to 1912 when all furnaces closed down, but in 1913 the industry again picked up. It fluctuated thereafter, with a low mark of 11,836 tons in 1915 and 114,720 tons in 1918. In 1922 the amount of hematite mined was too small to permit of publication of the figures, as there were less than three producers. At present most of the ore is used for paint, with a small tonnage going to furnaces in Tennessee and Alabama. Operations are confined chiefly to the east side of Taylor's Ridge in Walker and Chattooga counties, and to the mines at Estelle, Walker County. A few small strippings are being made in Walker County near Cooper Heights and Cassandra. The description of individual deposits which follow, is limited to those workings opened up since the issuing of Bulletin No. 17, Fossil Iron Ores of Georgia.

The table below shows the production of fossil ore from 1893 to 1922:

Production of Fossil Iron Ore. 1893-1922

Year	tons	Year	tons
1893	38,012a	1911	18,445
1900	35,844a	1912	134,637
1901	215,599b	1913	59,076
1902	117,812a	1914	11,836
1903	124,648	1915	16,505
1905	45,408a	1916	110,647
1906	105,606	1917	101,895
1907	106,885	1918	114,720
1908	1,248	1919	
1909	9,521	1920	38,794
1910	60,324	1921	1,009
		1922	221,260c

a. Georgia and North Carolina.
b. Georgia and North Carolina and South Carolina. Total.
c. Hematite and limonite.

DESCRIPTION OF INDIVIDUAL DEPOSITS

WALKER COUNTY

SHACKELTON AND HARDY PROPERTY

Shackelton and Hardy of Rome, own about 80 lots on Taylor's Ridge, which extend from High Point in Chattooga County across Walker County and for about 4 miles into Whitfield County. All of these lots are said to have red ore in varying quantities. At the present time mining is being carried on near LaFayette, Walker County and Gore, Chattooga County.

Lots 33 and 39, 26 dist.—These two adjoining lots are located 6 miles east of LaFayette near the LaFayette-Villanow public road. The ore has been mined by stripping in two places, one on lot 39 and the other on lot 33. Both workings are on the east side of the ridge, near its summit, and about 1 mile northeast of the public road. The operations are being carried on by Tate and Evans of LaFayette who leased the property in the early part of 1923.

The stripping on lot 33 was a small one at the time of the writer's examination, the ore-bed having been exposed for about 100 feet along its strike (N.30°E.) and 25 feet down the dip (S.21°E.) The overburden consisted of about 6 feet of clay inclosing thin layers

of sandstone. It becomes much too thick for economic mining farther down the dip. The ore-bed averages about 14 inches in thickness, but it is about 3 feet in thickness in places. The ore is very hard, low in phosphorus, and high in iron content. It is easily broken up into blocks with crow-bars and picks. Five teams were hauling it to LaFayette for shipment to Rock Run, Ala.

The ore from lot 39 was taken from a stripping about half a mile south of the one on lot 33. This is a more extensive working of the same ore-bed.

The chief drawbacks to economic mining on these lots are the distance from a railroad and the rather heavy overburden. Ore from lot 33 analyzed as follows:

Analysis of Red Ore. Peters Property

Moisture at 100°C	.30
Loss on ignition	4.64
Soda (Na_2O)	trace
Potash (K_2O)	trace
Lime (CaO)	.00
Magnesia (MgO)	trace
Alumina (Al_2O_3)	7.38
Ferric oxide (Fe_2O_3)	77.18
Ferrous oxide (FeO)	
Manganous oxide (MnO)	.18
Titanium dioxide (TiO)	.36
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.34
Carbon dioxide (Co_2)	
Silica (SiO_2)	9.76
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	100.14
Metallic iron (Fe)	54.03
Sulphur (S)	.00
Phosphorus (P)	.15

J. M. LEATH PROPERTY

This property, lot 122, 11th dist., is located half a mile west of Cooper Heights. It was formerly known as the Broom property and some mining was done upon it years ago. A tramway connected the workings with the Tennessee, Alabama and Georgia Railroad at Cooper Heights.

In 1922 Tate and Evans of LaFayette sunk a shaft near the public road along the dip of the ore-bed to a depth of about 100 feet.

The ore-bed dips 20 degrees to the west and varies from 2 feet to 3 feet in thickness. A hand hoist was used in getting the ore from the incline. An analysis of the ore shows it to have an uncommonly high percentage of lime.

Sample of Ore. Leath Property

Moisture at 100°C	.36
Loss on ignition	22.16
Soda (Na_2O)	.32
Potash (K_2O)	.31
Lime (CaO)	24.80
Magnesia (MgO)	1.00
Alumina (Al_2O_3)	5.54
Ferric oxide (Fe_2O_3)	42.26
Ferrous oxide (FeO)	
Manganous oxide (MnO)	.32
Titanium dioxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.14
Phosphorus pentoxide (P_2O_5)	.04
Silica (SiO_2)	2.16
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	99.77
Metallic iron (Fe)	29.58
Sulphur (S)	.06
Phosphorus (P)	.02

CHARLES WATSON PROPERTY

This property, lot 42, 7th dist. is located about 3 miles west of LaFayette on the LaFayette-Estelle public road. The ore-bed has been worked at intervals in a small open-cut beside the road. It averages about 18 inches in thickness and is quite free from shaly partings. The ore is used for paint.

THOMAS COULTER PROPERTY

Tate and Evans have also worked the ore on this property, lot 204, 11th dist., located half a mile west of Cassandra. The ore-bed exposed by strippings, ranges from 10 inches to about 3½ feet in thickness and dips to the southwest at an angle of 51 degrees. The ore is shipped to the Lookout Paint Company, Chattanooga. It brings $2.50 to $3.00 per ton. About one car a week was being shipped at the time of the writer's examination in June, 1923.

In addition to these prospects the mines at Estelle, now owned by the Chattanooga Iron and Coal Company, are producing a small

amount of ore for use in the paint industry. It is reported that operations on a large scale are soon to be resumed.

CHATTOOGA COUNTY

SHACKELTON AND HARDY PROPERTY

This property, consisting of lots 110, 111, 105, 5th dist., 4th sec., is about 5 miles southwest of Gore on the east slope of Taylor's Ridge. Tate and Evans of LaFayette have leased the property and have done considerable mining on each of the lots. The ore bed is the same one worked by Tate and Evans on Taylor's Ridge in Walker County. It averages about 18 inches in thickness, and has about 6 feet of clay overburden. The ore bed, as exposed by the stripping, strikes N.30°E. and dips S.16°E. At the time of the writer's visit five cars of ore per week were being shipped to Rock Run, Ala.

The Rome and Northern railroad which extends from Rome to Gore is now in the hands of a receiver, and is in poor physical condition for traffic. Before mining to any extent can be carried on it will be necessary to put the railroad in proper shape. If this is done it will materially improve the mining industry in this section.

L. S. COLYAR PROPERTY

The L. S. Colyar property, lot 109, 5th district, Chattooga County, is located on the west slope of Taylor's Ridge, about two and a half miles east of Summerville. Typical fossil iron ore was discovered here last summer, well up on the side of the ridge at a point several hundred feet stratigraphically below the outcroppings of the same ore-bed on the east side of the ridge. The abnormal position of the ore at this point is accounted for by what may be termed a land slide, that is, the rocks from the top of the ridge have in time become detached and, impelled by gravity, have been moved downward to their present resting place.

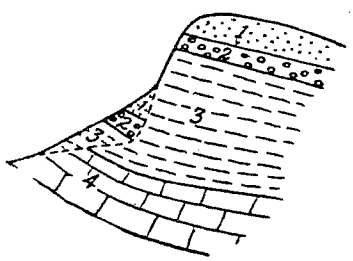


Fig. 7. Showing slumping of fossil iron ore bed.
1. Sandstone and shale above iron ore.
2. Fossil iron ore bed.
3. Sandstone and shale below iron.
4. Chickamauga limestone.

This explanation of the position of the ore would indicate that the deposit is

quite local and would be expected to extend only a short distance into the ridge. At the time of the writer's visit only two of the shallow excavations were made and only a small amount of the ore was to be seen. Judging from the size of the individual fragments the bed is thin, not more than a foot or 18 inches in thickness. The ore is what is known as a soft ore and as shown by the following analysis is of a fair grade:

Analysis of Ore. L. S. Colyar Property

Metallic iron (Fe)	51.40
Titanium dioxide (TiO_2)	.36
Sulphur (S)	.00
Phosphorus (P)	.12
Silica (SiO_2)	13.34

Another analysis furnished by Mr. Colyar gives the following results:

Analysis of Ore. L. S. Colyar Property

Metallic iron (Fe)	55.70
Silica (SiO_2)	10.50
Alumina (Al_2O_3)	3.50
Phosphorus (P)	.30

For a more complete description of the iron ores of Chattooga County see Bulletin No. 17, published by the State Geological Survey.

CATOOSA COUNTY

T. S. EMERSON PROPERTY

This property, lots 157 and 168, 28th dist., 3d. sec., is located on the east slope of White Oak Mountain, about 1¼ miles from Ringgold on the Dalton-Ringgold public road. About a quarter of a mile north of the road and a short distance from a branch flowing southward to Chickamauga Creek, there is a pile of ore taken from a small open-cut, now almost completely obscured. The ore is soft and carries considerable silica. No exposure of the ore-bed is to be seen.

Analysis of Red Ore. Emerson Property

Moisture at 100°C	.76
Loss on ignition	3.60
Soda (Na_2O)	.43
Potash (K_2O)	.32
Lime (CaO)	.00
Magnesia (MgO)	.00
Alumina (Al_2O_3)	4.05
Ferric oxide (Fe_2O_3)	77.03
Ferrous oxide (FeO)	
Manganous oxide (MnO)	1.36
Titanium dioxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.74
Carbon dioxide (Co_2)	
Silica (SiO_2)	11.36
Copper (Co)	trace
Total	100.01
Metallic iron (Fe)	51.92
Sulphur (S)	
Phosphorus (P)	0.32

KITTLE AND CLARK PROPERTY

J. P. Kittle and J. H. Clark of Ringgold own this property, lot 204, 28th dist., located immediately south of the Emerson property. This lot, together with lots 157 and 168 mentioned above, formerly belonged to the Georgia Mineral Company. In 1911 the company opened up the ore-bed on lot 204 by tunneling at the base of the eastern slope of Taylor's Ridge, a quarter of a mile south of the railroad bridge over Chickamauga Creek. The ore-bed is not completely exposed, but it is said to have been 18 inches thick. It dips slightly to the southeast and strikes about N15°E. It occurs in sandy shale. The old tunnel is now inaccessible.

A sample of the ore piled up in front of the tunnel analyzed as follows:

Analysis of Red Ore. Kittle and Clark Property

Moisture at 100°C	.02
Loss on ignition	15.40
Soda (Na_2O)	.09
Potash (K_2O)	.22
Lime (CaO)	10.00
Magnesia (MgO)	4.00
Alumina (Al_2O_3)	3.12
Ferric oxide (Fe_2O_3)	58.20
Ferrous oxide (FeO)	
Manganous oxide (MnO)	1.64
Titanium dioxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.43
Phosphorus pentoxide (P_2O_5)	1.00
Silica (SiO_2)	5.60
Cobalt (Co)	trace
Nickel (Ni)	trace
Total	100.08
Metallic iron (Fe)	40.74
Sulphur (S)	.17
Phosphorus (P)	.44

PART III.

MAGNETITE ORES

GENERAL STATEMENT

The magnetite iron ores of Georgia are confined to the crystalline rocks which cover a large area in the northern and central part of the State. No mining of these ores so far has been attempted and but little prospecting has been done. As a matter of fact, with the data now at hand it is not at all certain that these ores really occur in commercial quantities.

Magnetite is widely distributed as an accessory mineral in both the igneous and metamorphic rocks of Georgia. The mineral is especially common in the basic igneous rocks which are rocks of low silica content, such as diorites. The class of rock here referred to is quite abundant in Cobb County as well as in many of the other counties of the northern part of the State. Near the contact of these rocks with the granites and gneisses as well as within the diorites themselves, are often to be found segregations of magnetite usually in the form of veins or irregular ore-bodies of limited extent. The resistance to weathering of the magnetite often gives rise to low elevations whose slopes are strewn with fragments of float ore, the abundance of which is frequently all out of proportion to the actual size of the vein itself.

In addition to the occurrence of magnetite with basic rock, as above referred to, it is also sometimes found associated with a silicious rock, apparently metamorphic sandstone or quartzite. The ores in the Draketown district in Paulding County are associated with rocks of this character.

ORIGIN

According to modern views magnetite ores originated from deep-seated, molten magmas of homogeneous composition. The mag-

mas, intruded into the overlying rocks, cooled and separated into chemically unlike portions,[1] a process probably generally caused, by fractional crystallization.[2] Liquidation, influence of mineralizers, assimilation of wall-rock and pressure during consolidation are also undoubtedly of importance.[2] Petrographic studies tend to strengthen the belief that for each region there is one essentially homogeneous magma from which the various types of rocks are derived by some process of differentiation. It is the general opinion, that the primary magma was of intermediate composition and has been separated into basic and acidic forms, like basalts or rhyolites.[3]

These "parent" magmas also give off aqueo-igneous material or vapors which may enrich earlier magnetite segregations or replace the intruded rock. The latter is well illustrated in the case of quartzites. The silica of the quartzite is dissolved away and crystals and grains of magnetite take its place, often forming several inches in thickness. The mineral may likewise be scattered throughout the rock at some distance from the contact.

