GEOLOGICAL SURVEY OF GEORGIA

W. S. YEATES, State Geologist

BULLETIN No. 10—A

A

Preliminary Report

on a Part of the

Iron Ores

OF

GEORGIA

Polk, Bartow and Floyd Counties

BY

S. W. McCALLIE

Assistant Geologist

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GEO. W. HARRISON, State Printer

Atlanta, Georgia

WORKED AREA OF THE REED MINE, NEAR CEDARTOWN, POLK COUNTY, GEORGIA.

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of the

Geological Survey of Georgia

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ERRATA

1 On page 66, 4th line from the bottom, for "W. H. Bunn", read *W. C. Bunn.*

2 On page 83, 14th line from the bottom, for "900 acres", read *9,000 acres.*

3 On page 87, 14th line from the bottom, for "unincorporated", read *incorporated.*

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LETTER OF TRANSMITTAL

GEOLOGICAL SURVEY OF GEORGIA
Atlanta, Oct. 1st, 1900.

To His Excellency, A. D. CANDLER, *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. S. W. McCallie, Assistant Geologist, on the IRON ORES OF POLK, BARTOW AND FLOYD COUNTIES, to be published as Bulletin No. 10-A, A Preliminary Report on a Part of the IRON ORES OF GEORGIA.

The great commercial interest in this important subject has created a strong demand for the information contained in this Report; and it is, for this reason, published in smaller size, than was at first intended.

Mr. McCallie is now in the field, making a survey of the Iron Ores of other counties, for a second bulletin of this series, to be published at the earliest time possible.

Very respectfully yours,

W. S. YEATES,
State Geologist.

THE IRON ORES OF GEORGIA

CHAPTER I

THE VARIETIES, THE GEOGRAPHICAL AND GEOLOGICAL DISTRIBUTION, THE MODE OF OCCURRENCE, THE ORIGIN, AND THE METHODS OF MINING THE IRON ORES, ETC.

THE VARIETIES OF THE IRON ORES, AND THEIR IMPURITIES

The only iron ores, of commercial importance, so far discovered in Polk, Bartow and Floyd counties, are limonite and hematite. The former, commonly called brown hematite, or simply brown ore, is far more abundant, than the latter; and its discussion comprises the greater part of this report. *Limonite* is a hydrous sesqui-oxide of iron; and, when pure, it contains 25.7 per cent. of oxygen, 59.8 per cent. of metallic iron, and 14.5 per cent. of water. The color is some shade of brown, or, when earthy, of brownish or ochre yellow. Its hardness varies from 5 to 5.5, and its spe-

cific gravity, from 3.6 to 4.0. Brown iron ore includes several species of minerals, which differ from limonite in chemical composition and physical structure. Thus goethite contains 10.1 per cent of water; xanthosiderite, 18.4 per cent.; and limnite, 25.23 per cent. Bog-iron ore and ochre are varieties of limonite, which depend upon their physical structure, for distinction. When limonite loses its water, it passes into hematite, thereby increasing its percentage of iron to 70, and, at the same time, assuming a reddish-brown, or steel-gray color. The brown ores, now being worked, in the above named counties, are rarely ever pure limonite. In many cases, they have been partially de-hydrated, probably by local metamorphism, and approach, in chemical composition, true hematite. This accounts, in a great measure, for the analyses of the brown ores, in some instances, running higher in metallic iron, than theoretical limonite does.

The most common impurities of the brown iron ore are silica, alumina, phosphorus, sulphur and manganese. The two first of these impurities usually occur, in great measure, in the brown ores of Georgia, in the form of chert or sand with clay, as a physical mixture. They are readily reduced to a minimum, by washing and hand-picking. The other physical impurities are of such chemical constitution, that they determine the character of the iron produced by the furnace. The phosphorus is present, chiefly in the form of apatite. It renders the iron brittle, when cold. This element is especially objectionable, in ores to be used, for making steel, by what is known as the Bessemer process. The Bessemer limit of phosphorus has been placed at .05 per cent. for 50 per cent. ore, which is much lower, with only one or two exceptions, than the percentage of phosphorus given in any of the analyses of the brown ores, in this report. Sulphur, which occurs chiefly in the form of pyrite, a sulphide of iron,

makes the iron brittle when hot. In some of the ore-banks of Polk and Bartow counties, pyrite is more or less plentiful. It occurs, usually, in the form of bowlders, with an outside covering of brown ore, one or more inches in thickness. Good specimens of this class of ore are to be seen on the McMeekin and the Crocker properties, 3½ miles northwest of Cedartown. Manganese is one of the most common of the impurities of brown iron ore. It exists as a physical impurity. In this condition, it is often seen, associated with the brown iron ores of Bartow county, especially in the vicinity of the manganese ore-banks. It is also met with, in the iron ore-banks of Polk and Floyd counties; but it is not so common. Iron ore, containing more than two per cent. of manganese, is undesirable for the manufacture of pig iron. Such ores, however, are well adapted for the making of steel.

THE GEOGRAPHICAL DISTRIBUTION OF THE BROWN IRON ORES

The brown iron ores, in workable quantities, are limited to certain well defined districts. These differ greatly in size, and are often quite irregular in outline. This distribution seems to be conditioned, in a great measure, by the exposure of certain geological formations, as may be seen by an examination of the accompanying map.[1]

THE POLK COUNTY DEPOSITS are naturally divided into six distinct divisions; namely, the Cedartown district, the Fish Creek district, the Wray district, the Esom Hill district, the Etna Valley district and the Aragon district. Each of these districts has a

[1] Opposite page 28.

somewhat indistinct boundary. However, they are, as a whole, completely separated, one from the other.

The area embraced in THE CEDARTOWN DISTRICT is from one to two miles wide, and about eight miles long. It extends in a northwest direction, parallel with Cedar creek, from the VanDevander property, some two miles southwest of Cedartown, to the Floyd County line. Along its course, is a chain of well-rounded red hills, on which the ore-banks are located. Some of the most noted mines in this district are the Ledbetter, the Reed and the Wood mines, all of which have been extensively worked, and have furnished large quantities of excellent ore.

THE ETNA VALLEY DISTRICT lies in the extreme western part of the county, along the Selma branch of the Southern Railway. This iron-bearing belt, which is about 2½ miles wide and 5½ miles long, enters the county from Alabama, at Etna station, and follows the valley, of the same name, to within a short distance of Cave Spring. The belt has an almost due north-and-south course, corresponding to the trend of a fault line, traversing this section. The State-Line, the Etna, the Oredell and the Hematite ore-banks are the principal ones, that have been worked on a large scale, in the Etna district. The ore occurs principally in the ridges, adjacent to the valley; but, in some places, it is, also, found in workable quantities in the valley itself.

The ore deposits of THE FISH CREEK DISTRICT occur along the head-waters of a stream, of the same name. The most extensive workings of this district are the Grady and the Central Mining Company's banks at Grady station, on the East & West R. R., six miles east of Cedartown. This district, which has a northeast-and-southwest trend, is about four miles long, and from 1 to 1½ miles wide. It lies along the east side of a broad chert ridge, which is crossed, in going from Grady to Cedartown. The most

valuable and extensive deposits are confined mainly to the foot-hills of the chert ridge, along the margin of Fish Creek valley.

Some seven miles northeast of Fish Creek district, in the vicinity of the Aragon Mills, is THE ARAGON DISTRICT. It is not so extensive, as the other districts, heretofore described. However, it has furnished a large quantity of ore. The main deposits occur in a narrow belt, on both sides of the Southern Railway, between Aragon and Seney. Isolated deposits, of some economic value, are, also, found along the East & West R. R., southwest of Taylorsville, which, geographically, belong to the Aragon district.

The two remaining districts, namely, THE ESOM HILL and THE WRAY DISTRICTS, are both located in the southwestern portion of the county. The former deposits occur along the East & West R. R., near the Georgia-Alabama State-line, and the latter, along the head-waters of Lime creek. Neither of these districts are very extensive; but the ore is usually of high grade.

THE BARTOW COUNTY IRON DEPOSITS arrange themselves geographically, into the following divisions, namely, the Eastern district, the Iron Hill district and the Linwood district. The most important of these divisions is THE EASTERN DISTRICT, which is confined chiefly to the metamorphic region in the eastern part of the county. The iron deposits of this district begin on the Jones property, about two miles south of Emerson, and extend in a northerly direction to Sugar Hill, a distance of about 16 miles. The width of the iron-bearing belt varies from one to four miles. It reaches its greatest width, a short distance north of Emerson, where numerous iron banks have been worked, in the quartzite ridges. Some of the most important brown iron ore deposits of the State, such as the Sugar Hill ore-banks, are located in this district. In addition to the brown iron ores, there is, also, in this

district, considerable hematite, of the variety, micaceous hematite, which is, in places, of sufficient abundance, to be of economic value.

The two other iron districts are located in the western part of the county. The deposits of THE IRON HILL DISTRICT occur in the vicinity of Ligon Post-office, some seven miles southwest of Kingston. The district is about two miles long, and half-a-mile wide. Its longer axis runs north and south, corresponding to the course of the ridges, traversing this part of the county.

THE LINWOOD DISTRICT lies along both sides of the Western & Atlantic R. R., between Linwood and Adairsville. The deposits, here, are scattered through the chert ridges, covering a considerable area; but none of them appear to be of any great economic value.

There are only two districts in FLOYD COUNTY, in which iron ore has been worked, to any considerable extent. One of these is located in the southern, and the other, in the eastern part of the county. The former is known as the Cave Spring district, and the latter, as the Silver Creek district.

THE CAVE SPRING DISTRICT is an extension of the Cedartown district. It is only about three miles long, and not over a mile broad. However, it has some of the most extensive and valuable deposits in the county.

THE SILVER CREEK DISTRICT has, so far, furnished but a small amount of ore. Nevertheless, there is to be found, here, in places, considerable deposits along the hill-slope in the vicinity of the Chattanooga, Rome & Southern R. R.

THE GEOLOGICAL DISTRIBUTION OF THE BROWN IRON ORES

The brown iron ores of Polk, Bartow and Floyd counties are confined, mainly, to two distinct geological formations, namely, the Knox Dolomite series and the Cambrian quartzites.

The Knox Dolomite series is the oldest and the most extensive member of the Lower Silurian formation, exposed in Northwest Georgia. It is always ridge-forming, and consists chiefly of heavy-bedded, gray magnesian limestones, with a maximum thickness, varying from 3,000 to 3,500 feet. One of the most marked distinguishing characteristics of the formation is the abundance of chert, which it contains. This siliceous material, in some of the beds, forms well defined layers; and, frequently, it continues over considerable areas. Generally, however, it is present, as irregular nodules, promiscuously distributed throughout certain horizons. Upon the weathering of the dolomitic limestone, the chert is set free, in the form of nodules and bowlders, which, in places, frequently mantle the surface of the ridges and hills, to a depth of many feet. An excellent idea can be had of this residual product, by an examination of the several cuts along the East & West R.R., between Grady and Cedartown. The district, here referred to, is the southern extension of a wide belt of dolomite ridges, traversing Bartow, Floyd and Polk counties.

By an examination of the accompanying map,[1] it will be observed, that the main iron deposits of the Knox Dolomite series are confined to its upper beds, near the line of contact with the overlying Chickamauga limestone, where they are to be found in the

[1] Opposite page 28.

residual clays. It seems quite likely, that, upon a more thorough examination, some of the deposits will be found to occur in the residual clays of the Chickamauga limestone itself. This is especially true, of a portion of the deposits in the Cedartown district, which has, accordingly, been mapped as belonging to that formation. In other cases, as in the Etna Valley and Linwood districts, the ore occurs near the line of contact of the Knox Dolomite with the Connasauga shales. It might be stated, as a general rule, with only a few exceptions, that the brown iron ores of the Knox Dolomite series occur in the greatest abundance, near the contact of this formation with some other; and, furthermore, that the most extensive deposits are not often far removed from the exposures of Chickamauga limestone. The exceptions, here referred to, where the ore does not occur near a contact, is well illustrated by the deposits of the Cedartown and the Iron Hill districts. In the former case, the iron-bearing belt extends entirely across the residual clays of the Knox Dolomite series; while, in the latter, the deposits occur near the center of a wide belt of this formation.

The iron-bearing Cambrian quartzites, termed by Hayes the Weisner[1] quartzites, are confined to the eastern part of Bartow, and the western part of Polk, counties. The formation consists of sandstones and slates, more or less metamorphosed. The quartzites, which, in most instances, are heavy-bedded, give rise to the numerous bold ridges and hills, traversing that portion of these counties. The slates, associated with the quartzites, are often much folded and contorted, and, frequently, are altered into schists. The entire district, traversed by the iron-bearing belt, shows every evidence of profound earth movement. This is especially true,

[1] The Chilhowie sandstone of Safford.

in the vicinity of the iron deposits in the neighborhood of Emerson, where quartzite, in places, seems to have been crushed into a fine powder, resembling, somewhat, a partially consolidated volcanic ash. Associated with the iron ores of the Weisner quartzites, are extensive and valuable deposits of manganese, ochre and barite.

In addition to the two above named iron-bearing formations, there is another, of small extent, but of some economic interest, lying along the East & West R. R., a short distance north of Rockmart, in Polk county. Dr. Spencer, formerly State Geologist of Georgia, has designated this formation, as the Deaton series. It consists of dark-colored, brecciated, ferruginous limestone, probably belonging to the upper division of the Lower Silurian formation.

THE MODE OF OCCURRENCE OF THE BROWN IRON ORES

The brown iron ores of the area, under consideration in this report, occur chiefly in the form of pockets, or irregular deposits, in the residual clays. The deposits are quite variable in size. They frequently contain only a few car-loads of ore; but, generally, they are far more extensive, and often cover a considerable area. Some of the deposits in the Cedartown district have been worked, on a more or less extensive scale, for more than twenty years, without exhausting the supply of ore. It is not uncommon, to find the deposits extending over five or six acres; but it must be borne in mind, that the ore does not occur in equal abundance over the entire area. On the contrary, it is often traversed and

intersected by clay "horses," or barren areas, so that, when the ore is removed, the surface frequently presents the appearance of an old land surface, much dissected by erosion. The depth, to which the ore extends, seems to be as variable, as the superficial extension of the deposits, themselves. In some cases, they are quite superficial, being only a few feet in thickness; while, in other cases, they appear to extend to great depths. In many places, deposits have been worked to a depth of 50 feet, or more, without reaching the limit. A bore-hole, put down for artesian water at Oredell, in Etna valley, is said to have demonstrated the continuance of the brown ore, at that place, to the depth of 180 feet. It is not uncommon to find the ore extending below the water-level. In some instances, the deposits on the hill-slope are found to extend into the valley below, where the ore occurs, in considerable abundance, in the stream-beds. The ore, in the individual deposit, is found mostly in the form of bowlders or gravel, in the residual clays. The proportion, which the ore bears to the entire material mined, varies greatly. In some of the most valuable deposits, the ore will average, probably, 50 per cent., or more, of the material mined; but, generally, it falls far short of this average.

In addition to the above described form of ore deposit, there are two others, which deserve to be mentioned, namely, the Vein deposit and the Bedded, or Blanket, deposit. The best examples of these two deposits are to be found in Bartow county; the former, in the vicinity of Emerson, and the latter, in the Sugar Hill district. The vein deposits vary in thickness, from a few feet to several yards, and extend to a greater depth, than has yet been reached by mining.

A good illustration of this class of deposit is to be seen, at what is known as the Wheeler ore-bank, located among the quartzite

ridges, about 2½ miles northeast of Emerson. The vein, here, is quite variable in thickness; and it has been successfully worked along its outcropping, for more than a quarter of a mile, to the depth, in places, of 40 feet, or more. The walling, on either side of the vein, consists of highly contorted mica-schists, which, in places, have been altered to brown iron ore. The veins usually conform, in strike and dip, to the country-rock; but there is no evidence, whatever, that the ore is a stratified deposit. On the contrary, all the facts go to show, that it is a true vein deposit, resulting from the precipitation of iron from chalybeate water, circulating in an open fissure.

The bedded deposits of the Sugar Hill district occur near the base of Pine Log mountain, in the northwest part of Bartow county. The deposits, which overlie a rather coarse-grained, porous quartzite, are often several feet in thickness, and frequently extend over an area of a number of acres. Overlying the deposits, generally occurs a covering of clay and partially decomposed slate. The ore, which is mostly what is known as soft ore, has originated from massive siderite (iron carbonate), lying between the shales and the quartzites; and it is not an original stratified deposit, as some suppose.

THE ORIGIN OF THE BROWN IRON ORES

There has been presented, from time to time, a number of theories, as to the origin of the brown iron ores of Bartow, Polk and Floyd counties. These theories have apparently been based, in some cases at least, upon imperfect and superficial field-study; and,

as a consequence, they are not always in accordance with the facts. Dr. J. W. Spencer, formerly State Geologist of Georgia, in discussing this question says : — [1] " The brown ores of the older Paleozoic belt have been entirely derived from ferruginous limestones. Whether the iron was in the condition of carbonate or of sulphide, is of little consequence ; for, where available, it is now always associated with the remains of decayed limestones, some of which were highly calcareous, with but little flinty matter ; whilst, again, to a lesser extent, the iron deposits are derived from the siliceous beds, with a marked difference in character. Some of the iron-bearing limestones may have been ferruginated, after their formation, and that irregularly, by iron-bearing streams, often flowing transversely across the formations, from the older metamorphic rocks to the east ; for, frequently, the trend of the ore-bearing ridges is across the general direction of the formations, which normally extend from the eastward of north to the opposite direction. Possibly, the directions of some of these former iron-bearing streams can be recognized ; but, probably, a greater proportion of the ore has been deposited synchronous with the rock formation, adjacent to the mouths of streams, or in lagoons, as pointed out, in connection with manganese and aluminum ores." * * * * * " Any one, familiar with the various coast lines, is aware of the common occurrence of low islands, numerous channels and lagoons, such as are found along our own shores. The manganese, being converted into the soluble carbonate by superficial waters, at its original highland source, was borne by the streams, which were eventually retarded, upon entering the dismembered water-basins along the coast. Adjacent to the streams, and in the quiet waters of the lagoons or the estuaries, the conditions are

[1] The Paleozoic Group, by J. W. Spencer, Geological Survey of Georgia, pages 151 and 207.

favorable, for the conversion of the soluble carbonates of manganese into oxides. Under these conditions, the metals borne down by many streams, in both solution and, to a small extent, in a finely divided mechanical condition, would have been deposited in separated basins, all of which were, however, in a general trend, parallel with the direction of the coast line. * * * * The metals are generally disseminated, to a small extent, amongst all the rocks; but they are concentrated only in limited areas."

Dr. C. W. Hayes, of the U. S. Geological Survey, who has made a very thorough study of the structural geology of the brown iron ore districts of Northwest Georgia, divides the deposits into four separate divisions, namely, gossan-ores, Tertiary gravel-ores, concentrate-deposits and fault-deposits; and he has the following to say, as to their origin:—[1] "The best-known deposits of gossan-ore occur in the Ducktown district. As is well known, copper occurs there, associated with great quantities of pyrrhotite. The latter has been oxidized, at the surface, to limonite; and, during the process of oxidation, the copper has been concentrated at the bottom of the weathered zone, forming the rich deposits of "black copper," overlying the unaltered pyrrhotite. The gossan-ore has a variable depth, down to 50 feet or more, and consists of soft, porous, ochre-yellow limonite.

"During Tertiary times, the valley-region was reduced very nearly to sea-level, and in its lower portion, chiefly those underlain by the Chickamauga limestone (the next formation above the Knox Dolomite), swamps were formed, which received drainage from the adjacent regions, and in which extensive deposits of bog-ore were formed. When the region was elevated, the lime-

[1] Geological Relations of the Iron-ores in the Cartersville District, Georgia. By C Willard Hayes, U. S. Geological Survey; Transactions of the American Institute of Mining Engineers, Washington meeting, February, 1900; pages 9, 10 and 11.

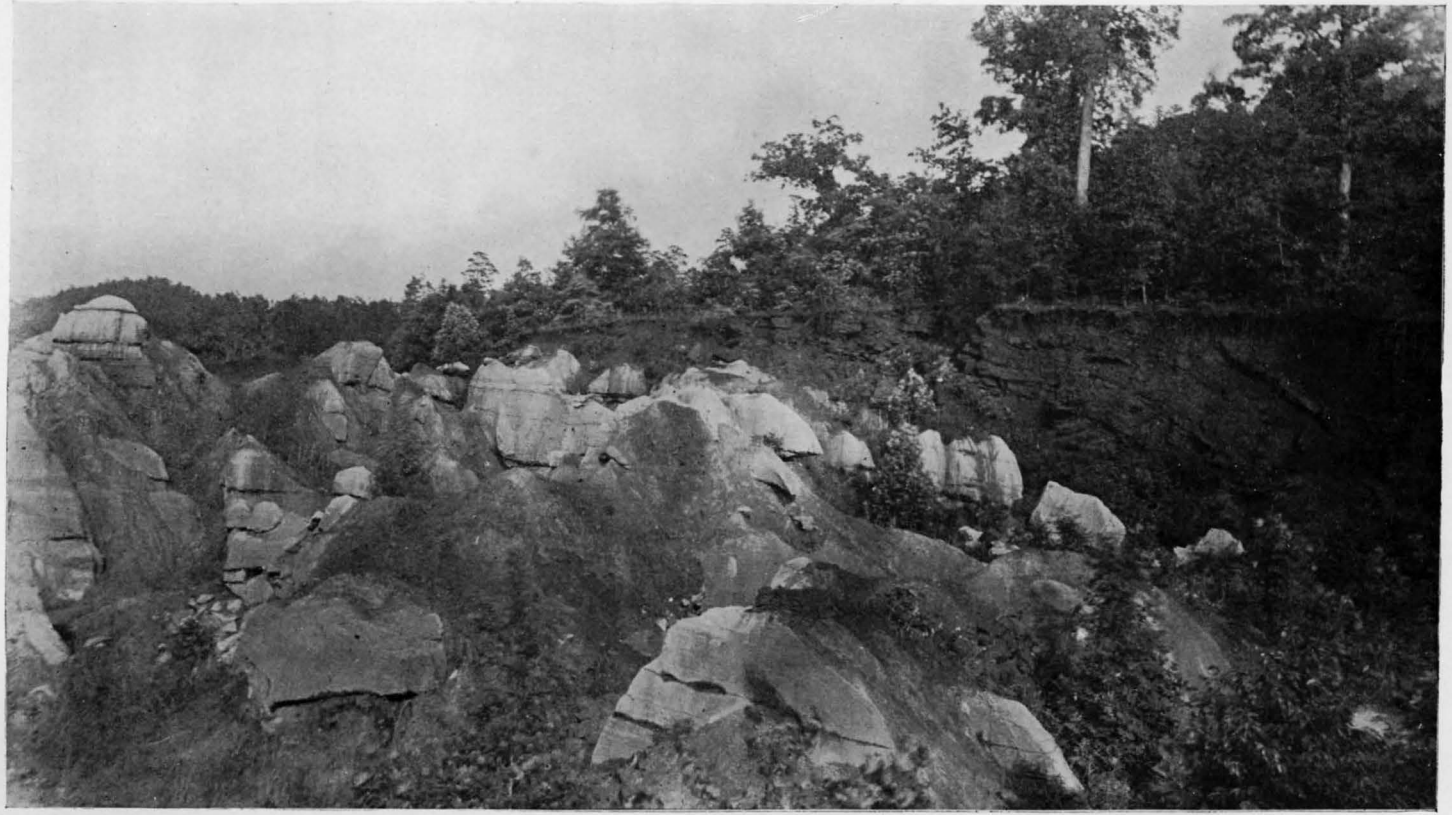
stone areas were again reduced more rapidly, than the adjacent areas underlain by dolomite, and doubtless much of the accumulated iron-ore was removed by erosion. Around the margins, however, the ore remained embedded in the residual clay. Deposits of this character are especially abundant in the Rockmart and Cedartown districts. * * * * * * * * The brown hematites of the third class, here called concentration-deposits, constitute the most important deposits of the Cartersville district. They may occur wherever a limestone is underlain by an insoluble and impervious stratum, such as sandstone or quartzite. Favorable conditions, for the accumulation, occur in Northwest Georgia and Alabama, at the contact of the Lower Carboniferous limestones with sandstones, which sometimes underlie it, and at the contact of the Beaver limestone with the underlying Weisner quartzite. The Beaver limestone is more readily soluble, than the formations on either side; and, hence, in the erosion of the region, it has always formed valleys. At various times, these valleys have received the drainage, not only from the adjacent quartzite and limestone, but, probably also, from other of the valley-formations; and the widely disseminated iron, leached from these formations, during the process of decay, has been transported to the limestone valley, and there concentrated upon the underlying impervious quartzite. As the surface of the limestone was lowered, chiefly by solution, upon successive elevations of the region, remnants of the ore-deposits, thus formed, were left resting upon the underlying quartzite, and marking elevations, at which the surface of the limestone had remained for considerable periods. * * * * * * * * * As already remarked, the quartzite has been considerably folded, and is doubtless also intersected by numerous faults, of small throw, the evidence of the faulting being chiefly the occurrence of breccia. The latter usually con-

sists of fine angular fragments of quartzite, cemented by limonite; and associated with these breccias, are often found considerable deposits of iron-ore. These are sometimes irregular deposits, imbedded in the residual material, which covers the surface, and are not sharply differentiated from the concentration-deposits above described. In other cases, the ore appears to form well-defined fissure-veins, with distinct walls of the inclosing formation. This is notably the case, at the Wheeler Bank, about 4 miles southeast of Cartersville. The vein is from 12 to 15 feet in width, with occasional off-shoots. * * * This ore-body has evidently been deposited, subsequent to the development of schistosity in the inclosing rocks; since it shows no evidence of movement, in the way of brecciation or slickensides."

The theory, advanced by Dr. Spencer, would be quite plausible, if the ores could be found embedded in the limestones, with which they generally occur; but, only in one instance, as far as my own observation extends, do they occur in such position. The case, here referred to, is the iron ores of the Deaton series, which are exposed at several points along the East and West R.R., between Rockmart and Taylorsville. This formation consists of highly ferruginous limestones, carrying from 10 to 20 per cent. of magnetite. The limestone, when fresh, has a dark-gray color, or is almost black; but, upon weathering, it gives rise to a brown, porous iron-ore, retaining, in part, its former magnetic properties. There can be no question, as to the origin of the iron ores, in this individual formation; yet, to say, that the extensive deposits of ore, in the residual clays of the Knox Dolomite and the Chickamauga limestones, are concentration deposits, in limited areas of these formations, does not seem to be justified by my own field observations. In a few instances, as will be seen in the following description of individual properties, the ores are found in the red

clays, in contact with, and immediately above, the limestone. However, in no instance, do they occur in the limestones themselves, in sufficient abundance, to warrant the term ferruginous limestone, from which the ores are supposed to be derived.

Dr. Hayes's theory of the brown iron ores appears to be far more in accordance with the facts, than that advanced by Dr. Spencer. His explanation of the origin of the ores, overlying the Knox Dolomite and the Chickamauga limestone, under the head of Tertiary deposits, as far as my own observation extends, seems to be the most plausible theory yet advanced. The theory explains not only the geological distribution of the ores; but it also throws considerable light upon their mode of occurrence. According to this theory, the ores were originally laid down in swamps, in more or less extensive beds, near the line of contact of the Knox Dolomite and the Chickamauga limestones. After a re-elevation of the region, probably about the close of the Tertiary period, these swamps were drained; and, being covered by heavy beds of iron ore, they resisted erosion, and thus in process of time, gave rise to low, well-rounded, hills which now contain some of our most valuable iron-ore deposits. The irregular form of the deposits, and their mode of occurrence, in pockets and leads, associated with the vari-colored clays, are due, according to this theory, to irregular weathering of the underlying limestones. As the limestone, below the iron deposits, weathered, chiefly by being carried off in solution, its surface naturally became very irregular. The iron deposits, in adjusting themselves to the newly formed surface of the underlying limestone, would naturally be broken up, and, at the same time, arrange themselves, more or less in pockets and leads, corresponding to the more deeply weathered portion of the limestone. Such an irregular form of ore deposit, as is here outlined, is well



THE DEATON MINE, POLK COUNTY, NEAR TAYLORSVILLE, GEORGIA.

illustrated by the Deaton mine.[1] In this case, a ferruginous limestone, which corresponds to the supposed iron-ore beds, deposited in the swamps, here overlies the Chickamauga limestone; and, upon weathering, it gives rise to irregular ore deposits, very similar to those, met with, in the vicinity of Cedartown and elsewhere.

The Concentration-deposits, which, Dr. Hayes says, constitute the most important deposits in the Cartersville district, do not occur, according to my own observation, at any point, either in Bartow or Polk counties. These deposits, as he states, are found wherever a limestone is underlain by an insoluble and impervious stratum, such as sandstone or quartzite. In this class of deposits, he evidently includes the Sugar Hill deposit, and all other deposits of the Cartersville district, which are underlain by the Weisner quartzites; but, unfortunately for the theory, the ores, in all cases, are found to be overlain, in some part of the banks, by slates. It is true, that these slates are generally much decomposed, and are often called by the miners clays. Nevertheless, there can be no question about their nature, or their true stratigraphical position. When I first examined these deposits, I was of the opinion, that they had originated from the deposition of chalybeate waters, circulating between the slates and quartzites. The large amount of pyrite, found in the quartzites and slates, was supposed to be the original source, from whence the iron ores originated. This theory is likely true, in part; but the recent developments in the Sugar Hill district show, that the ores are derived chiefly from iron carbonate, which here occurs in the form of a stratum, 20 or more feet in thickness, between the slates and the quartzite. It is more than likely, that many of the iron deposits, associated with the Weisner quartzites, originated from beds of iron carbonate, as in

[1] See Plate II.

the Sugar Hill district. However, the fault-deposits, as pointed out by Hayes, and illustrated by the Wheeler bank, are probably more generally met with, throughout the Cartersville district, than any other class of deposits. To this class, also, probably belongs a majority of the deposits, associated with the Weisner quartzites in the Etna Valley district.

