INDIANA.

DEPARTMENT

OF

Geology and Natural Resources.

THIRTY-FOURTH ANNUAL REPORT.

W. S. BLATCHLEY,
STATE GEOLOGIST.

1909.

INDIANAPOLIS:
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THE STATE OF INDIANA,
EXECUTIVE DEPARTMENT,
June 30, 1910.

Received by the Governor, examined and referred to the Auditor of State for verification of the financial statement.

OFFICE OF AUDITOR OF STATE,
INDIANAPOLIS, July 19, 1910.

The within report has been examined and found correct.

JOHN C. BILLHEIMER,
Auditor of State.

JULY 19, 1910.

Returned by the Auditor of State, with above certificate, and transmitted to Secretary of State for publication, upon the order of the Board of Commissioners of Public Printing and Binding.

MARK THISTLETHWAITE,
Secretary to the Governor.

Filed in the office of the Secretary of State of the State of Indiana. July, 19, 1910.

FRED A. SIMS,
Secretary of State.

Received the within report and delivered to the printer July 19, 1910.

A. E. BUTLER,
Clerk Printing Board.

State of Indiana,
Department of Geology and Natural Resources.
INDIANAPOLIS, IND., June 30, 1910.

HON. THOS. R. MARSHALL, *Governor of Indiana:*

MY DEAR SIR—In accordance with law I have the honor to submit to you herewith the manuscript and illustrations of the Thirty-fourth Annual Report of the Indiana Department of Geology and Natural Resources, the same being for the calendar year 1909.

Yours very truly,

W. S. BLATCHLEY,
State Geologist.

ASSISTANTS.

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B. A. Kinney	State Supervisor of Natural Gas.
Isadora Kessler	Clerk.
Millard Gilliam	Messenger and Janitor.

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DEPARTMENT OF GEOLOGY AND NATURAL RESOURCES.

INDIANAPOLIS, INDIANA.

W. S. BLATCHLEY, State Geologist.

Please acknowledge receipt of this volume.

In return, scientific books, fossils and implements of the "Stone Age" are acceptable.

State Museum, Room 126, Third Floor, State House.
Open to the Public from 8 a. m. to 5 p. m., except on Sundays and legal holidays. Admission free.

Office of State Geologist, Room 89, Third Floor, State House.

INTRODUCTORY.

The work of the Indiana Department of Geology during the field season of 1909 was carried on along two lines. The Soil Survey, begun in 1907, was continued by Messrs. A. E. Taylor and Chas. W. Shannon. Between April 15 and November 1 Mr. Taylor covered Randolph, Wayne, Union, Fayette, Franklin, Rush and Henry counties. Mr. Shannon was in the field from June 1 to September 15, and covered Gibson, Pike, Vanderburgh and those portions of Warrick and Spencer counties not treated by the U. S. Soil Survey.

Their reports, accompanied by maps showing the exact area covered by each type-soil, form the first part of the present volume. Each of the principal soils found in the area surveyed is fully described, its origin traced, and an analysis given showing its constituents. By aid of the analyses and other data gathered in the field, they have shown the use to which each type-soil can best be put, and the kind of fertilizer most needed. Methods of crop rotation, tiling and other matters are discussed and much information given which will undoubtedly prove of value to the landowners, both present and future, of the areas surveyed.

During the three seasons of 1907, '08 and '09, thirty-three counties in southern Indiana have had their soils classified, mapped and treated in detail by the Department Survey, and the work thus begun will be continued each season until the State is wholly covered.

The second line of field work carried on by the Department during 1909 was the gathering of detailed data regarding the undeveloped water-power sites of the larger streams of the State. Within the past five years methods of transmission of power for long distances by electric current have been so improved and put in practical use that an enormous saving of expense and energy has resulted. It has long been known that falling water, when properly harnessed, offers the cheapest source of water power known to mankind. For thousands of years millions of horse-power have been annually wasted along the streams of Indiana. The early settlers made use of some of it in their grist and sawmills, but aside from that it has been wholly unutilized. With the rapid disappearance of the stored fuels, petroleum, natural gas and coal, the question of the development of the better water-power sites of the country as a source of much of the energy and heat of the future has become a most important subject of discussion. Up to the present the only sites of importance developed within the State are on the St. Joseph River, near Elkhart and South Bend, where large dams and extensive machinery have been installed, which produce power for running and lighting a number of the larger factories of those cities. One site on the West Fork of White River, a few miles above Noblesville, is also being improved and will soon be ready to furnish power to that city.