According to F. W. Clarke the average iron content of all igneous rocks is 4.46 per cent. Consequently it might be expected that magmatic concentrations of magnetite would be abundant, but such is not the case.[4] During the consolidation of the rocks, some of the iron crystallizes out in the form of magnetite, but the more general tendency is to form ferromagnesian silicates, because of the considerable amount of silica present in the magma. Magnetite deposits of magmatic origin have proved of commercial importance only when associated with syenite, syenite-porphyries and keratophyres, and then the magnetite probably crystallized later than the ferromagnesian silicates and the feldspars.

As a secondary product magnetite is formed by the dehydration, deoxydation and metamorphism of limonite and hematite. It is often found in considerable quantities as a result of this alteration. On several properties along the Chattahoochee Iron Lead northwest

1. Iddings, J. P.
2. Clark. F. W., Geo. Chemistry, 1911, p. 298.
3. Lindgren W., Mineral Deposits, 1st. edition, p. 739.
4. Lindgren, W., op. Cit.

of Canton, Cherokee County, considerable magnetite is present, mixed with limonite. Part of it is probably altered limonite and part the original material deposited in the schist from aqueo-igneous solutions or vapors emanating from deep-seated sources.

TITANIFEROUS MAGNETITE ORES

Analyses of the magnetite ores of Georgia show them to carry, in most cases, a considerable quantity of titanium. The study of the possibility of the utilization of the titaniferous magnetites has been an interesting one for many years and the literature is voluminous. It has been definitely proved that the ores can be directly smelted successfully and commercially for the production of pig iron, but blast furnace operators are prejudiced generally against titaniferous ores. Magnetic concentration of the ore has been attempted but on the whole the results were disappointing. Certain types of the ore are very amenable to magnetic separation and yield concentrates requiring the admixture of only a small proportion of non-titaniferous ore for furnace use. There are other types in which the percentage of titanium separable in this way is extremely small, so that before the ores may be used a process must be discovered to make their use feasible.

A study of the micro-structure of the ores clearly reveals the cause of the difference in behavior of the ores toward magnetic separation.[1] The titanium occurs in these ores in the form of ilmenite grains of about the same size as the magnetite grains, as ilmenite inclusions and intergrowths of microscopic size in the magnetite, and as an integral part of the magnetite molecule itself. The titanium occurring as ilmenite grains is readily separable by magnetic concentration, except in the finest grained ores with which the degree of crushing required would make such concentration impracticable. The titanium occurring in the last named forms cannot be separated mechanically. Therefore, a metallographic study of the ores of a deposit must be made before their amenability to magnetic separation can be determined.

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1. Singewald, Jr., J. T., The titaniferous iron ores in the United States, their composition and economic value. U. S. Bureau of Mines Bull. 64, 1913.

The utilization of the ores on a large scale is likely to be only a question of time, however, because of the importance of titanium in the iron and steel industry. In past years the principal source of titanium was rutile (TiO_2), but the known workable deposits of that mineral are few and widely scattered. Hence, it has been necessary, for some uses, to turn to ilmenite ($FeTiO_3$), and highly titaniferous magnetite.

The non-titaniferous magnetites are mined quite extensively in some localities, but the production is far from being as great as that of the other iron ores. In 1922 the magnetic concentration of the ores of the eastern part of the Mesabi Range in Minnesota was begun. A high grade concentrate is obtained and operations are so far very successful.

DESCRIPTION OF INDIVIDUAL DEPOSITS

COBB COUNTY

The locality which seems to give the most promise of having commercial deposits of magnetite is an irregular belt about 8 miles long and approximately 1 mile wide, extending roughly from Marietta, Cobb County, northward to Woodstock, Cherokee County. The country rock is a diorite of Archean age, and the magnetite is apparently a differentiation product of the dioritic magma.

There is a large amount of surface ore on some of the properties. However, because of the extreme resistance to weathering, the float from a small vein is often sufficient to cover a considerable area.

MRS. W. L. DEAN PROPERTY

This property, lot 1282, 15 dist., Cherokee County, is located 2 miles southeast of Woodstock and half a mile east of the Louisville and Nashville Railroad. A very good grade of magnetite ore occurring as fragments ranging in size from 3 inches in diameter down to small pebbles forms a rather thick mantle on several acres of ground. No prospecting has ever been done. The property is well located for working, being but a short distance from the railroad and a creek, furnishing an ample supply of water for washing

the ore. An analysis of an average sample of this surface ore gave the following results:

Analysis of Magnetite Ore. Dean Property

Moisture at 100°C	.18
Soda (Na_2O)	.34
Potash (K_2O)	.22
Lime (CaO)	trace
Magnesia (MgO)	.22
Alumina (Al_2O_3)	6.04
Ferric oxide (Fe_2O_3)	64.72
Ferrous oxide (FeO)	24.52
Manganous oxide (MnO)	.72
Titanium dioxide (TiO_2)	.44
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.07
Silica (SiO_2)	2.44
Nickel (Ni)	trace
Cobalt (Co)	trace
Total	99.91
Metallic iron (Fe)	64.37
Sulphur (S)	.00
Phosphorus (P)	.03

J. M. DAWSON PROPERTY

This property, lot 15, 16th dist., joins the Dean lot, above described, on the south. The same type of ore is thickly strewn over a considerable area. Several tons of good ore could be picked up from the surface. An analysis of the ore is given below:

Analysis of Magnetite Ore. Dawson Property

Moisture at 100°C	.02
Soda (Na_2O)	.52
Potash (K_2O)	.12
Lime (CaO)	.08
Magnesia (MgO)	.12
Alumina (Al_2O_3)	3.72
Ferric oxide (Fe_2O_3)	66.39
Ferrous oxide (FeO)	22.00
Manganous oxide (MnO)	.85
Titanium dioxide (TiO_2)	4.85
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.02
Silica (SiO_2)	.72
Nickel oxide (NiO)	.44
Cobalt oxide (CoO)	trace
Total	99.85
Metallic iron (Fe)	63.58
Sulphur (S)	.00
Phosphorus (P)	.01
Titanium (Ti)	2.92

JOHN B. KNIGHT PROPERTY

This property is located about 2½ miles north of Blackwell and half a mile east of the Louisville and Nashville Railroad. The most promising show of ore in the belt occurs on this lot. Several acres on the top and slopes of a low ridge have a thick mantle of magnetite fragments 3 inches or more in diameter. Quartz and diorite fragments are also rather abundant. The property is well located for economic mining both with regard to railroad facilities and water supply.

An average sample of the ore gave the following analysis:

Analysis of Magnetite Ore. Knight Property

Moisture at 100°C	.02
Soda (Na_2O)	.20
Potash (K_2O)	.12
Lime (CaO)	.08
Magnesia (MgO)	.06
Alumina (Al_2O_3)	1.65
Ferric oxide (Fe_2O_3)	60.30
Ferrous oxide (FeO)	29.73
Manganous oxide (MnO)	.57
Titanium dioxide (TiO_2)	5.44
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.02
Silica (SiO_2)	1.88
Nickel (Ni)	trace
Cobalt (Co)	trace
Total	100.07
Metallic iron (Fe)	65.31
Phosphorus (P)	.01
Titanium (Ti)	3.26

J. W. GUNNIN JR. PROPERTY

This property lies 1½ miles north of Blackwell near the Louisville and Nashville Railroad. Two test wells 8 feet deep and 4 feet in diameter were recently dug on the brow of a hill near the Gunnin residence 100 yards east of the railroad. Nothing in the nature of ore was revealed. On the west side of the same hill there is a small amount of pebble ore scattered over the ground. These small fragments carry some magnetite, but are largely silica.

J. P. ROGERS PROPERTY

This property is located 1 mile south of Blackwell on the Canton-Marietta public road. A good grade of float ore occurs beside the

road, but it is not very plentiful. The property is favorably located for working but further prospecting is necessary to determine the extent of the ore.

A. D. KEMP PROPERTY

The Kemp property is located 2½ miles northeast of Marietta. On the north side of a low ridge near the Kemp home there is a large amount of float ore consisting of small magnetic pebbles and large fragments 6 inches in diameter, which is spread over an area of approximately 2 acres. No openings have been made to ascertain the quantity of ore. The property is about three quarters of a mile from the railroad and near a small branch.

The following analyses indicate the nature of the ore on the Kemp property.

Analyses of Magnetic Ore. Kemp Property

CONSTITUENTS	1	2	3
Moisture at 100°C	.02	.06	----------
Soda (Na_2O)	.08	.10	----------
Potash (K_2O)	trace	.14	----------
Lime (CaO)	.12	.08	----------
Magnesia (MgO)	.48	.42	----------
Alumina (Al_2O_3)	.80	2.00	----------
Ferric oxide (Fe_2O_3)	43.34	71.34	40.13
Ferrous oxide (FeO)	25.29	19.68	7.09
Manganous oxide (MnO)	.54	.62	----------
Titanium dioxide (TiO_2)	26.46	4.60	11.56
Sulphur trioxide (SO_3)	.00	.00	----------
Phosphorus pentoxide (P_2O_5)	.12	.06	----------
Silica (SiO_2)	2.52	.86	31.72
Nickel (Ni)	trace	trace	----------
Cobalt (Co)	trace	trace	----------
Total	99.77	99.96	----------
Metallic iron (Fe)	50.09	67.43	41.38
Sulphur (S)	.00	.00	----------
Phosphorus (P)	.052	.026	----------
Titanium (Ti)	15.87	2.76	6.93

1. Average sample of massive, magnetic ore.
2. Magnetic pebble-ore.
3. Fine, wash material collected from road ditch.

GREENE COUNTY

JUDGE JOHN C. HART PROPERTY[1]

This property, containing 1150 acres, is located in Greene County, near the Taliaferro County line, about 2½ miles north of Robinson. It was worked in 1917, first by Judge Hart and later by the Georgia Manganese Company of Birmingham. The ore was taken from two shafts each about 80 feet deep, located side by side but a short distance from the public road. Two short drifts were driven from the bottom of these shafts. The hoisting apparatus consisting of a small boiler and engine is still to be seen at the head of the shafts, which are now inaccessible.

The ore occurs in mica schist in two parallel, bedded "veins", striking N.62°E. and dipping steeply to the northwest. The main "vein" can be traced more than half a mile by broken outcrops. The total thickness of the ore-body is 3 feet. It has been revealed a second time in a small open-cut, located a short distance southeast of the shafts and beside the public road. This opencut is now caved in and the true thickness of the ore-body could not be determined.

Besides the ore exposed in these excavations there is a large amount of good float ore spread over a considerable acreage in the vicinity. It is intimately mixed with feldspar, quartz and schist fragments.

There is about a carload of ore on the dump at the head of the shafts. The ore is massive and made up chiefly of magnetite and manganese, with pyroxenite, mica, quartz and garnet as constituents. Some samples of the ore run high in iron and low in manganese, while others are low in iron and high in manganese. The manganese apparently originated from the garnet.

The nearest shipping point is Robinson on the Georgia railroad.

The following analyses show the character of the ore.

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1. The property was worked primarily for manganese and a more detailed discussion is to be found in Bulletin 35, Manganese Deposits of Georgia.

Analyses of Magnetite Ores. John C. Hart Property

CONSTITUENTS	1	2	3	4	5
Moisture at 100°C	1.00				
Loss on ignition	3.82				
Soda (Na_2O)	.82				
Potash (K_2O)	1.76				
Lime (CaO)	3.66				
Magnesia (MgO)	trace				
Alumina (Al_2O_3)	16.48				
Ferric oxide (Fe_2O_3)	9.08		86.51	79.35	41.83
Ferrous oxide (FeO)					
Manganous oxide (MnO)	36.00	0.52	0.76	2.46	14.34
Titanium dioxide (TiO_2)	.92				
Sulphur trioxide (SO_3)	.00				
Phosphorus pentoxide (P_2O_5)	trace		trace		
Silica (SiO_2)	26.38	7.50	3.80	11.65	37.45
Cobalt (Co)	trace				
Nickel (Ni)	trace				
Total	99.92				
Metallic iron (Fe)	6.39	61.88	62.60	55.55	29.28
Manganese (Mn)	27.89	.33	.48	1.91	11.10
Sulphur (S)	.00	.05		.08	.04
Phosphorus (P)		.06		.10	.16

1. RH-106. Average sample of ore from dump-pile.
2, 3, 4, 5. Ore samples collected by S. W. McCallie, State Geologist.

TALIAFERRO COUNTY

W. H. MURDEN PROPERTY

The Murden property is situated about 1 mile north of Robinson. The ore found on this property is apparently on the same ore "lead" as the Hart property. There is seen here a small open cut from which a carload of ore was shipped to Birmingham some years ago. Considerable float occurs on the surface, but its areal extent is limited.