THE METHODS OF MINING THE BROWN ORES

Formerly, the brown ores of Polk, Bartow and Floyd counties were mined by means of pick, shovel and screen. By this method of mining, much of the fine ore was lost in the dump; and the ore frequently ran high in aluminum, on account of the clay adhering to its rough surface. In a few instances, the ore was calcined, in order to drive off the water; but, as a general rule, it was shipped directly to the furnace, just as it came from the bank, without any special preparation, except hand-picking. This method of mining is still followed, where the ore-banks are small, or where they are unhandy to water; but, as a general rule, this method is unsatisfactory, unless the ore occurs in huge masses. In this case, the ore is always comparatively free from impurities, and requires no special dressing, before shipment to the furnace. After mining, in the above named counties, became a better established industry, and the demand for higher grade ore, for longer shipment, became imperative, the ore-washer was introduced, and, soon thereafter, the steam-shovel. These improvements not only increased the output of the mines; but, at the same time, they raised the grade of the ore, by removing from it, in a great measure, all mechanical

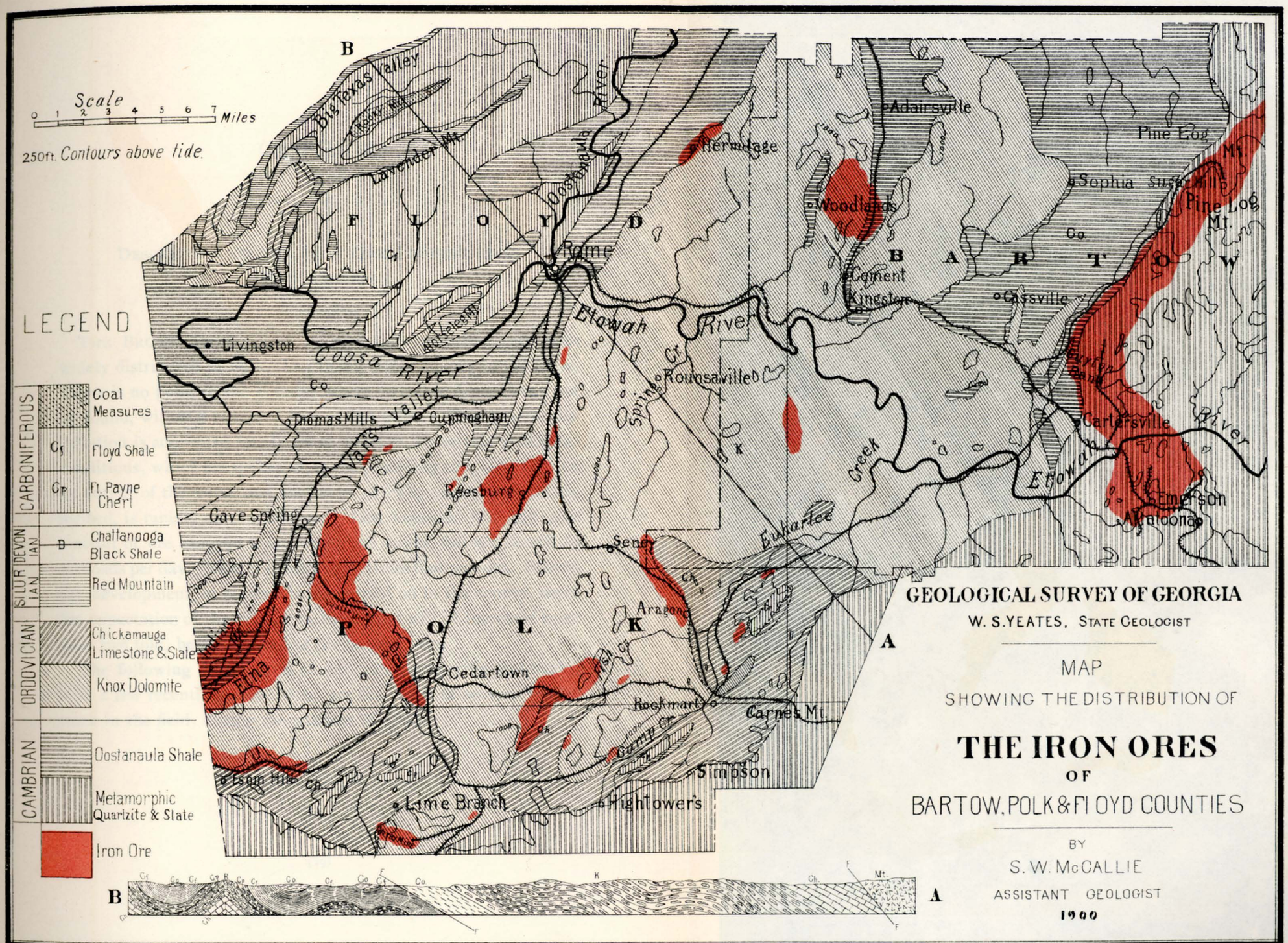
impurities. At some of the larger mines, such as the Reed mine, in the vicinity of Cedartown, where the ores occur in clays, they are mined and dressed, ready for shipment, almost entirely by machinery. A steam-shovel, operated by five or six men, is said to mine as much ore, in a day, as 50 men, and at a greatly reduced cost. In some of the banks, now being operated by improved machinery, it is claimed, that the ore can be mined, washed and put aboard the cars, for less than 50 cents per ton.

THE IRON FURNACES OF POLK, BARTOW AND FLOYD COUNTIES

Probably the first iron furnace, put in blast in Georgia, was that, erected on Stamp creek in Bartow county, about 1840. It is reported, that, as early as 1853, five blast furnaces were in operation, at one time, in this county. All these furnaces, the remains of which are still to be seen on Stamp creek and the Etowah river, were small charcoal furnaces, with a capacity, varying from two to four tons per day. The ore, supplying them, was obtained from ore-banks in their immediate vicinity, or was picked up from the surface of the cultivated fields. The iron industry, thus begun on a small scale in Bartow county, gradually grew in importance, until the Civil War. At this time, the furnaces had been greatly enlarged and otherwise improved, so that their output was increased many fold.

After Sherman's invasion of Georgia, all the furnaces 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. About the time the furnaces in Bartow county were shut down, the Cherokee furnace, at Cedartown, and the Etna furnace, in Etna valley, Polk county, went into blast. These were both modern hot-blast 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; but all are now inactive, except the Cherokee and the Rome furnaces, which consume daily about 100 tons of ore.



GEOLOGICAL SURVEY OF GEORGIA

W. S. YEATES, STATE GEOLOGIST

MAP

SHOWING THE DISTRIBUTION OF

THE IRON ORES

OF

BARTOW, POLK & FLOYD COUNTIES

BY

S. W. McCALLIE

ASSISTANT GEOLOGIST

1900

CHAPTER II

Description of the Iron Ore Properties in Polk County

The Brown Iron Ores, in workable quantities, are more widely distributed in Polk, than in any other county in the State. There is no point in the county, where valuable deposits can not be found, within a radius of four or five miles. This general distribution is accounted for, in great measure, by certain geological conditions, which are spoken of, in the preceding chapter. The total output of the numerous ore-banks of Polk county, as here described, is rapidly on the increase. Last summer, the aggregate amount of ore, shipped from the several mines, did not exceed 20 car-loads per day. Now, it is fully three times that amount. Should the development, at present being carried on in the county, reach the expectation of the promoters, the output will be increased more than two fold, before the end of the present year.

The following descriptions of individual properties and banks, with a few recently added notes, are the result of several weeks' work in the field, during the summer of 1899.

THE LEDBETTER MINE

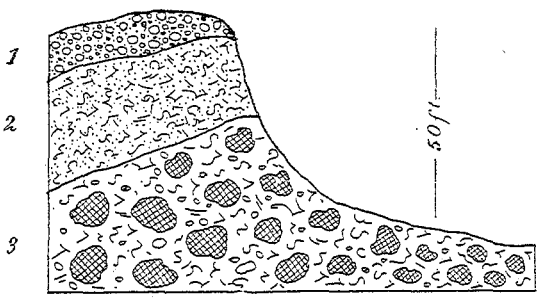
THE LEDBETTER MINE is located on *lots 661, 662 and 665, 2nd district*, Polk county, about 1¼ miles west of Cedartown. The main workings are situated upon the top, and along the slope, of a well-rounded hill, which has an elevation of about 150 feet above Cedar creek. The ores occur, here, in the form of nodules, pebbles, "pots"[1] and large irregular masses, distributed throughout the vari-colored clays. Many of the irregular masses are of huge size, often weighing as much as several tons. They are sometimes quite compact; but, more frequently, they are more or less porous. In either case, they are comparatively free from impurities, and always run high in metallic iron. The "pot" ore, so abundant in this bank, is a hollow concretion, or geode, filled with water, or white clay. These "pots" vary in size, from a few inches, to a foot or more in diameter. They always have a rounded form, and, when broken open, they frequently show, within, a beautiful play of colors. The gravel-ore is found in greatest abundance, in the surface clay; and it generally runs higher in metallic iron, than the other varieties of ore. The individual pebbles, constituting this class of ore, are usually of small size, many of them passing through the meshes of a ¼-inch screen. These different varieties of ore often occur in the same beds, where they constitute a high percentage of the material mined.

The clays, in which the ores occur, present a great variety of colors. The surface clays, in which the gravel-ore is most abundant, has always a dark-red color. It varies from two to five feet in thickness, and is separated from the clays below, by a distinct

[1] A local term.

line. Beneath the red clays, occur clays of all colors; these are often irregularly mixed and mingled, showing no distinct indication of stratification. Here, may be seen a pure white mass of kaolin, in immediate contact with yellow or purple clays. This condition is especially marked in the clay horses, which occur, more or less abundant, in the ore-bodies. Associated with the clays are to be found, in places, small pieces of partially decomposed shale and chert, and, occasionally, a few fragments of sandstone. The sandstone fragments are all angular, and show no indication, whatever, of the action of running water. The fragments of shale, chert and sandstone, together with the clays containing the ores, have all apparently originated *in situ*, from the magnesian limestone. This conclusion seems to be further strengthened, by the magnesian limestone, in the immediate vicinity, containing thin layers of shale and sandstone, and nodules of chert, which are similar in character to those found in the clays, associated with the ores. In some instances in the Ledbetter mine, the white or vari-colored clays overlie the ores;[1] but more frequently, they are found beneath them. The white clays of the clay horses are often in the form of laminated masses, and, sometimes, they possess a concentric structure.

FIG. 1



Section along the East Side of the Central Cut, Ledbetter Mine, Showing White Clay Overlying Gravel- and Bowlder-ore. 1. Red Clay and Gravel-ore. 2. White Clay. 3. Gravel- and Bowlder-ore in Yellow Clays.

[1] See fig. 1.

The magnesian limestone, which is known to underlie the residual clays, containing the iron ores, at the Ledbetter mine, is exposed at only two points in the workings. These exposures are limited to two outcroppings — one, in the southern, and the other, in the western portion of the mine, where some 15 or 20 feet of earth have been removed. The magnesian limestone, here exposed, is almost completely crystalline, and often brecciated. It is of a dark-gray color, traversed by white veins of calcite; and it gives off a decidedly fetid odor, when struck with the hammer. In places, it also contains thin layers of black shale, only a fraction of an inch in thickness. The weathered surface of the rock has a granular appearance, very closely resembling a fine-grained sandstone. A few hundred yards north of this exposure, near the mud dam, at the foot of the hill, is to be seen a considerable exposure of limestone. The outcropping, here, shows several layers of limestone, which differ in color, and, also, in mineral composition. Some of the layers consist of blue, compact limestone, the weathered surfaces of which often exhibit fossil remains of cephalopods and other mollusks. Inter-bedded with these blue limestones, are heavy layers of motley, more or less completely crystalline, fine-grained magnesian limestone, which weathers unevenly, and which frequently shows, projecting from its surface, a few minute crystals of quartz. At one place at this point, is to be seen a small workable deposit of nodular, water-worn brown iron ore, in immediate contact with the limestone. The intimate relation, here existing between the iron ore and the limestone, appears to throw some light upon the origin of the former. This question, however, is discussed in another part of this report.

Chert, which is one of the most prevalent mechanical impurities of the brown iron ores of Polk county, is not very abundant in the Ledbetter mine. It seems rather singular, that so little

chert should occur in this ore-bank; while on the eastern slope of the hill, on which the bank is located, the surface of the ground is covered with a thick mantle of this material. With the exception of chert, and a few fragments of sandstone and shale, the clays, containing the ores, are practically free from foreign impurities.

The ratio, which the ore bears to the entire material mined at the Ledbetter bank, is quite variable; as the ore runs in leads and pockets. In some places, 50 per cent. of the whole material is merchantable ore; while in others, it runs as low as 10 per cent., or even less.

The chemical composition of the ores from the Ledbetter mine is shown by the following partial analyses, furnished by Mr. H. N. VanDevander: —

Fe	P	Insoluble	SiO_2	Mn	Remarks
51.89 [1]	.824	9.63	——	——	40 ft. below surface.
53.65 [1]	.871	5.82	——	——	35 " " "
50.13 [1]	1.583	8.14	——	——	10 " " "
50.04 [1]	1.103	8.11	——	——	6 " " "
55.45 [1]	.567	——	6.82	——	Fine red gravel.
53.13 [1]	.363	7.30	——	——	
—— [2]	.384	——	——	——	
42.81 [1]	1.083	16.47	——	——	6 ft. below surface.
50.62 [1]	.637	8.32	——	——	
51.72 [1]	1.262	——	——	——	
52.89 [1]	.863	7.98	——	.576	
50.06 [2]	——	13.07	——	——	
48.23 [2]	——	17.42	——	——	
49.85 [2]	——	——	9.52	——	
45.65 [2]	.752	——	——	1.150	
55.31 [2]	.681	——	——	.661	

[1] By J. B. Britton, of Philadelphia, Penn.

[2] By S. L. Graham, of Rome, Ga.

The Ledbetter mine has been worked almost continuously, since 1889. The output of the mine, to date, is estimated at 350,000 tons of ore, which is said to have averaged more than 48 per cent. metallic iron.

The worked portion of the Ledbetter mine covers an area of something like 10 acres. The ore is mined entirely by open-cuts. These cuts are variable in depth. Some of them, in places, where the ore is abundant and of good quality, extend to a depth of 50 or 60 feet; but, as a general rule, they rarely attain a depth of more than 30 feet.

At the time of the writer's visit to the Ledbetter mine, it was being operated by THE NORTH GEORGIA MINING CO., under the management of Mr. H. N. VanDevander. This company is well equipped with mining machinery, having a steam-shovel, a double log-washer, a dummy engine, pumps, and all other equipment and tools, necessary for mining these ores. The pumping-station, from which the water, that supplies the washer, is obtained, is located on Cedar Creek, about one mile east of the ore-bank. The mine is connected with the main line of the East & West R. R., by a branch road, about 1¾ miles long. The ore passes directly from the washer into the cars, without further handling. During the summer of 1899, there were regularly employed at the mine, from 50 to 75 hands; and the monthly output was about 150 car-loads of ore. The ores, at present mined at the Ledbetter mine, are all shipped to Alabama and Tennessee; but, formerly, they were used by the furnace at Cedartown, in making charcoal iron.

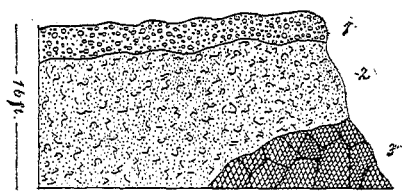
The amount of workable ore, still remaining in the Ledbetter mine, is a matter of conjecture. On the eastern side of the workings, there remains in sight a large amount of ore; and, in places, in the old workings, rich deposits extend to unknown depths. There seems to be good evidence, that this property will

long remain a source of revenue to its owners. However, the true value of the deposit can only be conclusively demonstrated, by actual mining.

THE CHEROKEE MINE

This mine is located on *lot 707, 2nd district*, which lies immediately east of the Ledbetter mine. The main workings are situated near the summit, and on the western slope, of a low ridge, having an elevation, some 30 feet lower, than the summit of the Ledbetter hill. There are to be seen, here, several large open-cuts, varying from 5 to 30 feet in depth, from which large quantities of ore were mined, some years ago, for use in the furnace at Cedartown. The walls of the excavations are now much fallen in, so that only an imperfect idea can be had, of the extent and character of the deposit. Nevertheless, from the few exposures and surface indications, there can be no doubt, that it is very similar to the Ledbetter deposit. There is an abundance of gravel-ore in places, and there seems to be no reason, why valuable deposits should not be found, below. Some chert occurs with the ore; but it is usually much disintegrated; and it could, in a great measure, be removed by the washer. In one of the excavations, near the center of the property, were seen water-worn pebbles associated with the ore.

FIG. 2



Section along an Open-cut on the Cherokee Property, Showing the Position of the Ore. 1. Red Clay and Gravel-ore. 2. Varicolored Clay. 3. Massive Bowlder-ore.

These pebbles, which consist chiefly of chert, appear to be quite local, in their distribution, and are of scientific interest, only. Fig. 2 shows how the ore occurs in one of the cuts, near the top of the hill.[1]

THE T. N. PACE PROPERTY

This property, *lot 708, 2nd district*, adjoins the Cherokee property, on the north, and includes a portion of the same hill, on which the Cherokee deposits are located. The ore, here, is similar to that found on the Cherokee lot; and it may be considered as an extension of the same deposit. The workings consist of two main cuts, which vary from 3 to 20 feet in depth, and from 2 to 4 rods in length. The ore occurs, in the form of gravel and nodular masses, in the dark-red clays. It appears to be of good quality, though some of the nodular masses contain more or less silica, in the form of sand. The excavations on this property are too limited, to give any very definite idea, as to the extent or commercial value of the ore.

The address of Mr. T. N. Pace, owner of this property, is Cedartown, Ga.

[1] Since the above was written, several excellent ore-banks have been opened up, on the Cherokee property, by THE ALABAMA & GEORGIA IRON COMPANY, its present owners; and the ore is now being used at the Cedartown furnace. There is, at present, no property in the vicinity of Cedartown, that shows more encouraging prospect of high-grade ore, than does the Cherokee property. The statement, made above, in reference to valuable deposits of ore beneath the surface, has been fully justified by recent developments.

S. W. GREEN'S PROPERTY

The iron ore, found on THE GREEN PROPERTY, is of excellent quality; but it does not seem to be very abundant. The principal excavations are located on *lot 660*, *2nd district*, which lies immediately north of the Ledbetter mine. All the workings, with the exception of a few test-pits, occur on a small knoll, resembling an Indian mound, situated in the narrow valley, only a short distance below the dam, constructed, to retain the mud from the Ledbetter washer. The knoll was originally almost circular, having a diameter of about 150 feet; but much of it has been removed, in the process of mining. It is reported, that about 2,000 tons of ore were taken from this knoll, and used mainly by the furnace at Cedartown. The ore occurs in the form of nodules and gravel in the red clays. Fragments of chert and sandstone occur associated with the ore. Along the hill-slope, directly east of the hillock, and on the same lot, is to be seen much float-ore, and a few shallow prospect-pits. The ore at this point is of excellent quality, much of it having a fibrous structure, and called by the miners "needle" ore. However, it appears too limited in quantity, to be of commercial value. On the adjacent side of the valley, along the hill-slope, is to be seen, a more favorable surface prospect; but the extent of the deposit, at this place, had not been investigated, at the time of the writer's visit. The ore, in the last named locality, often occurs in masses, weighing 50 pounds or more. These masses are quite compact; and they appear, frequently, in very irregular shapes, being sometimes called "plough-share" ore, from a fancied resemblance to plough-shares. There is considerable outcropping of limestone along the eastern hillside, on lot 660. It is heavy--

bedded, and often shows fossil remains, on a weathered surface. Iron ore, in the form of gravel, is found in the red clays, in immediate contact with the limestone.

Mr. Green, the owner of this property, may be addressed at Cedartown, Ga.

THE J. H. DODD PROPERTY

THE DODD PROPERTY, *lot 732, 2nd district*, lies about half-a-mile northeast of the Green property. The ore, that occurs on this property, is located in a comparatively level field, at an elevation of not more than 10 feet above the surface of Cedar creek, which is only a short distance away. There are three open-cuts, here, from which ore has been mined. None of these excavations have a depth of more than eight or ten feet, the natural water-level. It is reported, that about three car-loads of ore were shipped from these excavations, and used in Tennessee furnaces. For some reason, this ore did not prove satisfactory, and the work was discontinued. Mr. H. N. VanDevander, the shipper of the ore from the Dodd property, reports that it averaged about 50 per cent. metallic iron. The ore, occurring here, is porous, and has somewhat the appearance of common bog-ore. Its extent is not known; but the surface indications are not unfavorable for a considerable deposit. Near the excavation, is to be seen an extensive outcropping of limestone. It dips at a low angle, and contains, in places, an abundance of chert, in the form of concretions; and often a few imperfect casts of gastropods are also to be seen.

The owner of this property, Mr. J. H. Dodd, may be addressed at Cedartown, Ga.

A. H. VANDEVANDER'S PROPERTY

This property, *lot 916, 2nd district*, is located on the east side of Cedar creek, 1½ miles due south of Cedartown. The ore occurs on the southwest side of a hill, having an elevation of about 130 feet above Cedar creek. This hill is owned, in part, by THE CEDARTOWN COMPANY, of Cedartown, Ga. It seems to be ore-bearing, on all sides. There are a number of large open-cuts on the VanDevander property, from which ore has been mined. The workings cover an area of about five acres, with a maximum depth of about 20 feet. Mining operations began on this property, in 1878, and were continued, at irregular intervals, until 1896. During this period, a large quantity of high-grade ore was mined and shipped to Cedartown and elsewhere. The ore is mostly in the form of gravel; though bowlder-ore also occurs. The gravel-ore is so abundant, at some points on the hill-slope, that it almost completely mantles the red soils. More or less chert and other siliceous material, in the form of jasper, occur with the ore; also, some impure ochre. The VanDevander ore-bank is only a short distance from Cedar creek; and it is favorably located for working. The surface indications and the exposure of the ore in the old pits seem to justify a continuation of mining operations on this property.

THE FORK-FIELD ORE-BANK

THE FORK-FIELD ORE-BANK, *lot 988, 2nd district*, is located near the Chattanooga, Rome & Southern R. R., about half-a-mile

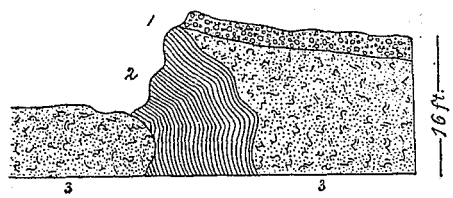
directly east of the VanDevander property. There are two workings to be seen here, each located upon small elevations, that rise some 20 feet, or more, above the level of the surrounding country. It is reported, that the workings have furnished between 8,000 and 10,000 tons of ore, which was used in the furnace at Cedartown. The excavations, which were made some ten or fifteen years ago, are now much fallen in; and but little ore is to be seen *in situ*.

However, it is said, that there still remains considerable workable ore in the bank.

THE CEDARTOWN COMPANY'S PROPERTY

THE CEDARTOWN COMPANY'S PROPERTY, *lot 957, 2nd district*, lies immediately east of that of Mr. A. H. VanDevander. The ore deposits of the two properties are located in the same hill, and may be considered as belonging to the same deposit. Judging from the extent of the excavations, there has probably been more ore mined on the Cedartown Company's property, than on the VanDevander property. The ore from the two properties is quite similar, and occurs under like conditions. In one of the excavations on the Cedartown Company's property, there is a decided tendency in the more impure iron ores, to assume a laminated structure.[1] There

FIG. 3



Section through an Open-cut on the Cedartown Company's Property, Showing Impure Laminated Ore. 1. Red Clay and Gravel-ore. 2. Impure Laminated Ore. 3. White and Vari-colored Clays.

[1] See fig. 3.

MINING ORE BY USE OF THE STEAM-SHOVEL AT THE REED MINE, NEAR CEDARTOWN, POLK COUNTY, GEORGIA.

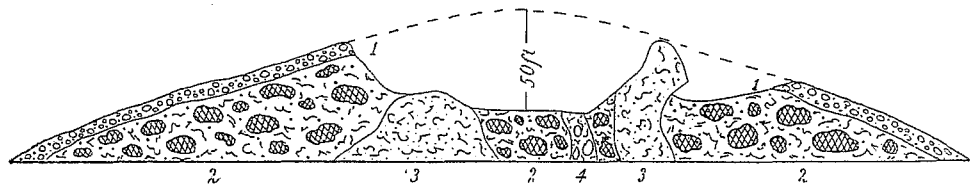
is also to be seen, here, a very rich pocket of ore, almost circular, and several feet in diameter, extending to unknown depth. It has the appearance of a huge pot-hole, filled with ore and clay. Chert and clay horses, here, as elsewhere, are the chief difficulties to be overcome, in mining. This property, like the VanDevander property, is favorably located; and there appears to be no good reason, why certain portions of the bank could not be worked with profit.

THE REED MINE

THE REED MINE, which is owned by THE ALABAMA & GEORGIA IRON COMPANY, of Cedartown, Ga., is located on *lots 639 and 640, 2nd district*, about 2½ miles northwest of Cedartown. This mine has been worked, almost continuously since 1889, and is reported to have produced more than 100,000 tons of ore. The entire workings cover an area of something like eight acres. They are situated on a ridge, having an elevation of about 150 feet above Cedar creek. The excavations consist of large open-cuts and a few pits, together with some short tunnels. The cuts are often many rods in length, and frequently attain a depth of 70 feet. The ore is very similar to that, occurring in the Ledbetter mine. Gravel-ore predominates; though bowlders, massive and "pot" ore are, also, more or less abundant. The ores are associated with white and vari-colored clays, and with chert containing fragments of gastropods. Near the summit of the ridge, was observed, at one point, a bed of well-rounded, water-worn quartz pebbles, varying from one to six inches, in diameter. The bowlders overlie the ore deposits, and were evidently laid down, at a subsequent period.

The Reed bank is noted for the abundance and great variety of its "pot" ore. A number of specimens of this form of ore, showing beautiful irridescence, are now on exhibition in the State Museum. These "pots" are usually found in the white clay, and are frequently filled with water. Many of them are of large size, weighing 100 pounds or more. A mantle of dark-red clay, varying from 2 to 6 feet in thickness, covers the hill. This clay always carries more or less high-grade gravel-ore, and occasionally

FIG. 4



Section through the Large Open-cut at the Reed Mine. 1. Red Clay and Gravel-ore. 2. Vari-colored Clays with "Pot" and Bowlder Ore. 3. White Clay Horses. 4. Chert and Clay.

quartz crystals, with irregularly formed faces, and fragments of sandstone. The manner, in which the ore occurs in the Reed bank, is best shown by diagram.[1]

Partial analyses of ore from the Reed bank, by the Woodstock Laboratory, of Anniston, Ala.: —

Fe	P	SiO_2	Mn	Al_2O_3
47.00	——	9.02	——	8.60
51.70	——	7.30	——	4.70
47.80	——	11.10	——	7.30
36.81	0.113	24.30	——	11.15
41.28	0.180	19.05	1.65	8.10

[1] See fig. 4.

The following is an average of 77 cars produced by the Rome Iron Co., of Rome, Ga. : —

Fe	P	Insoluble	Remarks
46.60	0.12	26.60	5 Cars
45.00	——	26.81	14 "
49.00	——	15.40	15 "
44.37	——	22.05	24 "
44.10	——	21.18	19 "

Last summer, there were regularly employed at the Reed mine about 30 hands; and there were shipped to the furnaces in Alabama, on an average, about 60 or 70 cars of ore per month. Formerly, the ore was used mainly in the Cedartown furnace.

The equipment of the Reed mine consists of two double log-washers ;[1] steam-shovels; a dummy engine; a large pump with a capacity of 1,000 gallons per minute; a 150-horse-power engine, to operate the washer; one mile of 12-inch water-pipe; 2½ miles of standard-gauge railroad, connecting the mine with the East & West R. R.; tram-cars; etc. The mine is less than a mile from Cedar creek; and it is otherwise favorably located for working.

THE ALABAMA & GEORGIA IRON CO. owns 265 acres of land, in the immediate vicinity of the Reed mine. Much of the area has favorable surface prospects; but the depth, to which the ore extends, has not been investigated. Should the present ore-bank become exhausted, which is not likely to occur soon, there will still remain much excellent ground, to be prospected. Hon. Chas. D. Lawton, Commissioner of Mineral Statistics of Michigan, in summarizing a report, made by him, on this property, says : — "It will readily be seen, that, with a depth of 60 to 80 feet, and a width of several hundred feet, and a length of half-a-mile, all, workable ground, and apparently rich, there must be a great amount of work-

[1] Only one now in use.

able ore." This estimate is evidently overdrawn; but there can be no doubt, that the property contains a large amount of valuable ore.

Since the Alabama & Georgia Iron Co. took possession of the Reed mine, its output has been greatly increased. The mine now produces, daily, from five to seven car-loads of ore. This increase in output is due, mainly, to the opening up of rich deposits, and the installation of new steam-shovels, improved washers etc.

THE WOODSTOCK ORE-BANK

THE WOODSTOCK PROPERTY, *lot 663, 2nd district*, lies directly south of the Ledbetter property, and is traversed by the same ore-bearing ridge. The workings, which are confined chiefly to the west side of the ridge, consist of several open-cuts, each exposing a greater or less quantity of ore.

Immediately south of the Woodstock property, is THE MANN PROPERTY, *lot 664, 2nd district*, which has also been more or less extensively worked. Both of these properties seem to have considerable quantities of workable ore; but neither has been worked, in the past few years, except to a limited extent.

THE WOOD MINE

This mine is situated two miles southwest of Cedartown, on *lots 667 and 702, 2nd district*. The ore occurs, here, on an oval-shaped

hill, having a diameter, at its base, of about 1,000 feet. The hill has a gentle slope, on all sides, and rises something like 100 feet above the valley. The surface, in places, is covered with gravel-ore, more or less mixed with chert and sandstone. Near the summit, on the west side, is a large out-cropping of impure ore, in the form of bowlders. The surfaces of these bowlders have the appearance of a good quality of iron ore; but, when broken open, they are seen to be made up, in a large measure, of silica. The workings consist of several open-cuts, near the top of the hill. Some of these excavations are of large size; and, in places, they attain a depth of 30 feet. Several thousand tons of ore are said to have been shipped from this mine, in 1889. The ore was used, almost entirely, in the furnace at Cedartown. It occurs as gravel, bowlders, and in large masses in the residual clays. It usually runs high in metallic iron, as is shown by the following partial analyses of the ore, made by the Woodstock Laboratory, of Anniston, Ala.: —

Fe	P	SiO_2	Mn	Al_2O_3
52.18	1.052	6.10	——	——
47.28	.216	15.21	——	——
43.50	.326	22.18	——	——
50.62	.710	12.41	1.950	——
50.48	.320	12.36	——	4.09
44.76	.310	12.71	——	4.51
45.29	.290	11.92	——	4.24
41.44	.267	15.43	.980	7.22
45.87	.241	10.82	.518	4.92
45.67	.240	11.82	.716	4.16
42.65	.250	14.22	.642	6.56
40.62	.235	15.22	.037	5.88

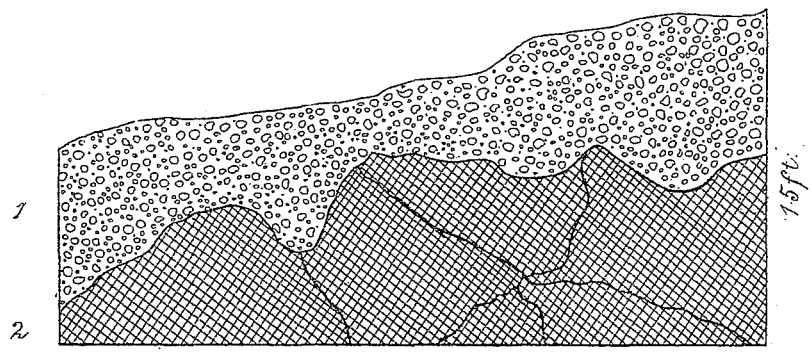
A double log-washer, now in a somewhat dilapidated condition, is located on the side of the hill near the ore-bank. Water, for

washing the ore, was obtained from Peek spring, a quarter of a mile away. The mine is on the Woodstock branch of the East & West R. R. The workings cover about 2½ acres, and are now much fallen in; and only a limited amount of ore is in sight.[1]

THE PEEK BANKS

THE PEEK ORE-BANKS, *lots 704 and 737, 2nd district*, are situated on two separate hills, or ridges, about ¼ of a mile north of

FIG. 5



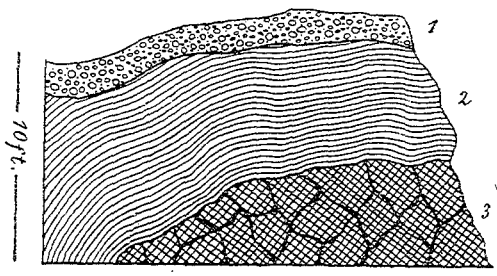
Section along the Open-cut on the Peek Property, near the Public Road. 1. Red Clay and Gravel-ore. 2. Massive Iron Ore in Clay.

the Wood mine. One of the hills, on which the ore occurs, has an elevation of between 250 and 300 feet, above Cedar creek. Near its summit, is a bluff of ferruginous chert, from 20 to 30 feet in height, and several rods in length. It has somewhat the

[1] Subsequent to the writing of the above, the Wood mine has passed into the hands of THE ALABAMA & GEORGIA IRON CO., and it is now producing from two to four car-loads of ore per day. The old washer has been put in good repair, and the mine is supplied with a steam-shovel; so, that there, now, seems to be nothing in the way of the Wood mine's again becoming a profitable producer.

appearance of an artificial wall. The chert, forming the bluff, is much broken up; and, in places, it is traversed by veins of excellent ore. At one end of the bluff, the chert contains so much iron, that an attempt was made, at one time, to use it in the furnace; but it was found to run too high in silica, to be of commercial value. Further down the hill, on either side, are to be seen large open-cuts, now partially filled with crumbling earth; from these, large quantities of ore were mined, some years ago. In some recent cuts on the hill-side, near the public road, the ore occurs mostly in the form of large masses, in the motley clays.[1] It, here, probably makes up fully 25 per cent. of the entire material mined, and runs high in metallic iron. There seems to be but little doubt, that there still remains in this hill a large amount of workable ore. The other hill, on which the ore-banks are located, has also, much chert on its summit; but it occurs mostly as large brecciated bowlders. The workable ore, here, as in the other case, is found on the side of the hill; and, at no point, does it occur in paying quantities near the summit. It always contains more or less chert. The clays, in one of the banks on this hill, seem to be somewhat stratified.[2]

FIG. 6



Section along an Open-cut on the Peek Property, Showing Iron Ore beneath Clay. 1. Red Clay and Gravel-ore. 2. Laminated Clays. 3. Massive Iron Ore.