From trips made in a rowboat over all of the larger streams of the State, the writer became convinced that each of them offered a number of sites of value, and it was therefore determined to make a special investigation and survey of the more important of these. Mr. W. M. Tucker, a graduate student in geology at Indiana University, was put in charge of this work. Assisted by J. A. Smith, he spent four months of the season in southern Indiana, making topographical maps, installing gauges, measuring the current and determining the amount of available power of the more important and best located sites. This work will be continued in northern Indiana by Mr. Tucker during a part of the season of 1910, and if completed will be published in the next annual report of the department.

During the past year the State Mine Inspector, James Epperson, of Linton, Indiana, and his four deputies have enforced impartially the laws relating to the mining industry and have looked after the interests of both miner and operator in such a way that today the coal mines of the State are in better condition than ever before in all matters pertaining to ventilation, sanitation and safety appliances. In his report, which forms a part of the present volume, the State inspector has full and complete tables of statistics relating to the coal industry for the year. From these have been compiled the following condensed table showing the relative rank of the thirteen coal-producing counties of the State, with the output of each in tons and the amount of wages paid in each.

TONS OF COAL PRODUCED AND WAGES PAID TO MINERS IN 1909 BY COUNTIES.*

Counties.	*Tons produced.*	*Wages paid.*
Vigo	3,490,349	$2,870,418 91
Sullivan	2,800,570	2,314,440 21
Greene	2,602,876	1,909,393 93
Vermillion	1,350,053	1,151,403 96
Clay	912,567	989,233 12
Parke	703,014	701,880 71
Knox	559,943	402,668 69
Warrick	392,583	275,669 29
Pike	372,182	290,535 12
Vanderburgh	250,218	235,949 41
Gibson	208.654	194,364 86
Daviess	47,772	42,850 38
Perry	1,308	1,242 45
Totals	13,692,089	$11,380,051 04

The table shows an increase in output for the year of 1,694,785 tons, or 14.1 per cent. over that of 1908. This substantial increase shows that the mining industry in Indiana is once again on the upward grade after the slump in 1908, due to the financial depression, and there is little doubt but that the annual output will reach twenty millions of tons before 1915. In 1898 the amount of coal mined in the State was but 5,146,920 tons; in 1909, or eleven years afterward, it was 13,692,089 tons, or an increase of more than 166 per cent. Not only was the output greater in 1909 than ever before, but the number of tons mined per death in the mines was greater than in any recent year, the number being 273,841 tons for each death. Aside from the explosion in the Sunnyside mine in March, when six men were killed, all the other accidents were single, and due largely to falling slate, a condition which will always exist as long as coal is mined. The percentage of deaths in the Indiana mines, based on the tonnage, is far less than in any other State having as large an output.

Of the coal produced, 718,213 tons were block and the remainder bituminous. The output of block coal was 134,747 tons, or 15.8 per cent. less than in 1908. This loss was due to the working

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*This table, as in all those of recent years, is based upon the output of the shipping mines, or those working more than ten men, which are the only ones required by law to make monthly reports to the State Inspector. However, statistics gathered from the small local mines show their total output to have been approximately 350,000 tons for the year, or a grand total of 14,042,089 tons produced in the State.

out and abandoning of a number of the block coal mines. The area producing this fine domestic coal is limited, is rapidly being exhausted, and the supply will last but a few years. Of the block coal produced, Clay County yielded 406,618 tons, Parke County 198,946 tons, and Vigo County 112,649 tons.

While very few of the coal mines of Indiana contain inflammable or explosive gases in any quantity, such gases are always liable to accumulate in some deserted room or working. Moreover, there is not a mine in the State but that is liable to catch fire in some manner, and thus endanger the lives of all the miners. Recent accidents in Illinois, Kentucky, West Virginia and other States in which scores or hundreds of men lost their lives in mines which were considered "safe," show that accidents by fire and explosion are bound to occur when least expected. I would strongly urge, therefore, the passage of a law requiring each mine to be equipped with one or more manway escape shafts, such shafts to be located one-fourth to one-half mile from the main shaft. If both sides of the mine are connected by several cross-entries, one escape shaft at some distance from the main shaft would be sufficient, but where the only passageway from one side to the other of a large mine leads by the main or hoisting shaft, each side should be equipped with an escapeway. While all the larger mines of the State at present have an air-shaft, it is usually within a few hundred feet, or at most yards, from the main shaft, and an acccident to the latter is very apt to shut off escape by the air shaft. Our coal mines are the only places in the State where hundreds of men are compelled to work with but one, or at most two, adjacent openings between them and liberty in case of a fire. A tax of five cents on each ton of coal produced in the State would yield $684,604 in one, or $1,369,208 in two years, a sum far more than sufficient to equip each mine in the State with a hole and a ladder, thus giving the occupants at least a fighting chance for life when the main shaft is shut off by fire or explosion.