The property is well located for working, but it should be thoroughly prospected before any further mining is attempted. The Georgia Railroad has offered to build a spur track to the property, provided the ore is found in commercial quantity.

Sample of Ore. Murden Property

Moisture at 100°C	.98
Loss on ignition	12.04
Soda (Na_2O)	1.14
Potash (K_2O)	.73
Lime (CaO)	.00
Magnesia (MgO)	.12
Alumina (Al_2O_3)	13.11
Ferric oxide (Fe_2O_3)	15.14
Ferrous oxide (FeO)	
Manganous oxide (MnO)	53.92
Titanium oxide (TiO_2)	.36
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.19
Carbon dioxide (CO_2)	
Silica (SiO_2)	1.80
Cobalt oxide (CoO)	trace
Nickel oxide (NiO)	.12
Total	99.65
Metallic iron (Fe)	10.60
Sulphur (S)	.00
Phosphorus (P)	.08
Manganese (Mn)	38.84

LUMPKIN COUNTY

WATER POWER AND MINING COMPANY PROPERTY

This property, lot 682, 12th district, 1st. section, formerly owned by the Dahlonega Consolidated Gold Mining Company, is about 3 miles west of Dahlonega near the Dahlonega-Ellijay public road. Some prospecting for magnetite has been done on the property on the north side of the road. A pit about 6 feet deep has been sunk along the dip of the country rock. The magnetic formation is apparently 5 feet in thickness and composed of weathered, yellowish-gray, foliated schist, and quartzite. The magnetite occurs as fine, irregular grains scattered and layered in the formation. It is more abundant in the quartzite than in the schist. It is doubtful if the deposit is of commercial importance.

The "lead" continues about S.60°W. from the prospect described above. For several hundred yards, fragments of magnetic quartzite are scattered over the ground. About 150 yards southwest of the first described prospect, on a westward sloping, wooded hillside, ore of the same nature has been exposed in a pit 10 feet wide and 30 feet long, pitching about 50 degrees to the southeast. It is partly

filled with debris and of unknown depth. The ore body appears to be in the form of a "shoot", 6 to 8 feet thick and 20 feet wide. It pitches to the southeast at an angle of about 40 degrees. The quartzite carries besides magnetite fine, specular flakes of hematite.

The lead may be traced farther to the southwest across the hills, but the float is not at all plentiful and generally is in the form of fragments of limonite, probably altered from magnetite. It is not apparent that a commercial body of ore occurs.

Analyses of the ore by N. P. Pratt, Atlanta, were as follows:

Analyses of Magnetic Ore. Consolidated Gold Mining Company Prop.

CONSTITUENTS	1	2
Iron oxide { (Fe_2O_3) (FeO) }	98.71	95.42
Metallic iron (Fe)	69.10	69.08
Silica (SiO_2)	1.01	4.25
Phosphorus (P)	.00	.00
Sulphur (S)	.00	.00
Titanic acid	.00	.00

In addition to the magnetite prospect here referred to there are others in the County but they are apparently of little commercial promise owing to the smallness of the individual deposits and distance from transportation. Magnetic schists are known which carry considerable magnetite but it is doubted whether they would prove of economic importance unless a more efficient method of electric separation could be devised.

DAWSON COUNTY

Magnetic iron ore is known to occur on lot 97, 4th dist., formerly belonging to Sam Howard. A sample of the ore, collected some years ago, showed the following analysis:

Analysis of Magnetic Ore. Sam Howard Property

Moisture at 100°C	.28
Loss on ignition	.98
Ferric oxide (Fe_2O_3)	64.31
Ferrous oxide (FeO)	11.40
Manganous oxide (MnO)	8.23
Alumina (Al_2O_3)	4.52
Lime (CaO)	.34
Magnesia (MgO)	.50
Titanium dioxide (TiO_2)	.13
Sulphur trioxide (SO_3)	.05
Phosphorus pentoxide (P_2O_5)	.22
Silica (SiO_2)	9.01
Total	99.97
Metallic iron (Fe)	53.88
Sulphur (S)	.02
Phosphorus (P)	.09

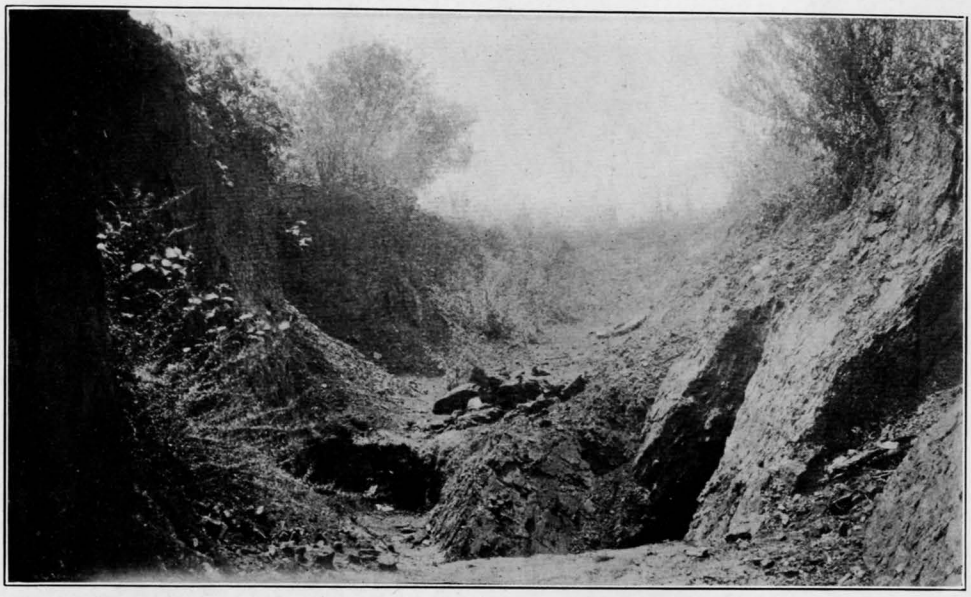
GILMER COUNTY

W. H. SEARCY PROPERTY

This property, lot 215, 7th dist., 2d. sec., is located a quarter of a mile south of Cherrylog on the Louisville and Nashville Railroad. Magnetic schist outcrops near the south line of the lot, 200 yards west of the railroad on a hillslope at an elevation of about 150 feet above the level of the track. The outcropping is indefinite, but the strike of the formation is about N10°E. and the dip S53°E. The thickness of the formation could not be determined. A sample collected by the writer gave this analysis:

Analysis of Magnetic Schist. Searcy Property

Moisture at 100°C	1.62
Loss on ignition	1.82
Soda (Na_2O)	.87
Potash (K_2O)	1.51
Lime (CaO)	.64
Magnesia (MgO)	.12
Alumina (Al_2O_3)	6.00
Ferric oxide (Fe_2O_3)	50.11
Ferrous oxide (FeO)	13.60
Manganous oxide (MnO)	.48
Titanium dioxide (TiO_2)	.72
Sulphur trioxide (SO_3)	.00
Phosphorus pentoxide (P_2O_5)	.99
Silica (SiO_2)	21.66
Nickel (Ni)	trace
Cobalt (Co)	trace
Total	100.14
Metallic iron (Fe)	45.66
Sulphur (S)	.00
Phosphorus (P)	.29



A. GOSSAN IRON ORE VEIN, KING PROPERTY NEAR DRAKETOWN, HARALSON COUNTY.

B. EXPOSURE OF BROWN ORE ON COLUMBUS-RICHLAND ROAD NEAR RICHLAND, STEWART COUNTY.

CHEROKEE COUNTY

MRS. FANNY HUTCHERSON PROPERTY

This property is owned by Mrs. Fanny Hutcherson of Atlanta and is located on lot 202, 14th dist., 2d. sec., 1 mile east of Canton on the Canton-Creighton public road. Magnetic schist occurs here on two round topped hills, one on the east and the other on the west side of the road. The associated rocks are hornblend schists, gneisses and garnetiferous mica schists. The general strike is northeast and dip southeast. The surface of both hills is covered by a red soil that contains many fragments of magnetic schist and quartzitic rock.

The following section from Town Creek bridge northward to the Canton-Creighton road, made by J. P. D. Hull, former Assistant State Geologist, gives a general idea of the different formations associated with the magnetic schist:

0′—Town Creek bridge.
225′—Bottom land in cultivation to foot of hill.
235′—Ten feet of weathered, rusty-yellow, conglomerate, quartzose schist.
275′—Decomposed, rusty yellow formation with limonite layers a fraction of an inch thick, representing replacement of mica schist. A spring is located on east side of road at this point.
290′—Light-gray, quartzose matrix rock with green balded crystals of hornblende.
310′—Mica schist with quartz lenses up to one foot in thickness.
370′—Dark, somewhat carbonaceous foliated mica schist with quartz lenses. Contains pyrite, probably representing the northeast lead from the Canton "copper" mine, 1 mile to the southwest.
440′—Quartz schist with garnets and hornblende and mica particles.
520′—Bluish-gray mica schist with garnets and carbonaceous phases.
Traces of pyrite.
660′—Concealed.
680′—Rusty, decomposed schist with band of dark, magnetic schist five feet thick in center.

820′—Partly concealed. Partly decomposed, rusty-yellow schist, a representative of hornblende schist. Partly magnetic.
880′—Magnetic, finely-banded schist, much weathered and decomposed.
910′—Hornblende gneiss (?).
1080′—Concealed.
1085′—Magnetic schist, decomposed and finely banded.
1580′—Concealed.
2000′—Foliated, garnetiferous mica schist with many quartz lenses and veins.
Canton-Creighton road.

A sample of the magnetic schist analyzed as follows:

Analysis of Magnetic Schist. Hutcherson Property

Moisture at 100°C	.94
Loss on ignition	2.63
Manganous oxide (MnO)	.32
Titanium dioxide (TiO_2)	1.92
Silica (SiO_2)	41.51
Metallic iron (Fe)	23.04
Sulphur (S)	.03
Phosphorus (P)	.06

GEORGE W. EVANS PROPERTY

This property, lot 56, 22d. dist., 2d. sec., is located 7½ miles west of Canton on the old Canton-Cartersville pike. Black, shiny mineral particles, originating in the garnet schist of the Gilmer formation, have accumulated in considerable quantity in road ditches. They analyze as follows:

Analysis of Magnetic Particles. Evans Property

Moisture at 100°C	.06
Loss on ignition	increase
Sulphur trioxide (SO_3)	.40
Magnesia (MgO)	.00
Ferric oxide (Fe_2O_3)	37.66
Ferrous oxide (FeO)	35.02
Manganous oxide (MnO)	trace
Titanium dioxide (TiO_2)	23.16
Silica (SiO_2)	3.98
Total	100.28
Metallic iron (Fe)	53.60
Sulphur (S)	.16

PAULDING AND HARALSON COUNTIES

DRAKETOWN DISTRICT

Magnetite occurs here in association with manganese and pyrite. The manganese exists partly as the oxide in a banded sandstone or quartzite, and partly as manganiferous-bearing magnetite, which forms a considerable percentage of the rock in places. Concentration of the manganese, along with the iron has taken place near the margin of the quartzite in contact with mica schist. The quartzite outcrops in two "leads" locally known as the "east vein" and "west vein" about 1½ miles apart The magnetite occurs as small grains and crystals in the quartzite, arranged along the bands of varying thickness and purity. Such types of ore are found on the Douglass property, lot 981, 19th dist., Haralson County.

The association of pyrite and magnetite is well illustrated on the Smith-McCandless prospect, lot 851, 20 dist., Haralson County. Within a width of half a mile at right angles to the strike of the country rock, five parallel strips may be distinguished by the rock fragments and minerals weathered in the soil. The pyritiferous belt, marked by the red clay loam usually accompanying these pyrite deposits, occupies part of the top and eastern slope of a gentle ridge. The strike of the schistosity is generally N45-55°E. and S55-65°E. Flanking the ore belt on the northwest is a belt 100 yards wide with many garnet crystals, as large as three eights of an inch in diameter, and exposures of irregular, white quartz masses. Down the slope on the northwest side of the garnetiferous strip, magnetite fragments are abundant in the soil. On the southeast side of the red pyrite strip, toward the Buchanan-Dallas road, 100 yards or more of manganiferous magnetite formation occurs, and adjoining it along the public road another garnet schist appears. The pyrite prospect with its northeast course, it is thus seen, lies in the center of this mineralized zone.

On the Swift and Company property, lots 1184, 1197, 1198, 1199, 19th dist., 3rd. sec., Paulding County, the pyrite ore is mixed with considerable magnetite.