[1] See fig. 5.

[2] See fig. 6.

Partial analyses of ore from the Peek banks, furnished by Mr. H. N. VanDevander : —

Fe	P	Insoluble	Remarks
50.65	.0402	10.50	Analyst, Wallace Bowron, South Pittsburg, Tenn.
47.80	1.0702	13.60	" " " " " "
45.65	1.0700	11.12	" J. B. Britton, Philadelphia, Penn.
44.44	.8550	14.11	" " " " "
43.87	.8640	20.16	" S. L. Graham, Rome, Ga.

The Peek ore-banks are located about ¾'s of a mile from Cedar creek, where water, in any desired quantity, can be had, for ore-washing.

COL. J. O. WADDELL'S PROPERTY

THE WADDELL PROPERTY, *lots 784, 786, 799, 800 and 801, 2nd district*, is located on the Cave Spring road, 2½ miles northwest of Cedartown. A limited amount of mining was done on this property, some years ago; and the ore was hauled, by wagon, to the furnace at Cedartown. The old workings, now much fallen in, are situated on the roadside, at the end of a low ridge. The excavations consist of two or three small open-cuts, 8 or 10 feet in depth. The ore, found here, is mostly in the form of gravel. It is said to have given very satisfactory results at the furnace. The ridge, at the base of which the excavations occur, has much float-ore strewn about its surface, in places. At one or two points prospect-pits expose the ore, to the depth of a few feet. The pits are too limited in number, and not of sufficient depth to give any definite knowledge, as to the extent of the ore beneath the surface. On the opposite side of the road, near the mansion-house, is to be

seen another pit, exposing what appears to be a considerable deposit of excellent ore. The excavation, which is only a few feet in depth, seems to penetrate an almost solid body of ore. Surface-ore, mostly in the form of gravel, is quite plentifully strewn about the hill, on which the excavation occurs. It is also more or less abundant, about the mansion-house. Ferruginous chert is often associated with the ore. The Waddell property evidently has considerable ore; but it would be a great pity to injure this handsome property, by mining, unless the ore occurs in great quantities. The property makes an ideal country home; and it would be almost a public calamity, to have its beauty destroyed by mining.

THE T. G. W. McMEEKIN PROPERTY

THE McMEEKIN PROPERTY, *lot 571, 2nd district*, lies on the west side of Cedar creek, about 4 miles northwest of Cedartown. There has recently been exposed, on this property, what appears to be valuable ore deposits. The ore occurs on the side of a hill, where it has been worked in several pits and open-cuts. Most of the ore is in the form of large masses or bowlders, in the vari-colored clays. Some of these bowlders contain a core of pyrite, frequently in the form of loose powder. The ore, surrounding the pyrite, is always quite compact, and has a dark-brownish color. Mr. Linton Sparks, who was working this property, when it was visited by the writer, said, that the ore from this bank always runs high in metallic iron, and meets with a ready sale at the furnace. The bowlders, containing the pyrite, are discarded at the mine, and only the ore, free from this impurity, is shipped to the furnace.

None of the excavations on the McMeekin property attain a depth of more than ten feet. Chert and other mechanical impurities are almost entirely absent from this ore-bank. On the adjoining *lots*, namely, *581 and 582*, also owned by Mr. McMeekin, are other deposits of iron ore. Here, are to be seen some old pits and cuts, from which, it is said, 200 tons of ore were mined, some years ago, for the Cedartown furnace. All the excavations are now so filled with fallen earth, that only an imperfect idea can be had of the nature and extent of the deposit. Samples of ore, found on the dump, are porous; but they appeared to be of good quality. The McMeekin property is favorably located for working.

THE NANCY CROCKER PROPERTY

This property is located immediately south of the McMeekin property, on *lot 570, 2nd district.* The ore-bank, here, occurs on a hillside, only a short distance from Dry creek. It was opened last summer, and was worked by Mr. Sparks, in connection with the McMeekin bank. These two banks are situated on opposite sides of the same hill, and are not over 200 feet apart. The ore of the two banks is quite similar, and evidently belongs to the same deposit. The workings on the Crocker property consist of a few open-cuts, 8 or 10 feet in depth. The entire amount of ore, mined at this bank, would probably not exceed a dozen car-loads. The ore is hauled by wagon to Hematite, a station on the Southern Railway, some 4 or 5 miles distant.

THE BEN HUNT PROPERTY

THE BEN HUNT PROPERTY is situated on the Cave Spring road, about 4 miles northwest of Cedartown. Iron ore occurs on this property, in several places; but it is most abundant, on *lot 573, 2nd district*, near Cedar creek, where considerable prospecting has been done. The main excavation is in a cultivated field, only a short distance from the public road. This is a small open-cut, from which a limited amount of ore was mined and shipped, some years ago. The ore, here exposed, is chiefly in the form of nodular masses, associated with fragments of sandstone and chert. These mechanical impurities are more or less abundant; and, unless removed, they would materially affect the commercial value of the ore. A small amount of pyrite was noticed in a specimen of ore, examined at this excavation. This impurity, however, does not seem to be very abundant. Strewn about the cotton-field, in which the prospect-pits are located, occurs considerable gravel-ore. In places, the gravel-ore almost completely mantles the surface. This, together with other favorable indications, would seem to warrant a more thorough exploration of the property.

THE J. R. HUNT PROPERTY

This property, *lots 435, 436 and 502, 2nd district*, lies on the left side of Cedar creek, in the vicinity of Mount Hope church. At several places, on each of the above named lots, float-ore occurs,

in greater or less quantities. At the time of the writer's visit, in the summer of 1899, the property was being prospected by its owner; but the work had not progressed sufficiently, to afford any definite information, as to the value of the deposit. The surface indications, in places, seem to be quite favorable, for workable deposits. The ore is found on the slopes of the red hills, which here rise to a height of from 100 to 200 feet above Cedar creek. Many of the gullies along the hillsides show considerable gravel and "dornick" ore.

THE WATTS PROPERTY

THE WATTS PROPERTY comprises several lots of land on the west side of Cedar creek, a short distance north of Mr. J. R. Hunt's property. The main ore deposits occur on *lots 1,235, 1,236 and 1,237, 3rd district;* also, on *lot 433, 2nd district.* The most extensive deposit is on the last named lot, only a few hundred yards from Cedar creek. The ore appears here on the surface, in great abundance, in the form of bowlders, which vary, from a few inches to two feet, in diameter. Several car-loads of ore are strewn about the surface, within a small area, of less than two acres. A pit, made near the center of this area, shows, that the ore extends beneath the surface; but, to what depth, it is not known. This, however, could easily be determined, by sinking prospect-pits. The ore is of a dark-brown color, and is quite compact. It has the appearance of sulphur-bearing ore; but a diligent search failed to reveal any trace of this impurity. The ore seems to be entirely free from chert and other mechanical impurities; and, should the

deposit prove as extensive as the surface prospects indicate, the lot would be very desirable mining property. Its location on the hillside, and its being within a short distance of Cedar creek, are other factors, which go to make the lot desirable for mining purposes. Recently, the Georgia and Alabama Mining Co., under the management of Col. H. F. DeBardelaben, has, more or less extensively, prospected this lot; and it is now erecting a washer, and making other improvements, with a view, to begin the shipment of ore, at an early date. The numerous cuts and pits, made recently upon the property, disclose considerable ore; but it does not appear to be so abundant, as the surface prospects would seem to indicate.

A short distance from the above deposit, in a cultivated field near the mansion-house, is another deposit. The ore, here, occurs in considerable abundance, mostly in the form of gravel in the red soil. It seems to be of good quality; but no attempt has been made to investigate its extent.

The ore on *lot 1,235* occurs near the top of a wooded hill, where it is exposed in two open-cuts. The ore is mostly in the form of bowlders, and appears to be in workable quantities. On the adjoining *lot, 1,236*, near the summit of a hill, having an elevation of about 250 feet above Cedar creek, are to be seen other recent prospecting-pits. The ore, here exposed, is different from any, heretofore described. It is a red, porous ore, containing, more or less, fragments of chert. The ore seems to be a true hematite, which has probably been altered from limonite, by local metamorphism. It does not seem to be very abundant; and it is more of scientific interest than of economic importance. Near the foot of the ridge, on *lot 1,237*, on which the red ore occurs, is quite a deposit of brown iron ore. The brown ore here is shown, by a number of test-pits, to be quite abundant; and the deposit is con-

sidered valuable. The ore is chiefly in the form of "pots" and solid masses. Both chert and pyrite occur with the ore, in limited quantities. The pyrite is often found in the center of the "pots," or geode masses.

A partial analysis of the ore from the Watts property, lot 1,237, made for the Geological Survey,[1] resulted as follows: —

Water at 100° C	.460
" above 100° C	10.050
Iron Sesqui-oxide	67.500
Equivalent to Metallic Iron	(47.260)
Manganese	.420
Phosphoric Acid	.196
Equivalent to Phosphorus	(.085)
Sulphur	.049
Sand or Insoluble Matter	19.080

THE CANNON PROPERTY

This property, *lots 1,211 and 1,212, 3rd district*, adjoins the Watts property, and is owned by the same parties. The ore, found on these lots, is located on a wooded hillside. It is similar to the ore, found on the Watts property; though it seems to be freer from pyrite. The ore is quite abundant on the surface; and the excavations, recently made, show, that it extends to a considerable depth. The indications, for a workable deposit on this property,

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

are considered good. Both the Watts and the Cannon properties are traversed by a branch rail-road, now being constructed by the Southern Railway, from Cave Spring to the iron deposits, northwest of Cedartown. When the road is completed, it is the intention of the Georgia and Alabama Mining Co. to begin mining operations, on an extensive scale, on the above named properties.

THE D. N. HAMPTON PROPERTY

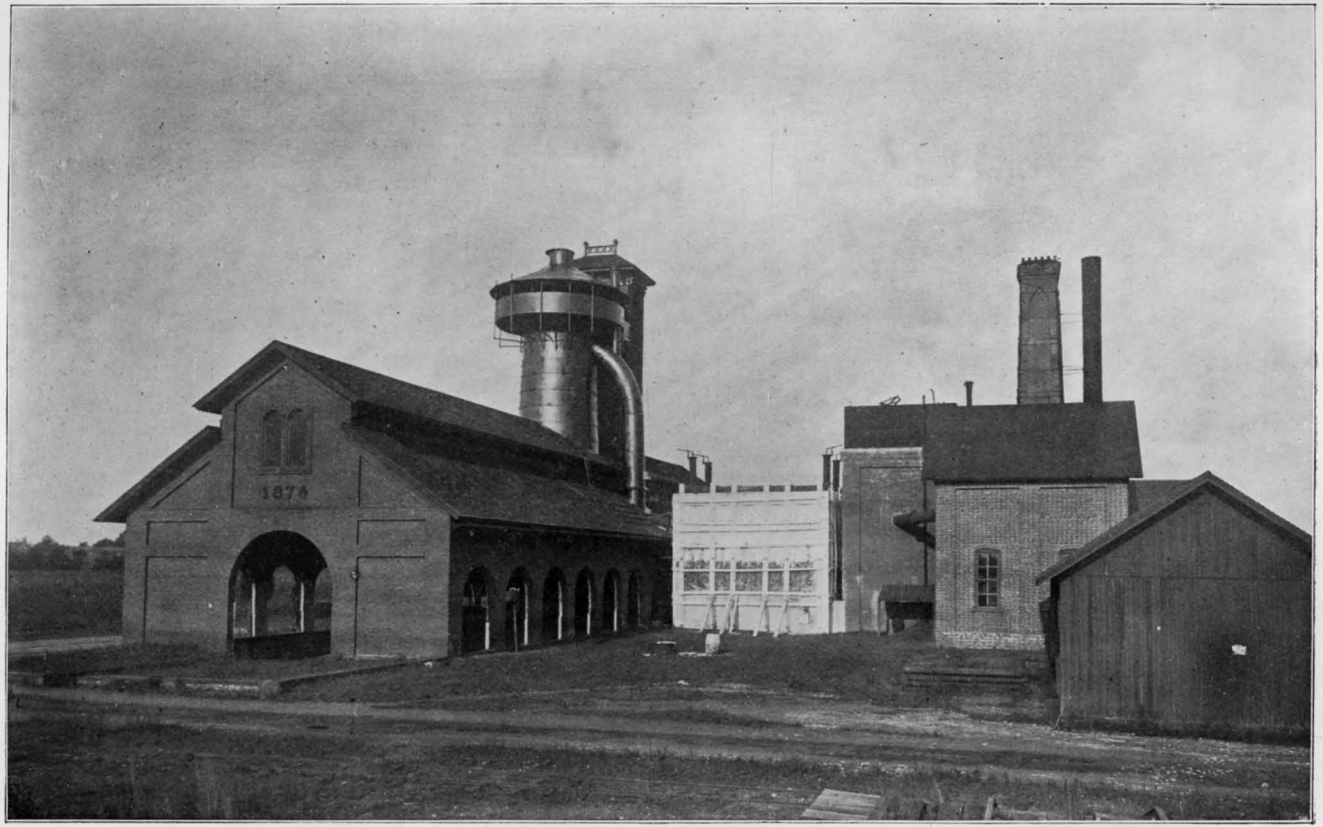
The Hampton property, *lots 146 and 212, 2nd district*, has recently been purchased by the Georgia and Alabama Mining Co. This property is located in the Knox Dolomite ridges, about 2½ miles west of the Watts property. The exposures on lot 212 are confined to a number of small prospect-pits and open-cuts, on a hill-slope in an old field. The deepest excavation does not exceed ten feet. The ore seems to be somewhat siliceous, and is apparently not very abundant. The ore on lot 146 seems to be more plentiful, and of better quality, than the ore on lot 212. It is exposed in two open-cuts, on a wooded hillside, where a small amount of ore has been mined. The ore occurs as nodular masses and gravel, in the vari-colored clays. Its chief mechanical impurity is silica, in the form of chert, together with a limited amount of manganese. The latter mineral occurs, mostly as small crystals, which are quite noticeable on the dump, where they have been washed clean by the rain. Owing to the limited exposures on lot 146, it is impossible to form any definite idea of the extent of the workable ore.

THE W. J. BROWN PROPERTY

This property, *lot 286, 2nd district*, lies between the Watts and the Hampton properties, and is only a short distance from the branch rail-road, now being constructed from Cave Spring to the iron deposits south of Cedartown. At the time of our visit to the property, it was being prospected by Mr. Brown, who had opened up a number of cuts, and shipped a few car-loads of ore. The prospect-cuts are confined mainly to the slopes of a chert ridge, along which are to be seen, at various points, natural exposures of impure ore. The ore appears associated with large quantities of chert, which here often occurs in the form of huge bowlders, several feet in diameter. Many of these bowlders contain considerable iron ore; but it is questionable, whether it could be separated from the chert, with profit. It is possible, that future prospecting may reveal deposits of iron, of economic value, on the Brown property; but the outlook, at the time of examination, was not at all encouraging.

THE J. E. CALLAHAN PROPERTY

THE CALLAHAN PROPERTY is situated about a quarter of a mile directly west of the Cannon property, on *lot 1, 214, 2nd district.* Considerable surface-ore occurs, in places, on this lot; and, at one or two points, a limited amount of prospecting has been done. The most favorable deposit on the lot is to be seen on a steep hillside, in a cultivated field. The ore, here, is quite plentiful on the surface.



THE CHEROKEE IRON FURNACE AT CEDARTOWN, POLK COUNTY, GEORGIA.

It is mostly in the form of gravel, and is apparently of good quality. Associated with the gravel-ore, is more or less chert and fragments of sandstone. Further prospecting is necessary, to determine the extent of the ore on this property.

THE W. T. BURGE ORE-BANK

This ore-bank was worked, more or less extensively, some years ago, and the ore was hauled, by wagons, to Cave Spring, some three miles distant. The bank is located on the east side of Cedar creek, about a mile from the Floyd county-line. The main excavations consist of two large open-cuts, near the top of a red hill, which has an elevation of about 200 feet above Cedar creek. The cuts are now much fallen in; and but little ore, except that occurring on the surface, is in sight. The ore, here, as elsewhere in the Cedartown district, is in the form of gravel and bowlders; and it occurs in pockets and leads. The amount of ore, taken from the Burge bank, is not known; but judging from the extent of the excavation, there appears to have been several hundred tons taken out. Near one of the cuts, is to be seen the remains of an old log-washer, formerly used in washing the ore. The water, which supplied this washer, was obtained from Cedar creek, less than half-a-mile away. The ore-bank is well located for mining; and it is thought to still contain much workable ore. This bank is situated on *lot 1,239, 3rd district*, and is now owned by Mr. J. S. DeVitt, of Cedartown.

THE JAMES KING PROPERTY

The exposures of iron ore on THE KING PROPERTY, *lot 1,240, 3rd district*, occur on two separate hills, only a short distance from Cedar creek. No prospecting, to any considerable extent, has been attempted. However, the surface indications are very favorable, for a more or less extensive deposit of iron ore. The ore, in the form of bowlders of considerable size, is so plentiful, in places, that it has been used for terracing the steep hillsides. The ore seems to be of excellent quality, and is generally free from chert and other impurities. This lot adjoins the Burge property on the west; and it is considered valuable for mining purposes.

THE GRADY MINE

This mine is located at Grady station, on the East & West R. R., about six miles east of Cedartown. Mining operations were begun, here, in 1879, by THE CHEROKEE IRON CO., and were continued, with but few interruptions, until 1891. During this time, the mine is supposed to have produced something like 300,000 tons of ore, which were used in the furnace at Cedartown. The main ore-banks are on *lots 730, 731, 804, 805 and 824, 21st district*, only a short distance from the East & West R.R. They occur, chiefly, along the spurs and foot-hills of a rather prominent Knox Dolomite ridge, traversing this section of the county. The entire works, which are on both sides of the rail-road, consist of open-cuts covering an area of about 10 acres. Some of these cuts are of huge size.

One of them is more than a hundred yards in length, several rods wide, and, in places, 60 feet deep. These banks were first worked by shovel, pick and screen; but, afterwards, a double log-washer was introduced, and convict labor was used. Water, for washing the ore, was obtained from a large well on the property. The scarcity of water has always been a drawback to the Grady banks. This disadvantage, however, could be overcome, by constructing a pipe-line to Fish creek, two miles distant, and establishing a pumping station at that point. With this improvement, the Grady mine could compete with any mine in the county, in the cheap production of ore. The close proximity of the banks to the rail-road, and their location on the hill-slope, together with abundance of dumping ground, near by, for the waste from the washer, are other conditions, favorable to cheap mining.

The ore from the Grady mine usually runs high in metallic iron; though, in places, considerable chert and impure jasper are associated with it. Where these mechanical impurities are abundant, it is necessary to remove them by hand. Decomposed shale also occurs, in places, with the ore. This impurity, however, is readily removed by the washer.

The ore is found in the vari-colored clays, in the form of large irregular masses, pebbles and rounded bowlders. The massive ore is often honey-combed or porous; while the gravel and the bowlder-ore are generally quite compact. The gravel-ore is most abundant in the red clays near the surface; but it is also present, at all depths. Especially is it abundant in the soil, in the immeate vicinity of the excavations, where it sometimes almost completely mantles the surface.

Partial analyses of the Grady ore, made in the Laboratory of the Cherokee Iron Furnace at Cedartown, resulted as follows :—

Fe	SiO_2	Al^2O_3	CaO	MgO	Mn	P	H_2O
49.40	8.01	13.210	1.27	0.42	0.12	0.253	5.01
59.20	3.23	.053	——	0.01	0.01	0.160	11.74

The depth, to which the ore in the Grady banks extends below the surface, is not known; since none of the excavations reach a depth of more than 60 feet. The presence of ore, however, in the deepest excavations on the hillsides, and its occurrence, also, in the valley below, would indicate, that it extends to considerable depth, — probably to the limestones underlying the residual clays, in which it occurs. Should these deposits extend to such depths, the amount of workable ore, still remaining in the banks, must be very great. Clay horses, consisting frequently of white kaolin, often occur in the Grady banks. Some of these are of large size; and, in places, they interfere with mining.

The Grady property is now owned by THE ALABAMA & GEORGIA IRON CO., of Cedartown, which is shipping, at present, from the several banks, from four to five car-loads of ore per day. This company is now erecting a double log-washer on the property, and is constructing a pipe-line to Fish creek. When these improvements are completed, it is the intention of the company to increase its output to at least 15 car-loads of ore per day.

THE CENTRAL MINING COMPANY'S PROPERTY

THE CENTRAL MINING COMPANY'S PROPERTY is situated on the opposite side of the East & West R. R., from the Grady mine. It comprises *lots 878, 879, 880, 897, 953, 954, 955 and 971, 21st*

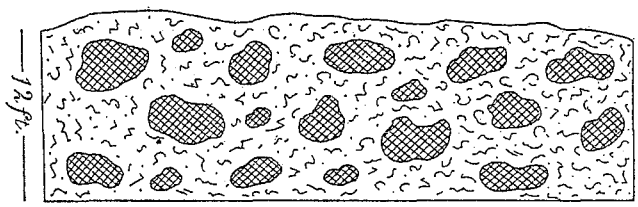
district. Mining operations were begun, here, in 1889, and were continued until 1895. During this time, several ore-banks were opened and a large quantity of ore was shipped. As many as three double log-washers were in operation on the property, at once, and the output of the several banks aggregated many car-loads of ore, daily. The banks, here, as at the Grady mine, are situated on the foot-hills of the Knox Dolomite ridge. These hills are usually covered with extremely red soils; and they attain a height of from 100 to 150 feet above Fish Creek valley, which lies at their base. The ore occurs in pockets and irregular deposits in the vari-colored clays. Some of the excavations are of large size, and have furnished much ore. In places, they attain a depth of 40 feet, and are many rods in length. Clay horses and chert, as in the Grady banks, are also present, here. In one of the cuts, near the East & West R. R., is to be seen a large quantity of low-grade ore, showing evidence of stratification; but, in all the other excavations, there is no indication, whatever, of bedding.

The excavations, as a general rule, are now so fallen in, that there is but little ore exposed to view; and, as a consequence, only an imperfect idea can be had of the extent of the deposit. The surface prospects, in places, however, are quite favorable; and there can be but little doubt, that there still remains a large amount of workable ore. Water in abundance can be had at Fish creek, about a mile away. Formerly, the several banks were connected with the East & West R. R., by a branch road, so that the ore passed directly into the cars, from the washer, without further handling.

THE LINDSEY PROPERTY

THE LINDSEY PROPERTY, *lots 966 and 967, 21st district*, lies in the midst of the Knox Dolomite ridges, about three quarters of a mile west of the Central Mining Co's. property. There are two ore-banks on the property, each of which was worked, more or less extensively, a few years ago. These deposits are peculiar; as they occur in the chert ridges, and consist, in a large measure, of limonite, partially altered to hematite. The largest excavation on the property is to be seen on *lot 966*, in a hollow or depression between two well-rounded chert ridges. The ridge on the south rises about 75 feet above the excavation; while the one on the north rises about 50 feet above the same level. Both ridges have gentle slopes, and their surfaces are covered by a heavy mantle of chert. Mixed with the chert, may be seen a few fragments of iron ore; but the amount is so small, that it would hardly seem to justify a prospector, in making examination for a workable deposit. The ore occurs in very irregular pockets, mostly as gravel and small bowlders, in the motley red clays, which are often much jointed and fissured. In places, they show indistinct bedding; but, generally, they are massive. In one excavation, water-worn pebbles of chert were noticed associated with the ore. The pebbles seemed

FIG. 7



Section along an Open-cut on the Lindsey Property, Lot 967, Showing Bowlder-ore in Massive Vari-colored Clays.

to fill a pot-hole, instead of forming a continuous deposit. The main excavation on lot 966 is almost circular, being several rods in diameter and 40 feet, or more, in depth. There are, near by, several other pits, from which ore has been taken. They all show, in their banks, more or less ore of the same character. The ore, shipped from these excavations, was mined by pick, shovel and screen, and was hauled, by wagon, about a mile, to the East & West R. R. The work, done on *lot 967*, is not so extensive, as the work, on lot 966. There are, on the former, only two pits, from which ore has been taken. They are of small size, and have apparently furnished only a few car-loads of ore. The ore, in these pits, occurs in the form of large masses.[1]

The Lindsey property is unfavorably located, for mining, on account of the lack of water for ore-washing.

THE B. J. WEST PROPERTY

This property, *lots 453, 510 and 511, 21st district*, is situated about 1½ miles north of the Grady mine. There is to be seen, on this property, several excavations, from which, it is reported, about 75 car-loads of iron ore were shipped, in 1898. The ore is found in the chert ridges, in what appears to be small pockets. It is of good quality; but it is more or less mixed with chert. All the excavations on the property are small, and extend only a few feet, in depth. They are simply prospect-pits, and give only an imperfect idea of the extent of the ore deposits. On the adjoining properties, owned by Henderson, Capp and others, are small exca-

[1] See fig. 7.

vations, showing similar exposures of ore. Some excellent examples of mud dikes are to be seen in the excavation on the West property. These dikes, which consist of very fine red clay, vary from two to eight inches in thickness, and generally dip at a high angle. The dikes were evidently, at one time, open fissures in the residual clays, which have since been filled with fine clay, deposited from muddy surface waters. Their contrast, in color, with the residual clays, is quite marked; but their small size renders them of no special importance in mining. The nearest point, at which water, for washing ore, can be had, on the above property, is Fish creek, some 3½ miles distant. This, together with the length of haul to the rail-road, places these properties at a decided disadvantage, in the production of cheap ore.

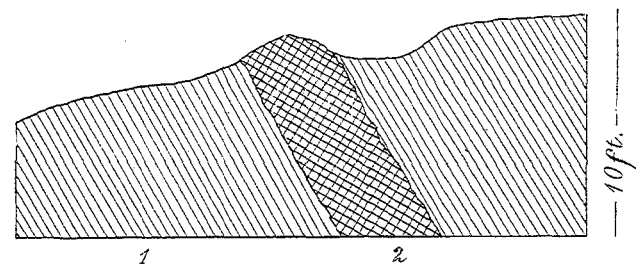
THE G. W. WADDELL PROPERTY

This is a recent prospect, located on *lot 1,052, 21st district*, near the head-waters of Fish creek. There occurs, here, near the base of a small hill, what appears to be a considerable deposit of iron-ore. The prospect was opened up, last summer; and, at the time of the writer's visit, it had produced only a few car-loads of ore. The deposit consists largely of bowlders and huge masses, weighing a ton, or more. The ore is found in residual clays, overlying the Rockmart slates. It is quite free from chert and other mechanical impurities. The prospect may prove to be a profitable ore-bank. However, the surface indications do not point to a very extensive desposit.

THE R. H. BREWER PROPERTY

THE BREWER PROPERTY, *lots 951, 974 and 1,025, 21st district*, is located about 1¼ miles from Grady station. The main deposit of iron ore, on this property, is located on the side, and near the top, of a slate ridge, having an elevation of about 150 feet above the general level of the surrounding country. The works consist of several small open-cuts, from which a number of car-loads of ore have been shipped, during the last few months. The ore, which is more or less siliceous, occurs in irregular veins, or deposits, in the sandy slates. It seems to be, in part, a replacement of metamorphic sandstone, or quartzite, which occurs as thin beds, interlaminated with the slates. Associated with the ore, is found, in places, considerable wavellite, in the usual form of small implanted hemispheres, only a fraction of an inch, in diameter. This mineral occurs chiefly in small fissures, in the more siliceous ores. Cacoxenite is also present; but it is not so plentiful as the wavellite. This mineral, which is in the form of radiated silky tufts, is found, like the wavellite, in fissures or cavities in the siliceous ores. A partial analysis of the ore from the Brewer property, made by Mr. J. B. Britton, of Philadelphia,

Fig. 8



Section along a Cut in the Brewer Bank. 1. Slate. 2. Vein of Iron Ore, 2½ Feet Wide.

Penn., for Mr. H. N. VanDevander, of Cedartown, gave the following result: —

Metallic Iron	50.040
Phosphorus	.547
Silica	13.360

The mode of occurrence of the ore is shown by figure 8. Other workings, from which some 20 or 30 car-loads of ore have been shipped, are to be seen on THE BIGGERS PROPERTY, about a quarter of a mile west of the Brewer property.

THE LEE CLARK ORE-BANK

THE CLARK ORE-BANK, *lot 715, 21st district*, is a recent prospect, opened up near the East & West R. R., about 1 mile northeast of Fish creek. The main workings consist of a single open-cut, 40 or 50 feet long, and from 5 to 12 feet deep, situated on the northwest side of a gently sloping hill. The ore, which occurs mostly in the form of gravel and bowlders, appears in the variegated clays. It seems to partake somewhat of the nature of red ore, and is quite free from impurities. Chert is more or less plentiful on the surface; but it appears to be chiefly superficial. The Clark ore-bank is thought to contain a considerable quantity of workable ore. Some two or three miles south of the Clark bank, on the same side of Fish creek, are other prospects, on *lots 907, 1,027 and 1,015, 21st district*, owned by Messrs. W. H. Bunn, R. H. Biggers and J. F. Dever, respectively. THE BUNN AND THE BIGGERS PROPERTIES have each been worked, in the last few months, to a limited extent, and have furnished a few car-loads of ore.

THE W. A. CAMP PROPERTY

THE CAMP PROPERTY, *lot 537, 21st district*, is located in the chert ridges, about four miles northeast of Grady. Iron-ore has been known to exist on the property, for some years; but it is only within the last few months, that any effort has been made to work it. At the time of the writer's visit, only one cut, of any size, had been made on the lot. This cut had furnished four or five car-loads of ore. The excavation is situated on a hill-slope. It is some three or four rods long; and, in places, it attains a depth of about 15 feet. The ore occurs, in considerable abundance, in the variegated clays, mostly as gravel and "dornick" ore. THE C. M. CAMP, AND THE BREWER AND JONES PROPERTIES, near by, on *lots 538 and 684, 21st district*, have similar prospects. From the latter property, some four or five car-loads of ore have been recently shipped.

THE GREEN BANK

THE GREEN ORE-BANK, *lot 1,252, 21st district*, was opened in 1894, and was worked, for about two years. It produced, during this time, a considerable amount of ore, which was shipped to the furnaces at South Pittsburg, Tenn. The ore deposit occurs on the side of a hill; and, judging from the extent of the surface-ore, it must be more or less abundant. The main works consist of two open-cuts, near the base of the hill. These excavations, which are now much filled by fallen earth, vary from 10 to 20 feet in depth,

and are several yards in length. The ore, now exposed in these cuts, is mostly in the form of bowlders or large masses. It appears to be in considerable quantities; but its black glistening color was said to indicate the presence of phosphorus. The following partial analysis, however, furnished by Mr. Chas. D. Lawton, Commissioner of Mining Statistics of Michigan, shows, that there is but little of this injurious element present: —

Metallic Iron	54.200
Silica	7.130
Phosphorus	.637

Chert and fragments of sandstone both occur with the ore; but neither, in very great abundance. The chief difficulty, in working the Green ore-bank, arises from the scarcity of water. The only source of this indispensable article is a so called dry-branch three-quarters of a mile away, which is too irregular in its flow, to supply water for continuous mining. The bank was formerly connected, by a branch road, with the Chattanooga, Rome & Southern R. R., and was supplied with a double log-washer and all other machinery, necessary for successful mining. The Green bank has recently been purchased by THE ALABAMA & GEORGIA IRON CO.