The report of the State Gas Supervisor, B. A. Kinney, of Marion, Indiana, follows that of Mr. Epperson, and gives the latest information regarding that once abundant but now almost exhausted fuel, natural gas. His report shows that under the direction of the supervisor or his deputies 3,029 abandoned gas and oil wells were properly plugged during the year 1909. In the southern third of the old Central-Eastern Indiana gas field, where the gas wells were never drawn upon for manufacturing purposes, many companies are still supplying natural gas for domestic use, especially for cooking.

In the Oakland City pool of southwestern Indiana a number of new gas wells of large capacity were finished during the year, but they were so isolated one from another and from cities or towns of any size that the product at present is being used only in the field and in Oakland City. The results of drilling during the year 1910 will doubtless prove either the value or worthlessness of this Oakland City area.

Following the precedent of ending each volume with a paper on natural history, an extended illustrated paper on the Coleoptera or Beetles of Indiana was prepared by W. S. Blatchley and offered for publication as a part of this annual report. The State Printing Board refused to publish it as a part of the volume, and it is therefore being published as Bulletin No. 1 of the Indiana Department of Geology, in accordance with an act providing for the issuing in that manner. As the funds for its publication must be paid from the sum allotted the Department of Geology for expenses, but 1,000 copies of the Bulletin can be printed.

A SOIL SURVEY OF RANDOLPH, WAYNE, HENRY, RUSH, FAYETTE, UNION AND FRANKLIN COUNTIES.

BY

A. E. TAYLOR

A Soil Survey of Randolph, Wayne, Henry, Rush, Fayette, Union and Franklin Counties.

By Arthur E. Taylor.

The area under consideration in this report comprises 2,431 square mile in east-central Indiana. For good schools, roads, railway facilities, farms, farmers and general progressiveness, the people living in this area claim second place to none in the State. Yet, with all of their advancements, they realize that their great industry, agriculture, is far from being at its best. The land will have to be put into better condition for plant growth, and more intensive farming take the place of the extensive, in order that the necessities of life may be supplied to the increasing population. Is it possible to so improve the soil that the people of this area may realize an increase of 50 per cent. in their annual yield? The answer of the leading farmers throughout these seven counties is in the affirmative. A careful study of the crop and stock tables of each county, giving the average crops of the poor, average and best farmers, also bears out such a conclusion. It is not the fault of the farms that better yields are not realized, but it is the fault of the farmer. A horse cannot furnish its best labor, unless it is properly fed, groomed and housed; neither can a farm furnish you its best yields unless it is properly replenished, cultivated and underdrained.

PHYSIOGRAPHY AND GEOLOGY.

With exception of along stream courses where erosion has exposed the bed rocks, this whole area lies beneath a blanket of glacial drift. The drift that occurs as the main surface formation is known as the Later Wisconsin and the other is known as the Illinoian. The only places that the Illinoian drift covers the surface are found in southern Fayette County, the western half and west of the Whitewater River in Franklin. The thickest drift known in the State is located near Newcastle of Henry County, where it was penetrated 500 feet in well boring. As one goes south the general thickness of the moraine becomes less and less, until it is only about 10 to 30 feet in the Illinoian area of Franklin County. The topography of the drifts varies quite noticeably, that of Randolph County, in the northeast corner of the area, is in great part a gently undulating plain, containing shallow stream valleys, while Wayne County, immediately south, is rolling, leaving a series of ridges and valleys extending northeast and southwest. Henry and Rush counties would be classed topographically between Randolph and Wayne counties, having some of the gently undulating and some of the rolling surface. Fayette and west Union counties are considerably broken by rather deep stream valleys, while east Union County and a strip in northeastern and east central Franklin County is of the gently undulating and gently rolling types. The remainder of Franklin County is the most broken portion of the area, there being in places a difference of altitude of 500 feet between the stream beds and the tops of the ridges along them. The topography both of the present and of the past has had much to do with the character of the soil. When the Later Wisconsin ice sheet covered a large portion of what is now the State of Indiana it contained a very heterogeneous load of clay, rock flour, sand, gravel and boulders, which were the ingredients from which most of the soils of this area were derived. Upon the melting of the ice this load, known as glacial drift or moraine, was dropped, leaving a hummocky and undrained surface, dotted with numerous ridges, hills, little lakes, ponds and marshes.