Ore from the old Y. L. Crawley property, lot 1014, 19th dist., Paulding County, showed the following analysis:

Analysis of Magnetic Ore. Crawley Property

Moisture at 100°C	.09
Loss on ignition	.60
Ferric oxide (Fe_2O_3)	45.84
Ferrous oxide (FeO)	1.74
Manganous oxide (MnO)	3.44
Alumina (Al_2O_3)	.37
Lime (CaO)	.34
Magnesia (MgO)	.06
Titanium dioxide (TiO_2)	trace
Sulphur trioxide (SO_3)	.15
Phosphorus pentoxide (P_2O_5)	.03
Silica (SiO_2)	47.17
Total	99.83
Metallic iron (Fe)	33.44
Phosphorus (P)	.02
Sulphur (S)	.06

ANALYSES OF IRON ORES OF GEORGIA
LIMONITE ORES
BARTOW COUNTY

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
C. T. Culver, lot 304, 5th dist.	.80	10.72						40.46		22.13	.18	.00	.74	19.62		
Jesse Carson, lot 230, 5th dist.	1.52	12.90						68.50		.32		.00	1.22	13.85†		
H. J. Lumpkin, lot 147, 2nd dist.	.90	7.08	.53	.54	.00	.88	5.46	52.66		1.00	.54	.07	.50	30.02	tr	tr
J. R. Lewis, est. lot 9, 16th dist.	1.26	10.26	.37	.44	.00	.00	3.88	69.12		1.50	.27	.00	.17	12.40	tr	tr
W. C. Walton, lot 197, 4th dist.	3.12	12.74	.16	.58	.00	.00	.84	71.50		.83	.36	.00	.28	9.62	tr	tr
P. E. Alford, lot 324, 17th dist.	1.20	11.40	tr	tr	tr	tr	1.86	79.60		.50	tr	.00	.20	5.10	.00	.00
A. B. Greene, lot 228, 5th dist.	5.72	7.26						6.12		3.21	.18	.00	.107	70.61		
J. R. Whittaker, lot 271, 5th dist.	.42	10.10						75.08		.40	.09	.00	1.09	10.32†		
do	.54	6.88						9.91		29.73	.00	.00	.749	50.08†		
do	1.06	8.74						66.06		3.78	tr	.00	.438	17.32†		
do	.78	10.82						78.78		tr			1.032	5.66		
do	.08	14.30						63.77		15.52		.00	.64	6.61		
J. T. Norris, lot 478, 4th dist.	.40							85.96				.20	.492	2.41		
H. L. Smith, lot 234, 5th dist.	.44						2.66	30.87		15.88			.299	39.06		
W. T. Gaines, lot 126, 5th dist.	1.46							68.74		3.549			.531	13.17†		
J. W. Vaughan, lot 258, 3d dist.*		11.33					6.57	56.22		13.832	.18	.125	.028	12.54		
N. C. Anderson, lot 39, 16th dist.	1.48	7.16						79.54		.18		.00	.206	9.98†		
do	.62	9.52						63.80		.12		.075	.102	23.72†		
Etowah Devt. Co., lot 114, 4th dist.	.72	9.88	.60	.30	.00	.35	1.50	81.60		.44	tr	.025	.98	3.92	tr	tr
do Crow ore bank	2.30	12.40	.25	.50	.00	.00	1.59	71.01		.89	tr	.00	4.22	7.22		
do								76.24*					3.874			
do	.42	12.00						72.85*		.683		.115	2.161	9.570		
do lot 750, 21st dist.								62.69		7.176		.00	2.160	20.20		
do Allatoona bank								72.16*					3.155	7.23		
do	.390	10.99						76.34*		.423		.085	2.423	6.61		
do Wheeler bank								67.81*					2.204			
do								72.91*					2.389			
do								74.39*					2.204	6.85		
do lot 575, 21st dist.	.510	11.73						74.07*		1.163			.387	11.03		
do lot 576, 21st dist.	.390	11.60						76.01*				tr	2.387	5.33		

*–Analysis from Bull. 10-A.
†–Includes insolubles.

BARTOW COUNTY—Continued.

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
Etowah Devt. Co., Lot 616, 4th dist. (Micaceous hematite)								92.14*				.025	.046			
do								92.13*					.023			
do								86.04*					.023			
do	.130	7.90						82.32		.325		.00	.032	15.370		
do—Lot 331, 4th dist.	1.66	6.70						15.24		1.92	.36	.00	.09	72.23		
do—lot 465, 4th dist.								87.30*				.0125	.139			
do—lot 400, 4th dist.	.62							77.95*		.497		.123	1.659	7.30		
Lot 274, 5th dist.								82.45*					.069	14.11		
Lot 311, 5th dist.								75.81					.116	14.71		
Lot 303, 5th dist.								79.27					.023			
J. R. Dellinger, lot 271, 5th dist.	1.12	9.56						59.44		1.89	.18	.06	1.16	23.16†		
do	2.74	10.91	.22	1.18	.00	tr	13.69	41.45	.00	5.16	.69	.00	.83	22.86	.00	.00
do								23.12		1.71		.00	.158	71.15†		
do								22.28		1.03		.00	.13	74.47†		
do								37.98		3.42		.00	.206	46.66†		
R. B. Satterfield, lot 259, 4th dist.	.80	9.00	.40	.52	.00	.00	4.60	73.16		.29	tr	.00	.63	10.82	tr	tr
L. I. Sutton, lot 104, 15th dist.	1.42	10.92	.50	.65	.00	.00	2.34	71.00		1.20	.54	.00	.11	11.20	tr	tr
J. B. Mahon, lot 291, 22d dist.	.76	9.94	.94	1.39	.00	tr	.859	56.14		.84	.72	.00	.19	19.22	tr	tr
J. J. Bennett, lot 296, 22d dist.	.28	8.98	tr	.04	.00	.03	4.27	76.63		.00	.00	.00	.18	9.38	.00	.00
James Nolan, lot 84, 4th dist.	.51							64.68		6.253			.056	19.74†		
do	1.40							9.37		2.34			.023	76.38†		
Neel and Neel, lot 142, 22d dist.	.42	9.58						75.68				.00	1.394	14.87†		
H. L. Smith, lot 407, 4th dist.	.86	8.94						53.34		.16		.00	.142	31.77†		
Poor House Farm	1.48	10.82						66.67		1.664		.00	3.00	13.44†		
Alfred Truitt	1.56							73.14					2.90	12.94†		
M. G. Dobbins								64.50		.949		.225	1.292	26.95		
John A. Stevens, lot 480, 4th dist.	.30							79.45		trace			.297	5.56		
J. T. Norris, lot 271, 5th dist.	.96	15.36						62.00		11.648		.00	.362	10.48		
W. W. Callaway	3.06	5.41						63.66		.36	.36	.00	.96	19.99		
do	3.34	10.82						71.00		.72	.24	.00	.984	13.56		

*—Analysis from Bull. 10-A.
†—Includes insolubles.

BARTOW COUNTY—Continued.

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
H. Goode, lot 321, 22d dist.	.68	8.40						55.07		4.72		.00	.49	27.72		
do	1.06	11.20						54.57		12.07		.00	.89	14.33		
J. C. Kerr, lot 100, 16th dist.	1.30	11.00	.15	.29	.00	.00	3.55	60.27		4.02	tr	.00	.29	19.04	tr	tr
do lot 99, 16th dist.	1.60	10.18	.14	.32	.00	.00	5.10	73.96		1.88	tr	.00	.22	6.34	tr	tr
Anderson & Bishop, lot 38, 16th dist	2.34	6.68	tr	tr	.00	.00	3.05	82.65		.50	tr	.00	.20	4.80	tr	tr
do	1.10	8.76						60.60		.12		.00	.362	28.26†		
N. C. Anderson, lot 52, 16th dist.	.86	10.94						77.12		.18		.00	.283	9.02†		
C. M. Jones, lot 1040, 4th dist.	.53	10.22						65.57*		.576		.228	.345	20.10		
do lot 1050, 4th dist.	.66	10.42						72.85*		.416		.06	.963	11.22		
J. A. Stephens, lot 981, 4th dist.	.52	12.05						72.12*		.711		.205	1.916	.915†		
do lot 680, 4th dist.	.16	1.01						53.91		.251		.105	.12	37.73		
Tenn. Coal, Iron & Railroad Co, lot 970, 4th dist.	1.40	11.80	.24	.26	.00	.00	2.66	71.42*		4.93	.00	.00	.66	6.36	tr	tr
do	.48	10.65						74.31*		2.99		.00	.553	7.07		
do								77.35*		.229			1.125	6.00		
Lot 506, 21st dist.								76.78		.468			.868	6.95		
do								85.11		.117			.209	3.64		
W. H. Felton, lot 96, 4th dist.								86.71		tr		.175	.091	.480		
Ga. Mining & Mineral Co., lot 200, 5th dist.					.17	.21	4.73	79.01	.48	tr		.0075	.756	4.49		
Mrs. O. T. Peeples, lot 201, 5th dist.	.02	.38			tr	.06	7.33	51.17		.03		.05	.04	40.87		
Ga. Mining & Mineral Co., Lot 312, 5th dist.								72.34				.448	1.54			
do								90.57					1.75			
do	.56							74.31		.172		.238	.365	18.50		
do								87.04					1.023	.20		
do (Kinsey ore-bank)	.49	12.						73.10		2.93		.103	2.402	5.47		
do	.41	12.51						77.95		.325		.06	2.257	3.25		
do Sugar Hill ore-b.	.47	10.99						76.01		.384		.22	1.313	7.54		
do								76.50					1.48	7.37		
do Cripple Creek ore-b	.70	11.63						76.01		.25		.193	2.151	6.43		
do Pine Hill ore-b.	.51	12.01						74.55		1.98		.23	2.379	7.47		

*–Analysis from Bull 10-A.
†–Includes insolubles

BARTOW COUNTY—Continued

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
A. H. Morris, lot 376, 17th dist.	.55	10.22	----	----	----	----	----	76.25	----	.41	----	trace	.924	.858	----	----
Colliar prop, lot 444, 17th dist.	.37	11.05	----	----	----	----	----	75.28	----	.55	----	.065	1.291	7.08	----	----
Armington prop., lot 117, 16th dist.	.38	10.03	----	----	----	----	----	73.10	----	.301	----	.12	.241	12.43	----	----
C. M. Jones, lot 981, 4th dist.	----	----	----	----	----	----	----	73.78	----	----	----	trace	1.24	5.34	----	----
C. M. Jones, lot 966, 4th dist.	----	----	----	----	----	----	----	60.86	----	----	----	trace	.82	27.57	----	----
do	----	----	----	----	----	----	----	77.52	----	----	----	.025	.38	4.71	----	----
POLK COUNTY																
Woodstock Operating Corp. Ledbetter mine	----	----	----	----	----	----	----	74.13*	----	----	----	----	1.91	9.63†	----	----
do	----	----	----	----	----	----	----	76.65*	----	----	----	----	2.02	5.82†	----	----
do	----	----	----	----	----	----	----	71.61*	----	----	----	----	3.67	8.14†	----	----
do	----	----	----	----	----	----	----	71.49*	----	----	----	----	2.56	8.11†	----	----
do	----	----	----	----	----	----	----	79.21*	----	----	----	----	1.32	6.82†	----	----
do	----	----	----	----	----	----	----	75.90*	----	----	----	----	.84	7.30†	----	----
do	----	----	----	----	----	----	----	61.15*	----	----	----	----	2.51	16.47†	----	----
do	----	----	----	----	----	----	----	72.31*	----	----	----	----	1.48	8.32†	----	----
do	----	----	----	----	----	----	----	73.89*	----	----	----	----	2.93	----	----	----
do	----	----	----	----	----	----	----	75.56*	----	7.49	----	----	2.00	7.98†	----	----
do	----	----	----	----	----	----	----	71.51*	----	----	----	----	----	13.07†	----	----
do	----	----	----	----	----	----	----	68.90*	----	----	----	----	----	17.42†	----	----
do	----	----	----	----	----	----	----	71.21*	----	----	----	----	----	9.52	----	----
do	----	----	----	----	----	----	----	65.21*	----	1.50	----	----	1.74	----	----	----
do	----	----	----	----	----	----	----	79.01	----	.86	----	----	1.97	----	----	----
do Etna Mine	----	----	----	----	----	----	----	69.30	----	1.95	----	----	.81	----	----	----
do Mine No. 3	----	----	----	----	----	----	----	72.36*	----	----	----	----	.093	10.50†	----	----
do	----	----	----	----	----	----	----	68.30*	----	----	----	----	2.48	13.60†	----	----
do	----	----	----	----	----	----	----	65.21*	----	----	----	----	2.48	11.12†	----	----
do	----	----	----	----	----	----	----	63.50*	----	----	----	----	1.98	14.11	----	----
do	----	----	----	----	----	----	----	62.67*	----	----	----	----	2.00	20.16	----	----

*–Bull. 10-A.
†–Includes insolubles.

POLK COUNTY—Continued.