THE SIMPSON MINE

This mine is situated three miles directly east of the Green ore-bank, on *lot 1,241, 21st district*, only a short distance from Euharlee creek. It was opened in 1889, and was worked, more or less extensively, for about three years. The mine is connected with the Chattanooga, Rome & Southern R. R., by a branch road,

5½ miles in length, and the deposit is naturally well located for working. It occurs on a small hill, which has an elevation of about 75 or 80 feet above the level of the valley. The hill has been attacked by two large open-cuts, driven into it from the north side. The upper ends of the cuts, which are several rods in length, attain a depth of about 40 feet. The walls of these excavations, although now much fallen in, disclose, in the vari-colored clays, considerable ore, in the form of gravel and bowlders. In some places, honey-comb ore occurs; but it is not very abundant. The main part of the deposit seems to be made up mostly of gravel-ore. Associated with the ore, are chert and fragments of sand-stone. The former is frequently altered into a soft, white, chalky substance, which is easily separated from the ore, by the washer. The ore is generally of good quality, and runs high in metallic iron.

Following are partial analyses of the Simpson iron ore: —

Fe	P	SiO_2	Mn	S	Remarks
52.53	.275	14.22	Trace	——	Analyst, R. Swain Perry, Cave Spring, Ga.
52.80	.330	10.41	——	.037	" , Battle & Nye.
48.29	.488	——	——	——	" , J. B. Britton, Philadelphia, Penn.

There is considerable ore still in sight at the Simpson mine; and, by judicious management, the bank could probably again be worked with profit, at the present prices of ore. The mine is now in poor condition for working. The two double log-washers and the steam-shovel, formerly used at the mine, have long since been removed, or were allowed to decay, and are now valueless. The branch rail-road has also been torn up, and the iron taken away; so that the property does not at present offer a very encouraging proposition to the practical miner.

Near the Simpson mine, on the side of the branch rail-road, is a limestone quarry. This was opened, during the time the Simp-

son ore-bank was being worked; and a considerable amount of stone was shipped for fluxing purposes. It is a heavy-bedded, blue limestone, frequently much fissured; it belongs to the Chickamauga formation.

MRS. KATE HIGHTOWER'S PROPERTY

The iron deposit on this property, *lot 1,118, 2nd district*, is situated upon the slope of a red hill, about half-a-mile from Young's Station, on the Chattanooga, Rome & Southern R. R. In 1890, about 120 car-loads of ore were shipped from this bank to the Citico furnace, at Chattanooga. The ore, which is in the form of bowlders and gravel, appears to be quite abundant, and of excellent quality. Some of the bowlders or masses of ore are of huge size, and often weigh many tons. There still remains much valuable ore in this bank; and there is apparently no reason, why it should not be made a paying mine. The ore occurs mostly in pockets; but they are usually of large size, and extend to considerable depth, as is shown by the excavations. Cedar creek, which is about half-a-mile away, furnishes ample water, for ore-washing. It would be a difficult matter, to find an ore-bank, more favorably located, for economic mining, than the Hightower bank.

JAMES YOUNG'S PROPERTY

This property, *lot 1,190, 2nd district*, is half-a-mile east of the Hightower bank. There is only one excavation on this property,

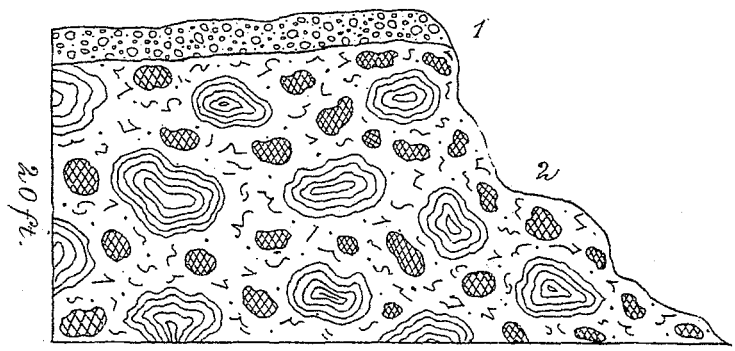
where ore has been mined. The cut is of small size; and it has furnished only two or three car-loads of ore. The work was done in 1890, by the same parties, that worked the Hightower bank. The ore, which seems to be quite abundant, is mostly in the form of huge masses. The chief impurity, noticed in the ore, is silica, in the form of sand. The bank is located on the hillside, favorably for working.

THE WRAY MINE

THE WRAY MINE is located on *lot 191, 1st district.* It was opened in 1895, and has been worked almost continuously, ever since. Its output, up to the present, is supposed to aggregate 60,000 tons. The works consist of several open-cuts, covering a total area of about two acres. They are located on the side of a ridge, which has an elevation of about 150 feet above the valley. Some of the excavations attain a depth of 75 feet, without reaching the limit of the ore. Last summer, about 30 hands were employed at the Wray mine; and from one to two car-loads of ore were shipped daily. The mine has connection with the Chattanooga, Rome & Southern R. R., by a branch road, 2½ miles long. It is supplied with a double log-washer, pumps, tram-cars, and other machinery, necessary for mining. The water, for supplying the washer, is obtained from Young's spring, 1½ miles away, and on the opposite side of the ridge. The pumping-station is located at the spring, and the water is forced directly to the washer, through a 6-inch pipe, without the intervention of a reservoir. The amount of water, thus supplied, is ample for the washer.

The ore of the Wray mine consists mainly of gravel, though there is much bowlder-ore present. The gravel-ore often has a purplish tint, and always runs high in metallic iron. It has the appearance of limonite partially altered to hematite. Picked samples of this ore are reported to yield 60 per cent. of metallic iron. Associated with the ore, in places, was noticed considerable manganese; especially was this true, in the old excavation near the base of the hill. The manganese, which occurs mostly in the form of a black powder, could in a great measure, be removed by the washer. Huge masses of siliceous material, partaking of the nature of both jasper and quartzite, also occur in the ore-banks.[1] These masses, which are frequently so large, that they cannot be removed, without the use of a derrick, often seriously interfere with mining.

Fig. 9



Section Showing Quartzite Bowlders Associated with Iron Ore at the Wray Mine. 1. Red Clay and Gravel-ore. 2. Varicolored Clays Containing Iron Ore and Large Quartzite Bowlders.

On the adjoining *lot, 192*, which belongs to the Wray property, are other excavations, where a limited amount of ore has been mined. The ore occurs, here, on the top and upon the slope of a rather steep hill. The deposit does not seem to be very extensive; but the ore is of good quality.

[1] See fig. 9.

THE COX PROPERTY

A considerable amount of ore occurs on THE COX PROPERTY, *lot 193, 1st district*, immediately east of, and adjoining, the Wray property. The deposit is an extension of the deposit, spoken of above, on lot 192, and is situated on the same hill. Some of the open-cuts on lot 192 are prolonged to lot 193, which appears to have the most valuable part of the deposit. The work on the Cox property is confined to a few open-cuts. These excavations are only a few feet in depth, and give but little indication of the extent of the ore. The large amount of float-ore, strewn about the surface in the cotton-field, on the summit of the hill, seems to indicate a deposit, of considerable economic importance. The ore is of good quality, and is quite free from mechanical impurities. It occurs as gravel and bowlders, and often has a dark-red or purple color.

THE J. S. YOUNG PROPERTY

THE YOUNG PROPERTY, *lots 188 and 189, 1st district*, adjoins the Wray property on the west. This property is, at present, undeveloped. However, the surface prospect for an extensive deposit of iron is excellent. There is no undeveloped property in the county, that presents a more favorable prospect. The ore occurs on the same ridge, on which the Wray ore-banks are located; and it is an extension of the same deposit. The surface-ore is in great abundance; and, in places, it completely hides the soil. It occurs

mostly in the form of bowlders, weighing from 10 to 50 pounds. Gravel-ore is also more or less abundant. A pit, three or four feet in depth, put down on the side of the ridge, shows an almost solid bed of bowlder- and gravel-ore. Near the top of the hill, the ore becomes more massive, and is occasionally in the form of huge "pots," made up, in part, of the so-called needle-ore. The entire deposit covers quite an area, on the side of the ridge; and, should it hold out in depth, the amount of workable ore will aggregate many thousand tons. Some samples of the ore, examined, contained considerable silica; but, as a general rule, the ore appears to run high in metallic iron. Ample water, for washing, can be had at the Young spring, only about half-a-mile distant.

The following is a partial analysis of ore from this property, made for the Geological Survey: —[1]

Water at 100° C	.580
Water above 100° C	9.830
Iron Sesqui-oxide	73.820
Equivalent to Metallic Iron	(51.680)
Manganese	.175
Phosphoric Acid	1.688
Equivalent to Phosphorus	(.735)
Sulphur	.012
Sand or Insoluble Matter	12.230

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

THE NANCY ISBELL PROPERTY

THE NANCY ISBELL PROPERTY, *lot 267, 21st district*, was prospected, in 1850, for copper; but the result was unsatisfactory. About this time, the copper mines of Ducktown, Tenn., were attracting considerable attention, and there was extensive prospecting for copper veins, throughout North Georgia. The general opinion among miners, then, was, that the various beds of iron ore, in or near the crystalline area of North Georgia, were gossan, or altered out-croppings of copper pyrites veins. As a result of this erroneous idea, many of the iron banks were opened up, and, among them, the bank on the above named property.

These excavations, which are located on a small elevation near the margin of a metamorphic area, are now well filled with earth. Nevertheless, they disclose, along their sides, to the depth of six feet or more, large masses of ore. To what depth the ore extends, is not known. Its presence on the surface, in considerable quantities, indicates, that the deposit is probably of commercial value. The ore occurs mostly in the residual clays, that have resulted from the breaking down of metamorphic slates.

THE R. B. BREWSTER PROPERTY

THE BREWSTER PROPERTY, *lot 243, 16th district*, is situated on the Georgia State-line, only a short distance from the famous Baker Hill mine in Alabama. The ore deposit of this property is found on a well-rounded red hill, about a quarter of a mile north

of the East & West Rail-road. Several pits and open-cuts are to be seen here, from which considerable ore was mined, some years ago. The excavations vary from 5 to 25 feet, in depth; and, in places, they disclose, in the vari-colored clays, gravel- and bowlder-ore in abundance. The ore seems to be of excellent quality, and is comparatively free from mechanical impurities. Chert and fragments of sandstone are both present; but neither is in sufficient quantity to materially affect the commercial value of the ore. In one of the excavations, decomposed shale occurs with the ore; and the clays seem to be somewhat stratified; but, as a general rule, the clays are distinctly massive. The Brewster property is considered excellent mining property. However, it is unfavorably located, with respect to water. In order to secure sufficient water, for operating a washer on the property, it would be necessary to construct a pipe-line, three quarters of a mile, or more, in length, and to maintain a pumping-station.

THE TUMLIN PROPERTY

This property, *lot 244, 16th district*, adjoins the Brewster property, on the south. The iron ore, found on the property, is somewhat similar to that, found on the Brewster property. The ore occurs on the same line of hills, and appears to be a part of the same deposit. The surface prospect, on the Tumlin property, is quite favorable; and the excavations, also show much ore in place. The works consist of three open-cuts, from 5 to 20 feet deep, and several yards in length. Many car-loads of excellent ore are reported to have been taken from these cuts, during the time, the

Brewster mine was being worked. The Tumlin ore-bank is favorably located for working; but, like the Brewster bank, it has no water, for operating a washer. Until this difficulty is overcome, mining on the Tumlin property must be carried on by pick, shovel and screen, which method would be necessarily wasteful; as the ore consists, in a large measure, of fine gravel. Ore is also said to occur on *lot 192, 16th district*, belonging to the Tumlin property; but its extent and character were not investigated, because only small openings had been made on the property, and these were now filled with débris.

THE SHILOH CHURCH PROPERTY

The main works on this property, *lot 105, 2nd district*, are located on the hill-slope, only a few rods from Shiloh church. It consists of an open-cut, about 75 feet long, and from 5 to 15 feet deep. Several car-loads of ore were shipped from this excavation, in 1897. The ore occurs in the form of gravel and bowlders; the latter sometimes contain pyrite. Another excavation on the hillside, in the cotton-field near by, shows similar deposits. Considerable ore of like nature is also to be seen in the gullies, along the public-road at the foot of the hill. There is evidently considerable ore on the Shiloh Church property; but the presence of pyrite would probably affect its commercial value.

THE GEORGIA LOAN AND TRUST COMPANY'S PROPERTY

The ore-bank on this property, *lot 113, 2nd district,* is located on the hill-slope, near the public-road, about half-a-mile northeast of the Shiloh Church property. The bank has been opened, in two or three places, by open-cuts, from which a few car-loads of ore have been shipped. The cuts are now well-filled with earth ; so that they show but little ore in place. Float-ore is quite plentiful on the hill-slope, about the excavations ; and this would seem to indicate the presence of a considerable deposit of ore. The bowlder-ore, here, as at the Shiloh Church bank, occasionally contains pyrite. Chert is also present ; but it is not abundant. With the exception of water, the ore-bank of The Georgia Loan & Trust Co., is favorably located for economic mining. At the base of the hill, in a large lime-sink, was noticed an exposure of fossiliferous limestone, which evidently belongs to the Chickamauga formation.

THE C. M. ISBELL PROPERTY

THE C. M. ISBELL PROPERTY, *lot 106, 2nd district,* adjoins the Shiloh Church property on the south. Ore occurs here, on a steep, high hill. A few shallow test-pits have been put down, at different points on the hill-slope ; but they show only a limited amount of ore. Some float-ore was noticed, in places ; but it is not abundant. The chert, found on this hill, differs from that, usually found in this section, in that it often contains cavities, lined with drusy

quartz. It is the prevailing opinion in the neighborhood, that this kind of chert indicates the presence of precious minerals in the hill. Such an opinion, however, is not based upon fact; and any exploration of the hill for precious minerals will evidently result in the useless expenditure of money.

THE J. F. SLOAN PROPERTY

An ore-bank was opened on this property, *lot 40, 2nd district*, some years ago, and four or five car-loads of ore were mined and shipped to the furnace. The ore occurs in the form of huge masses in the yellow clays. It is of dark color, and is quite brittle. Only one excavation has been made on this lot; and, as a consequence, but little is known of the extent of the deposit. The excavation, from which the ore was taken, is located in the valley, only a short distance from the foot of the hill, spoken of above, on the Isbell property. The deposit is peculiar, both in its location and in the character of the ore. Most deposits of the brown ores of Polk county are founded on elevated ground; and they always consist largely of gravel- and bowlder-ore.

THE NOBLE BANK

There are four different ore-banks on THE NOBLE PROPERTY, *lots 32, 2nd district, and 32, 16th district*, from which a considerable amount of ore has been shipped. The ore, found in these banks,

is very similar, in character, to the ore at the Wray mine. It often has a purplish color. Especially is this true of the gravel-ore, in the red surface clays. Associated with the ore in all the banks, is more or less chert and ferruginous quartzite. The latter often occurs in large bowlders, which interfere, somewhat, with mining. The excavations, originally having a maximum depth of about 25 feet, are now much fallen in; so that only a very imperfect idea can be had, of the extent of the ore in the banks. This property, together with the adjoining lot, owned by Mr. B. M. Jones, which has also been worked, to a limited extent, is thought to still have a considerable amount of workable ore. All the banks are located on the hillside, only a short distance from the East & West Rail-road.

THE VANDEVANDER PROPERTY

THE VANDEVANDER PROPERTY, *lot 42, 2nd district*, is located on the East & West R. R., about 1½ miles east of Esom Hill. The ore, on this property, occurs on a hillside, only a few hundred yards from the rail-road. The bank was opened by Mr. H. N. VanDevander, in 1895; and some 25 or 30 car-loads of ore were mined and shipped to the furnace. The main excavation consists of an open-cut, near the base of the hill. It discloses considerable ore in the vari-colored clay, and, also, some chert and fragments of sandstone. On the adjacent hillside, in a rail-road cut, is to be seen quite an exposure of sandstone, partly metamorphosed into quartzite. The sandstone is heavy-bedded, and belongs, apparently, with the iron ore, to the Knox Dolomite series. Some

pyrite is present in the ore, exposed in the excavation; but it does not, probably, occur in sufficient abundance, to materially affect its commercial value. Other prospects are reported, on the Van-Devander property; but, as the pits were filled by fallen débris, they were not examined.

THE J. E. PITTMAN PROPERTY

The ore-bank on THE PITTMAN PROPERTY, *lot 115, 2nd district*, is on a wooded hill-slope, half-a-mile northeast of the VanDevander property. The bank was opened, a few years ago; and about 10 car-loads of ore were shipped. The ore is of good quality; though it does not appear to be very abundant. It is quite free from chert and other mechanical impurities. Gravel- and bowlder-ore are both present. They occur in deep-red clays. There is but one main excavation. Its maximum depth is not over eight feet. The bank is about a quarter of a mile from the East & West R. R., and is otherwise favorably located for working.

THE STATE-LINE BANK

This bank, so-called because of its location near the Georgia-Alabama State-line, is on the Southern Railway, about half-a-mile southwest of Etna station. The bank was opened up, in 1875, and has been worked almost continuously, ever since. It is reported to have produced, during this time, several hundred

thousand tons of first-class ore. The works consist of several large cuts on the hillside, covering a total area of about five acres. The excavations vary from 10 to 40 feet in depth; and they are often connected, one with another, by means of short tunnels, which form the common road-ways, leading to the washers. The ore occurs in pockets and leads, which have been followed up, by the main cuts. These cuts form a perfect labyrinth, extending in all directions. The surface-clays on the hill are usually quite red, and carry mostly gravel-ore; while, below, the clays are variegated, and contain, besides gravel, bowlder- and honeycomb-ore. Clay horses are frequently met with. Some of them rise up, as large cones, often completely cutting off the ore; while, in other cases, the ore dips beneath them. The hill, on which the ore-bank is situated, has an elevation of less than 100 feet above Etna valley. It is only one of a number of hills and ridges, in the vicinity, that are ore-bearing. The State-Line ore-bank is now owned by THE TECUMSEH IRON CO., of Esom Hill, Ga., which is now operating it. Last Summer, the company was employing at the bank, regularly, about 35 hands, and was shipping daily, from 75 to 100 tons of ore, guaranteed to average 48 per cent. of metallic iron. The mine is supplied with two double log-washers and all other machinery, necessary for mining. Water, for washing the ore, is obtained from Indian mountain, 1½ miles away. The waste from the washers is retained on a small elevation, near the ore-bank, by a large dike. By this means, the accumulated waste of several years, is confined to an area of a few acres.

The following is a partial analysis[1] of a sample of ore, collected by the writer, from the State-Line bank: —

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

Water at 100° C	.590
Water above 100° C	9.880
Iron Sesqui-oxide	76.500
Equivalent to Metallic Iron	(53.550)
Manganese	1.100
Phosphoric Acid	1.318
Equivalent to Phosphorus	(.574)
Sulphur	None
Sand or Insoluble Matter	7.830

THE ETNA FURNACE COMPANY'S PROPERTY

THE ETNA FURNACE COMPANY'S PROPERTY lies immediately east of the State-Line ore-bank. This property, which is one of the most noted and extensive iron properties in the State, comprises an area of about 900 acres, a considerable portion of which lies in the Etna valley. The principal ore deposits of the Etna Furnace Company's property occur on the dolomite ridges, east of Etna valley. There are four of these ridges, noted for their iron deposits, namely, Battle ridge, Washer No. 1 ridge, Pond Bank ridge and Pennington ridge. All these ridges contain more or less extensive ore deposits, which were worked, to a considerable extent, during the time the Etna Furnace was in blast.

Battle ridge, which has an elevation of about 150 feet above the general level of Etna valley, lies farthest to the south and west. Its trend is to the northwest and southeast. Near the western end of the ridge, only a short distance from its summit, is to be seen, what is known as the Battle Ridge cut. The excavation is about 150 feet long, from 10 to 30 feet deep, and 2 or 3 rods

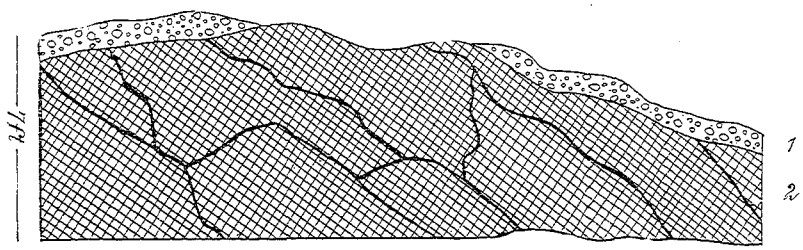
wide. The work was done several years ago; and the banks are now much fallen in; so that only a limited quantity of ore is exposed to view. The ore is chiefly gravel, and is of good quality. Something like 200 yards west of the Battle Ridge cut, near the base of the ridge, is the Adams cut. The dimensions of this excavation are not so great, as those of the Battle Ridge cut; but the quality and the extent of the ore is similar. Further to the southeast, along the slope of the ridge, is to be seen the Diamond cut; while, on the east side, near the summit, are two large excavations, known as the Blankinship and the Mahan cuts. All these excavations expose ore, of good quality. About one mile southeast of the Battle Ridge cut, on the continuation of the same ridge, are the more extensive workings, known as the State-Line cuts. Besides the above named openings, there are many other smaller excavations along the ridge, showing ore, in greater or less abundance.

Washer No. 1 ridge lies immediately east of Battle ridge. It has about the same altitude as Battle ridge; but it becomes much broadened, as it approaches Etna valley. Along its slope, facing the valley, are to be seen the Walthrop, the Asbury and the Washer cuts, all showing ore, of good quality. The surface, here, is well covered with float-ore, which is said to have been so abundant, formerly, as to interfere with the cultivation of the soil. On the west side of this ridge, is located the State-Line ore-bank, above described.

Pond Bank ridge is not so high, as the other ridges; but its slopes are usually steeper. This ridge has been more extensively worked, than any of the others; a fact due, evidently, to the excellent quality of the ore, and to its proximity to the Etna furnace. One of the longest cuts on the ridge is the King cut, located on its western slope. The cut is about 100 feet long, from 10 to 50 feet deep, and from 30 to 40 feet wide. On the top and

the eastern side of the ridge, are other excavations, known as the Lyons, the Coleman and the Pond Bank cuts, all revealing more or less ore in their crumbling walls. In the Pond Bank cut, the ore occurs in the form of massive layers,[1] while, in the other cuts, it is found mostly as gravel, though bowlder- and honeycomb-ore also occur. The Pond Bank ridge extends for some distance to

Fig. 10



Section through the Pond Bank, Showing Massive Iron Ore. 1. Red Clay and Gravel-ore. 2. Massive Iron Ore.

the southeast, and shows gravel- and surface-ore, at several points along the grade of the old Bullock rail-road.

The Pennington ridge is the most eastern of the ore-bearing ridges, belonging to the Etna Furnace Co. Its trend is, at first, to the northeast, parallel with the other ore-bearing ridges; but, upon approaching the valley, it turns, in a northwest course, and forms its eastern boundary. Along the western slope, overlooking the valley, several excavations are to be seen. Among these, might be mentioned the Tyler and the Leila cuts. The ore in this ridge seems to be quite abundant; but, in places, it contains more or less silica. In the Leila cut, are to be seen small veins of hematite, cutting the sandstone, almost at right angles to its bedding.

Besides the iron-ore deposits, on the above named ridges, the Etna Furnace Co. owns a number of other lots in the vicinity

[1] See fig. 10.

of Oredell and Hematite, which, also, have more or less extensive deposits of ore. There are, in addition, good surface prospects on the chert ridges, belonging to the company, along the grade of the old Bullock line of road, two or three miles east of the station. The latter deposits have been prospected, to only a limited extent; and but little is known of the character and extent of the ore.

The ore of the Etna Furnace Co's. property occurs, in leads and pockets, in the residual clays, which have resulted mainly from the breaking down of the Knox Dolomite. Chert and fragments of sandstone are associated with the ore, in all the banks; but, as a general rule, these mechanical impurities are not abundant.

Partial analyses of ore from the Etna Furnace Company's property, furnished by Mr. A. S. Hamilton, are as follows: —

Fe	SiO_2	S	P	Remarks
61.58	6.23	—	.31	Analyst, J. J. Hamilton
61.06	4.71	—	.38	—— ——
51.43	9.04	—	.57	Analyst, N. H. Ballard
51.00	10.02	—	.51	" J. J. Hamilton
49.08	11.05	—	.61	" N. H. Ballard
52.18	7.15	—	.41	" J. J. Hamilton

A partial analysis[1] of a sample of ore from the Pond Bank property, collected by the writer, resulted as follows: —

Water at 100° C	.430
Water above 100° C	9.830
Iron Sesqui-oxide	68.480
Equivalent to Metallic Iron	(47.940)
Manganese	.287
Phosphoric Acid	.435
Equivalent to Phosphorus	(.189)
Sulphur	.056
Sand or Insoluble Matter	17.900

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

It will be noticed, that some of the above analyses run higher in metallic iron, than theoretical limonite does. These specimens were probably taken from the Leila cut, where the ore has been altered to hematite.

The several banks, spoken of above, have been worked, more or less extensively, since 1871, when the Etna furnace was put in blast. This furnace, which is located at the base of Washer No. 1 ridge, within a few rods of the Selma branch of the Southern Railway, was first constructed as a cold-blast charcoal-furnace, with a capacity of 12 tons per day. In 1889, it was changed to a hot-blast furnace, having a capacity of 25 tons. Owing to the cheapness of iron, it has remained idle, since 1894. During the time, the furnace was in operation, it is said to have produced about 150,000 tons of first-class pig-iron, from ore obtained from the company's property. The furnace is now out of repair; but, according to Messrs. S. and F. J. Slucky, consulting engineers, of Oxford, Ala., it could be put in blast, at a cost, not exceeding $7,000. Belonging to the Etna Furnace Company, is the unincorporated town of Etna, a village, formerly of about 500 inhabitants. The company's improvements, within the town-limits, besides the furnace, consist of 50 cottages for miners and furnace employees, a Superintendent's residence, a laboratory, an office-building, a ware-house etc., all in fair state of repair. The company owns one single, and one double log-washer, with engine, pumps etc., to operate the same. It also owns a large number of tram-cars, some 600 feet of 8-inch water-pipe, a saw-mill, and all the equipment, necessary to operate a large farm.

Water, for washing ore and for furnace purposes, can be had on the property, from Fiddler's hollow and Myers' spring. The former, which is about 1½ miles distant from the furnace, furnishes 100 gallons of water per minute. Its static head has an elevation of

several feet above Etna valley; so that the water is conducted to the furnace in pipes, without the use of pumps. The Myers spring is about three miles east of the furnace; and it is said to furnish 250 gallons of water per minute. Should water from these sources prove inadequate, for both the furnace and the washer, an additional supply might be obtained from Cedar creek.[1]

THE J. M. PRIOR PROPERTY

The iron ore deposits of the Etna Company extend on to the adjoining property, *lot 128, 17th district*, now owned by Mr. J. M. Prior. The ore occurs, here, on the side of the ridge, which forms the eastern boundary of Etna valley. The property was worked in 1893–'94 by Mr. C. A. Wood, who reports the shipment of about 1,000 tons of ore. The excavations are all small, and are so fallen in, that, at only a few places, is the ore to be seen *in situ*, in the residual clays. The extent of the ore is unknown; but,

[1] Since the above was written, several excellent prospects have been opened up, on the Etna property, by Mr. Alexander Hamilton. Among these exposures, may be mentioned the recent prospects on Pennington ridge, the Davenport property, the Shorter mountain and the Holsomback hollow, all of which show more or less extensive exposures of good ore.

The prospects on Shorter mountain and Holsomback hollow are of special interest, on account of the extent of the deposits, and their occurrence in the Weisner quartzites. These deposits are the eastern extension of the deposits, which have been extensively worked at Bluffton, Ala., just across the State-line.

Should future developments, here, disclose such deposits of ore, as the surface indications seem to warrant, the amount of ore in these quartzite ridges will compare favorably with, if not surpass, the large deposits in the chert ridges east of Etna valley. The largest exposures are to be seen on *lots 207, 208, 225, 260, 261 and 280, 17th district*, where the ore has been recently laid bare, by numerous open-cuts and pits. The most extensive exposure occurs on lot 280, in what is known as Holsomback hollow. The ore, here, occurs in a compact mass, several rods across. A recent charge of dynamite has exposed the deposit at one point, to the depth of several feet, and has thereby demonstrated, that the ore is, by no means, of a mere superficial nature.

CLAY HORSE IN THE GRADY ORE-BANK, POLK COUNTY, GEORGIA.

owing to the large amount of float-ore, scattered about the surface, there, probably, still remains a considerable deposit. The ore is chiefly gravel. It is of good quality, and quite free from mechanical impurities. On the adjacent side of the valley, are other deposits, on the same property. They have all been worked, to a limited extent, and some ore has been shipped. The main excavation, here, is located on what is known as Piney Wood hill, a small oval elevation, rising about 30 feet above the valley. The work was done in 1892. The excavation, which is reported to have furnished about 20 car-loads of ore, is something like 100 feet long, and from 10 to 20 feet deep. The ore occurs, here, associated with shale and sandstone. Near by, are other excavations, from which ore has been shipped. They are, now, all partially filled with crumbling earth, and show but little ore. The surface-ore, about these excavations, is quite plentiful. However, it is claimed, that a large amount has been picked up and hauled off.

THE C. A. WOOD PROPERTY

THE WOOD PROPERTY, *lots 58 and 88, 17th district,* is situated on the east side of Etna valley, opposite Prior station. It is traversed by the same ore-bearing ridge, spoken of above, in the description of the Etna and the Prior properties. The ridge on the Wood property seems to contain a large quantity of ore, on the side facing Etna valley. Here, are to be seen a number of open-cuts, from which about 2,000 tons of ore are said to have been shipped, between 1888 and 1892. There are three principal excavations, on the side of the hill. None of them, however, attain a depth of more than 25 feet. The ore occurs in pockets,

in the residual clays, associated, more or less, with manganese ore and chert. It is mostly in the form of gravel, though massive and honeycomb ore also occur. The last variety of ore is said to run unusually high in metallic iron; but, unfortunately, it seems to be limited in quantity. In one of the cuts, a large mass of impure ore is exposed. It consists largely of silica, and runs too low in metallic iron, to be shipped. The Wood, like the adjoining Prior ore-bank, is favorably situated, for working, with the exception of water. If water could be had, on these properties, there is no doubt, that the ore-banks could be worked, with much profit.

Immediately east of lot 58, on *lot 25*, are to be seen, on the hill-slope facing Etna valley, a recently opened iron-ore bank, now being worked by THE JENEFER IRON CO., who are, at present shipping, daily, from one to two car-loads of ore. The ore is said to be of good quality; and it is thought to exist in considerable quantities.

THE OREDELL PROPERTY

THE OREDELL PROPERTY comprises an area of several hundred acres of mineral land, located on both sides of the Southern Railway, in the vicinity of Oredell station. The ore deposits on this property were worked, on a small scale, as early as 1876; but actual systematic mining may be said to date from some years later, when the property fell into the hands of THE REPUBLIC MINING & MANUFACTURING CO. This company operated the property, for some time, under the successful management of Mr. H. N. Van-Devander; but finally it sold the property, in 1891, to Mr. E. W.

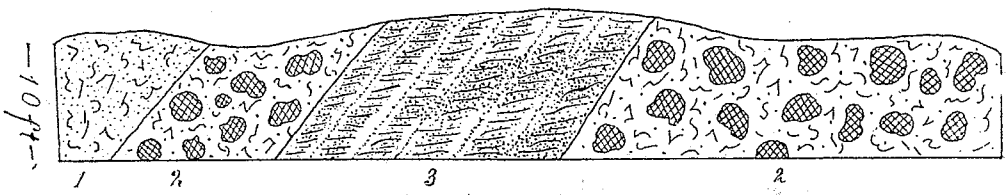
Marsh, of Atlanta. Mr. Marsh, at once, began extensive improvements, by constructing an expensive pipe-line, three miles in length. He, also, erected the latest improved ore-washer with jigs, and purchased a steam-shovel and all other machinery, necessary for the equipment of a first-class mining plant. Hardly had the plant been put in operation, when the panic in iron came, and the mining of ore ceased to be profitable. Nevertheless, Mr. Marsh continued operations, until 1894. Up to this date, the total output, of all the ore-banks on the property, is estimated at 150,000 tons. During last summer,[1] Mr. Marsh sold the Oredell property to Mr. J. D. Lacey and associates, of Chicago, who have recently put the property in good shape for working, by opening up new banks and putting the old ones in order. There is probably no property in Polk county, at present, in so good a condition as the Oredell, for carrying on mining, economically. The washers, pumping-station and pipe-line have all been put in good condition, and tram-tracks are now being constructed to the several ore-banks, in the immediate vicinity of the washers. The main tram-way, leading to the washer, exposes, in its open-cuts, which, in places, attain a depth of 15 feet or more, large quantities of excellent gravel-ore in the red clays. There is now being mined and shipped, from the Oredell property, about five car-loads of ore, daily. When the works start up, in full force, it is thought they will be able to ship, daily, about 15 car-loads of ore.