Vegetation, such as mosses, grasses and sedges, grew about the waters and ultimately filled the lakes and ponds with partially decayed vegetation, where they had not been drained by streams working their heads back into them. The sites of these accumulations of vegetation are very conspicuous even today, dotting all of the Later Wisconsin drift area as patches of black land (Miami black clay loam), which runs very high in organic matter. The types dotted by these dark areas and which comprise over 90 per cent. of the late drift in this part of Indiana are the Miami clay loam and Miami silt loam. These have been derived directly from the drift through the various processes of weathering, such as decomposition and disintegration. Where streams have been established in the glacial areas, Huntington and Wabash loams are the types found covering the flood-plains and terraces. Occupying the outwash plains is the Miami loam, while the Miami fine sandy loam occurs on the surfaces of kames. The Oak Forest silt loam is the Illinoian drift land of Franklin County, while the limestone slope clay loam is largely a residual soil, derived from the weathering of the Cincinnati limestone in the same county. A bottom land, that is found along the smaller streams in the Oak Forest silt loam and the limestone slope clay loam area, is known as Hamburg loam.

MIAMI CLAY LOAM.

The Miami clay loam, which comprises 55 per cent of the seven counties, has a medium or light brown to a light or ashy gray color. The medium brown is commonly known as sugar tree land, because the rock maple grew abundantly on it, while the ashy gray soil, for a similar reason, is called white beach or white oak land. The soils of intermediate colors are considerably more numerous. These have growing upon them the rock maples, red beech, white beech, white oak, yellow poplar, elm, ash, hickory and black walnut.

The subsoil of the medium brown type is generally a sandy clay at a depth of one foot, grading into a fine sandy loam at 1½ feet. The lighter colored soil is sometimes underlain by a very tough and compact clay, containing some gravel, but more often it is a tough sandy clay. As one goes deeper in the section the texture becomes more sandy and gravelly. The intermediate soil most frequently grades into a sandy clay and in going deeper into a fine sandy loam or medium sandy loam.

The land on which the sugar trees grow and which has the medium brown color is the warmest and richest in plant foods of the Miami clay loam, while the ashy gray soil, which has had a heavy growth of white beech and white oak timber, is the coldest and is the most deficient in plant food. Farmers claim that the sugar tree land can be planted from one to two weeks earlier than the white beech. Some reasons that might help to account for these differences are the following: (1) As noted above the soil of the medium brown land is of a much looser nature, containing more gravel and sand, and thus facilitating the circulation of the ground water. This more rapid circulation, through capillary action, brings a greater amount of water into the soil from beneath. This water carrying various salts, in solution, deposits them, sometimes by chemical reaction, but generally upon the evaporation of the water, thus imparting to the soil the medium brown color, caused by the iron separating out from the solution. The water that carries the iron salts also carries salts of potash, phosphoric acid and other plant foods. Owing to the more compact nature of the clay loam underlying the ashy gray soil, the circulation of underground waters is comparatively slower than in the subsoil of the medium brown land, thus bringing less iron and other salts to the surface. (2) The fact that the medium brown soil has received more moisture by capillary attraction gives it a more thrifty plant growth which supplies a greater amount of humus. (3) The dark color of the sugar tree land enables it to absorb more of the radiant heat energy from the sun, thus warming it more than the white beech land. (4) The looser nature of the medium brown soil gives the air a better chance to circulate and come in contact with the plant roots, furnishing the leguminous plants (those having the bacteria tubers, such as clover, alfalfa, cow-peas, and soy-beans, which extract the nitrogen directly from the air) with a good supply of nitrogen. Where the leguminous plants supply the soil with considerable nitrogen, the succeeding corn crop, which has not the power of taking the nitrogen from the air, has a good supply of a very important nourishment. Because the white beech land is seldom as productive as the sugar tree, it does not follow that it cannot be made so. In showing the results of improvements the white beech land has no equal in the area. Where farmers have given careful attention to tiling, green manuring, using commercial fertilizer, selecting seed, cultivating and feeding stock over the places, their general crop averages rank among the best.

The Miami clay loam, when well cared for, is an excellent general farming soil. Annual corn crops ranging from fifty-five to sixty-five bushels per acre is no more than an average for the better farms, but from twenty-five to thirty-five bushels is about all the unimproved and poorly tended farm can be expected to yield, and crops of ten and twelve bushels per acre are not uncommon. The best farmers are getting about twenty-two bushels of wheat per acre, while the general run will average about fourteen. More and more the farmers are learning the importance of systematic cropping, though only a very low per cent. always follow out a three-years rotation. The order of cropping is corn, wheat and clover, the clover, or clover and timothy, being sowed with the wheat. If the stand of wheat is not good, corn is tried again. Usually the clover is cut for both hay and seed and then pastured. The succeeding year it is plowed for corn again. Oats ordinarily average from thirty to forty bushels per acre, potatoes seventy-five to 150, and tomatoes six to eight tons.