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
Barnsdall Corporation Pond ore-b..	43.0	9.83	----	----	----	----	----	68.48	----	.373	----	.14	.435	17.90	----	----
Other Mines	----	----	----	----	----	----	----	87.97*	----	----	----	----	.72	6.23	----	----
do	----	----	----	----	----	----	----	87.23*	----	----	----	----	.88	4.71	----	----
do	----	----	----	----	----	----	----	73.47*	----	----	----	----	1.32	9.04	----	----
do	----	----	----	----	----	----	----	72.86*	----	----	----	----	1.18	10.02	----	----
do	----	----	----	----	----	----	----	70.11*	----	----	----	----	1.42	11.05	----	----
do	----	----	----	----	----	----	----	74.54*	----	----	----	----	.95	7.15	----	----
Oremont	.68	9.98	----	----	----	----	----	61.92*	----	.88	----	.06	.557	24.06	----	----
do	.54	11.41	----	----	----	----	----	70.42*	----	.77	----	.065	.516	10.88	----	----
do	.71	8.70	----	----	----	----	----	56.30*	----	1.749	----	.15	.868	30.48	----	----
The Alabama Co	.45	8.75	----	----	----	----	----	69.94*	----	.533	----	.048	.088	16.82	----	----
do	.46	8.21	----	----	----	----	----	66.30	----	.55	----	.23	.201	22.02	----	----
do Lot 140, 17th dist.	----	----	----	----	----	----	----	1.20	----	55.64	----	----	----	18.50	----	----
do	----	----	----	----	----	----	----	1.30	----	61.62	----	----	----	14.00	----	----
do	----	----	----	----	----	----	----	11.71	----	46.54	----	----	----	24.40	----	----
do	----	----	----	----	----	----	----	8.00	----	51.95	----	----	----	16.60	----	----
do	----	----	----	----	----	----	----	14.85	----	41.73	----	----	.56	22.75	----	----
do	----	----	----	----	----	----	----	6.89	----	41.16	----	----	----	----	----	----
Richard Gammon, Lot 452, 21st dist.	.24	9.04	----	----	.00	.14	9.23	73.49	----	tr	tr	.00	.29	7.22	----	----
do Lot 453, 21st dist.	.66	10.30	----	----	tr	tr	3.29	78.90	----	.38	.72	.00	.29	5.92	----	----
do Lot 449, 21st dist.	.08	11.48	----	----	.04	.06	4.79	75.95	----	tr	tr	.00	.34	6.96	----	----
C. W. Peek, Lot 1330, 21st dist.	.20	9.78	.20	.25	.00	.00	6.82	75.10	----	.76	.36	.00	.87	5.30	tr	tr
do Lot 1254, 21st dist.	.76	11.48	.25	.20	.00	.00	7.06	72.75	----	tr	.00	.00	1.15	5.22	----	----
R. H. Jones, Lot 488, 2nd dist.	1.32	10.78	tr	tr	.00	.00	6.88	66.52	----	1.58	.18	.00	1.32	11.52	tr	tr
C. B. Short, Lot 571, 2nd dist.	1.02	11.60	.60	.30	.00	.00	tr	81.74	----	tr	tr	.00	.66	4.48	----	----
Mrs. E. B. Short, Lot 570, 2nd dist.	.32	10.00	.12	.16	.00	.00	.59	79.68	----	tr	.00	.00	.15	9.70	----	----
F. L. Clark, Lot 715, 21st dist.	1.24	7.66	.40	.56	.00	.00	6.20	71.36	----	2.92	.36	.31	.08	8.52	tr	tr
A. D. Greenfield, Lot 1052, 21st dist.	1.52	10.64	.37	.40	.00	.00	6.70	58.20		tr	.18	.00	2.22	19.80	----	----
do	4.62	10.30	.40	.42	.00	.00	6.44	54.86	----	tr	.18	.00	2.74	19.94	----	----
do	2.96	10.70	.29	.22	.00	.00	1.41	66.46	----	tr	tr	.00	4.57	12.24	----	----
do	2.08	9.60	.70	1.00	.00	.00	6.73	60.97	----	tr	.18	.00	.56	17.96	----	----

*–Bull. 10-A.

POLK COUNTY—Continued.

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
W. J. Richardson, Lot 565, 2nd dist.	.54	10.80	.60	.40	.39	tr	9.00	66.88	----	1.57	.54	.00	.35	8.88	tr	tr
do	.75	8.51	----	----	----	----	----	74.51	----	.00	----	.05	.35	15.07	----	----
G. A. Garrett, Lot 648, 21st dist.	1.78	9.32	.40	.30	.00	.06	3.22	74.14	----	tr	.36	.00	.19	10.18	----	----
Allen Curtis, Lot 1255, 21st dist.	.34	10.10	tr	tr	.00	.00	7.30	72.76	----	.98	.54	.23	.39	7.26	tr	tr
Reese Curtis, Lot 1036, 21st dist.	.56	12.12	tr	tr	.00	.00	2.44	81.54	----	.34	.36	.00	.06	3.08	.00	.00
Sally Patterson, Lot 937, 18th dist.	1.50	10.00	.50	.60	.00	.57	8.40	53.67	----	1.94	.18	.00	.75	21.68	tr	tr
J. R. Davis, Lot 966, 21st dist.	1.52	10.08	.42	.32	.00	.06	8.60	68.86	----	tr	.36	.00	.84	8.78	----	----
B. F. Weaver, Lot 355, 2nd dist.	.36	10.48	.09	.18	.00	tr	3.50	80.09	----	tr	.36	.00	.15	4.38	----	----
G. F. Hutcheson, Lot 939, 18th dist.	1.88	11.00	.30	.20	.00	.04	.19	77.62	----	.83	.54	.00	1.31	5.80	tr	tr
J. O. Long, Lot 326, 18th dist.	1.18	10.56	.30	.40	.00	.06	7.06	68.53	----	.31	.36	.00	.47	10.83	tr	tr
A. Y. Henderson, Lot 1190, 2nd dist	1.16	6.86	.85	.30	.00	.00	2.41	70.00	----	.18	.36	.08	.98	16.92	----	----
R. L. Shiflet, Lot 453, 21st dist.	2.10	6.88	.60	.41	.00	tr	1.78	76.79	----	tr	tr	.00	.75	9.80	.00	.00
E. A. Morgan, Lot 1164, 21st dist.	.92	10.00	.40	.55	.00	.00	3.40	69.30	----	4.98	.18	.15	.47	7.42	tr	tr
J. J. Goss, Lot 152, 18th dist.	.66	12.34	tr	tr	.10	.65	4.60	74.83	----	1.76	tr	.00	1.51	3.68	tr	.09
John Lee, Lot 1191, 18th dist.	.88	10.56	tr	tr	.00	.00	5.19	59.00	----	1.50	.36	.00	1.50	20.96	tr	tr
Hutchings, Lot 1216, 20th dist.	1.22	11.80	tr	tr	.04	.00	4.81	76.63	----	.38	.36	.00	1.46	3.18	tr	tr
Pulaski Company, Lot 879, 21st dist.	.98	9.82	.25	.48	.80	.14	2.49	73.07	----	1.00	.36	.00	.56	10.00	tr	tr
J. H. Carmichael	.30	13.08	----	----	.00	.00	1.26	80.92	----	.00	.00	.00	2.80	1.20	----	----
S. A. Edmondson, Lot 915, 2nd dist.	1.61	8.64	----	----	----	----	----	40.46	----	tr	.00	.00	1.02	40.51	----	----
Reed Mine, Lots 639, 640, 2nd dist.	----	----	----	----	----	----	8.60	67.14	----	----	----	----	----	9.02	----	----
do	----	----	----	----	----	----	4.70	73.86	----	----	----	----	----	7.30	----	----
do	----	----	----	----	----	----	7.30	68.30	----	----	----	----	----	11.10	----	----
do	----	----	----	----	----	----	11.15	52.60	----	----	----	----	.26	24.30	----	----
do	----	----	----	----	----	----	8.10	58.97	----	2.15	----	----	.41	19.05	----	----
do	----	----	----	----	----	----	----	66.57	----	----	----	----	.28	26.60†	----	----
do	----	----	----	----	----	----	----	64.30	----	----	----	----	----	26.81	----	----
do	----	----	----	----	----	----	----	70.00	----	----	----	----	----	15.40	----	----
do	----	----	----	----	----	----	----	63.38	----	----	----	----	----	22.05	----	----
do	----	----	----	----	----	----	----	63.00	----	----	----	----	----	21.18	----	----
Wood Mine Lots 667, 702, 2nd dist.	----	----	----	----	----	----	----	74.54	----	----	----	----	2.44	6.10	----	----
do	----	----	----	----	----	----	----	67.54	----	----	----	----	.50	15.21	----	----
do	----	----	----	----	----	----	----	62.14	----	----	----	----	.76	22.18	----	----

†—Includes insolubles.

POLK COUNTY—Continued.

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
Wood Mine, Lots 667, 702, 2nd dist.	------	------	------	----	----	----	------	72.31	----	2.54	------	------	1.64	12.41	----	----
do	------	------	------	----	----	----	4.09	72.11	----	------	------	------	.67	12.36	----	----
do	------	------	------	----	----	----	4.51	63.94	----	------	------	------	.62	12.71	----	----
do	------	------	------	----	----	----	4.24	64.70	----	------	------	------	.55	11.92	----	----
do	------	------	------	----	----	----	7.22	59.20	----	1.27	------	------	.55	15.43	----	----
do	------	------	------	----	----	----	4.92	65.53	----	.67	------	------	.58	10.82	----	----
do	------	------	------	----	----	----	4.16	65.24	----	1.66	------	------	.55	11.82	----	----
do	------	------	------	----	----	----	6.66	60.94	----	.83	------	------	------	14.22	----	----
do	------	------	------	----	----	----	5.88	58.03	----	.05	------	------	------	15.22	----	----
FLOYD COUNTY.																
Samuel Johnson, lot 177, 22nd dist.	.90	9.58	.50	.65	.00	.08	2.46	79.60	----	tr	.00	.00	.30	5.80	----	----
------do------lot 111, 22nd dist.	.34	10.70	tr	tr	.00	tr	5.50	73.16	----	tr	tr	.00	.52	9.46	----	----
T. R. Rich, lot 151, 23rd dist.	.52	10.34	.22	tr	.00	tr	4.84	81.62	----	.24	tr	.00	.43	1.68	tr	tr
John Davis, lot 18, 5th dist.	2.46	10.80	.40	.25	.00	.08	7.54	73.49	----	.40	.36	tr	4.05	6.14	tr	tr
do	.48	10.36	tr	.54	.53	.10	3.08	63.88	----	.54	.23	tr	1.04	18.97	----	----
do----lot 94, 5th dist.	2.56	11.52	.32	.40	.00	.18	5.76	43.19	----	22.54	.54	.05	1.73	11.14	tr	tr
do	2.53	8.68	.28	.43	.15	.07	10.09	56.78	----	1.96	.23	.00	1.41	16.95	----	----
A. J. Spence, lot 662, 3rd dist.	.95	7.25	------	----	----	----	------	83.00	----	5.17	------	------	.07	3.15	----	----
Henry Walker	0.16	------	------	----	----	----	------	48.30	----	------	------	.00	.39	35.36†	----	----
J. M. Harris	1.77	11.25	.20	.43	.18	.30	4.08	54.77	----	3.46	------	------	4.85	17.64	----	----
do	1.60	11.07	.25	.20	.23	.28	2.92	62.92	----	2.15	------	.35	3.74	14.33	----	----
A. J. Spence	.63	------	------	----	----	----	1.66	82.71	----	.75	------	------	.26	2.96	----	----
do	1.07	------	------	----	----	----	.74	80.63	----	7.83	------	------	.22	2.04	----	----
CHATTOOGA COUNTY																
J. M. Bellah, lot 82, 5th dist.	1.32	12.46	tr	tr	.00	.00	3.55	77.60	----	tr	.18	.00	1.10	3.92	----	----
G. W. Agnew, lot 186, 13th dist.	.68	11.38	.45	tr	.20	.04	1.31	77.79	----	3.14	.36	.00	.28	3.58	tr	tr
J. D. Taylor	.58	3.67	------	----	----	----	------	68.20	----	.18	------	------	.28	23.19†	----	----
W. Shropshire	------	------	------	----	----	----	------	70.90	----	.46	------	.00	1.45	18.34	----	----
W. J. Crawford	------	------	------	----	----	----	------	23.86	16.70	------	------	------	------	------	----	----
Lot 187, 13th dist.	.84	10.61	.02	.10	.51	.07	2.83	75.80	.07	.26	.09	.42	.74	7.84	----	----
G. W. Jordan, Haywood dist.	.34	12.86	------	----	----	----	------	73.44	----	.94	tr	.00	4.06	5.02	----	----
W. T. Henry, lot 171, 13th dist.	1.49	4.07	------	----	1.43	1.02	8.07	67.66	----	.18	.30	.05	1.68	14.46	----	----

†–Includes insolubles.