The ore deposits of the Oredell property occur in the hills and ridges, on both sides of the Etna valley, and also, in the valley itself. A bore-hole, put down for artesian water at Oredell station, is said to have demonstrated, that the ores, there, extend to a depth of 180 feet below the surface of the valley. The hills, east of the valley, usually have their summits heavily mantled with chert,

[1] 1899.

which evidently belongs to the Knox Dolomite series. The most valuable ore-banks, on this side of the valley, occur near the base, and along the sides, of these hills. Some of them have been worked more or less extensively, and have furnished considerable ore. The excavations consist of numerous cuts and pits, rarely attaining a depth of more than 20 feet. The ore occurs in pockets and leads, in the clays. It is usually of good quality, and runs high in metallic iron; but, in places, it becomes siliceous, forming what is known as rough ore. Associated with the ore, are large masses of ferruginous chert, which frequently interfere with mining.

Fig. 11



Section along the West Side of Cut No. 2, Oredell Property, Showing Ore Associated with Quartzite. 1. Massive White Clay. 2. Bowlder Ore in Vari-colored Clays. 3. Quartzite Broken to Fragments.

The hills, west of the valley, differ from those on its eastern side, in having no definite arrangement. They constitute the eastern margin of the knobby section, lying along the base of Indian mountain, and are underlain by shale and sandstone. The main ore deposits occur chiefly on the hills, bordering the valley. Along the sides of these hills, are to be seen a number of cuts and pits, where ore has been mined. The largest of these excavations, known as Cut No. 1 and Cut No. 2, are located on the same hillside, only a few hundred yards from Oredell station. They both enter the hill from the same point, one running northwest, for about 100 yards, and the other, west, for about the same distance. Near the western end of the latter, is a branch cut, running north,

for a hundred feet or more. These cuts vary from 30 to 80 feet in width; and, in places, they attain a depth of 40 feet. Considerable ore is exposed along their sides; but much of it is low-grade, and contains a high percentage of silica. The ore, here, occurs in the vari-colored clays, associated with the quartzite.[1] It is often massive or honeycomb; and, sometimes, it contains small angular fragments of chert or sandstone. Samples of ore, taken from other cuts, on the above hill, show a partial alteration to hematite. The ore, occurring in the valley, is similar to that, found upon the hills. However, it is generally freer from mechanical impurities. One of these banks, known as Snake Pond bank, has furnished a large quantity of excellent ore. It is located on the side of a small pond, only a short distance from Oredell station. The ore, mined at this bank, often occurs in huge bowlders, weighing a ton or more.

The following partial analyses[2] were made for the Geological Survey, from samples of ore, collected by the writer from the Marsh property: —

SAMPLE NO. 1

Water at 100° C	.680
Water above 100° C	9.980
Iron Sesqui-oxide	61.920
Equivalent to Metallic Iron	(43.350)
Manganese	.675
Phosphoric Acid	.557
Equivalent to Phosphorus	(.242)
Sulphur	.024
Sand or Insoluble Matter	24.060

[1] See fig. 11.

[2] By A. M. Lloyd, McCandless Laboratory, Atlanta.

SAMPLE NO. 2

Water at 100° C	.540
Water above 100° C	11.410
Iron Sesqui-oxide	70.420
Equivalent to Metallic Iron	(49.300)
Manganese	.592
Phosphoric Acid	.516
Equivalent to Phosphorus	(.224)
Sulphur	.026
Sand or Insoluble Matter	10.880

SAMPLE NO. 3

Water at 100° C	.710
Water above 100° C	8.700
Iron Sesqui-oxide	56.300
Equivalent to Metallic Iron	(39.410)
Manganese	1.345
Phosphoric Acid	.868
Equivalent to Phosphorus	(.378)
Sulphur	.060
Sand or Insoluble Matter	30.480

Samples Nos. 1 and 3 were two of the more siliceous ores, taken from the cut near the washer.

THE J. A. WRIGHT PROPERTY

This property, *lot 62, 17th district*, adjoins the Oredell property on the east. The main iron deposits occur along the foot-hills of

the chert ridge, which bounds the Etna valley on the east. Considerable ore was mined, here, some years ago. The ore is similar to that, found on the Oredell property, and occurs in like manner. The property is now being worked by Mr. Linton Sparks, of Cave Spring, Ga., who is mining and shipping, daily, from one to two car-loads of ore. With the exception of water for washing, the Wright property is well located, for economic mining.

THE HEMATITE PROPERTY

The Hematite property is a large tract of mineral land, of about 1,100 acres, adjoining the Oredell property on the north. Some mining was done on this property, in 1874; but the greater part of the work has been done, since 1897. There occurs, here, in the hills west of the Southern Railway, a large number of ore-banks, many of which have been worked more or less extensively. The ore occurs, here, as elsewhere throughout Polk county, in pockets and leads, associated with chert in the vari-colored clays. Quartzite, in the form of angular fragments, cemented into large masses by oxide of iron, thus forming a typical breccia, is also present. In some of the banks, the ore seems to consist largely of limonite, partially altered to hematite. This alteration is especially noticeable in Bank No. 1, located on the hillside near the Hematite siding. The ore here consists, largely, of what is known among miners, as soft ore. It is quite porous, and is easily crushed to powder. The cavities in the ore are usually angular, and often contain fragments of partially disintegrated chert. In some instances, the cavities are traversed by minute stalactites of

ore, having a beautiful play of color. Most of the ore has a purplish-red color; but, in places, it has a mottled appearance, due to included fragments of brown ore. There are two main excavations at the above ore-bank; but neither is of large size. The one farther up the hill — the larger of the two — has a length of about 50 feet, and is from 5 to 20 feet in depth. It is a recent excavation, and has furnished a considerable amount of ore. Other ore-banks, recently worked on the Hematite property, are the Shelton and the Pasture Field banks. The ore in the former bank occurs mostly in the form of huge masses, associated with large bowlders of siliceous material. There appears to be a quantity of ore in the hill, on which the Shelton bank is located; but much of it is of low grade. The ore, at the Pasture Field bank, is of more uniform grade, and is comparatively free from mechanical impurities. It occurs as gravel and bowlders, in the form of small pockets, in the red clays. The scarcity of water, for ore-washing, on the Hematite property, has been a great draw-back in its development. If this article, so essential to economic mining, were at hand, there is no reason, why the property should not become a constant and profitable producer. To supply an abundance of water, it would be necessary to construct a pipe-line, and maintain a pumping-station, which would necessitate a considerable expenditure of money. Water in abundance could be had from Little Cedar creek, a mile or so away. With the exception of water, the Hematite property possesses every essential, necessary to cheap mining. The Southern Railway runs almost directly through the center of this property; and the ore-banks, with only a few exceptions, are all located on the hillsides, where deep excavations can be made, without coming in contact with water. Mr. Linton Sparks, who has been working the Hematite ore-banks, since 1897,

estimates the entire out-put of the several banks, up to the present time, at about 20,000 tons. Judging from the extent of the excavations, this is a conservative estimate.

Partial analyses[1] from samples of ore, collected by the writer, from the Hematite property, resulted as follows: —

SAMPLE NO. 1, FROM BANK NO. 1

Water at 100° C	.450
Water above 100° C	8.750
Iron Sesqui-oxide	69.940
Equivalent to Metallic Iron	(48.990)
Manganese	.410
Phosphoric Acid	.088
Equivalent to Phosphorus	(.038)
Sulphur	.019
Sand or Insoluble Matter	16.820

SAMPLE NO. 2, FROM THE PASTURE FIELD BANK

Water at 100° C	.460
Water above 100° C	8.210
Iron Sesqui-oxide	66.300
Equivalent to Metallic Iron	(46.410)
Manganese	.420
Phosphoric Acid	.201
Equivalent to Phosphorus	(.087)
Sulphur	.092
Sand or Insoluble Matter	22.020

Recently, the Hematite property has been purchased by THE ALABAMA CONSOLIDATED IRON, COAL & COKE CO., which has

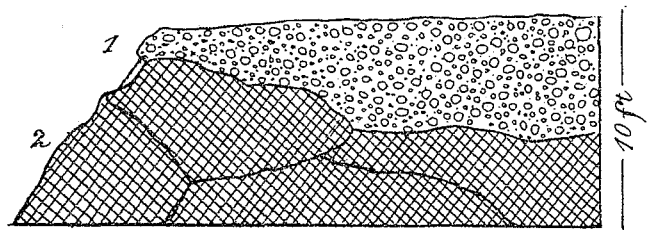
[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

leased it to THE HEMATITE MINING CO. The latter company is now mining daily about five car-loads of ore, which is shipped to Gadsden, Ala. The greater part of the ore is, at present, mined at what is called the Wood cut, where the ore occurs mostly massive, associated with motley clays. The Hematite company is now constructing double log-washers, and making other improvements, with a view to increasing the output of the mine.

THE EARL SLOAN ORE-BANK

This ore-bank is located on *lot 20, 21st district*, near the Chattanooga, Rome & Southern R. R., about a quarter of a mile south of the Floyd County line. The works, which consist of two main open-cuts, from 5 to 15 feet deep, and several yards in length, are situated on the hill-slope, scarcely a stone's throw from the railroad. The excavations expose a large quantity of ore, in the vari-colored clays. The ore occurs chiefly as gravel and bowlders, near the surface; but, in the bottom of one of the cuts, it becomes massive.[1] Associated with the ore, is more or less chert and fragments of sandstone. The bank was opened in January, 1900. Since this time, a

Fig. 12



Section Showing Massive Ore in the Sloan Bank. 1. Red Clay and Gravel-ore. Massive Iron Ore.

[1] See fig. 12.

considerable amount of ore has been mined and shipped to the furnaces at Chattanooga and Rome.

Some two miles southwest of the Sloan bank, are other prospects. These are situated on MRS. A. W. BYRD'S PROPERTY, *lot 1,115, 3rd district.* The ore, which is here exposed in a few old pits, is associated with manganese.

COL. J. O. WADDELL'S PROPERTY

THE WADDELL PROPERTY, *lot 400, 21st district,* is located about one mile northwest of Aragon. This property was worked for iron, in 1892, by Mr. John D. Pope; and, later, by THE CENTRAL MINING CO. The exact number of tons, mined, is not known; but, judging from the excavations, there must have been a considerable quantity. The main workings are located in the northeastern corner of the lot, near the summit of a low ridge. There is to be seen, here, a large open-cut, several rods in length, and from 10 to 20 feet deep. It is now much fallen in, and shows but little ore. In the northwest corner, and also near the center of the lot, are other excavations, from which ore has been taken. The entire workings cover an area of about 1½ acres. The ore, exposed in the cuts, consists largely of gravel; though bowlder, "pot" and honeycomb ore are also to be found. The ore is quite free from chert, and other impurities, and always runs high in metallic iron. There is considerable surface ore, in places, on the lot, which would seem to indicate the presence of workable deposits, below. The Waddell property is only about half-a-mile from Young's station on the Southern Railway, from which point there

is a branch road, extending to the ore-banks on this and the adjoining property. All the water, necessary for washing, can be obtained from Fish creek, about half-a-mile distant. The favorable location of the Waddell property, together with the excellent quality of the ore, makes it desirable property for mining purposes.

THE McGEE PROPERTY

THE McGEE PROPERTY, *lots 341 and 401, 21st district*, adjoins the Waddell property, on the north and east. It was worked, more or less extensively, from 1888 to 1893, by THE CENTRAL MINING CO. The ore-banks are located on the same ridge, as the Waddell property. The works, which consist of a number of open-cuts, of large size, cover a total area of something like five acres. The excavations rarely ever attain a depth of more than 20 feet. These are now much fallen in; but considerable ore is exposed, in places. The ore occurs in pockets, in the red and yellow clays. It is largely gravel-ore, of good quality. Some shale and decomposed chert is associated with the ore; but neither is of sufficient abundance, to affect the value of the ore. The shale is mostly in thin layers, traversing the ore-bearing clays. On the hill-slope, near the excavation, are to be seen the remains of an old double log-washer, formerly used in washing the ore. The ore-banks of the McGee property are favorably located for working. They are within reach of water, and are only a short distance from the Southern Railway, with which they were formerly connected by a spur-track.

THE CENTRAL MINING COMPANY'S PROPERTY

This property, *lot 239, 21st district*, lies between the McGee property and the Southern Railway, a few hundred yards west of Young's station. The ore deposits, on THE CENTRAL MINING COMPANY'S PROPERTY, are similar to those of the Waddell and the McGee properties. In fact, these properties may all be considered as belonging to one and the same deposit. The ore-banks on the Central Mining Company's property, were first opened by Mr. J. D. Pope, and, afterwards, were worked by the Central Mining Co. The entire worked area covers about two acres. The excavations consist of open-cuts, partially filled with crumbling earth.[1]

THE JAMES LONG PROPERTY

Ore, in workable quantities, occurs on the above named property, on *lots 326 and 327, 21st district.* The deposit on the former lot has not yet been worked. Nevertheless, the surface indications are most favorable. The prospect is located on a low, well-rounded hill, about a quarter of a mile west of the Southern Railway.

[1] Since the above was written, the Central Mining Company has again opened the ore-banks, and is shipping, daily, two or three car-loads of ore. New banks have been opened; a washer has been erected; and everything seems now to be in good shape, to carry on mining with profit. The manner, in which the ore occurs in the recent excavations, differs but little from that on the adjoining properties.

There occurs, here, scattered over several acres, a large amount of surface ore, mostly in the form of gravel. It seems to be of excellent quality, and is comparatively free from mechanical impurities. On the eastern side of the above ore-bearing hill, is a lime-sink, in which is to be seen quite an exposure of limestone. It is a bluish-gray, heavy-bedded limestone, evidently belonging to the Chickamauga series. The deposit on *lot 327* has been worked, more or less extensively, and has furnished a quantity of ore. The main excavations on the lot, from which ore has been taken, are three in number. They are all located on the hillside, only two or three hundred yards from Young's station. The excavations were made, some years ago; and they now show but little ore in sight. Near one of the cuts, are to be seen the remains of a log-washer, formerly used for washing the ore. Water, for operating the washer, was obtained from the lime-sink, near by.

THE T. M. RANDALL PROPERTY

The chief workings on THE RANDALL PROPERTY consist of a large open-cut, about 100 yards long, from 5 to 20 feet deep, and, in places, several rods wide. The excavation is located on *lot 190, 21st district*, on the Southern Railway, about one mile from Long's station. The ore-bank is on a low ridge, which has an elevation of only a few feet above the valley. The deposit does not appear to be very extensive. It was worked in 1892, by the Central Mining Co., who erected a washer at a small pond, near by. The ore occurs in pockets, in the decomposed shales and vari-colored clays. It seems to be of good quality; but, unfortunately, it is apparently not very abundant.

On *lot 192*, are other old workings, from which considerable ore has been shipped. Recently, Mr. W. L. Craig, of Rockmart, has been prospecting this lot, with a view to shipping the ore. At the time of our visit, the work had not progressed to a sufficient extent, to foretell the result of the undertaking. However, as far as it had gone, it seemed to be encouraging.

THE BLACK ROCK BANK

THE BLACK ROCK BANK, which now belongs to THE TECUMSEH IRON CO., of Alabama, is located on *lots 43 and 106, 21st district*, about half-a-mile east of the Southern Railway. This bank has been worked irregularly, for some years, and has produced, altogether, something like 10,000 tons of ore. In 1891, a double log-washer was erected upon the property, near the ore-bank; but, on account of the scarcity of water, it was operated for only a short time. The other improvements consist of a commissary; a spur-track, half-a-mile long, connecting the banks with the Southern Railway; etc. The deposits occur on a low, flat ridge, but little elevated above the surrounding country. The works consist of four large open-cuts, together with a number of lesser excavations, none of which attain a depth of more than 20 feet. The ore seems to be quite abundant; but, in places, it is of an inferior grade. It often occurs in large masses, weighing a ton or more. These masses are generally compact, and of dark color; hence, the name of the bank. Associated with the massive ore in the yellow clays, are, also, "pot" and honeycomb ore. The former consists largely of hematite, inclosing masses of bluish clay. The

hematite contains a few particles of pyrite, which seem to throw light on its origin. In some of the excavations, is to be seen considerable decomposed shale with the ore. The shale is of a brownish-red color, and is easily excavated with the pick. The main difficulty in working the Black Rock ore-bank is the lack of water. The pond, near the Southern Railway, furnishes ample water, during the wet season; but a continuous supply would have to be obtained, elsewhere.

Following, is a partial analysis[1] of a sample of ore from the Black Rock mine, collected by the writer: —

Water at 100° C	.610
Water above 100° C	10.680
Iron Sesqui-oxide	70.880
Equivalent to Metallic Iron	(49.620)
Manganese	1.325
Phosphoric Acid	1.857
Equivalent to Phosphorus	(.808)
Sulphur	.063
Sand or Insoluble Matter	13.020

THE S. K. HOGE ORE-BANK

This ore-bank is located on the east side of Euharlee creek, about two miles north of Rockmart, only a short distance from the public-road leading to Aragon. The bank was opened up, only a few months ago, by Mr. W. L. Craig; and it had furnished, at the

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

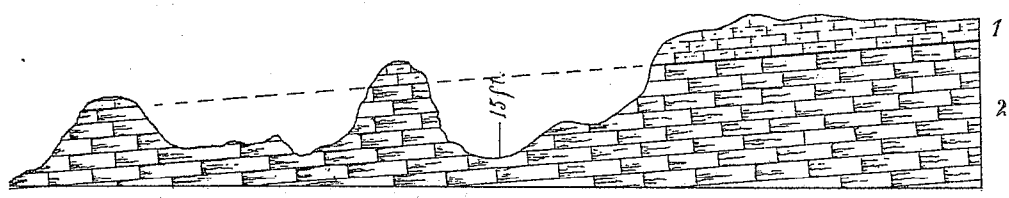
time of our visit, about 50 car-loads of ore. The work is confined chiefly to one main excavation, located at the base of a limestone hill, which, here, rises a hundred feet, or more, above the valley of Euharlee creek. The ore occurs as gravel and bowlders, in a large pocket, in the residual clays and slates, near the contact of the latter with the limestone, which is exposed on the hillside, only a few rods away. The limestone, at this place, is much sheared; and it carries pyrite, in the form of small crystals. Near by, on an adjoining lot, the limestone has been altered, along certain lines, by local metamorphism, into white fine-grained marble, which, at one time, was thought to be of sufficient abundance, to be of economic value as an ornamental stone.

THE DEATON MINE

THE DEATON ORE-BANK is situated on the East & West R. R., about a mile southwest of Taylorsville, on *lots 64 and 81, 18th district.* The deposit occurs, here, near the base of a high ridge, which rises from three to four hundred feet above the valley. The works consist of a perfect labyrinth of open-cuts, which, in places, attain a depth of 20 feet or more. There is every evidence to show, that this ore-bank, at one time, contained a large quantity of ore; but the workable part of the deposit seems now, to be, in a great measure exhausted. The character of the ore, found here, and also its mode of occurrence, differ greatly from those of any of the ores, hitherto described. One of the first things to attract attention, in approaching the ore-bank, is the unusual redness of the soils. In these soils, are to be seen large numbers of small angular pieces of

ore. They are of a dark-brown or chocolate color, and are quite porous and light. Associated with these, are other fragments of ore, similar in form; but these are of a dark-red color, and consist of hematite in the place of limonite. Some of these fragments seem to be made up almost entirely of small concretions, resembling the casts of ostracods; but they are too much altered to admit of identification. Other fragments are quite cavernous, and resemble, in structure, scoria or slag from a furnace. These ores are derived from a bed of ferruginous limestone, overlying the Chickamauga formation at this point.[1] Dr. J. W. Spencer, for-

Fig. 13



Section through the Deaton Ore-bank, Showing Ferruginous Limestone Overlying Chickamauga Limestone. 1. Ferruginous Limestone. 2. Chickamauga Limestone.

merly State Geologist of Georgia, in speaking of this deposit, says: — "At the Deaton mine, these ferruginous beds rest upon Maclurea limestone (Chickamauga series), which has been rendered cavernous, in places, beneath a roof of the iron limestone series. This weak roof has subsequently collapsed, and filled the chambers with a heterogeneous mass of ore. The ore is known to have a depth of 40 feet, at least."

The perfect labyrinth of open-cuts, referred to above, are separated from each other, by walls of solid limestone. At the upper ends of the excavations, the ferruginous limestones, partially

[1] See fig. 13.

altered into brown iron ore, is seen to overlie the more compact limestone. The unaltered ferruginous limestone has a dark-brown color, and often contains angular fragments of a similar material, of lighter color. On the weathered surface, these angular fragments are often conspicuous. Microscopic examination shows the rock to carry a large quantity of magnetite, which is evidently the original source of the brown iron ore of the Deaton mine.

The following partial analyses of ore, from the Deaton mine, are reproduced from the report of former State Geologist, J. W. Spencer, on the Paleozoic Group of Georgia: —[1]

Fe	SiO_2	P	S	Ti	H_2O	Ca	Al
48.56	14.25	0.363	Trace	0.011	1.30	——	——
49.32	11.04	0.335	——	——	2.53	0.73	——
49.80	12.03	0.287	——	——	——	Trace	9.04

One other analysis is reported to have yielded 33.12 per cent. of metallic iron, with less than .3 per cent. of phosphorus.

The location of the Deaton mine on the rail-road, together with its proximity to Euharlee creek, which is only a few hundred yards away, made it possible to mine the ore, at a minimum cost.

THE RED-ORE BANK

This ore-bank, which belongs to THE CENTRAL MINING CO., is situated on *lot 509, 18th district*, about 2½ miles southeast of Aragon. It was worked, for a short time, in 1894; but it does not appear to have been very profitable. The works, which consist of open-cuts, are confined, principally, to a small circular hill, rising

[1] The Paleozoic Group of Georgia; Geological Survey of Georgia; by J. W. Spencer; page 174.

not over 60 feet above the valley. The ore, found here, is similar to that, found at the Deaton ore-bank. It seems to be more or less abundant; and it is of fine quality. The same deposit extends on to the adjoining *lots, 571 and 572;* and Dr. Spencer reports its occurrence, also, on *lots 868, 869, 870, 932 and 1,076;* but, on none of these lots, has there been any work of importance. The origin of these spongy chocolate-colored ores is well illustrated, on the top of a hill, on *lot 371*. Here, may be seen the ferruginous limestone, overlying the Chickamauga limestone. The ferruginous limestone, where it has been long exposed to atmospheric agencies, has been leached of its lime; so that it now occurs as a spongy iron-ore, still retaining in a great measure the original form of the parent rock.

With the exception of water, the Red-ore bank is well located for working. It was formerly connected with the East and West R. R., by a branch road, a mile or more in length.

CHAPTER III

Description of the Iron Ore Properties in Bartow County

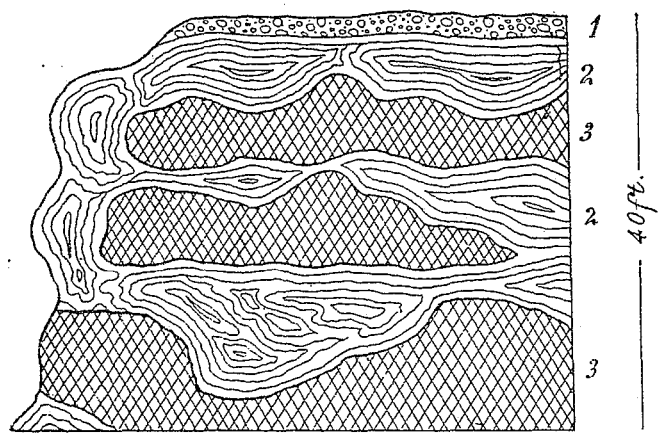
The iron ore banks of Bartow county have been worked, on a more or less extensive scale, for more than half-a-century. It would be a difficult matter, to give anything like a reliable estimate of the aggregate amount of ore, mined at the several banks, during this time. The output has always been quite variable, depending largely upon the price of the ore. At present, there are shipped, from the several banks, 75 to 80 car-loads of ore per day. The most extensive and valuable iron deposits of the county are associated with the Cambrian quartzites, in the eastern part of the county. The ore is chiefly limonite; though hematite and siderite also occur. The latter, which has, in a great measure, given rise to the extensive brown ore deposits in the Sugar Hill district, is also reported to occur, in a considerable bed, at the base of Pine Log mountain, a few miles north of this point.

The following descriptions of the numerous banks and properties, here given, is thought to include all the iron deposits, now known to be of economic value, in Bartow county.

COL. C. M. JONES'S PROPERTY

THE JONES PROPERTY, which comprises an area of several hundred acres of mineral and agricultural lands, is located on Pumpkin Vine creek, about one mile south of Emerson. The iron deposits of this property have been known for many years, and have been worked, more or less extensively, since 1876. The main workings are chiefly confined to *lots 966, 978, 1,039, 1,040 and 1,050, 4th district.* The first mining of any importance, done on the property, was at *Bank No. 1*, located near the southeast corner of *lot 1,040*. This bank is on a small eminence, known as Cemetery Hill, which is the eastern termination of one of the spur ridges, extending down from the main quartzite ridge, which lies a short distance to the west. Cemetery Hill has an elevation of about 75 feet above Pumpkin Vine creek; while the main quartzite ridge rises 300 or 400 feet above the same level. The workings at Bank No. 1 consist of a large open-cut, about 100 yards long. It varies from 100 to 200 feet in width; and, in places, it

Fig. 14



Section Showing the Occurrence of Iron Ore on the C. M. Jones Property, Lot 1,040, 4th District. 1. Red Clay and Gravel-ore. 2. Contorted Metamorphic Slate. 3. Iron Ore.

attains a depth of 50 feet. In addition to this excavation, there are some short tunnels, and a number of test-pits. The ore, exposed to view in these excavations, occurs in large irregular masses, or pockets, and leads, in the decomposed metamorphic slates or schists.[1] Some of the ore-bodies are of large size, sufficient to furnish several car-loads of ore. They are all more or less connected, one with the other; and they may be considered as a continuous deposit, replacing or filling cavities in the highly contorted schists. The ore is usually quite compact; and, frequently, it discloses numerous particles of white quartz distributed through it. These quartz particles are often arranged in parallel lines; and they seem to have been derived from the original schists. Many of the specimens, collected, contain a large amount of fibrous limonite, filling cavities and fissures in the more impure ore. Manganese, in small quantities, occurs with the ore. It is usually present, however, as a black powder, which can, in a measure, be removed by the washer. At the eastern base of the hill, in a rail-road cut, are to be seen large quantities of siliceous ore, in its natural bedding. This ore occurs, associated with a heavy-bedded quartzite, which, here, dips at a high angle. On the hillside above the cut, are huge quartzite bowlders, weighing many tons, partially buried in the red clays, which mantle the surface. These red clays contain, in addition to the quartzite bowlders, considerable float-ore. Cemetery Hill seems to contain quite a good deal of workable ore. It is reported, that the bore-holes, put down on the hillside, here, demonstrated, that the ore extends to a depth of more than a hundred feet below the surface. If this statement is correct, there probably still remains much more workable ore in the hill, than has heretofore been mined. *The Ceme-*

[1] See fig. 14.

tery ore-bank is connected, by a branch road, with the Western & Atlantic R. R., at Emerson. It is also within a stone's throw of Pumpkin Vine creek, where water, for ore-washing, can be had, in any quantity.

The following partial analysis was made[1] from a sample of ore from Bank No. 1 of Col. C. M. Jones's property, collected by the writer: —

Water at 100° C	.530
Water above 100° C	10.220
Iron Sesqui-oxide	65.570
Equivalent to Metallic Iron	(45.900)
Manganese	.445
Phosphoric Acid	.345
Equivalent to Phosphorus	(.150)
Sulphur	.091
Sand or Insoluble Matter	20.100

Ore-bank No. 2, is located on *lot 1,050*, about half-a-mile west of Bank No. 1. This bank was opened in 1879, and was worked, off and on, until 1896. Two years later, a double log-washer was erected at the bank, and an attempt was made to work the deposit, on a more extensive scale; but, owing to a reduction in the price of ore, only a limited amount of work was done. Previous to 1896, all the ore, taken from Bank No. 2, was mined by means of shovel, pick and screen, and was hauled, by wagon, to Emerson, 1½ miles distant. The total amount of ore, mined during this time, is not known; though, judging from the extent of the excavation, it would seem to aggregate many hundred tons. The ore-bank is situated on a hill-slope, about 400 yards from Pumpkin

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

Vine creek. This hill, like the Cemetery Hill, is one of the foot-hills of the high quartzite ridge, a short distance to the west. The excavations at Bank No. 2, consist of two large open-cuts, each about 75 yards long and from 50 to 100 feet in width. They both enter the hill from the same point, one running northeast, and the other, southeast. In the former cut, near where it joins the latter, the ore is said to have been worked, to the depth of 50 feet. The surface of the hill at this point is covered with a deep red or mottled clay, containing gravel-ore. Beneath these clays, in places, occur beds, from 1 to 2 feet in thickness, of water-worn quartz pebbles. The workable part of the ore-deposit is found in pockets, in the clays and the decomposed schists. Associated with the ores in the southeastern cut, are to be seen masses of siliceous material. These masses, which are often brecciated, or have a banded structure, are usually of a dark color, and are quite porous. Some of the hand specimens, taken from the bowlders, have a close resemblance to volcanic tufa; while others are not unlike compact limestone. The siliceous masses, here referred to, probably originated from the crushing of the quartzites, during the process of folding and faulting of the rock of this region. The iron ore, exposed in the excavations, is mostly in the form of nodules, pebbles and "pots." It is usually of good quality; but it often contains more or less silica. Some ochre and manganese occur with the ore, in limited quantities. Ore-bank No. 2 is supplied with a double log-washer, an engine, pumps etc., all in fair state of repair.

A partial analysis[1] of a sample of ore, collected by the writer, from Bank No. 2 of Col. C. M. Jones's property: —

Water at 100° C	.660
Water above 100° C	10.420
Iron Sesqui-oxide	72.850
Equivalent to Metallic Iron	(51.000)
Manganese	.320
Phosphoric Acid	.963
Equivalent to Phosphorus	(.419)
Sulphur	.024
Sand or Insoluble Matter	11.220

Ore-bank No. 3 is near the summit of a ridge, on the west side of *lot 978*. This bank was formerly known as the *Black Bank*, from the color of the ore. The excavations, here, are small; they have furnished, according to report, only about 12 car-loads of ore. The work was done several years ago, and the cuts are now so fallen in, that but little ore is to be seen in places. Specimens of the ore, found on the dump, were in the form of nodules and pebbles. The nodular masses often consist largely of fibrous or "needle" ore. About 400 yards southwest of Bank No. 3, is to be seen quite an exposure of limestone, which was more or less extensively quarried, some years ago, for making lime for local use. The limestone is much fissured and broken up; and it appears to be more or less crystalline. Ore-bank No. 3 has an excellent location. However, it is questionable, whether it contains much workable ore.

Ore-bank No. 4 is situated on a hillside, near the east side of *lot 1,039*. The main excavation in this bank is small; nevertheless

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

it is claimed, that it has produced about 50 car-loads of ore. The ore occurs as angular gravel and bowlders; and it usually carries considerable silica, in the form of sand. On the hill-slope above the main excavation, are to be seen several small prospect-pits, all showing more or less siliceous ore.

Ore-bank No. 5 has been worked to only a limited extent. It is located on a rather steep hill-slope, on *lot 978*, only a few rods from the branch railroad, extending from Emerson to Ore-bank No. 1. The ore, in this bank, is usually rough and honeycombed; and it seems not to be very extensive. Considerable ochre is here found, with the ore; but it is too impure to be of economic importance.