WALKER COUNTY

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
L. L. Richardson, lot 59, 7th dist.	1.10	10.64	.42	.62	.00	tr	1.88	69.36	----	tr	.00	.00	1.36	14.26	----	----
Nancy Vealer, lot 238, 8th dist.	1.24	10.02	.45	.09	.00	.00	2.00	77.60	----	tr	.18	tr	.37	7.98	----	----
Sugar Valley Land Co., lot 199, 26th dist.	.70	10.78	----	----	----	----	----	46.88	----	.31	.00	----	.57	33.89†	----	----
J. Tapp, lot 15, 8th dist.	1.46	5.46	.10	tr	.00	.00	6.10	77.39	----	tr	.18	.00	.33	8.80	----	----
Rex Henry, lot 20, 11th dist.	----	----	----	----	----	----	----	25.76	----	----	----	----	.65	45.33	----	----

WHITFIELD COUNTY

H. S. Houston, lot 104, 13th dist.	1.12	8.28	.40	tr	.00	.00	1.21	53.67	----	tr	.36	.00	2.92	32.10	----	----
Wisconsin-Georgia Coal and Iron Co., lot 73, 13th dist.	1.00	9.27	----	----	----	----	----	47.05	----	.44	----	.05	.48	39.22†	----	----
Chicago-Tenn., Coal & Oil Co., lot 60, 11th dist.	1.00	----	----	----	----	----	8.46	60.80	----	5.60	----	----	.726	17.13	----	----
C. J. Hamilton, lot 65, 11th dist.	1.20	7.78	----	----	----	----	----	53.49	----	1.07	----	.00	.16	35.68†	----	----
Crow, lot 6, 12th dist.	.63	6.30	----	----	----	----	----	43.91	----	.31	----	.00	.074	46.40†	----	----
Lot 191, 11th dist.	.34	----	----	----	.03	----	1.47	87.46	----	1.61	----	----	.29	4.77	----	----

GORDON COUNTY

LaFollette Coal and Iron Co., lot 307, 26th dist.	1.26	10.52	.46	.27	.00	.00	2.05	75.96	----	tr	.18	.00	1.33	7.72†	----	----
do---lots 20, 91, 25th dist	----	----	----	----	----	----	----	69.50	----	.975	----	----	----	12.84†	----	----
do	----	----	----	----	----	----	----	69.34	----	.936	----	----	----	13.25†	----	----
do	----	----	----	----	----	----	----	64.03	----	.858	----	----	----	18.62†	----	----
do	----	----	----	----	----	----	----	68.97	----	.884	----	----	----	15.12†	----	----
do	.46	7.60	----	----	.48	.19	2.00	68.96	----	.00	----	tr	1.11	19.03	----	----
Coplin and Miller, lot 255, 13th dist	1.08	8.09	----	----	----	----	----	53.13	----	1.16	----	.00	.55	29.59†	----	----
L. S. Vincent, lot 253, 14th dist.	----	----	----	----	----	----	----	68.80	----	----	----	.00	2.22	16.65	----	----
C. J. Hord, lot 288, 14th dist.	----	----	----	----	----	----	----	56.17	----	----	----	.00	1.36	22.60	----	----
C. J. Hord, lot 253, 14th dist.	----	----	----	----	----	----	----	19.70	----	----	----	----	.14	69.88†	----	----

†-Includes insolubles.

GORDON COUNTY—Continued.

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
A. M. McBrayer	.60	11.80						73.02				.00	.26	12.39		
W. T. Bradford, lot 77, 23rd dist.	.76	12.43	.06	.17	.15	.20	.19	76.44	.36	.14		.30	3.80	5.28		
W. B. Freeman, lot 59, 24th dist.	.23	12.99						70.77		.80	.36	.00	.79	6.78		
MURRAY COUNTY																
J. M. Poteet, lot 306, 10th dist.	2.51	9.53						41.89		.42		.40	1.20	38.92†		
Buckeye Mountain	.91	10.35		6.91	.49			61.77				.60	.079	17.80		
A. H. Green	.77						10.76	34.10		22.19		.00	2.89	11.84		
R. C Fouts, lot 162, 27th dist.	.50	11.40						79.04		2.34		.43	1.22	5.53†		
Samuel Hickey, lot 203, 26th dist.	1.90	7.96						46.57		1.05		.48	.96	40.41†		
J. R. Harris, lot 164, 10th dist.	1.90	13.20						68.65		.44		.78	1.53	11.94†		
F. M. Powell, lot 237, 27th dist.	.62	10.20						63.43		2.11		.35	1.32	24.15†		
do	3.24	11.30	.40	.38	.00	.00	6.15	61.14		10.22	.54	.00	2.32	4.16	tr	tr
do								79.36		.44		tr	1.58	6.26		
do								71.81		1.01		.00	1.35	12.07		
do								71.17		5.30		.00	3.20	8.82		
do								71.78		.78		tr	1.81	9.42		
do								76.37		.26		tr	1.67	10.55		
do								48.41		14.34		.00	1.02	30.11		
F. M. Kendricks, lot 240, 27th dist.	1.12	9.06	.64	.52	.00	.00	8.01	50.37		.42	.54	.00	1.96	27.04	.00	.00
Y. A. Adams, lot 101, 10th dist.	.74	10.82	.15	.20	.23	.10	2.71	73.27		.12	.09	.08	.37	10.94		
F. M. Powell, lot 236, 27th dist.	.31	10.24	.30	.37	tr	.07	3.45	75.82		.03	.10	.05	1.57	7.45		
do	1.03	10.99	tr	tr	tr	.10	4.58	63.17		2.10		tr	1.88	16.30		
FANNIN COUNTY																
W. L. Conley, lot 265, 8th dist.	1.58	11.04	tr	tr	.00	.02	.72	81.33		.30	.36	.00	2.27	2.40	tr	tr
do	1.16	10.12	tr	tr	.00	.00	4.17	67.22		.36	.72		1.85	14.44		
do	1.54	10.67						52.05		1.91		.88	.87	31.38†		
C. C. Glover, lot 229, 8th dist.	.61	12.84						75.47		1.48		.65	.34	8.29†		
do	1.24	10.80	tr	tr	tr	.62	2.86	70.84		1.70	.36	.00	.92	10.92	tr	tr

†–Includes insolubles.

FANNIN COUNTY—Continued.

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
G. Plowman, lot 278, 8th dist.	.84	10.04						57.34		1.26			.49	26.49†		
I. C. Owenby, lot 11, 8th dist.	.60	10.82						66.63		3.39		.20	.87	17.97†		
J. M. Silvey, lot 10, 8th dist.	.89	9.84						64.38		1.27		.43	1.13	23.86†		
J. M. Heaton, lot 201, 8th dist.	1.26	9.47						53.14		.312		.35	.66	33.22†		
W. L. Collins, lot 30, 8th dist.	1.64	12.41						71.11		2.76		.43	1.53	10.22†		
L. B. Crawford, lot 297, 8th dist.	1.74	10.44	.40	.12	.00	tr	9.00	63.00		tr	.72	.00	.28	14.06		
Georgia Baptist Assembly, lot 314, 8th dist.	2.22	8.74						64.17		.85		.30	.18	20.39†		
Mine No. 20, lot 20, 9th dist.	.98	9.70						59.54		.31		.55	.59	26.84†		
C. C. Glover, lot 177, 8th dist.	.43	10.30			.34	.15	1.09	83.22		.15		.06	.57	3.89		
Robertson, lot 6, 8th dist.	.46	10.22			.38	.84	3.30	78.98		.44		tr	3.52	2.09		
Mine No. 20, 9th dist.	.40	9.50			1.61	1.41	1.25	80.14		.50		tr	1.14	4.92		
GILMER COUNTY																
Ellijay Mining Co., lot 84, 11th dist.	2.14	9.52						64.41		.78		tr	2.00	19.53		
do	2.18	10.04	tr	tr	.36	tr	.92	69.76		.44	.45	.00	2.29	13.38	tr	tr
do	3.08	11.24						72.12		1.66	tr	tr	4.66	6.83		
do	2.56	9.86	tr	tr	.00	tr	5.81	61.93		2.48	.72	.00	4.30	12.08	tr	tr
do	1.64	10.60	tr	tr	.54	tr	3.25	71.84		2.06	.28	.00	2.84	7.32	tr	tr
do	2.45	11.48	.22	.45	.00	.00	2.50	75.96		tr	tr	.00	4.33	2.78		
do	.23		.36	.77				66.11					6.03	10.35		
do	1.14	10.12						57.90		4.26	tr		2.03	24.60		
do	.98	11.01						47.97		.74		.20	2.84	35.72†		
do	2.16	15.12					11.03	50.17		3.71	.72	.87	3.58	5.59		
do								57.63		tr	.00	.00	3.75	21.78		
do								40.04		tr	.00	.00	2.19	42.91		
do								63.74		0.16	.00	.00	2.84	18.75		
W. H. Searcy, lot 215, 7th dist.	.94	10.44	tr	tr	.00	.04	8.50	58.28		6.50	.72	.00	.72	13.84	tr	tr
do	1.70	12.44	.55	.67	.24	.16	4.80	10.93		60.39	.45	.00	.42	6.32		
do	2.50	13.42	.39	.70	tr	.25	11.86	5.78	.00	56.98[2]	.92	.44		10.92	.41	2.01

[2]–MnO_2–56.00

†–Includes insolubles.

GILMER COUNTY—Continued.

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
W. H. Searcy, lot 215, 7th dist.	1.04	10.76	tr	tr	1.26	.00	4.09	73.90	----	2.16	.50	.00	2.55	4.70	tr	tr
do	.46	11.54	tr	tr	.68	.08	2.97	80.92	----	.28	.18	.00	.37	2.30	tr	tr
do	1.50	11.33	.04	tr	.00	.00	.52	80.94	----	.88	.54	.00	2.26	2.22	tr	.12
do	1.69	8.78	------	----	----	----	------	47.66	----	2.11	------	.28	1.14	37.46†	----	----
do	4.25	------	------	----	----	----	------	5.94	----	23.66	------	------	.36	43.93†	----	----
do	1.46	------	------	----	----	----	------	16.90	----	15.38	------	------	1.16	44.37†	----	----
do—lot 219, 7th dist.	3.62	11.78	.62	.32	.00	.00	6.84	51.30	----	17.07	.72	.00	.92	7.12	tr	tr
do—lot 214, 7th dist.	4.58	9.72	1.46	.44	.00	.00	9.05	58.63	----	.30	.27	.00	1.77	13.64	tr	tr
do	1.14	------	------	----	----	----	------	53.74	----	12.95	------	------	1.02	13.57†	----	----
Lee Eller, lot 154, 11th dist.	1.38	10.38	tr	tr	.42	tr	1.85	71.67	----	3.99	------	.00	2.08	8.56	tr	tr
Stephen Eller, lot 171, 11th dist.	.64	11.19	.25	.35	.00	.04	4.92	59.62	5.68	.72	.00	.00	2.72	14.06	.05	.12
T. W. Craigo, lot 119, 11th dist.	------	------	------	----	----	----	------	73.87	----	------	------	------	3.14	10.00	----	----
W. H. Eller, lot 135, 11th dist.	------	------	------	----	----	----	------	78.96	----	------	------	------	2.60	2.73	----	----
J. E. Stembridge, lot 208, 11th dist.	.76	11.86	tr	tr	.00	.00	.54	78.66	----	1.62	.36	.00	.94	5.72	tr	tr
Georgia-Tioga Iron Co., lot 260, 11th dist.	.06	9.76	------	----	----	----	------	60.05	----	.62	------	.45	.38	29.49†	----	----
W. A. Davis, lot 253, 7th dist.	2.50	13.55	------	----	----	----	------	57.34	----	2.12	------	.65	1.89	22.57†	----	----
do	.38	10.10	------	----	.44	.10	3.21	80.00	----	.11	------	.12	.69	5.07†	----	----
Haley, lot 304, 10th dist.	1.29	------	------	----	----	----	------	68.44	----	------	------	.10	.22	12.68†	----	----
do	.95	10.74	------	----	----	----	------	59.05	----	1.91	------	.55	2.72	24.03†	----	----

PICKENS COUNTY

J. W. Gay, lot 172, 13th dist.	2.00	11.50	------	----	----	----	------	74.23	----	------	------	.40	1.56	1.13†	----	----
A. M. Darnell, lot 103, 4th dist.	.81	11.12	------	----	----	----	------	70.33	----	.43	------	.25	1.54	11.25†		
W. J. Hogan, lot 87, 4th dist.	1.51	11.49	------	----	----	----	------	66.23	----	.53	------	.45	8.14	15.80†	----	----
J. E. Farmer	3.24	7.44	------	----	----	----	------	17.57	----	------	------	.70	.36	62.08†	----	----
V. M. Haygood	------	------	------	----	----	----	------	74.88	----	------	------	tr	1.51	------	----	----

†–Includes insolubles.

CHEROKEE COUNTY

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
H. Clay Hollister, lot 155, 14th dist.	1.16	11.14	tr	tr	.00	.25	.97	69.70	-----	.35	-----	-----	1.76	14.76	-----	-----
do----lot 119, 14th dist.---	1.20	9.91	-----	-----	.00	-----	-----	74.85	-----	-----	-----	.20	1.62	10.15	-----	-----
do-----	.98	5.60	-----	-----	-----	-----	-----	63.14	-----	.18	.36	.15	.84	18.65	-----	-----
do----lot 98, 14th dist.----	1.28	5.38	-----	-----	-----	-----	-----	43.43	-----	.36	.40	.45	1.00	37.75	-----	-----
do-----	3.29	10.49	-----	-----	-----	-----	-----	68.55	-----	.36	-----	.45	1.63	13.58	-----	-----
do-----	1.21	8.29	-----	-----	-----	-----	-----	77.30	-----	.45	tr	tr	.91	12.64	-----	-----
do-----	.82	8.90	-----	-----	-----	-----	-----	50.80	-----	.30	-----	.45	1.95	24.19	-----	-----
do-----	.83	3.70	-----	-----	-----	-----	-----	91.43	-----	.36	-----	.38	.93	2.27	-----	-----
do-----	.40	10.31	-----	-----	.52	.11	2.87	71.89	-----	.50	-----	.075	1.76	11.81	-----	-----
do-----	.42	9.40	-----	-----	.42	.06	2.30	64.34	-----	.08	-----	.13	.42	22.73	-----	-----
do----lot 119, 14th dist.----	.41	10.50	-----	-----	.27	.12	4.09	77.06	-----	.10	-----	.06	1.97	5.56	-----	-----
do----lot 155, 14th dist.----	1.16	11.14	tr	tr	.00	.25	.97	69.70	-----	.35	-----	-----	1.69	14.76	-----	-----
Geo. W. Evans, lot 56, 22nd dist.----	.06	-----	-----	-----	-----	.00	-----	37.66	35.02	tr	23.16	.40	-----	3.98	-----	-----
do----Lot 58, 22nd dist.---	1.87	11.33	-----	-----	-----	-----	-----	75.80	-----	.54	-----	.35	4.62	3.31	-----	-----
S. M. Inman Est., lot 148, 14th dist.	.90	15.48	-----	-----	-----	-----	-----	79.38	-----	.24	-----	.40	1.22	3.81	-----	-----
do-----	.36	8.98	-----	-----	.07	.06	3.01	81.64	-----	tr	-----	tr	2.56	3.47	-----	-----
do----lot 150, 14th dist.----	.52	10.72	-----	-----	-----	-----	-----	75.89	-----	.10	-----	.02	1.03	3.92	-----	-----
U. L. Starnes, lot 79, 3rd dist.-----	.24	14.16	-----	-----	-----	-----	-----	58.83	-----	-----	-----	.14	4.21	22.14	-----	-----
do---lot 80, 3rd dist.-----	.30	11.85	-----	-----	-----	-----	-----	76.00	-----	-----	-----	tr	.27	12.15	-----	-----
G. P. McFarland, lot 221, 14th dist.	.92	12.25	-----	-----	-----	-----	-----	66.31	-----	-----	-----	.05	2.16	13.26†	-----	-----
do-----	.42	7.30	-----	-----	.04	.11	6.02	75.77	-----	-----	-----	tr	.69	9.98	-----	-----
Lot 55, 14th dist.-----	.42	10.60	-----	-----	.05	tr	3.42	75.71	-----	.49	-----	.03	1.19	8.16	-----	-----
A. B. Coggins, lot 24, 14th dist.----	.48	10.42	-----	-----	.04	tr	3.24	75.14	-----	.57	-----	.03	.57	9.12	-----	-----
Lot 191, 14th dist.-----	.48	10.76	-----	-----	.06	.05	-----	79.74	-----	.06	-----	tr	4.33	2.43	-----	-----
do-----	.52	10.21	-----	-----	.33	.36	3.82	60.49	-----	.07	-----	.04	2.80	21.50	-----	-----
Alice Holbert, lot 259, 4th dist.----	.34	10.10	-----	-----	.10	.13	2.25	74.78	-----	.06	-----	.03	4.05	8.51	-----	-----
H. Clay Hollister, lot 119, 14th dist.	.98	12.08	.20	.10	tr	tr	6.39	69.84	-----	.18	tr	.00	2.05	8.24	tr	tr
do-----	2.00	12.76	.35	.30	.36	tr	4.48	69.29	-----	.82	tr	.00	3.19	7.12	tr	tr

†–Includes insolubles.

UNION COUNTY

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
A. S. Coffey, lot 3, 10th dist.	4.16	10.59	.50	.30	.08	tr	4.66	72.12	----	.42	.00	.00	.49	6.52	tr	tr

TOWNS COUNTY

W. H. McConnell, lot 89, 17th dist.	1.98	9.38	.50	.42	.12	.00	tr	65.50*	----	.48	.18	.08	1.94	17.84	tr	tr
J. M. Berrong	----	----	----	----	----	----	----	67.20	----	----	----	----	----	12.20	----	----

HABERSHAM COUNTY

Piedmont Farms, lot 73, 10th dist.	.74	11.82	1.00	1.09	.00	tr	5.11	63.05	tr	tr	.72	.00	2.27	13.70	----	----
T. Hathcock	.06	----	----	----	----	----	----	66.34	----	----	11.02	.00	.158	18.23	----	----

SPALDING COUNTY

J. H. Walker	2.94	4.86	tr	tr	1.74	1.14	17.47	34.29	----	7.60	.54	.00	1.20	28.70	tr	tr

PIKE COUNTY

W. M. Hartley, lot 219, 8th dist.	1.98	5.10	tr	tr	2.92	1.32	12.57	25.02	----	8.58	.72	.00	1.91	39.66	tr	tr
Susie Stegars	6.00	11.00	----	----	.04	.14	18.48	41.10	----	8.80	.92	.00	.95	12.26	tr	tr

MONROE COUNTY

U. S. Fuller, lot 126, 11th dist.	2.34	10.78	.20	.16	.00	.14	.86	76.50	----	.08	.36	.00	.09	9.46	tr	tr
R. C. Goolsby	----	----	----	----	----	----	----	71.68	----	----	----	tr	2.00	2.26	----	----

MERIWETHER COUNTY

G. B. Grant, lot 46, Chalybeate dist.	.52	10.34	.22	tr	.00	tr	4.84	81.62	----	.24	tr	.00	.43	1.68	tr	tr
do	1.26	9.52	.45	.40	.00	.00	6.38	69.29	----	tr	.00	.00	.17	11.98	----	----
do	.91	----	----	----	----	----	----	78.77	----	----	----	.00	1.59	6.34	----	----

*-ZnO 1.88.

MERIWETHER COUNTY—Continued

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
J. F. Smith, lot 55, 2nd dist.	1.18	10.32	.60	.40	.00	tr	5.02	75.38	----	tr	tr	.00	.12	7.02	----	----
do	1.10	11.18	.32	.18	1.00	tr	2.87	76.29	----	1.02	.54	.00	3.00	2.40	tr	tr
W. A. Brannon	1.17	------	------	----	----	----	------	79.54	----	.20	.00	.00	2.95	4.17	----	----
J. S. Hooten	------	------	------	----	----	----	------	77.18	----	tr	------	.00	2.58	4.32	----	----
HARALSON COUNTY																
Tallapoosa Mine	3.18	14.66	1.80	.05	.00	tr	2.42	60.26	----	tr	.18	.00	.11	17.30	----	----
T. R. King, lot 852, 19th dist.	.14	3.64	tr	tr	.00	.00	5.85	86.45	----	tr	------	.00	.42	3.76	----	----
J. C. Ezzell, lot 712, 2nd dist.	1.56	9.98	.30	.10	.00	.00	4.26	60.06	----	1.16	.27	.00	2.49	13.42	tr	tr
W. T. Rabun, lot 146, 6th dist.	.18	3.20	.20	.60	.00	.37	1.09	51.61	----	tr	11.08	.00	1.21	40.54	----	----
W. M. Griffith, lot 774, 19th dist.	.33	2.32	.06	.09	2.35	.32	10.61	34.62	2.61	9.02	.69	.23	.30	35.72	----	----
Kingsbury, lot 246, 7th dist.	1.32	5.77	.00	.00	.15	.15	.99	82.13	.00	.10	.47	.025	.08	8.23	----	----
PAULDING COUNTY																
J. A. Austin, lot 410, 19th dist.	.78	14.28	1.10	.11	.00	.00	12.80	49.43	11.85	.00	tr	.52	.99	2.92	.00	.00
Swift & Co., lot 1119, 19th dist.	2.20	12.64	.14	.20	.00	.00	6.64	60.40	.43	tr	.54	1.54	.23	15.02	----	----
CARROLL COUNTY																
Reeds Mountain Mine, lot 246, 7th	1.70	8.02	.00	.00	.02	.02	2.32	70.40	1.23	.00	1.92	.14	.12	14.56	----	----
W. T. Lambert	------	------	------	----	----	----	------	83.36	----	------	.00	tr	3.73	1.19	----	----
DOUGLAS COUNTY																
Villa Rica Mine	3.12	12.62	.40	.36	.00	.00	2.92	73.93	.50	.86	.18	2.03	.25	3.00	tr	tr
STEWART COUNTY																
Troy Woods, lot 79, 24th dist.	3.02	10.92	.78	.21	.26	tr	1.81	78.19	1.02	.54	.00	.00	1.66	1.30	tr	tr
W. G. Holloman, lot 48, 24th dist.	1.46	------	------	----	----	----	------	75.30	----	------	------	.00	.47	7.40	----	----
C. Schomberg & Son, lot 87, 24th dist.	1.10	10.72	------	----	----	----	------	77.98	----	1.17	------	------	.26	5.73†	----	----
Lamar Flowers, lot 46, 24th dist.	.25	------	------	----	----	----	------	81.34	----	tr	------	.00	1.17	3.27	----	----

†–Includes insolubles.

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
MARION COUNTY																
J. Rogers	1.34	6.88	.55	.14	.36	.00	17.38	42.95	1.48	.24	.54	.00	.24	27.00	tr	tr
SCHLEY COUNTY																
Rees Land Co., lot 188, 29th dist.	2.27						13.90	53.76		.18				16.50		
do	4.21						14.54	35.04		.16				30.05		
do	2.23							74.56				.08	.58	10.03†		
PULASKI COUNTY																
J. F. Hendley, lot 20, 5th dist.	1.66	11.44	tr	tr	.00	.00	6.09	76.22		.64	.36	.00	.17	3.58	tr	tr
do								80.46				.00	.14	7.30†		
R. O. Pate, lot 166, 4th dist.	1.34	12.14	tr	tr	.00	.00	tr	80.09		.40	.45	.00	.12	5.74	tr	tr
BURKE COUNTY																
J. F. McElmurray	3.20	10.18	tr	tr	.00	tr	4.82	72.00		.40	.18	.00	.81	7.94	tr	tr
do	.98	10.95			.10	.12	.26	73.28		.04	.00	tr	.65	13.96		
do	.74	8.29				.01	.60	62.68		.03	.00	.00	.58	27.41		
do	1.04	8.28				.04	.98	66.86		.05		tr	.74	22.30		
E. E. Chance	.20	12.52	.18	.46	.00	tr	6.00	71.38		tr	.72	.00	.19	8.26		
RICHMOND COUNTY																
F. J. Merton	2.60	10.60	.60	.80	.00	.00	11.24	63.10		tr	.36	.00	.58	9.62		
COLUMBIA COUNTY																
L. A. Paschal	.52	10.40	.08	.07	.00	.13	25.91	32.20		tr	.96	tr	.09	29.00		
do	2.72	8.96			.00	.10	21.24	40.31	.12	.00	1.08	.08	.17	24.43		
Lee Ward	.62	7.38	.22	.18	.00	.00	14.97	55.95		.28	.90	.25	.08	19.30	tr	tr
H. S. Paschal							24.70	36.40			1.50	.20	.11	26.96		
McDUFFIE COUNTY																
I. E. Farmer	.75	10.26	tr	tr	.38	.00	26.26	35.50		.52	.92	.00	.06	25.44	tr	tr

†–Includes insolublse.