Ore-banks Nos. 6, 7 and 8 are all located on *lot 966*. *Bank No. 6*, known, also, as the *Convict Bank*, is situated in the northeastern corner of the lot. This bank was worked by convicts, in 1872; hence, its former name. The excavations are now so fallen in, that no ore is exposed to view. It is reported, that a large quantity of ore was mined at this bank, for the Etowah furnace. *Bank No. 7* is a few hundred yards west of Bank No. 6, on the Alabama road. It has been worked to only a limited extent. The ore does not seem to be very abundant; though it is of excellent quality. It has a red color, and seems to consist largely of hematite. *Ore-bank No. 8* is situated on a hill-slope, near the southeast corner of the above named lot. There is to be seen, here, near the top of the hill, a large open-cut, from which a considerable amount of ore was taken, some years ago. Further down the hill, are other more recent excavations, where a small amount of ore was mined, last summer. Bank No. 8 appears to contain a large quantity of ore; but it is rather expensive to mine, on account of its being associated with large quartzite bowlders. This is especially true

of the recent excavations on the hillside. The ore, in all the above banks, occurs in pockets, or in irregular veins, in the residual clays and decomposed slates, or schists.

Recently, THE CITICO IRON COMPANY, of Chattanooga, Tenn., has purchased the mineral interest in the Jones property; and it is now erecting a washer, and getting the banks in shape, to begin mining operations, on a more or less extensive scale. The company, at the time of our visit, had just exposed an extensive body of ore, in an open-cut on the hillside, only a short distance northwest of Bank No. 1.

THE J. A. STEPHENS PROPERTY

The main ore deposits on THE STEPHENS PROPERTY are situated near the summit of a rather high hill, on *lot 981, 4th district.* Both iron ore and manganese occur here, in considerable quantity. The latter mineral, until recently, seems to have attracted much more attention, than the iron ore. It is confined mainly to the western side of the hill, where it has been prospected, more or less extensively, by means of tunnels and shafts. It appears to be quite abundant, and is of excellent quality. The iron deposit is on the adjacent side of the hill. It is here well exposed, in an open-cut and a tunnel, the latter being an extension of the former. The total length of the tunnel, including the open-cut, is about 60 feet. It extends directly into the hill, and penetrates the ore for nearly its entire length. The iron-ore occurs in the decomposed metamorphic slates, and seems to partake somewhat of the nature of a stratified deposit. It is mostly in the form of nodular masses, which are often more or less honeycombed. Considerable gravel-

ore is also present. Near the summit of the hill, in the vicinity of the excavation, is much float-ore, which is frequently in the form of large irregular masses. Associated with the float-ore, is considerable quartzite, which, near by, forms a small bluff, extending for several rods along the hillside. At the base of the hill, on which these deposits are situated, is a large spring, which furnishes ample water, for ore-washing. This, together with the favorable surface indications, above referred to, makes lot 981 one of the most valuable mining prospects in the vicinity.

A partial analysis[1] of a sample of ore from the J. A. Stephens property, collected by the writer, resulted as follows: —

Water at 100° C	.520
Water above 100° C	12.050
Iron Sesqui-oxide	72.120
Equivalent to Metallic Iron	(50.490)
Manganese	.547
Phosphoric Acid	1.916
Equivalent to Phosphorus	(.834)
Sulphur	.082
Sand or Insoluble Matter	9.150

Mr. J. A. Stephens, of Cartersville, who owns this lot, also owns another lot, partially within the corporate limits of Cartersville, which has recently been worked, to a limited extent, for iron ore. The ore occurs, here, on the side of a quartzite ridge, in small irregular pockets. It is frequently siliceous, and does not seem to be very abundant.

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

THE JOHN P. STEGALL PROPERTY

THE STEGALL PROPERTY includes a number of lots in the neighborhood of Emerson, which have been worked for iron, more or less, since about 1870. One of the oldest workings on the property is to be seen on *lot 980, 4th district,* immediately east of the above described Stephens property. It consists of a large open-cut, near the base of the same hill, on which the Stephens prospect is located. The excavation was made, some 20 years ago; and it is reported to have produced several car-loads of ore. It is now much fallen in; so that but little ore is in sight. On the hillside, a few rods from the cut, is a short tunnel, begun with the view to striking the ore-deposit at a lower level. The abandonment of the tunnel before its completion, is said to have been due to encountering a bed of compact limestone. The ore, exposed in the walls of the open-cut, consists of nodules and gravel. It is quite free from mechanical impurities; and it appears to be of excellent quality. In the southeast corner of the same lot, is another excavation, from which a small amount of ore has been mined. The deposit, here, occurs in a ravine, near the Alabama road. The ore is somewhat siliceous; and it appears to be in limited quantities.

Probably the most valuable deposits, to be found anywhere on the Stegall property, is on *lot 979.* This lot, in places, has much float-ore on the surface; but, only at a few points, has the ore been worked to any extent. The main workings are situated on the summit and slope of a ridge, having an elevation of about 200 feet above the general level of the surrounding country. They consist of small open-cuts and shafts, varying from 10 to 30 feet in depth.

The greater part of this work was done, some 20 years ago. Nevertheless, the excavations, in places, still show considerable ore, *in situ*. Besides these old excavations, there are others, more recent. One of these, which is located on the hill below, is an extension of an excavation on the Jones property. It was worked, to a limited extent, last summer; and it was found, in good condition for examination. The ore has been mined, here, by an open-cut and a short tunnel, to a depth of about 25 feet. It occurs in irregular pockets, in the residual clays, mixed with masses of quartzite. It seems to be quite abundant; but it is somewhat siliceous. In the excavations near the summit of the hill, the ore appears to contain less silica, and is of better quality. There is but little doubt, that the iron deposits of the above lot are extensive and workable.

About three-quarters of a mile northwest of lot 980, near the branch road, leading from Emerson to the ore-banks on the Jones property, are other workings. The main excavation, to be seen here, is on a rather steep hillside. It is about 40 feet long, from 5 to 20 feet wide, and 4 or 5 feet deep. This work was done, some years ago, and the ore was shipped to the Citico and the Bartow furnaces. The ore is massive, and of dark color; and it appears to run high in metallic iron. The limited amount of work, done here, gives but little information, concerning the mode of occurrence and the extent of the deposit. Another excavation, of somewhat larger size, occurs on *lot 894, 4th district*, about half-a-mile southwest of Emerson. The ore, found here, is both massive and honeycomb, and is interlaminated with metamorphic slate and quartzite. The excavation, from which, it is reported, some 10 or 12 car-loads of ore were shipped, was made, about 10 years ago. The ore is partially altered to hematite. It is apparently limited in quantity; though, of good quality. In addition to the above,

there are also favorable prospects on *lot 900*. There, ore is found, mostly in the form of large masses, outcropping on the hillside. No attempt has been made, so far, to determine its extent.

All the ore-banks on the Stegall property are well located for working, none of them being more than 1½ miles from the Western & Atlantic R. R.

THE P. H. LAREY PROPERTY

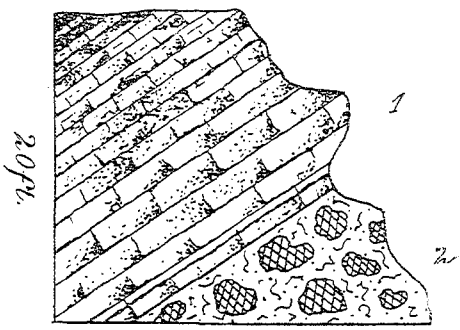
THE LAREY PROPERTY, *lots 671 and 750, 4th district*, is situated on the Western & Atlantic R. R., about one mile northwest of Emerson. The ore deposits on these lots are confined mainly to the east side of a quartzite ridge, which rises to an elevation of about 300 feet above the surrounding country. The main workings consist of six different open-cuts, from which it is reported, that about 200 tons of ore were mined in 1889, and shipped to the Chattanooga and the Rockrun furnaces. The ore, which is nodular, honeycomb and massive, occurs in irregular pockets, and in layers, interlaminated with the decomposed metamorphic slates and quartzite. In some of the excavations, the ore has a decidedly red color, and partakes of the nature of true hematite. This is especially true of the ore, occurring in what is known as the Buzzard ore-bank, a large open-cut in the head of a small ravine, well up on the hillside. It is reported, that small specimens of micaceous hematite have been picked up, at several places on the quartzite ridge; but no regular deposit of this kind of ore has yet been located. The brown ore, found on the Larey property, is usually quite free from mechanical impurities; but it does not appear to be very abundant.

THE WHEELER ORE-BANK, NEAR EMERSON, BARTOW COUNTY, GEORGIA.

THE BARTOW FURNACE COMPANY'S PROPERTY

THE BARTOW FURNACE COMPANY'S PROPERTY comprises an area of 1,000 acres of mineral and agricultural lands, located on both sides of the Western & Atlantic R. R., one mile east of Emerson. The first ore-bank was opened on this property, in 1862. Soon thereafter, other banks were opened; and mining operations, with various interruptions, were continued until 1877. The exact amount of ore, mined on the property, is a matter of conjecture. However, judging from the extent of the excavation, it must have aggregated many thousand tons. The entire output, from the several banks, was used at the Bartow furnace, the remains of which are still to be seen on the Western & Atlantic R. R., only a short distance from the ore-banks.

Fig. 15



Section through the East Side of Bank No. 1, of the Bartow Furnace Property. 1. Quartzite. 2. Iron Ore in Clay.

The most extensive workings, to be seen anywhere on the property, are located on *lot 903, 4th district*, about a quarter of a mile southwest of the furnace. The workings consist of two large open-cuts, covering a total area of about two acres. They are both on the same hillside, at an elevation of about 150 feet above the valley. The ore in these cuts is said to have been worked, in places, to the depth of 80 feet, without decrease in the quantity of ore. The excavations are now much filled with fallen earth; so that only a very imperfect idea can be obtained of the ore in place.

In the cut farthest to the south, the ore appears to partake of the nature of a stratified deposit, overlain by quartzite.[1] At other points, the ore seems to occur in the form of large pockets, or irregular masses, in the decomposed metamorphic slates. The ore occurs mostly in the form of angular gravel and nodules. The latter are frequently concretionary in form, and filled with clay. Associated with the ore, are large masses of ferruginous material, consisting largely of silica.

On the opposite side of the Western & Atlantic R. R., from the above excavation, something like 200 yards from the old furnace, is another huge excavation, from which large quantities of ore have been taken. This cut, known as *Ore-bank No. 2*, is located on the hill-slope, only a few rods from the rail-road. It is about 200 yards long, several rods wide, and, in places, 50 feet deep. The outline of the cut is very irregular, a fact due to its following the richer leads of the ore. Considerable ore is still to be seen, in the crumbling walls of the open-cut. It occurs in pockets and leads, in the red and mottled clays, and appears to be in workable quantities. Here, as at Bank No. 1, are large masses of siliceous material, associated with the ore. Manganese is also present, in a limited quantity. In some of the hand specimens collected, the manganese is almost as plentiful as the iron ore itself. Ore-bank No. 2 was opened in 1875, and was worked, more or less continuously, until 1885. Near the entrance of the excavation, is the site of an old log-washer, formerly used in washing the ore, before it was taken to the furnace.

A third ore-bank, known as *Bank No. 3*, is located on a low ridge, about a quarter of a mile south of the Bartow furnace. The main working, here, is an open-cut, about 100 yards long, and from 5 to 20 feet deep. It is now much fallen in, so that but

[1] See fig. 15.

little ore is to be seen *in situ*. The ore occurs mostly as gravel and nodules, in the red and yellow clays. It seems to be of good quality; but it is limited in quantity.

In addition to the brown ore, micaceous hematite occurs on the Bartow Furnace Company's property. The best exposure of this class of ore is found on the summit of the hill, on which Ore-bank No. 1 is located. The ore occurs, here, in considerable abundance, scattered about the surface as float-ore; and it is also exposed, in one or two small prospect-pits, where it is interlaminated with the metamorphic slate. The ore generally has a schistose or foliated structure, and a very marked metallic lustre. It probably exists in workable quantities; but further prospecting is necessary, to fully demonstrate this.

The following is a partial analysis of the micaceous hematite, from the Bartow Furnace Co's. property, by Prof. H. C. White, of the University of Georgia: —

Metallic Iron	64.500
Sulphur	.012
Phosphorus	.011

A partial analysis[1] of a sample of brown ore from the Bartow Furnace property, collected by the writer, yielded results, as follows: —

Water at 100° C	.480
Water above 100° C	10.650
Iron Sesqui-oxide	74.310
Equivalent to Metallic Iron	(52.020)
Manganese	2.300
Phosphoric Acid	.553
Equivalent to Phosphorus	(.240)
Sulphur	None
Sand or Insoluble Matter	7.070

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

Besides the iron deposits, here described, there are other favorable prospects on the Bartow Furnace Company's property, which would seem to warrant investigation.

THE ROAN IRON COMPANY'S PROPERTY

THE ROAN IRON COMPANY'S PROPERTY, *lot 680, 4th district*, is situated on the east side of the Western & Atlantic R. R., about 2½ miles northwest of Emerson. The iron ore, found on this property, consists entirely of micaceous hematite. It occurs on the spurs and foot-hills of a quartzite ridge, which here rises to an elevation of 300 or 400 feet above the general level of the surrounding country. The greater part of the work was done on this property, in 1877. For about eight months, during that year, it is said, that the mine produced daily about four car-loads of ore. The works consist of a number of open-cuts, shafts and tunnels, at different elevations on the hillside. All these excavations are now inaccessible, and no ore is to be seen, except on the dumps, or in the red surface soils. The surface or float ore is quite abundant, in places, on the hillside. In one of the small ravines near the excavations, it is said, that this ore was so abundant in the red soil, that it was profitably worked. The material on the dump demonstrates, that the micaceous hematite occurs associated with a fine-grained quartzite, which, in places, is quite fossiliferous. The fossils, however, have been so altered, that they are difficult to identify. The ore on the Roan Iron Company's property is of excellent quality; and, if found in large quantities, the deposit would be of great value; as the property is

so favorably located for working. The main excavations are within a few hundred yards of the rail-road, and water can be had, in inexhaustable quantity, from the Etowah river, not over half a mile away.

A partial analysis [1] of a sample of inferior ore, taken from the dump of the Roan Iron Co.'s property, resulted as follows: —

Water at 100° C	.160
Water above 100° C	1.010
Iron Sesqui-oxide	53.910
Equivalent to Metallic Iron	(37.740)
Manganese	.193
Phosphoric Acid	.120
Equivalent to Phosphorus	(.052)
Sulphur	.042
Sand or Insoluble Matter	37.730

THE ETOWAH IRON COMPANY'S PROPERTY

THE ETOWAH IRON COMPANY'S PROPERTY, which comprises an area of several thousand acres of mineral land, is located on both sides of the Etowah river in Bartow county, only a short distance west of Cartersville. This property is noted for its extensive and valuable iron deposits, which have been worked almost continuously, for more than half a century. As early as 1840, several cold-blast furnaces were erected on the property, and the ores were reduced, for local consumption. There occurs, on the property, a

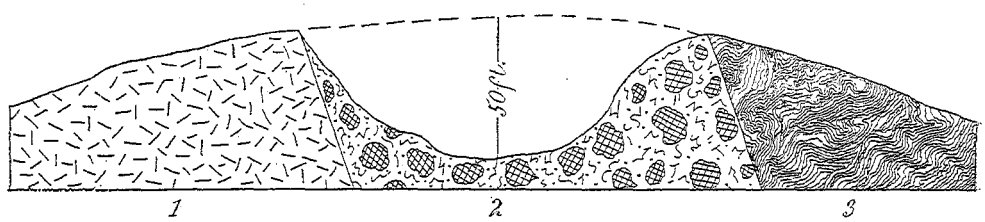
[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

large number of ore-banks, the most important of which are here described.

THE ALLATOONA ORE-BANK.—This ore-bank is located on *lot 729, 21st district*, two miles northwest of Allatoona. The bank was opened by Mr. Mark A. Cooper before the Civil War, to supply a small furnace with ore, then in blast on Allatoona creek. After the war, the bank was operated for some time, by an Atlanta company. This company constructed a narrow-gauge branch rail-road, a mile and three quarters long, connecting the ore-bank with the Western & Atlantic R. R., near Allatoona station. The ore-bank finally passed into the hands of the Etowah Iron Co., which operated it, until 1891. It is reported, that, during the last two years it was operated, the latter company shipped from the bank, to South Pittsburg and other points in Tennessee, something like 60,000 tons of ore. The Allatoona bank, together with the Crow bank, hereafter to be described, is located on a low ridge or hill, having an elevation of about 100 feet above the valley of Allatoona creek. The main workings at the Allatoona bank consist of two open-cuts near the top of the ridge. These excavations cover a total area of about three quarters of an acre. They are each about 100 yards long, and from 10 to 60 feet in depth. The cuts are entered by tunnels driven on a level with the rail-road, which runs along the side of the hill. By this means, the ore is conveyed directly to the cars, without having to be hoisted from the cuts. The ore-body, exposed in these excavations, seems to partake of the nature of both vein and pocket deposit. More properly speaking, it might be described as a continuous vein, or lead, several rods wide, having numerous large swells or pockets. The pockets frequently contain many car-loads of ore, which is generally quite free from quartz and other mechanical impurities.

The ore deposit, here exposed, occurs near the line of contact between the mica-schists and the granitoid gneiss.[1] The latter formation, in immediate contact with the schists, is much sheared; while, only a short distance away, it passes into a coarse-grained granitoid rock, containing large phenocrysts of feldspar. Associated with the ore, are large masses of siliceous material, in the form of huge bowlders, often several feet in diameter. Some of these masses frequently carry considerable iron; but they run too

Fig. 16



Section through the Allatoona Ore-bank. 1. Granitoid Gneiss. 2. Iron Ore in Clays. 3. Mica-schist.

high in silica, to be of economic value. Much of the ore, exposed in the walls of the cuts, appears in the form of angular and irregular fragments, which seem to have been broken up, by some recent earth movement. This was at first thought to be due to the use of dynamite or other explosives, used in mining the ore. But further examination showed, that this broken condition of the ore occurred, where no explosives whatever had been used. The crushed condition of the ore, found here, is probably due to the settling of the rock, in the process of weathering. The bank is favorably located for working, and appears to contain a large quantity of workable ore. A partial analysis of the ore from the Allatoona bank, by Mr. S. A. Reed, New York City, yielded:—

Metallic Iron	50.51
Silica	7.23
Phosphorus	1.36

[1] See fig. 16.

A partial analysis[1] of ore from the Allatoona bank, collected by the writer, resulted as follows: —

Water at 100° C	.390
Water above 100° C	10.990
Iron Sesqui-oxide	76.340
Equivalent to Metallic Iron	(53.720)
Manganese	.325
Phosphoric Acid	2.423
Equivalent to Phosphorus	(1.054)
Sulphur	.034
Sand or Insoluble Matter	6.610

The Iron deposit, exposed on Allatoona hill, extends into the adjoining *lot, No. 711*, where it has been exposed at a few points, by small prospect-pits. In the immediate vicinity of the Allatoona ore-bank, are other favorable prospects, on *lots 712, 732 and 738, 21st district.*

THE WHEELER ORE-BANK. — This Bank is one of the most extensive ore-banks on the Etowah property. It is situated on *lot 648, 21st district*, 1½ miles east of Emerson. The bank has been worked, at irregular intervals, since the early sixties, and has furnished a large quantity of excellent ore. The first ore, mined at the Wheeler bank, was reduced at the Allatoona furnace, then in blast on Allatoona creek, about a mile from the ore-bank. After the Allatoona furnace was closed, the ore was hauled by wagon to the Bartow furnace, located on the Western & Atlantic R. R., about one mile southeast of Emerson. In 1897, the Etowah Company constructed a standard-gauge road, 2½ miles in length, to Emerson, where it connects with the Western & Atlantic R. R.

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

Since the above date, the ore, from the Wheeler and other banks in the vicinity, has been shipped to the Tennessee furnaces. The total amount of ore, shipped to the above named furnaces from the Wheeler bank, is not known. However, judging from the extent of the excavation, it must aggregate many thousand tons. Capt. J. J. Calhoun states, that the Etowah Company shipped from the bank, for a period of 18 months, an average of about 100 tons of ore per day. The ore deposit of the Wheeler banks occurs in a well defined vein along the crest of a low ridge. The vein conforms, in strike and dip, to the schists, the country-rock. It has been worked, in large open-cuts along its outcropping, for fully a quarter of a mile. Some of these excavations are 40 feet deep, and several rods in width. The vein varies from 10 to 30 feet, in thickness, and extends to unknown depth. The walling, on either side of the vein, consists of hydromica-schists, highly contorted, and frequently replaced by brown iron ore, having a foliated or a concretionary structure. This is especially true, of the schists, in immediate contact with the vein. In places, the vein is separated into two divisions, and the schist walling, here, contains small pockets of ore. The ore is of good quality, and generally quite free from quartz and other mechanical impurities.

The following are partial analyses of ore from the Wheeler bank, made by Messrs. Booth, Garrett & Blair, of Philadelphia, Penn. : —

SAMPLE NO. 1

Metallic Iron	47.47
Phosphorus	.95

SAMPLE NO. 2

Metallic Iron	51.04
Phosphorus	1.03

Another partial analysis of ore from the Wheeler bank, made by S. A. Reed, of New York City, is as follows: —

Metallic Iron	52.07
Silica	6.85
Phosphorus	.95

There appears to be a large quantity of workable ore in the Wheeler bank; but it is rather difficult to mine, on account of the treacherous condition of the decomposed schists, forming the walls of the vein.[1] When the ore is removed, the schists have not sufficient strength to support their own weight; and as a consequence, they collapse, and fill the cavity, from which the ore was taken. On this account, but little ore is now exposed to view, except in the ends of the cuts. Ore deposits, similar to the above, are to be seen, at a recent open-cut, on lot 649, 21st district. This deposit seems to be a continuation of the Wheeler vein. There is now a double log-washer, located at the Wheeler ore-bank, in good condition. Water, for operating the washer, was obtained at a small branch about half-a-mile away.

THE IRON ORE DEPOSIT ON LOT 575, 21ST DISTRICT is quite extensive. The main part of the deposit occurs on the summit and slopes of a high quartzite ridge, about three quarters of a mile northeast of the Wheeler bank. Considerable ore was mined on this lot, before the Civil War, for use in the Allatoona furnace. These old excavations are now well filled with earth, and show but little ore in place. Recently, the lot has been pretty thoroughly prospected by the Etowah Company, so that the ore is now exposed, in no less than 20 excavations, at different points along the ridge. From these several prospect-pits and cuts, five or six

[1] Since the above was written, mining operations have been resumed at the Wheeler bank, by the Renfroe Brothers, who are now shipping from three to four car-loads of ore per day.

car-loads of ore were shipped, last summer, to the furnace, for a trial test. The result is said to have been satisfactory; and it is reported, that it is the intention of the company to begin mining here, at an early date, on a more or less extensive scale. The ore occurs in irregular veins and pockets, associated with quartzite and mica-schist. Frequently, these ore-bodies are of large size, and contain much ore. When they occur in vein-form, they alway conform, in strike and dip, to the country-rock. The ore often contains considerable silica, in the form of quartz, which seems to have been derived from the decomposed schists. Several of the excavations expose a large amount of stalactitic ore; but the greater part of the ore consists of irregular masses, often compact, but more frequently, cavernous, or somewhat laminated. The depth, to which the ore deposits extend, on lot 575, is not known; as none of the excavations are more than 15 or 20 feet in depth. Water, for ore-washing, can be had on this lot, in unlimited quantities at Allatoona creek, three quarters of a mile away.

Similar deposits occur on *lots 571, 578 and 579, 21st district.* A limited amount of prospecting has been done, on one or two of these lots.

The following is a partial analysis[1] of an ore sample, collected by the writer, from *lot 575, 21st district:* —

Water at 100° C.	.510
Water above 100° C.	11.730
Iron Sesqui oxide	74.070
Equivalent to Metallic Iron	(51.850)
Manganese	.125
Phosphoric Acid	.387
Equivalent to Phosphorus	(.168)
Sulphur	Trace
Sand or Insoluble Matter	11.030

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

LOT 612, 4TH DISTRICT. — There are to be seen, on this lot, several open-cuts, all made during the past year. They are situated on a hillside, only a few rods from the rail-road, leading from the Wheeler ore-bank to Emerson. Something like 40 car-loads of ore are reported to have been shipped from these excavations, last summer. The ore occurs in the red and yellow clays, mostly in the form of gravel and hollow nodules, called " dornicks ", by the miners. The latter often carry considerable silica, in the form of sand. In mining the ore, it was sluiced from the cuts, in a wooden trough, directly into the cars, without being further washed; and, as a consequence, it is reported, that it did not give the best results at the furnace.

ORE-BANK ON LOT 576, 21ST DISTRICT. — This ore-bank is situated on the point of a ridge, about half-a-mile due north of the Wheeler ore-bank. It was opened in March, 1899, and was worked, for about 6 months, during which time, it produced about 1,000 tons of ore. The working consists of a large open-cut, about 200 yards long, and from 5 to 30 feet deep; and, in places, 40 feet wide. The ore occurs, here, in a continuous vein, which varies from 5 to 15 feet in thickness. The vein is supposed to be the northern extension of the Wheeler vein, previously described. The ore at the two banks is quite similar, and occurs under like conditions. The vein dips at a high angle, and has a nearly due north-and-south trend. Its walling is hydromica-schist, much folded and contorted, and contains, in places, considerable graphite. Here, as at the Wheeler bank, the decomposed schists are of a treacherous nature, and make mining, without timbering, dangerous. At the time of our visit to the bank, much of the vein was hidden from view, by the recent caving in of the walls. By proper timbering, such mishaps as this could be easily avoided,

and the veins could be worked, to any desired depth. The bank is well located for working. It is within a few rods of a small brook, which supplies ample water for ore-washing, and is connected by a spur-track with the branch road leading from the Wheeler bank to Emerson. The double log-washer at the bank is comparatively new, and in good condition.

The following is a partial analysis[1] of a sample of ore from lot 576, 21st district, collected by the writer: —

Water at 100° C	.390
Water above 100° C	11.600
Iron Sesqui-oxide	76.010
Equivalent to Metallic Iron	(53.210)
Manganese	.775
Phosphoric Acid	2.387
Equivalent to Phosphorus	(1.039)
Sulphur	Trace
Sand or Insoluble Matter	5.330

LOT 541, 4TH DISTRICT adjoins lot 576, 21st district, on the north. In places, it has a good deal of float-ore on the surface; but, at only one point, has its extent been investigated. The prospecting work is limited to a single recent cut, about 50 feet long, and from 5 to 15 feet deep. The excavation is located on the wooded hillside, where considerable float-ore occurs strewn about the surface. The ore, exposed in the cut, is found in red and yellow clays, more or less mixed with angular fragments of quartzite. It is mostly in the form of gravel ore, and seems to be of good quality. On an adjoining *lot, No. 542*, are to be [illegible] other favorable surface prospects. Especially is thi[illegible]

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta

hill-slope, on which are located the old manganese pits. The surface prospects for iron ore is, here, unusually good, and would seem to warrant a thorough investigation of the entire hillside, where it occurs.

LOT 616, 4TH DISTRICT. — This lot is noted for its deposit of micaceous hematite. It is located only a short distance from the Western & Atlantic R. R., and adjoins the Roan Iron Company's property, previously described. The ore, on the above lot, occurs on the side of a quartzite ridge, at an elevation of about 100 feet above the valley. It has been worked to a considerable extent, at various places along the hillside; but all the excavations, with one exception, are now filled with earth, and are inaccessible. The exception, here referred to, is a short tunnel, well up on the hillside. Here, the ore is to be seen in the sandy clays, mixed with fragments of quartzite, as if it had been removed from its original position by a land-slide, or by some other local disturbance. It is reported, that the ore, in some of the excavations, appears as a well defined bed, from two to five feet in thickness, interstratified with quartzite. This statement is evidently true; for the material, found on the dump, consists largely of coarse-grained quartzite, often interlaminated with thin layers of micaceous hematite. Both the quartzite fragments and some of the more impure specimens of ore, found on the dumps, are often quite fossiliferous, as is the case at the Roan Iron Company's property. Mr. A. R. McCutchen, formerly Assistant State Geologist of Georgia, in a private report to the Etowah Company, some years ago made the following statement, in reference to the iron deposits on lot 616: — "The ore is found on this lot, in scattered

from the top to the foot of the ridge, on which it out-

worked on an adjoining property, up to the

limit of this lot, where the vein, now covered with débris, is said to be five feet in thickness, with some intercalated slates and sandstones. The ore is of superior quality, as is shown by the analysis of specimen below. This appears to be stratified ore, occurring in a regular bed, and may continue throughout the lot. It may be traced by the surface ore, wherever the associated sandstone and slates are exposed."

A partial analysis of micaceous hematite, from *lot 616, 4th district*, from a report by Mr. A. R. McCutchen: —

Metallic Iron	64.50
Sulphur	.01
Phosphorus	.02

A partial analysis of micaceous hematite, from *lot 616, 4th district*, by Mr. D. G. Wiggins: —

Metallic Iron	64.49
Phosphorus	.01

A partial analysis of micaceous hematite, from *lot 616, 4th district*, by Messrs. Booth, Garrett & Blair, of Philadelphia: —

Metallic Iron	60.23
Phosphorus	.01

A partial analysis[1] of a sample of micaceous hematite, from *lot 616, 4th district*, collected by the writer, is as follows: —

Water at 100° C	.130
Water above 100° C	.790
Iron Sesqui-oxide	82.320
Equivalent to Metallic Iron	(57.630)
Manganese	.250
Phosphoric Acid	.032
Equivalent to Phosphorus	(.014)
Sulphur	None
Sand or Insoluble Matter	15.370

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

It will be seen, from the above analyses, that the ore from lot 616 runs very low in phosphorus; and it may therefore be classed as a true Bessemer ore. The extent of the workable ore, to be found on lot 616, is unknown. However, the favorable surface indications, together with the high grade of the ore, would seem to justify a thorough exploration of the hillside, on which the ore occurs.

THE HURRICANE HOLLOW ORE-BANKS.—This group of ore-banks, which is owned by the Etowah Company, is located on the foot-hills of Pine mountain, about three miles east of Cartersville. The most extensive workings, to be seen here, occur on *lots 400 and 465, 4th district.* The greater part of the work on these lots was done before the Civil War, in order to obtain ore for the Cooper furnace, then in blast on the Etowah river, only about a mile away. The largest of these old excavations, now known as *the Big ore-bank*, is situated on lot 465, near the end of a steep ridge, which extends down from Pine mountain. The excavations consist of huge open-cuts, varying from 10 to 40 feet in depth, and covering altogether an area of something like half-an-acre. The walls of the cuts are now much fallen in, and show but little ore in place. The ore occurs in clays and decomposed schists, associated with quartzite, in the form of irregular pockets and veins. The pockets are frequently of large size, and often contain many car-loads of nodular and gravel ore. Stalactitic ore also frequently occurs; but it is limited in quantity. Mixed with the ore, in places, are numerous angular fragments of quartzite, which are very friable, and easily crushed between the fingers. With this exception, the ore is quite free from mechanical impurities. Immediately below the above excavations on the hillside, are two old tunnels, formerly driven into the hillside in search of

manganese, which is often found in this vicinity, associated with the iron deposits. The brown ore at the Big ore-bank frequently has a reddish color, and seems to be partly altered to hematite, as is indicated by the following partial analysis of ore, from *lot 465, 4th district*, from a report by Mr. A. R. McCutchen: —

Metallic Iron	61.100
Sulphur	.005
Phosphorus	.060

The following is a partial analysis[1] of ore, *from the Hurricane Hollow ore-bank*, collected by the writer: —

Water at 100° C	.620
Water above 100° C	9.450
Iron Sesqui-oxide	77.950
Equivalent to Metallic Iron	(54.570)
Manganese	.382
Phosphoric Acid	1.659
Equivalent to Phosphorus	(.722)
Sulphur	.049
Sand or Insoluble Matter	7.300

On the eastern side of the ridge, on which the Big ore-bank is situated, are numerous other excavations, extending for half-a-mile or more, to the northwest. Here, are to be seen cut after cut and tunnel after tunnel, exposing ore, in greater or less quantities. One of these tunnels, now partially filled with earth, but still accessible, extends into the hillside, for fully 30 feet, exposing ore, its entire length. Near by, is another tunnel, at the mouth of which are several car-loads of ore. This tunnel, which is now inaccessible, is said to extend into the hill, to a distance of 40 feet

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

through solid ore. The ore, found on the heap, is quite compact, and of a dark color. Some of the specimens, collected, contain numerous small angular fragments of quartz, which seem to have been derived from the weathered schists. The quality of the ore taken from this tunnel is shown by the following partial analysis of ore by Messrs. Booth, Garrett & Blair, of Philadelphia: —

Metallic Iron	55.93
Phosphorus	.79

In the hollow, a few rods from the mouth of the above tunnel, are to be seen the remains of an old rail-road, constructed in 1889, by the Etowah Company, for hauling ore from the several banks in the vicinity. The road, here referred to, is one of the divisions of the main branch-road, built from the Western & Atlantic R. R. to the Cooper Iron Works on the Etowah river. Only a short distance away, are to be seen the remains of another road. This is a narrow-gauge road, constructed to the manganese ore-banks, in the neighborhood of Rowland Springs. These two roads, if put in repair, would furnish excellent facilities for transporting the ores, which occur in such abundance in this neighborhood. The ridge, on which the Big ore-bank and the several excavations, here referred to, are located, extends to the northwest, for some distance, and finally divides into two distinct ridges, one taking a western, and the other an eastern, course. On both of these ridges, for a mile or more, is one cut after another, exposing ore, in greater or less quantity. The ore, in all the excavations examined, occurs in irregular veins or pockets in the residual clays and decomposed metamorphic slates or schists. It often contains, in places, considerable silica, in the form of quartz; but, otherwise, it is of fair quality.