FOSSIL ORES
DADE COUNTY

Property	Hygroscopic H_2O	Combined H_2O	FeO	Fe_2O_3	Al_2O_3	MnO	CaO	MgO	SiO_2	S	P_2O_5	CO_2
Georgia Iron & Coal Co., lot 251, 11th dist.	0.10	2.04	2.65	45.29	3.14	0.28	21.41	0.44	7.28	tr	1.17	16.50
do lot 212, 11th dist.	0.32	.87	4.03	22.50	17.17	0.30	28.24	2.14	7.03	0.07	0.38	16.60
Solon Gwin's Prop, lot 185, 10th dist.	0.65	3.57	.00	81.57	5.57	0.43	0.29	0.42	6.55	0.25	0.45	.00
The New England Co., lot 251, 10th dist.	0.43	3.01	.00	77.04	5.21	0.69	1.02	0.47	11.85	0.04	0.62	.00
do lot 152, 10th dist.	0.45	0.90	0.90	56.53	4.16	0.52	16.76	0.55	7.93	tr	0.79	12.01
do lot 98, 10th dist.	0.70	2.40	1.00	48.49	1.98	0.36	19.65	1.23	7.67	0.09	0.36	15.60
do lot 115, 10th dist.	0.41	1.75	1.70	52.16	5.22	0.21	15.23	0.06	10.52	0.06	1.83	11.01
D. Martin Property, lot 50, 10th dist.	0.62	2.01	1.00	47.67	2.02	0.27	18.39	0.79	11.85	0.06	0.77	15.06
do lot 50, 10th dist.	0.82	2.41	0.65	44.50	5.74	0.23	22.33	0.08	4.16	tr	0.87	18.00
do lot 153, 10th dist.	0.13	0.60	0.50	31.50	1.67	0.22	34.02	0.42	4.00	0.05	0.93	26.05
The Tinker Property, lot 50, 18th dist.	0.27	0.75	2.05	42.20	3.89	0.23	24.95	0.40	4.62	0.10	1.31	19.40

FOSSIL ORES
WALKER COUNTY

Location	Hygroscopic H_2O	Comb. H_2O	FeO	Fe_2O_3	Al_2O_3	MnO	CaO	MgO	SiO_2	S	P_2O_5	CO_2	Na_2O	K_2O	TiO_2
Georgia Inn & Railroad Company, Prop., lot 7, 26th dist.	0.53	1.49	.00	80.69	1.76	1.41	2.26	0.54	10.91	0.12	0.52	.00	------	----	------
Peters Property, lot 33, 26th dist.	0.30	4.64	------	77.18	7.38	0.18	.00	tr	9.76	.00	0.34	tr	------	tr	.36
Mrs. Lizzie Henson property, lot 135, 12th dist.	0.32	2.22	1.25	41.38	11.57	0.42	3.63	1.89	32.68	0.12	0.60	3.60	------	----	------
Kensington Iron & Coal Company property, lot 342, 12th dist.	0.19	1.70	3.15	42.47	5.45	0.29	22.70	0.59	7.00	0.02	0.96	15.20	0.01	0.47	.18
E. L. Thurman property, lot 304, 12th dist.	0.11	1.20	0.18	82.63	2.59	0.49	1.41	0.34	10.00	0.10	1.36	------	------	----	------
The Partain property, lot 21, 11th dist.	0.50	2.00	.00	84.17	3.60	0.51	0.89	0.47	7.13	0.14	1.09	.00	------	----	------

FOSSIL ORES
WALKER COUNTY

Property	Hygroscopic H_2O	Comb. H_2O	FeO	Fe_2O_3	Al_2O_3	MnO	CaO	MgO	SiO_2	S	P_2O_5	CO_2	Na_2O	K_2O	TiO_2
W. A. Broom property, lot 122, 11th dist.	0.36	22.16	------	42.26	5.54	0.32	24.80	1.00	2.16	0.06	0.04	------	0.32	0.31	------
do---lot 217, 11th dist.	0.32	1.68	0.05	81.86	4.09	0.41	1.90	0.39	8.60	0.07	1.46	.00	------	----	------
The West property, lot 199, 10th dist	0.67	0.83	0.56	65.63	0.98	0.20	11.56	0.92	9.07	0.11	0.97	9.04	------	----	------
Mases Long property, lot 234, 10th dist.	0.40	2.02	.00	77.70	5.61	0.48	2.34	0.08	10.41	tr	1.65	.00	------	----	------
Frank Castello property, lot 271, 10th dist.	0.40	0.34	0.22	68.02	3.84	0.28	10.21	0.58	6.84	0.33	1.32	7.40	------	----	------
M. M. Phillips property, lot 308, 10th dist.	0.58	3.20	0.10	79.32	2.30	0.56	3.00	0.08	10.82	0.12	0.65	.00	------	----	------
Mrs Alice Parks property, lot 176, 9th dist.	0.19	2.04	2.00	45.00	4.05	0.49	24.80	0.38	5.16	0.25	0.72	15.00	------	----	------
do---lot 176, 9th dist.	2.15	4.84	.00	71.17	3.89	0.65	0.10	0.72	15.44	tr	0.75	.00	------	----	------
M.M. Fisher property,lot 104,9thdist	0.85	2.47	.00	85.24	1.57	0.35	0.08	0.23	8.58	0.08	0.92	.00	------	----	------
The Glen-Warthen property, lot 11 , 8th dist.	0.30	3.29	.00	76.50	5.68	0.30	0.28	0.24	12.81	0.11	0.63	.00	------	----	------
do---lot 152, 8th dist.	0.32	3.51	.00	76.88	1.13	0.67	0.30	0.17	16.12	0.12	0.22	.00	------	----	------
Virginia Iron, Coal & Coke property lot 111(?) 7th dist.	0.11	0.80	3.75	56.86	2.78	0.58	14.48	1.95	4.98	0.06	1.15	12.40	------	----	------
Dickson-Cameron property, lot 181, 7th dist.	0.14	0.85	0.90	36.51	2.18	tr	29.84	0.14	6.89	0.06	0.61	22.49	------	----	------
Georgia Iron & Railroad Co. prop., lot 304, 7th dist.	0.56	1.90	.00	69.92	2.14	1.76	0.30	0.78	22.46	0.29	0.23	.00	------	----	------
do---lot 200, 7th dist.	0.42	1.82	.00	82.13	3.83	0.29	0.86	0.08	10.46	0.04	0.85	.00	------	----	------
Mrs. Alice Parks property, lot 176, 9th dist.	2.15	4.84	.00	71.17	3.89	0.65	0.10	0.12	15.44	tr	0.75	.00	------	----	------
Kensington Iron & Coal Co. prop.	0.51	2.77	0.07	77.66	5.33	0.22	1.25	0.33	9.32	0.01	1.65	------	0.06	0.34	------
do	0.90	1.89	0.07	76.81	4.66	0.27	2.33	0.16	9.63	0.02	1.71	------	0.16	0.73	------
do	0.16	3.56	1.94	51.91	5.98	0.22	16.82	0.05	5.18	0.04	1.08	12.34	0.16	0.16	
do	0.32	1.96	1.34	53.40	11.89	0.08	14.89	0.16	6.41	0.01	1.28	8.42	tr	0.38	------
do---Estell Mine	0.73	1.60	.00	82.07	1.45	0.80	0.12	0.66	12.41	0.24	0.26	.00	------	----	------
do	0.60	4.24	.00	80.61	2.73	0.50	2.19	tr	7.20	0.10	1.24	.00	------	----	------

FOSSIL ORES

CHATTOOGA COUNTY

Property	Hygroscopic H_2O	Combined H_2O	FeO	Fe_2O_3	Al_2O_3	MnO	CaO	MgO	SiO_2	S	P_2O_5	CO_2
W. T. Henry's property, lot 171, 13th dist.	0.50	1.75	.00	63.90	9.01	0.28	5.44	0.33	15.14	0.10	2.62	1.50
A. J. Lawrence property, lot 188, 13th dist	0.30	7.00	.00	54.41	5.31	0.43	0.26	0.25	30.90	0.09	0.27	.00
Woodstock Iron & Coal Co. property, lot 210, 1 3th dist.	0.30	1.90	1.85	77.97	4.81	0.50	1.11	0.42	10.63	0.08	0.96	.00
Dalton Iron & Coal Co. property, lot 223, 13th dist.	0.61	2.76	.00	76.63	5.48	0.40	0.20	tr	12.29	0.12	0.69	.00
DaltonIron & Coal Co. prop., lot 256, 13th dist.	0.40	3.15	.00	80.48	3.28	0.09	tr	tr	11.47	0.10	0.57	.00
Rome Furnace Co., lot 140, 13th dist.	0.67	2.40	0.25	77.29	0.89	0.28	1.09	0.13	15.64	0.03	1.06	.00
do lot 141, 13th dist.	0.56	1.74	0.10	82.48	3.78	0.03	0.80	0.11	9.19	0.07	0.83	.00
I. W. Maddox property, lot 161, 6th dist	0.31	1.14	0.05	76.98	5.23	0.26	1.21	0.17	14.91	0.06	0.97	.00

CATOOSA COUNTY

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
Kittle and Clark, lot 204, 28th dist.	.02	15.40	.09	.22	10.00	4.00	3.12	58.20	----	1.64	.36	.43	1.00	5.60	tr	tr

WHITFIELD COUNTY

Property	Hygroscopic H_2O	Comb. H_2O	FeO	Fe_2O_3	Al_2O_3	MnO	CaO	MgO	SiO_2	S	P_2O_5	CO_2	Na_2O	K_2O	TiO_2
W.H. Shadden Prop. Lot 50, 11th dist.	0.27	4.05	0.75	48.07	4.35	0.42	9.81	0.55	22.79	0.06	0.79	8.00	------	----	------

CATOOSA COUNTY

The Smith Prop. Lot 95, 28th dist.	0.25	4.50	0.10	80.03	0.52	1.77	0.24	tr	11.40	0.08	0.79	.00	------	----	------
do Lot 156, 28th dist.	0.76	3.60	------	77.03	4.05	1.36	.00	.00	11.36	.00	0.74	------	0.43	0.32	.36
do Lot 204, 28th dist.	0.02	15.40	------	58.20	3.12	1.64	10.00	4.00	5.60	0.17	1.00	------	0.09	0.22	------
do Lot 61, 27th dist.	0.25	3.53	1.00	84.60	1.62	0.35	tr	tr	7.53	tr	1.01	.00	------	----	------
do Lot 25, 27th dist.	0.42	4.73	.00	81.01	2.86	0.01	0.04	0.59	9.29	0.01	1.13	.00	------	----	------
do Lot 10, 27th dist.	0.34	5.40	0.75	73.04	4.97	0.26	0.15	0.73	13.17	0.07	1.34	.00	------	----	------

MAGNETITE ORES

COBB COUNTY

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
James Dawson, lot 15, 16th dist.	.02		.52	.12	.08	.12	3.72	66.39	22.00	.85	4.88	.00	.02	.72	tr	.34
A. D. Kemp	.02		.08	tr	.12	.48	.80	43.34	25.29	.54	26.46	.00	.12	2.52	tr	tr
do	.06		.10	.14	.08	.42	2.00	71.34	19.68	.62	4.60	.00	.06	.86	tr	tr
do								40.13	7.09		11.56			31.72		
Ruth Ray	.08	2.64			6.60	1.90	20.94	5.28	6.24	.55	1.35	.00	1.85	51.00		
J. G. Westerman	.42							69.41		5.88						

CHEROKEE COUNTY

J. B. Knight	.02		.20	.12	.08	.06	1.65	60.30	29.73	.57	5.44	.00	.02	1.88	tr	tr
W. L. Dean, lot 1282, 15th dist.	.18		.34	.22	tr	.22	6.04	64.72	24.52	.72	.44	.00	.07	2.44	tr	tr
J. C. Taylor, lot 290, 14th dist.	1.38	12.36						70.95		.97		.27	1.30	6.52		
Fanny Hutcherson, lot 202, 14th dist.	.94	2.63				.00		32.91		.32	1.92	.08	.14	41.51		
G. W. Evans, lot 56, 22nd dist.	.06							37.66	35.02	tr	23.16	.40		3.98		

GREENE COUNTY

J. C. Hart	1.00	3.82	.82	1.76	3.66	tr	16.48	9.08		36.00	.92	.00	tr	26.38	tr	tr
do								88.40		.52		.12	.14	7.50		
do								86.51		.76			tr	3.80†		
do								79.35		2.46		.20	.23	11.65		
do								41.83		14.34		.10	.37	37.45		

TALIAFERRO COUNTY

W. H. Murden	.98	12.04	1.14	.73	.00	.12	13.11	15.14	.00	53.92	.36	.00	.19	1.80	tr	.09

LUMPKIN COUNTY

Water Power & Mining Co.								98.71			.00					
do								95.42			.00					
do	.00	.00			.00	.02	1.32	31.70	8.80	tr	.00		tr	58.34		

†-Includes insolubles.

MAGNETITE ORES

PAULDING COUNTY

Property	H_2O	Loss on ign.	Na_2O	K_2O	CaO	MgO	Al_2O_3	Fe_2O_3	FeO	MnO	TiO_2	SO_3	P_2O_5	SiO_2	Co	Ni
Y. L. Crawley, lot 1014, 19th dist.	.09	.60			.34	.06	.37	45.84	1.74	3.44	tr		.06	47.17		
DAWSON COUNTY																
S. Howard, lot 97, 4th dist.	.28	.98			.34	.50	4.52	64.31	11.40	8.23	.13	.05	.22	9.01		
GILMER COUNTY																
W. H. Searcy, lot 215, 7th dist.	1.62	1.82	.87	1.51	.64	.12	6.00	50.11	13.60	.48	.72	.00	.99	21.66	tr	tr
TROUP COUNTY																
J. C. Sledge, lot 120, 6th dist.								48.28				.65	.56	31.27		
TERRELL COUNTY																
J. A. Ferguson	3.31	9.38						73.73		2.47			.50	8.73		
TALBOT COUNTY																
S. M. Woodall, lot 99, 23th dist.								43.20				1.27	.72	36.21		
GREENE COUNTY																
S. W. Woodall, Woodville dist.								68.34		.00		.05	.102	40.42		

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