Ore deposits, similar to the above, and exposed in like excava-

tions, are found in the immediate vicinity, on the following *lots*:— *Nos. 329, 330, 392, 393, 399 and 466, 4th district.* Much of the work, on these lots, was done some eight or ten years ago by the Etowah Company, which shipped, at that time, a large quantity of ore from the several excavations. The ore, shipped by this company, is said to have been of excellent quality, and to have given satisfactory results at the furnace. The amount of ore, on the above lots, still in sight, is very great; and there can be no doubt, that, in many places, the deposit could be worked with profit.

LOT 253, 4TH DISTRICT. — This lot lies on the east side of Pine mountain. It was worked for iron ore, to a limited extent, by Mr. Mark Cooper, before the Civil War. The ore occurs near the summit of a sharp ridge, where it is exposed, in a few shallow cuts. It appears to be limited in quantity, and of a siliceous nature. Manganese occurs, in places, with the ore.

LOT 306, 5TH DISTRICT. — The iron deposits of this lot were worked prior to the Civil War, and the ore was used in the Etowah furnace. The works consist of several open-cuts, now much fallen in; but still, in places, considerable ore is to be seen *in situ*. The main deposit and working is to be found on the eastern slope of a hill, about half-a-mile from the narrow-gauge rail-road, constructed, some years ago, to the manganese deposit, in the neighborhood of Rowland Springs. Water, for ore-washing, can be had, about half-a-mile from the deposit.

LOT 268, 5TH DISTRICT was worked, to a considerable extent, a few years ago, for its iron deposits. The ore, found on this lot, is fossiliferous hematite, and resembles very closely the ore on lot 616, 4th district. It seems to occur here, as at the latter place, in a well defined bed, associated with quartzite. The old workings,

here to be seen, consist of open-cuts on a hill-slope. The excavations are now partially filled with fallen earth, so that but little ore is to be seen, except the float-ore, which appears in considerable abundance, in the deep red soil. No knowledge of the economic importance of the hematite deposit on this lot can be had, from the limited exposure of the ore.

LOTS 274, 303 AND 311, 5TH DISTRICT. — Prospects, similar to those on lot 268, occur on *lots 274, 303 and 311, 5th district.* These lots have, in places, some very favorable prospects; but, at the time of our visit, they were in no condition for examination. Samples of ore, taken from the excavations, show, that it is of fair quality.

Partial analyses of hematite, from two of these lots, made by Mr. S. Albert Reed, of New York City, are as follows: —

SAMPLE NO. 1 (LOT 274)

Metallic Iron	57.72
Silica	14.11
Phosphorus	0.03

SAMPLE NO. 2 (LOT 311)

Metallic Iron	53.07
Silica	14.71
Phosphorus	0.05

A partial analysis of the hematite from *lot 303*, by Messrs. Booth, Garrett & Blair, of Philadelphia, resulted as follows: —

Metallic Iron	55.49
Phosphorus	.01

The low percentage of phosphorus in these ores shows, that they are well suited for the manufacture of Bessemer steel. This, together with the favorable surface indications, would seem to warrant a more thorough investigation of the lots, on which the deposits occur.

THE CROW BANK

THE CROW BANK, *lot 728, 21st district*, is an extension of the Allatoona bank, previously described. This bank, now under the management of Mr. E. P. Earl, of Marietta, was opened, and worked to a limited extent, prior to the Civil War, by Messrs. Moore & Thomas. In recent years, it has been more extensively worked by Messrs. W. H. Renfroe & Sons. The latter firm is said to have worked the bank, more or less continuously, for a period of three years, shipping daily, during this time, about three carloads of ore, to South Pittsburg, Tenn. Messrs. Renfroe & Sons erected, near the bank, a double log-washer, the remains of which are still to be seen. The ore-deposits occur on the end of a low ridge, referred to, in the description of the Allatoona bank. There is to be seen, here, a huge open-cut, many rods long, and from 20 to 75 feet wide. The cut, in places, is said to have originally attained a depth of 130 feet; but it is now much fallen in, so that its greatest depth, at any point, does not, at present, exceed 75 feet. The excavation is entered, by a tunnel on its western side, through which the ore was taken to the washer, located on the hillside, a short distance away. The ore occurs as gravel and "dornick" ore, in a large irregular vein or deposit between the mica-schist and granitoid gneiss. It is of good quality; but, owing to the fallen-in condition of the cut, only a limited amount of it is, now, in sight. It is said, that a large quantity of workable ore remains in the bottom of the excavation. The Crow bank is well located for working; and it was formerly, like the Allatoona bank, connected with the Western & Atlantic R. R., by a branch road, 1¾ miles in length.

A partial analysis of ore from the Crow bank, by Messrs. Booth, Garrett & Blair, of Philadelphia, Penn., follows: —

Metallic Iron	53.37
Phosphorus	1.67

A partial analysis[1] of a sample of ore from the Crow bank, collected by the writer, yielded the following results: —

Water at 100° C	.420
Water above 100° C	12.000
Iron Sesqui-oxide	72.850
Equivalent to Metallic Iron	(51.000)
Manganese	.525
Phosphoric Acid	2.161
Equivalent to Phosphorus	(.940)
Sulphur	.046
Sand or Insoluble Matter	9.570

THE STEPHENS & LARRAMORE PROPERTY

This property, *lot 506, 21st district*, adjoins the Etowah property, lot 575, on the south. The ore deposits upon the latter lot, which have been previously described, extend upon the former, where they are, now, exposed, in three different prospect-cuts, located upon a steep hillside. These cuts are only a few feet in depth, and give but little information, concerning the extent of the deposit. The ore occurs associated with mica-schist and quartzite, and is of good quality, as is shown by the following analyses: —

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

Partial analyses of ore, from *lot 506, 21st district*, by Mr. B. Keppler, Bessemer, Mich. : —

UPPER CUT

Metallic Iron	54.150
Manganese	.330
Phosphorus	.485
Silica	6.000

LOWER CUT

Metallic Iron	53.750
Manganese	.360
Phosphorus	.374
Silica	6.950

On an adjacent ridge, only a short distance away, is to be seen a fourth prospect-cut. This excavation is small, and would be passed unnoticed, were it not for the peculiar ore, here exposed. This ore has a remarkably dark color and a glistening lustre, resembling, somewhat, anthracite coal. It is found in small fissures and joints in the quartzite, and is apparently limited in quantity.

THE W. P. LARRAMORE PROPERTY.

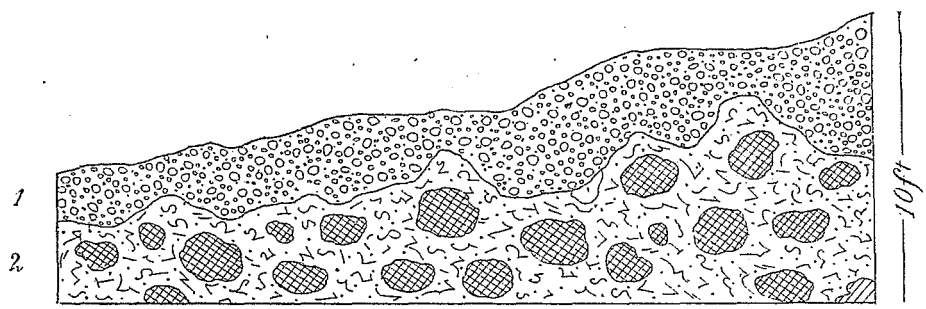
THE LARRAMORE PROPERTY, *lot 471, 4th district*, is located near the Etowah river, a short distance south of the Hurricane Hollow ore-banks. This property was worked, to a considerable extent, before the Civil War, by Mr. Mark A. Cooper. The main workings are situated on the top of a ridge, near the public road, a few hundred yards from the Etowah river. It consists of an open-cut, several rods in length, and from five to ten feet in depth. The ore seems to be of good quality; but little information could be

gained from the meagre exposure, as to the extent of the deposit. Near by, on another *lot*, *No. 474*, are to be seen similar workings and ore deposits.

DR. W. H. FELTON'S ORE-BANK

THE FELTON ORE-BANK, now being worked by THE FELTON MINING CO., under the management of Mr. L. S. Mumford, is located on *lot 96*, *4th district*, near the Tennessee road, 2½ miles

Fig. 17



Section through the Felton Ore-bank. 1. Red Clay and Gravel-ore. 2. Varicolored Clay with Bowlder-ore.

north of Cartersville. The bank has been opened up, only a short time; but it is now shipping regularly from two to four car-loads of ore per day. The working consists of an open-cut on a hill-slope at an elevation of 40 or 50 feet above the general level of the surrounding country. The ore occurs, mostly in the form of large bowlders, some of which are hollow, and sometimes contain, in their cavities, a small amount of pyrite.[1] The ore is generally of

[1] See fig. 17.

a brownish liver color, and very compact; and it runs unusually high in metallic iron. A number of analyses of the ore, made by the Tennessee Iron & Coal Co., show, that it rarely ever runs below 54 per cent. of metallic iron.

The bank is well located for working, being only a short distance from a large spring, which furnishes ample water for the double log-washer, now being operated on the hillside, a few rods from the mouth of the open-cut. The ore, here, seems to occur at the line of contact of the shales and limestones. The former, as is shown in a cut, transverse to the ridge, are much brecciated and folded, which indicates a fault or displacement at this place, along which the iron ores were deposited. If this interpretation of the structural geology of the locality be true, it is quite likely, that the ore extends to considerable depth, and is not a mere superficial deposit, as has been suggested. In addition to the above deposits, favorable surface prospects occur on lot 95, which is also the property of Dr. Felton.

The following analyses of the Felton ore were furnished by Mr. James L. Gaines, of the Tennessee Coal, Iron & Railroad Co.: —

SAMPLE NO. 1

Metallic Iron	59.58
Insoluble	3.64
Phosphorus	0.09
Manganese	0.09
Sulphur	—

SAMPLE NO. 2

Metallic Iron	60.700
Insoluble	0.480
Phosphorus	0.039
Manganese	Trace
Sulphur	0.070

THE GUYTON ORE-BANK

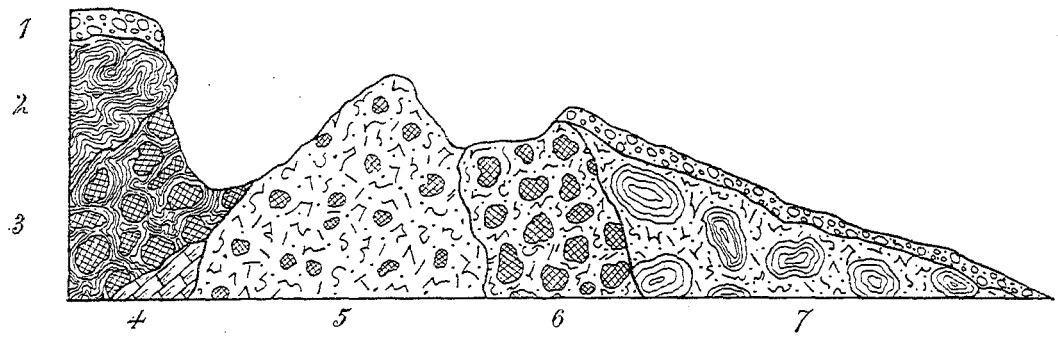
THE GUYTON ORE-BANK, which now belongs to THE SOUTHERN MINING CO., is located on *lot 200, 5th district*, four miles north of Cartersville. The bank was opened in the early sixties, and was afterwards worked, to some extent, in 1873. In 1880, it was purchased by Gov. Jos. E. Brown, who constructed a branch rail-road from the bank to Roger's station, on the Western & Atlantic R. R. Under Gov. Brown's management, the bank was worked, on quite an extensive scale, there being as many as three log-washers in operation, at the bank, at the same time. Mining was discontinued, in 1892, since which time the property has remained idle. No definite figures are to be had, as to the total output of the Guyton ore-bank. However, judging from the extent of the excavation, and the length of time mining operations were carried on, it would probably be no exaggeration, to place the entire output at several thousand car-loads.

The ore-deposit, at the Guyton bank, occurs in a low, well rounded hill, having an elevation of about 100 feet above Pettet creek, which flows at its western base. The main part of the work consists of large open-cuts, situated near the top and on the northern slope of the hill. The excavations, in places, are many rods wide, and often attain a depth of 60 feet, or more. The walls of the cuts are now much fallen in. Nevertheless, in places, a considerable amount of ore is to be seen, *in situ*. The ore occurs as gravel and "dornick" ore, in large pockets, in the vari-colored clays, and in the decomposed partially metamorphosed slates. Associated with the ore, in the residual clays, are large masses of siliceous material, which, in places, becomes so abundant, as to

interfere with mining. With the exception of this siliceous material, the ore seems to be quite free from mechanical impurities. The Guyton ore-bank is thought to still contain much workable ore, and it was reported, at the time of our visit, last summer, that it was soon to be opened up by the Southern Mining Co.

The bank is well located, being on the Iron Belt R. R., within

Fig. 18



Section through the Guyton Ore-bank. 1. Red Clay and Gravel-ore. 2. Decomposed Slate. 3. Iron Ore with some Decomposed Slate. 4. Oölitic Limestone. 5. Alluvial Clays with some Water-worn Gravel- and Bowlder-ore. 6. Vari-colored Clays and Iron Ore. 7. Vari-colored Clays with Large Masses of Impure Jasper and some Iron Ore.

a few rods of Pettet creek, which furnishes ample water, for ore-washing, at all seasons of the year.[1]

[1] Since the above was written, the Iron Belt R. R. Co., has opened up the Guyton ore-bank, and is now shipping from three to five car-loads of ore per day. A double log-washer is now in operation at the bank, and everything seems to be in good shape for carrying on successful mining. The manner, in which the ores occur, is shown by figure 18.

The following analysis of ore, from the Guyton bank, is reproduced from the U. S. 10th Census Report: —

Sulphur	0.003
Silica	4.490
Iron Protoxide	0.480
Iron Peroxide	79.010
Equivalent to Metallic Iron	(55.690)
Alumina	4.730
Manganese Protoxide	Trace
Lime	0.170
Magnesia	0.210
Carbonic Acid	0.090
Sulphuric Acid	0.020
Phosphoric Acid	0.756
Equivalent to Phosphorus	(0.330)

THE LOWRY ORE-BANK

This bank is located on *lot 201*, *5th district*, immediately north of the lot, on which the Guyton ore-bank is situated. It was worked, in 1891 and in 1893; and it is said to have produced a considerable amount of first-class ore. The workings, which consist of one large open-cut, 15 or 20 feet in depth, and a few smaller excavations, are located on a low ridge, rising 30 or 40 feet above the general level of the valley. The ore is found in pockets, in the residual clays, in the form of gravel and "dornick" ore. It appears to be of excellent quality; but it is limited in quantity. The main excavation is situated only a few rods from the Iron Belt Rail-road.

THE MUMFORD ORE-BANK

THE MUMFORD ORE-BANK is situated on the same ridge, and lot as the Lowry ore-bank, and only a short distance from it. The two banks may be considered, as belonging to one and the same deposit. The Mumford bank is reported to have been worked continuously, for some years, during which time, it is said to have produced a large quantity of first-class ore. Mr. L. S. Mumford, in speaking of the bank, says : — "There has been more ore taken from the Mumford bank, than from any other bank in the county, of equal size." The main workings consist of two large open-cuts, from 10 to 80 feet in depth, and covering a total area of about 1½ acres. The larger cut is now partially filled with water, so that but little ore is exposed to view. It is said, that the ore, which was mined from the two excavations, was remarkably free from all mechanical impurities, and always ran high in metallic iron. The limited exposure of the ore at the Mumford ore-bank gives no definite knowledge of the amount of workable ore still remaining in the bank.

A partial analysis of ore, from the Mumford bank, is reproduced from the U. S. 10th Census Report, as follows : —

Metallic Iron	54.360
Phosphorus	0.201
Manganese Oxide	0.450
Phosphorus in 100 Parts of Iron	0.370

THE D. J. GUYTON PROPERTY

The iron ore on this property, *lot 235, 5th district*, was worked, as early as the year 1848, and the ore was used in the furnace on Stamp creek. It was also worked, to some extent, several years later, and the ore was used in the furnace at Rogers station. The total amount of ore, mined on the property, would probably aggregate only a few thousand tons. The excavations are now well filled with earth, and show but little ore, *in situ*. It is reported, however, that there still remains in the bottom of the old workings a considerable quantity of valuable ore.

THE BISHOP ORE-BANK

THE BISHOP ORE-BANK, *lot 275, 5th district*, is located near the Iron Belt R. R., about two miles south of White's crossing. The working, which consists of an open-cut, about 200 yards long, and from 10 to 30 feet in depth, is situated on a hillside, at an elevation of something like 100 feet above the valley. The ore occurs in an irregular vein or lead, in the vari-colored clays, associated with quartzite. It is mostly in the form of gravel and bowlders; and it seems to be of good quality. The bank was opened, some five years ago, by Messrs. Renfroe & Sons, who erected and operated, for some time, a double log-washer, near the ore-bank. This company is said to have shipped quite a quantity of ore from the bank; but, for some reason, the working was continued for only a short time. Manganese was noticed, at one or two points

in the ore-bank, associated with the iron ore. Near the lower end of the open-cut, is to be seen a short tunnel, which is said to have been driven into the hill, in search of manganese. The limited exposure of ore, at the Bishop Bank, gives but little information concerning the extent of the deposit.

THE BURFORD ORE-BANK, NO. 1

This ore-bank was opened, some time in the sixties, and was worked, off and on, until 1890, during which time, it furnished a large amount of ore. The bank is located on *lot 301*, *5th district*, about half-a-mile east of the Iron Belt R. R. The workings, which consist of large open-cuts, covering a total area of something like two acres, are situated on a hill-slope, at an elevation of 75 or 80 feet above the valley of Pettet creek. In places, the excavations originally attained a depth of 40 feet or more; but now their walls are much fallen in; and, as a consequence, their depth has become much reduced. The ore is mostly limonite; though micaceous hematite also occurs. The latter appears as thin layers, rarely over an inch or so, in thickness, intercalated with layers of clay beneath massive ferruginous quartzite. This variety of ore is usually of excellent quality. However, it seems to be too limited in quantity, to be of commercial value. The limonite is far more abundant. It occurs as irregular deposits in the residual clays, mostly in the form of gravel and bowlders. Associated with the ore, in places, are numerous angular fragments of quartzite, with an occasional nodule or thin layer of manganese. With these exceptions, the ore is comparatively free from mechan-

ical impurities. In one of the cuts, is to be seen a large clay horse, made up of laminated clays. It is several feet in height, and is quite conspicuous, as the excavation is viewed from its lower side. The ore-bank was formerly connected with the Iron Belt R. R., by a branch road, about half-a-mile long. Nothing definite can be said, as to the amount of workable ore still remaining in this bank.

THE BURFORD ORE-BANK, NO. 2

BURFORD ORE-BANK, NO. 2, *lot 301, 5th district*, is located near the Iron Belt R. R., about half-a-mile south of White's crossing. The bank was opened, some 15 years ago; but most of the work was done, in 1888 and 1889, by Messrs. Renfroe & Sons. The works, which are situated on a hillside, having an elevation of about 60 feet above the valley, consist of an open-cut about 200 yards long, from 50 to 150 feet wide, and, in places, 40 feet deep. Both hematite and limonite occur here. The latter is found mostly in pockets; while the former appears as thin layers in the metamorphic slates, which are always much folded and contorted. Associated with the ore, are large masses of ferruginous, brecciated quartzite. Both varieties of ore, which occur at the above named ore-bank, appear to run high in metallic iron; but neither seems to be very abundant. The bank is well located. It is within a few yards of the Iron Belt R. R., and also, near Pettet creek, which furnished ample water, for ore-washing, during the greater part of the year.

DR. W. H. FELTON'S ORE-BANK, NEAR CARTERSVILLE, BARTOW COUNTY, GEORGIA.

THE WILD CAT BANK

The iron ore deposit of this bank, *lot 312, 5th district*, resembles very closely the deposits of the Sugar Hill bank. There are to be seen, here, several open-cuts along the sides of different quartzite ridges. They vary from 50 to 200 feet in length, and often attain a depth of 20 feet, or more. The ore is usually associated with heavy-bedded quartzite and light-colored micaceous slate. The limonite is far more abundant than the micaceous hematite. It occurs as irregular deposits and pockets, and is usually of good quality. The hematite is found chiefly in the form of thin layers, intercalated with the slates. It appears to be limited in quantity. The greater part of the work, on the Wild Cat bank, was done, in 1891. The excavations are, now, much fallen in. The bank was formerly connected with the Iron Belt R. R., by a branch road.

The following partial analyses of ore from the Wild Cat bank, are reproduced from the U. S. 10th Census Report: —

Samples	No. 1	No. 2	No. 3
Metallic Iron	60.930	50.640	63.400
Phosphorus	0.441	0.663	0.755
Sulphur	—	0.179	—
Silica	0.200	—	—
Water of Composition	10.300	—	—

A partial analysis[1] of a sample of ore from the Wild Cat mine, collected by the writer, resulted as follows: —

Water at 100° C	.560
Water above 100° C	5.030
Iron Sesqui-oxide	74.310
Equivalent to Metallic Iron	(52.020)
Manganese	.132
Phosphoric Acid	.365
Equivalent to Phosphorus	(.158)
Sulphur	.095
Sand or Insoluble Matter	18.500

THE CONNER BANK

This ore-bank, *lot 181, 22nd district*, which is situated on the Iron Belt R. R., half-a-mile northeast of White's crossing, was worked, to a considerable extent, some years ago. The main workings consist of two large open-cuts, covering a total area of something like an acre. The cuts, in places, are several feet deep; and, at the time of our visit, they were partially filled with water. The bank is located on a low ridge, having an elevation of only a few feet above the general level of the valley. The deepest part of the open-cuts is said to extend below permanent water-level. The ore occurs, in irregular deposits, in the clays, associated with the partially decomposed slates and quartzite. It is mostly in the form of gravel and bowlders. The latter frequently contains considerable

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

pyrite; but, otherwise, it appears to be of good quality. The clays, in which the ore occurs, is often laminated; and, at one or two points in the walls of the cuts, are to be seen deposits of water-worn quartzite pebbles. The greater part of the workable ore, at the Conner bank, appears now to be, in a measure, exhausted.

THE BIG MOUNTAIN ORE-BANK

THE BIG MOUNTAIN ORE-BANK, *lot 182, 22nd district*, is located on what is called Big mountain, about half-a-mile east of the Conner ore-bank. This bank was worked quite extensively, by convicts, a few years ago. It is connected, by a branch road, with the Iron Belt R. R., and it is otherwise favorably located for working. The chief working consists of a large excavation, situated near the top of the mountain, which has an elevation of something like 200 feet. The excavation is fully a hundred yards long; from 20 to 80 feet deep; and many rods wide. It is now much filled in, by fallen earth. The ore, which is limonite, seems to occur, mostly in large fissures and pockets, in the much broken-up quartzite and slates. It is usually of good quality, much of it being stalactitic ore. About 300 yards north of the above cut, and on the opposite side of the mountain, is another excavation, of somewhat smaller size. The ore in this cut has a reddish tint, and seems to partake of the nature of hematite. Its mode of occurrence is similar to that, of the other bank.

THE SUGAR HILL ORE-BANKS

THE SUGAR HILL ORE-BANKS, which are at present the most productive iron-ore banks in the State, are located in the north-eastern part of Bartow county, in the vicinity of Pine Log mountain. These banks were first worked, to a limited extent, prior to the Civil War, by parties operating a small blast-furnace on Stamp creek. Some of these old excavations are still to be seen, in the vicinity of what is known as Pine Hill ore-bank. They were originally several feet in depth; but they are now well filled with earth. The amount of ore, mined during these early workings, is not known; but, judging from the extent of the excavations, it probably did not exceed more than a few hundred tons. After the shutting down of the blast-furnace on Stamp creek, no further attempt was made, to work the Sugar Hill ore-banks, until they passed into the hands of the Iron Belt Rail-road & Mining Co. This company began mining operations on the property, in June, 1898, shortly after the completion of the rail-road to the ore-banks. Since the above date, the banks have been worked continuously, with an output of from 25 to 60 car-loads of ore per day. The ore-banks are all located upon the foot-hills of what is called Little Pine Log mountain, a short ridge, having an elevation of about 800 feet above the valley, which lies to the westward. This ridge, as well as Pine Log mountain proper, is formed of metamorphic slates and sandstone. The slates are vari-colored, and are often much folded and contorted. In places, they contain considerable graphite, and also some pyrite. The latter mineral usually occurs in the form of cubical crystals, pretty evenly distributed throughout the slates. The sandstone is more or less metamorphosed into quartzite. It

is of dark-gray color, and usually heavy-bedded. When weathered, the quartzite becomes quite porous, and assumes a brownish-red color. These conditions are due to the decomposition of pyrite, which is present in large quantities.

Limestone was noticed at only one point in the vicinity of the ore-banks. This exposure occurs on the right side of the branch, a short distance below the present mud dike. The outcropping is confined to a small circular depression, evidently an old lime-sink. The limestone is partially crystalline, and of a dark-gray color. It appears to be a comparatively thin stratum, intercalated with metamorphic slates and quartzite.

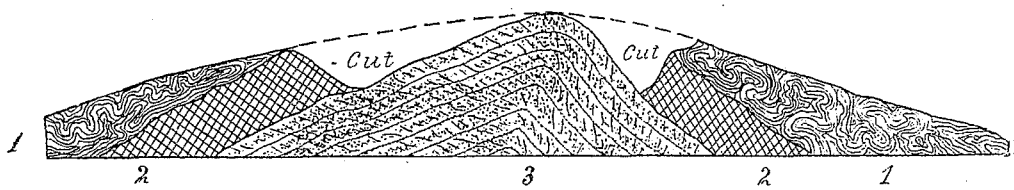
The iron ore of the Sugar Hill district, which is limonite, including a small amount of magnetite, occurs as irregular beds, overlying porous, coarse-grained quartzite. In some places, as at the Cripple Creek ore-bank, the ore has but little or no overburden; while, at other places, it is overlaid by residual clays and decomposed slates, often several feet in thickness. It has been suggested, on account of their bedded form, that these deposits are of sedimentary origin, and were deposited at the same time as the slates and quartzite. Furthermore, it is pointed out, in support of this theory, that the deposits always occur in the same stratagraphic position, immediately above the porous quartzite. These facts are certainly strongly suggestive of sedimentary origin. Nevertheless, the deposits are unquestionably of secondary origin, and were derived from the iron carbonate, and the pyrite in the underlying quartzites. Facts, supporting this theory, will be brought out in the description of the several ore-banks.

THE KINSEY ORE-BANK is located on the western slope of Sugar Hill, at an elevation of about 80 feet above the spring, which flows from its base. The excavation, which has a U-shape, is something

like 100 yards long, and from 10 to 25 feet deep. Between the arms of the U, is a large quartzite horse, which dips beneath the ore, where the two arms of the U unite. The quartzite horse, here exposed, is in the form of an anticlinal fold. The west side of the fold dips at a high angle, and soon disappears beneath the iron deposit; while, on the east side, the dip is very gradual, and the ore occurs as a blanket, covering the hill-slope.[1]

The ore in the Kinsey cut, as shown by the section, below, appears as a well defined bed, more or less mixed with clay and

Fig. 19



Section through Kinsey Ore-bank, near Ore-washer, Showing "Sandstone Horse."
1. Decomposed Metamorphic Slate. 2. Iron Ore. 3. Quartzite.

decomposed slate, overlying the porous coarse-grained quartzite. At the terminus of the lower arm of the U-shaped cut, the deposit attains a thickness of about 25 feet. The ore consists largely of what is called soft ore. Considerable "pot" ore also occurs. It is quite free from mechanical impurities, and always runs high in metallic iron, as is shown by the following partial analyses:—[2]

[1] See fig. 19.

[2] By A. M. Lloyd, McCandless Laboratory, Atlanta.

SAMPLE NO. 1

Water at 100° C	.490
Water above 100° C	12.000
Iron Sesqui-oxide	73.100
Equivalent to Metallic Iron	(51.170)
Manganese	2.254
Phosphoric Acid	2.402
Equivalent to Phosphorus	(1.045)
Sulphur	0.041
Sand or Insoluble Matter	5.470

SAMPLE NO. 2

Water at 100° C	.410
Water above 100° C	12.510
Iron Sesqui-oxide	77.950
Equivalent to Metallic Iron	(54.570)
Manganese	.250
Phosphoric Acid	2.257
Equivalent to Phosphorus	(.982)
Sulphur	.024
Sand or Insoluble Matter	3.250

A short distance west of the Kinsey bank, on the side of the rail-road, is to be seen another ore deposit, occupying the same stratigraphical position. The deposit has been worked, to only a limited extent; though there is quite a quantity of excellent ore exposed to view. On the hillside, about 200 yards south of this exposure, the ore again outcrops on the surface. It occurs, here, upon the surface, in the form of bowlders and gravel; and it is, also, well exposed in an old copper shaft, near by, which was sunk, in unsuccessful prospecting for copper, many years ago.

The thickness of the deposit, at this point, is several feet; and the ore appears to be of fair quality.

THE SUGAR HILL ORE-BANK is located on the hill-slope, only a short distance southwest of the Kinsey bank. It is one of the most extensive workings, in the Sugar Hill district. The main work consists of a large, irregular cut, several hundred feet in length. The northern extension of the cut is within 200 feet of the Kinsey cut. This part of the cut, which is about 200 feet long, and from 10 to 30 feet deep, has a southeastern trend, corresponding to the strike of the quartzite. The ore, here, occurs as an irregular bed, overlying the coarse-grained quartzite. The overburden consists of red and yellow clays and decomposed slates. At the southeastern end of this part of the excavation, the direction of the cut changes, rather abruptly, to the south, and finally, to the southwest, following in both instances, the trend of the underlying quartzite, and roughly, the contour of the hill. The character and mode of occurrence of the ore, in these divisions of the cut, differ but little, from that of the northwestern division. In the extreme southwestern part of the excavation, the ore is cut off, by an outcropping of heavy-bedded quartzite. Here, the regular formation seems to be much broken up; and the ore, which is usually soft and porous, is often associated with huge quartzite bowlders. At one point, there is to be seen a thin layer of honeycomb ore, underlying the brecciated quartzite, which is cemented by iron oxide. The deposit of ore, exposed in the Sugar Hill cut, is quite variable in thickness. In some places, it attains a thickness of ten feet, or more; while, in others, it is often reduced to five feet, or even less. The following partial analyses,[1] the first of which is from a sample collected by the writer, show the quality of the ore: —

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

SAMPLE NO. 1

Water at 100° C	.470
Water above 100° C	10.990
Iron Sesqui-oxide	76.010
Equivalent to Metallic Iron	(53.210)
Manganese	.295
Phosphoric Acid	1.313
Equivalent to Phosphorus	(.571)
Sulphur	.089
Sand or Insoluble Matter	7.540

SAMPLE NO. 2

Iron Sesqui-oxide	76.500
Equivalent to Metallic Iron	(53.550)
Phosphorus	.637
Sand or Insoluble Matter	7.370

On the hillside, a short distance below the west end of the Sugar Hill cut, is to be seen another excavation, from which considerable ore has been mined. It seems quite probable, that the greater part of the hill-slope, between the Sugar Hill cut and the creek, at the base of the hill, is underlain by iron ore. The recent developments on the hill-slope, here referred to, fully verify the above prediction. Two of the most extensive banks, anywhere to be seen, at present, in the Sugar Hill district, are now being worked at this point.

THE CRIPPLE CREEK ORE-BANK is situated near the base of Sugar Hill, about 300 yards southeast of the western end of Sugar Hill cut. The ore, here, occurs as a blanket, from 10 to 15 feet in thickness, with but little overburden. The underlying quartzite is porous, and, in places, quite friable. The ore, which extends

down to the foot of the hill, and outcrops in the creek, often occurs in the form of huge bowlders. Some of these large masses are several feet in diameter, and contains 50 tons, or more, of high-grade ore. The Cripple Creek ore-bank has furnished a large quantity of ore; but it now seems to be, in a great measure, exhausted.

The following is a partial analysis[1] of a sample of ore from the Cripple Creek bank, collected by the writer: —

Water at 100° C	.700
Water above 100° C	11.630
Iron Sesqui-oxide	76.010
Equivalent to Metallic Iron	(53.210)
Manganese	.192
Phosphoric Acid	2.151
Equivalent to Phosphorus	(.936)
Sulphur	.077
Sand or Insoluble Matter	6.430

A few rods below the Cripple Creek bank, in the bed of the small stream, furnishing water to the washers, is to be seen the iron carbonate (siderite), from which the brown ores in the district have been, in a great measure, derived. At the time of our visit, the deposit of iron carbonate was completely hidden by the mud, recently carried down from the washer located further up the stream; so, that it was impracticable, to see it in place. Near the exposure, in a dump, however, was to be seen a considerable amount of it, in the form of masses, weighing a hundred pounds, or more. The surfaces of these masses, in all cases, were encrusted, to the depth of an inch or more, with limonite. Maj. M. T. Singleton, the min-

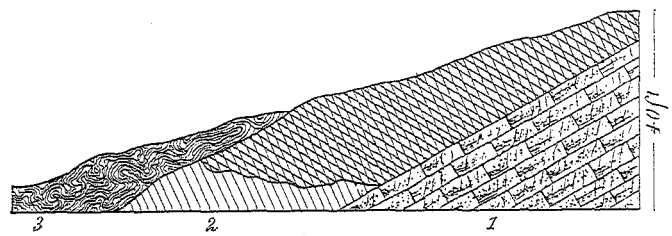
[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

[2] See fig. 20.

ing expert of the Iron Belt Rail-road and Mining Co., who was the first to discover this deposit of iron carbonate, informs the writer, that it occurs in the bed of the branch, and also at one point on the hillside, a few rods away, in the form of a well defined stratum, 30 feet wide, and dipping at a high angle to the southeast.

The iron carbonate, or siderite, when fresh and unweathered, has a dark-gray color, and resembles, very closely, partially indurated marl, or soft earthy limestone. The ore contains considerable pyrite, in the form of minute crystals, which are pretty evenly distributed through all the hand specimens examined. It is quite probable, that all the iron-ore deposits, now being worked, in the Sugar Hill district, will, sooner or later, as mining increases in depth, pass into the unaltered iron carbonate.

Fig. 20



Cross-section near Cripple Creek Ore-bank, Showing Massive Siderite (Iron Carbonate), Altered above to Limonite. 1. Quartzite. 2. Massive Siderite, Altered above to Limonite. 3. Metamorphic Slates.

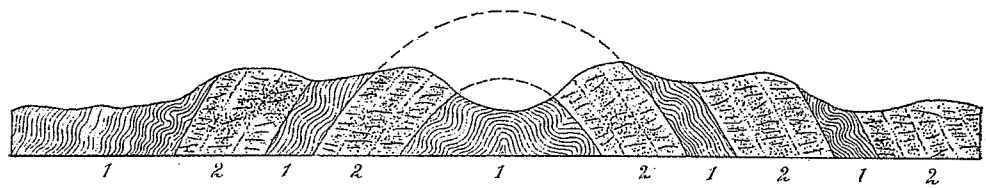
The following is a partial analysis[1] of a sample of massive siderite (iron carbonate) from Sugar Hill, collected by the writer:—

Water at 100° C	.320
Iron Carbonate	79.890
Equivalent to Metallic Iron	38.590
Phosphoric Acid	2.050
Equivalent to Phosphorus	.892
Sulphur	.687

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

PINE HILL ORE-BANK was one of the first, worked in the Sugar Hill district. It is located near the base of Pine Hill, about a quarter of a mile northwest of Cripple Creek ore-bank. The ore, here exposed, seems to be a part of the same deposit, now being worked at the Kinsey, Sugar Hill and Cripple Creek banks. The interruption in the continuity of the deposit appears to be due to the wearing away of an anticlinal fold.[1] The chief workings at the Pine Hill ore-bank consist of two large open-cuts, each many rods long, and, in places, 25 feet or more in depth. The ore, here,

Fig. 21



Cross-section from the Cripple Creek Ore-bank to the Pine Hill Ore-bank, Showing Anticlinal Fold. 1. Metamorphic Slate. 2. Quartzite.

as elsewhere in the Sugar Hill district, occurs in the form of an irregular deposit, associated with quartzite and slate. The quartzite, underlying the ore in the cut, farthest up the hill, is very much broken up; and it often partakes of the nature of tripolite, or some other very fine grained polishing powder. It has a white or brownish color, and is so friable, that it can be easily crushed between the fingers. Manganese occurs with the ore, in limited quantities; but it is mostly in the form of fine powder, which is in a great measure removed by the washer.

[1] See fig. 21.

The following is a partial analysis[1] of a sample of ore, from the Pine Hill ore-bank, collected by the writer: —

Water at 100° C	0.510
Water above 100° C	12.010
Iron Sesqui-oxide	74.550
Equivalent to Metallic Iron	(52.190)
Manganese	1.520
Phosphoric Acid	2.379
Equivalent to Phosphorus	(1.036)
Sulphur	.092
Sand or Insoluble Matter	7.470

THE BLUFF ORE-BANK, so called, on account of the ore originally occurring in the form of a bluff, is located on the side of the branch, only about 200 yards from the Pine Hill ore-bank. The ore contains some pyrite; but, otherwise, it appears to be of excellent quality. There are two excavations at the bank, both of which are of considerable size, and have furnished much ore. The excavation, located on the side of the branch, has been worked, several feet below water-level. The ore seems to occur here, in the form of a large pocket, which dips with the quartzite at a high angle to the southeast. In the other excavation, which is on the hill-slope, only a few rods from the branch, the ore appears to partake more of a bedded form. The ore, here exposed, is of a porous nature, and often contains a small amount of pyrite. Near the cut, is a bluff of massive quartzite, which apparently marks the limit of the iron deposit, in that direction. The Bluff ore-bank is still being worked; but it is thought, that the workable part of the deposit is, in a measure, exhausted.

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

THE IRON BELT RAIL-ROAD & MINING COMPANY employs, at the various ore-banks in the Sugar Hill district, about 100 hands, 50 of whom are convicts. There are, at present, in operation, four double log-washers; and two others are in course of erection. When the latter are completed and are ready for operating, it is said, that the company intends to augment the working force, by the addition of 50 more convicts, thereby increasing the output of the banks to 50 car-loads of ore per day. All the washers are situated on the main track of the Iron Belt R. R., or on short spur-tracks, so that the ore passes directly from the washers into the cars, without further handling. The washers are operated by steam-engines, varying from 10 to 20 horse-power; they are supplied by water from a pumping-station, located on the creek at the base of Sugar Hill. The creek, from which the water is obtained, is small; and it does not supply all the washers with sufficient water, in the dry season. To overcome this deficiency, the water from the washers is retained by dams, until the mud is settled, when it is pumped back to the washers, and used over, again and again. In addition to the above improvements, the company has a number of miners' cottages, repair and blacksmith shops, barracks for convicts, a commissary, a boarding-house etc., all comparatively new, and in good condition.

The contemplated improvements, above referred to, have now been completed, and the Sugar Hill district has, at present, an output of about 50 car-loads of ore per day.

THE GORDON PROPERTY

THE GORDON PROPERTY, now owned by THE IRON BELT RAILROAD & MINING CO., is located about 1½ miles north of Sugar Hill. The property has long been supposed to have extensive and valuable iron deposits; but, up to the time of our visit, no attempt had been made to work the ore. The main deposit is on the slope of a ridge, having an elevation of about 80 feet. The ore, here, occurs in the form of gravel and bowlders, in great abundance, strewn about the surface, for a distance, of about 300 yards. Some of the bowlders are of large size, being frequently two feet, or more, in diameter. The ore, in places, seems to be somewhat siliceous; but, otherwise, it appears to be of good quality. In its mode of occurrence, it resembles very closely the Sugar Hill deposit. There are but few iron properties in Bartow county, that show more favorable prospects, for an extensive and valuable ore deposit, than the Gordon property.

THE J. J. BENNETT PROPERTY

This property, *lot 296, 22nd district*, adjoins the Gordon property on the west. The iron deposits of the two properties are quite similar; and they occur under like conditions. The most extensive exposure, to be seen on the property, is near the summit of a small ridge, lying just back of Mr. Bennett's residence. The ore, here, occurs on the surface, in considerable abundance; but, as no

prospecting had been done upon the ridge, it was impossible to get any definite idea of the economic importance of the deposit. On an adjacent ridge, on *lot 317*, are other surface prospects; but the ore seems to be too limited, in quantity, to be of much value.

THE BLACK BANK ORE-BANK

THE BLACK BANK ORE-BANK, so called from the dark color of the ores, is located on one of the foot-hills of Pine Log mountain, about 3½ miles southeast of Sugar Hill. This bank was first worked, prior to the Civil War; and the ore was used in the small furnace, then in blast on Stamp creek, only a short distance away. The main workings, which are located upon a hill, having an elevation of about 200 feet above the small creek at its base, consist of several open-cuts. The excavations are all now much fallen in, so that but little ore is to be seen *in situ*. The ore, exposed to view, seems to be largely what is known as hard ore. It differs from the Sugar Hill ore, chiefly in being more compact, and in carrying more silica. The rocks, forming the hill, upon which the iron deposit occurs, consist of quartzite and metamorphic slates. The former, in places, is made up largely of angular fragments, cemented by iron ore. In one of the excavations, located on the side of the hill, near the branch, manganese occurs, in limited quantity, associated with the ore. With the exception of manganese and silica, the ore appears to be quite pure; and it is well located for working. It is impossible, from the limited exposure, to place any estimate upon the amount of workable ore in the bank.

THE KINSEY ORE-BANK, SUGAR HILL, BARTOW COUNTY, GEORGIA.

THE PEACHTREE BANKS

These ore-banks, on *lot 148, 22nd district*, are located along the top and side of a quartzite ridge, about 1 ½ miles south of the Black Bank ore-bank. The banks were worked, at the same time as the latter, and the ores were used in the same furnaces. The ridge, on which the ore occurs, has an elevation of something like 250 feet above the valley of Stamp creek. It is made up largely of quartzite, and has nearly a due north-and-south trend. The quartzite, as at the Black Bank, is often much broken up and fissured. The excavations, near the top of the ridge, are all small, and now show but little ore in sight. The ore, here, appears in the form of small pockets in the quartzite. It seems to be of fair quality; but it is limited in quantity. The excavations, on the east side of the hill, are much larger than those on top of the hill, and appear to have furnished a much larger quantity of ore. They consist of two large open-cuts, several rods in length, together with a few smaller excavations and prospect-pits. The ore occurs in fissures and joints in the quartzite; but the largest deposits are found along shearing planes in the quartzite. The ore is usually quite porous, and it often has a reddish color. It has every appearance of being an excellent ore.

THE A. H. MORRIS PROPERTY

The iron deposit on THE MORRIS PROPERTY, *lot 376, 17th district*, appears to be quite extensive. The ore occurs, here, in great

abundance, in the form of gravel and bowlders, covering an area of some five or six acres, on a gradually sloping hillside. In one place, the ore is so plentiful, that it interferes with the cultivation of the soil. It is usually quite compact, and generally, free from mechanical impurities. Some of the larger bowlders occasionally contain small fragments of chert, and also a limited amount of sand; but neither is in sufficient abundance, to affect the commercial value of the ore. A partial analysis[1] of a sample of the ore, collected by the writer, gave the following result: —

Water at 100° C	.550
Water above 100° C	10.220
Iron Sesqui-oxide	76.250
Equivalent to Metallic Iron	(53.380)
Manganese	.312
Phosphoric Acid	.924
Equivalent to Phosphorus	(.402)
Sulphur	Trace
Sand or Insoluble Matter	8.580

No prospecting has been done on the Morris property; and as a consequence, nothing definite can be said, as to the depth, to which the iron deposit extends below the surface. Should the deposit hold out, in depth, it will prove to be valuable; otherwise, it is of little commercial importance. The property is located about six miles southwest of Kingston, the nearest railroad station. The unfavorable location, with regard to transportation, accounts in a measure, for the undeveloped condition of the property.

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

THE COLLIAR PROPERTY

THE COLLIAR PROPERTY, *lot 444, 17th district*, is noted for its extensive surface deposit of iron ore. It would probably be no exaggeration, to say, that there are here exposed, upon the surface, thousands of tons of first-class ore. The deposit, which covers an area of six or eight acres, is located upon the adjacent wooded hill-slopes, near the public road, 1¼ miles east of Ligon P. O. The property was prospected, some three years ago, by a number of shallow pits and cuts; but no regular mining has been attempted. None of the excavations attain a depth of more than a few feet. They all disclose considerable ore; but, as a general rule, it does not seem to be so abundant below the surface, as above. The ore is mostly in the form of honeycomb ore; but compact ore is also plentiful. The former frequently occurs, in the form of huge masses, often 10 or 12 feet in diameter, and weighing several tons. Silica, in the form of sand and chert, together with a limited amount of slate, is the chief mechanical impurity, noticeable in the ore. It runs high in metallic iron, and low in sulphur, as will be shown by the following partial analysis[1] of a sample of ore, from this property, collected by the writer: —

Water at 100° C	.370
Water above 100° C	11.050
Iron Sesqui-oxide	75.280
Equivalent to Metallic Iron	(52.700)
Manganese	.425
Phosphoric Acid	1.291
Equivalent to Phosphorus	(.562)
Sulphur	.026
Sand or Insoluble Matter	7.080

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

Ore deposits, similar to the above, though not so extensive, are found on MR. Z. T. NICHOLS' PROPERTY, *lots 370, 371, 422 and 445*, and also on MR. W. A. HENNON'S PROPERTY, *lot 421*, all of the *17th district*. MR. Nichols, in sinking a well at his gin-house, only a few hundred yards from the Colliar deposit, reported that iron ore was struck, at a depth of 25 feet, and that the ore extended to the bottom of the well, 47 feet in depth. This seems to indicate, that the ore deposit probably extends to considerable depth, and is more valuable, than is generally supposed.

THE R. L. GRIFFIN PROPERTY

The most favorable prospect, for a valuable ore deposit, anywhere to be found on this property, occurs on *lot 426, 17th district*. The main exposure is to be seen upon a steep hill-slope, only a few rods from Ligon P. O. The ore occurs, here, in considerable abundance, in the form of bowlders and gravel in the red soil. It seems to contain more or less silica, in the form of chert; but, otherwise, it appears to be of good quality. No attempt had been made, at the time of our visit, to prospect the hill-slope, upon which the ore is exposed; and as a consequence, no idea can be had as to the depth, to which it extends. The abundance of float-ore, scattered about the cultivated fields in the immediate vicinity of the hill, suggests the presence of more or less extensive and workable deposits of ore, underlying the surface. Similar surface prospects occur on the adjoining property, *lot 367*, owned by MR. J. O. LIGON, and also on MR. F. L. DODD'S PROPERTY, *lot 374*. None of these deposits have been prospected; and, as a consequence, nothing can be said of their economic importance.

THE J. C. KERR PROPERTY

Brown iron ore occurs on the KERR PROPERTY, *lot 100, 16th district*, near the public road, and about 400 yards west of Linwood station. The deposit was opened and worked, to a limited extent, in 1887, by Mr. L. S. Mumford, who shipped a few car-loads of ore to Pittsburg, Penn. The working is confined to a single open-cut, three or four feet in depth, and only a rod or so in length. It is, now, much filled with earth, so that but little ore is to be seen *in situ*. Associated with the ore, and scattered about the excavation is much chert; and also, more or less manganese. The presence of the latter mineral in quantity is said to account for the shipment of the ore to Pittsburg. Besides the above deposit, ore also occurs on *lot 76, 16th district*, owned by MR. KERR. This prospect is located on a chert ridge, 3½ miles east of Linwood. The ore, which seems to be of fair quality, but limited in quantity, is exposed, in two small excavations, near the top of the ridge.

THE J. M. COPP PROPERTY

The ore deposit on THE COPP PROPERTY, *lot 102, 16th district*, is located on a chert ridge, about three quarters of a mile east of Linwood. The deposit was opened, several years ago, and a considerable amount of ore was mined. The work consists of a number of shallow cuts, all now more or less filled with fallen earth. The cuts expose but little ore, and only an imperfect idea can be formed of the extent of the deposit. The ore is associated with

more or less chert, which is quite abundant along the summit of the ridge. Near the iron deposit, on the same lot, are to be seen recent prospect-pits, exposing bauxite.

THE SHEATS PROPERTY

THE SHEATS PROPERTY, *lot 9, 16th district*, is located in the chert ridges, 2 ½ miles southwest of Adairsville. There is to be seen, here, on the side of the ridges, some eight or ten small prospect-cuts and pits, all exposing more or less ore. Considerable float-ore is also to be seen, scattered about the surface, which would seem to indicate the presence, below, of a workable deposit. The ore occurs mostly in the form of "pot" and honeycomb ore, and is always associated with chert. On the adjoining *lot, 22*, are other prospects, of similar nature. The ore, which is here exposed, in two small excavations on the hill-slope, does not appear to be very abundant; but it is of good quality, and comparatively free from chert. The Sheats property is 1 ¼ miles from the Western & Atlantic R. R., and is about the same distance from a stream furnishing sufficient water for ore-washing.

THE VEACH PROPERTY

This property, *lot 8, 16th district*, adjoins the Sheats property on the east. It was prospected and worked, to a limited extent,

some four or five years ago. The workings consist of a few small open-cuts, now well filled with earth. The ore appears to be of fair quality; but it does not seem to be abundant. It occurs, mostly in the red soils, as gravel and bowlders. Its chief impurity is silica, in the form of chert.

THE BURGMAN PROPERTY

This property, *lot 83, 16th district*, is located in the chert ridges, 1½ miles northeast of Linwood. It was prospected for iron, a few years ago, and four or five car-loads of ore were mined and shipped. The ore, which seems to be of fair quality, occurs in a hollow, and upon the side of the adjacent ridge. The excavations are all small, and now show but little ore. About three quarters of a mile north of these excavations, are other workings, on THE HOWARD PROPERTY, *lot 52*. The ore here occurs, near the summit of a chert ridge, where it has been worked, to a considerable extent, by open-cuts. The excavations, in places, still reveal ore; but they are all much fallen in. The surface ore, in the vicinity of the excavations, is quite plentiful; and it seems to indicate a deposit, beneath the surface, of some economic importance.

MRS. A. C. HOLT'S PROPERTY

The iron deposit on THE HOLT PROPERTY, *lot 65, 16th district*, occurs on the side of a chert ridge, only a few rods from a bauxite

mine, which has been worked, to a considerable extent, in the last few years. The iron ore is found, mostly as gravel and bowlders, strewn about the surface. At one or two points, shallow prospect-pits expose ore, a foot or more in depth. The ore is siliceous; and it does not seem to be very abundant.

A deposit, similar to the above, and occurring in the same position, with reference to the bauxite deposits, is to be seen on THE ARMINGTON PROPERTY, *lot 117, 16th district.* Some four or five car-loads of iron ore are said to have been shipped, from the last named property. The workings, here, which formerly consisted of small open-cuts, are now partially filled up, by the dump from the bauxite mine. Near the side of the road, is to be seen, near one of the excavations, a small heap of iron ore, from which a sample was taken for analysis. The ore seems to be of fair quality; but it is apparently limited in quantity.

A partial analysis[1] of the sample of ore, from the Armington property, collected by the writer, gave the following results: —

Water at 100° C	.380
Water above 100° C	10.030
Iron Sesqui-oxide	73.100
Equivalent to Metallic Iron	(51.170)
Manganese	.232
Phosphoric Acid	.241
Equivalent to Phosphorus	(.095)
Sulphur	.048
Sand or Insoluble Matter	12.430

[1] By A. M. Lloyd, McCandless Laboratory, Atlanta.

CHAPTER IV

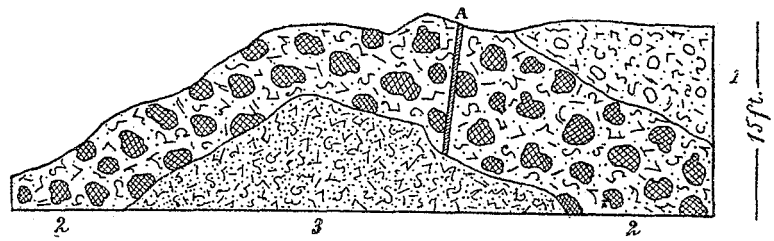
The Iron Ore Deposits of Floyd County

The Brown Iron Ores of Floyd County are confined to two districts, namely, The Cave Spring District and The Silver Creek District. The main deposits of the former district occur in the Knox Dolomite ridges, from one to two miles southeast of Cave Spring, on the several properties, hereafter to be described. The iron ore deposits of this district have, so far, received but little attention. This is due, in part, probably, to their distance from the rail-road, and to the lack of water, for ore-washing. The first of these difficulties is now overcome, to some extent, by the construction of a branch rail-road through the southern portion of the district, which, it is hoped, will do much toward the development of the properties. The ore deposits of the Silver Creek district are more fortunately located, with reference to transportation, than the ores of the Cave Spring district; but water, for ore-washing, is also here lacking. The chief deposits of this district are located on both sides of the Chattanooga, Rome & Southern R. R., in the vicinity of Reesburg. It is only recently, that these deposits have attracted much attention; and, as a consequence, but little ore has been mined. The entire output, of the several ore-banks of Floyd county, does not exceed, at present, more than ten carloads per day.

THE STATE ORE-BANKS

These banks, so called, on account of their being on the property of the State Deaf and Dumb Asylum, are located in the chert hills, on *lot 997, 3rd district*, 1¼ miles southeast of Cave Spring. The workings, which consist of two large open-cuts, each several yards long, and in places, 40 feet deep, are situated only a few rods apart, on the slopes of two adjacent ridges, here separated from each other, by a narrow hollow. The banks were

Fig. 22



Section through the State Ore-bank. 1. Clay and Chert. 2. Iron Ore in Vari-colored Clays. 3. Clay Horse. A. Mud Dike.

opened some 18 months ago; and they have been worked, by a small force of hands, almost continuously, ever since. The ore occurs, as gravel and bowlders, in the vari-colored clays; and it is more or less mixed with chert. Clay horses [1] are frequently met with, in the banks; and they often seriously interfere with mining. Clay dikes, which are fissures, from 4 to 18 inches wide, filled with very fine dark-red clay, are also of common occurrence. In one of these cuts, as many as four of these dikes are to be seen. They are usually parallel, and from 5 to 15 feet

[1] See fig. 22.

apart; and they extend to a greater depth, than has yet been reached by mining.

The ore, from the State banks sometimes has a reddish color, as if it were partially altered to hematite. It usually runs high in metallic iron; but it often contains considerable manganese oxide. This mineral is frequently noticeable in the banks, where it occurs as small veins and irregular pockets, associated with the iron ore, in the form of a black powder, and as minute imperfect rectangular prisms. There seems to be a large quantity of first-class ore still remaining in the State banks; but it is questionable, whether it can be economically worked, on account of the heavy over-burden and the clay horses.

THE T. W. ASBURY PROPERTY

THE ASBURY PROPERTY, *lots 950 and 951, 3rd district*, is located on the public road, two miles east of Cave Spring. The main workings on this property are to be seen, in a depression at the base of the hill, on which Mr. Asbury's residence is located. The ore, here, occurs in a small elevation, rising only a few feet above the general level of the depression. This ore-bank was first opened, in 1888, and was worked at irregular intervals, until a year or so ago, producing, during this time, according to the statement of Mr. Asbury, about 50,000 tons of ore. In 1894, a washer was erected at the ore-bank; and it was operated, for about two years. At the time of our visit to this property, last summer, the remains of this washer, together with a huge heap of screenings, and a large excavation, partially filled with water, were all, that

was to be seen of this once prosperous ore-bank. The excavation, from which the ore was taken, covers an area of something like half-an-acre; and, in places, it is said to attain a depth of 35 feet. The ore, which is reported to be of high grade, occurs, apparently, in the form of a large pocket. Considerable workable ore is thought to still exist, in the bank, beneath the old workings. On the hillside, a few hundred yards north of the above excavation, are to be seen other workings, from which more or less ore has been mined. On the same hill, was also noticed a small excavation, which had furnished a car-load or two of manganese ore.

The Asbury property has recently been purchased by THE GEORGIA & ALABAMA MINING COMPANY, which has also purchased the Scott, the Gordon, the King, and several other valuable mineral properties in the Cave Spring district.

THE J. J. WIGGINS PROPERTY

The main workings of THE WIGGINS PROPERTY are on *lot 948, 3rd district*, directly north, and adjoining the lot, on which the State banks are located. The chief deposits of the two properties are on the same ridge, the former being on the top, and the latter on the side. They may be considered as belonging to one and the same deposit. The excavations, which consist of several open-cuts, from 5 to 15 feet deep, are not over 200 yards from the main cut of the State banks. The ore is often in the form of geodes, or concretionary, hollow, rounded masses, from an inch to a foot or more, in diameter. Some of these concretionary masses are filled with a white siliceous material, in the form of fine powder, resem-

bling kaolin very closely. This siliceous material appears to have originated from the disintegration of the chert, which occurs in considerable abundance, associated with the ore. On an adjoining *lot*, *996*, are other old workings. One of the largest of these is only a few rods from Mr. Wiggins' residence. The excavation, here, is a small open-cut, exposing, in its crumbling walls, much ore, in the form of water-worn pebbles, varying in size from a fraction to four inches in diameter. In the gullies on the hillside, above the excavation, is to be seen a considerable quantity of similar ore.

The Wiggins property has been worked for iron, irregularly, for about five years. The entire output of the several banks is not known; but it would probably aggregate a hundred car-loads, or more. At the time of our visit, in May, 1900, only five or six hands were at work on the property. The ore, in the several excavations, seems to be of good quality; and, if it is as abundant, as the surface and other prospects indicate, the Wiggins property is quite valuable.

THE T. M. GORDON PROPERTY

THE GORDON PROPERTY, *lots 994 and 1,023, 4th district*, now owned by THE GEORGIA & ALABAMA MINING COMPANY, lies directly south of, and adjoins the Asbury property. The same deposits, which have been worked on the latter, extend on to the former property. With the exception of one or two prospect-pits, the Gordon property is undeveloped. There occurs, in places, considerable float-ore; and there can be but little doubt, that, if the

property were thoroughly prospected, there would be revealed considerable workable ore.

THE J. B. SCOTT PROPERTY

This property, *lot 953, 3rd district*, adjoins the Asbury property on the east. It was worked for iron ore, at a few points, some eight or ten years ago, and about 20 car-loads of ore were shipped. The excavations are all, now, well filled with fallen earth, and but little ore is to be seen *in situ*. Nothing definite could be determined, from the meagre exposures, as to the extent of the workable ore.

OTHER IRON PROPERTIES NEAR CAVE SPRING

In addition to the properties, here described, there are a number of other properties along the Southern Railway, north of Cave Spring, which show more or less surface ore. The deposits are usually found, near the line of contact between the Knox Dolomite and the Connasauga Shale. Such exposures are to be seen on THE DAVIS, THE NANCY, THE MONTGOMERY and THE GIBBONS PROPERTIES, between Cave Spring and Six-Mile station.

MISCELLANEOUS ISOLATED DEPOSITS

THE BOBO BANK

This bank was opened, in 1891, and was worked, at irregular intervals, until 1896. During this time, about 75 car-loads of ore are said to have been shipped from the bank to the furnace at Rock Run, Ala. The bank is located on the chert hills, on *lot 692, 3rd district*, about one mile north of New Prospect church. The main workings are confined to two open-cuts; one, on the slope of a low hill, and the other, in the hollow, near by. Neither excavation attains a depth of more than 25 feet. The ore is mostly a soft ore, and carries considerable silica, in the form of chert. Manganese is also associated with the ore; but it is not abundant. Only a few rods from the main excavation, there has recently been opened up, what appears to be a valuable deposit of bauxite. Another exposure of iron ore also occurs associated with bauxite, on *lot 607*. The iron ore deposits of the Bobo property seem to be of only trifling importance, compared with the bauxite deposits.

THE H. WASHINGTON PROPERTY

THE WASHINGTON PROPERTY, *lot 61, 22nd district*, is located on the Chattanooga, Rome & Southern R. R., about one mile north of Reesburg. The iron deposit on this property, which has re-

cently been opened up by Mr. Sparks, is situated on the slope of a chert ridge, a short distance from New Bethel church. The working is a small open-cut, from which seven car-loads of ore have been shipped, in the last six weeks. The ore is mostly massive, and is badly mixed with chert. The deposit is considered to be of little economic importance. Some two miles south of this bank, on THE FRICKS PROPERTY, Mr. Sparks is having some ore raised. From this property, he has recently shipped about 20 car-loads of ore. The workings, here, are limited to three open-cuts, none of which attain a depth of more than 15 feet. The ore in the Fricks, as in the Washington bank, is associated with chert; but analysis shows, that the ore from the Fricks property runs high in metallic iron, and low in phosphorus. The limited development, on the Fricks property, gives but little information, as to the extent of the ore deposit.

THE J. C. REESE PROPERTY

The iron deposits, on THE REESE PROPERTY, are confined mainly to *lot 49, 22nd district.* The deposit occurs on a chert hillside, only a short distance from the rail-road. The workings consist of only one or two small excavations, from which four or five car-loads of ore have been recently shipped. On the adjoining lot, just across the rail-road from the Reese property, iron ore, in limited quantities, is found associated with bauxite. The iron deposits of the Reese property extend south, and re-appear on THE WARE PROPERTY, from which a small amount of ore has been shipped. Similar deposits also occur on THE ATKINSON, THE

MINTER and THE HOWELL PROPERTIES, *lots 12, 13 and 14*, respectively. The Atkinson property is said to have produced some 25 or 30 car-loads of ore. The workings, from which the ore was obtained, are located near the top of a small chert hill. The ore seems to be in considerable quantities; but it is more or less mixed with chert. Near the base of the above hill, are to be seen the workings on the Minter property. No ore has yet been shipped from the last named working. However, two or three car-loads have recently been mined, and are now lying in a heap, near the mouth of the cut, from which it was taken. The ore on this property is also siliceous, and seems to be in limited quantities.

The several ore deposits, here referred to, in the vicinity of Reesburg, all belong to what has been termed the Silver Creek district, which has its southern limits in the neighborhood of Sloan bank, in the northern part of Polk county. This iron-bearing district continues north of Reesburg, to the northeastern part of Floyd county, following the red hills, east of the valley, which is underlaid by the Oostanaula shale. Float-ore occurs in considerable abundance, among these red hills, both north and south of Rome; but they have been worked, at only one point, namely, Hermitage, eight miles northeast of Rome. The iron deposits, at this point, were, at one time, thought to be quite abundant; but subsequent developments demonstrated, that they were limited to a few, more or less widely distributed, irregular deposits, which have since become, in a measure, exhausted. The iron ore mining, in the vicinity of Hermitage, seems itself never to have been very remunerative. Nevertheless, it resulted in the discovery and the development of the bauxite deposits of that region, which have proved far more valuable, than the iron deposits, however extensive the latter might have been.

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