To show how tiling affects a typical Miami clay loam, with a gently rolling surface, I can do no better than tell of the experience of Edwin Druly, with his 375 acre farm, one and one-half miles northwest of Fountain City, Wayne County. By examining the soil at different places on Mr. Druly's farm to a depth of three feet, the writer found the upper four to seven inches to be a medium to light gray color, becoming, in places, almost an ashy gray when dry. From 3 to 6 inches deeper the texture remained almost the same, but the color was lighter. For the next 8 inches to 1½ feet was a tough, heavy, sticky, dark brown sandy or gravelly clay, containing less pebbles and sand, and crumbling with difficulty. Below, to a depth of 3 feet, is an easily crumbled light brown, very fine, sandy clay loam, with limestone pebbles. In 1905 Mr. Druly planted corn, without doing any tiling, and realized twenty bushels to the acre. Subsequently, on every acre, at a cost of less than fifteen dollars, he has put in from twenty to twenty-seven rods of tile, which vary from 4 to 12 inches in diameter, the mains, which drain fifty acres, being 12 inches and the laterals 4 inches. After experimenting by placing the tile at various depths ranging from 52 to 30 inches, he found that the tile did the best work at the depth of 30 inches. In 1908 and 1909 Mr. Druly got sixty bushels of corn to the acre, an increase of forty bushels, which more than paid all of the expense of tiling. Numerous other cases could be enumerated where tiling on the Miami clay loam in these seven counties has brought about increases in corn crops ranging all the way from 15 to 500 per cent., the amount of increase depending on how wet the land was before tiling.

Miami Black Clay Loam.

The Miami black clay loam occurs more or less throughout all of the Wisconsin drift region of the area under consideration, but has its greatest extent in Randolph County and least in Fayette. It generally occupies the site of an old lake or swamp and has a flat surface. When it is first broken it often, especially when it contains very little sand or gravel, is found as a heavy, black, sticky, clay loam that is very difficult to plow. At such a time a spade thrust into it will cause it to shake for several feet around. If rubbed in the hands it breaks up into numerous little irregular solids. Upon being turned up and dried out it becomes very hard, and numerous deep cracks form on the surface, but as soon as a shower moistens it pulverization sets in and an excellent seed bed is the result. In the newly broken soil the texture frequently changes very little to a depth of 20 inches, but the color becomes a shade lighter. At a greater depth the color becomes a dark brown, grading at 2½ feet into a medium brown clay, with little pockets of light colored sand, due to the decomposition of limestone pebbles. In other cases, where the water has not long been absent, the color at a depth of 2 feet is a drab, with a slight bluish tint. Iron concretions are common in the subsoil.

After the Miami black clay loam has been cultivated for several years and a few crops of clover have been plowed into it, the tough, sticky nature disappears, leaving a very loose, granular and warm soil. Tiles are laid as deep as 52 inches and 30 rods apart on some of the most open textured of this land, and are claimed to do the work; but from 36 to 45 inches are more common depths and 12 rods apart a more common distance. When this soil has been thoroughly drained and well aerated, it is the best for corn in the area, containing a greater abundance of the proper plant foods, absorbing an excellent supply of air and water and more of the radiant energy from the sun. An average corn crop for the best farmer is about sixty-five bushels per acre, while a few exceptional farmers get as high as ninety bushels and even 100 in good years; but the ordinary run will not exceed forty-five bushels.

The average wheat yields are not more than twelve bushels, while the oats range from twenty-five to forty-five. Clover does well if the land is drained, otherwise it heaves and the plants die.

An especially strong soil is found in some cases where the Miami black clay loam has been covered by the wash from the upland, giving a mixed soil of 6 or 7 inches at the surface, underlain by 9 or 12 inches of black clay loam. This, in turn, is underlain by a dark clay loam grading into a gravelly brown clay loam, which contains highly decayed limestone pebbles occurring as pockets of light colored sand. On this kind of land the banner alfalfa crops are grown.

The deep cracking which occurs as the land dries is a serious difficulty with some farmers. These cracks, which are sometimes 3 feet deep and 1 inch wide at the surface, permit the air to come in contact with the plant roots, which not infrequently results in the death of the plant. The bad effect of this cracking can easily be avoided, in case of corn or any other crop that can be cultivated during the growing season, by stirring the soil frequently and keeping the cracks filled up.

MIAMI SILT LOAM.

The principal development of the Miami silt loam has been in the southern half of the area. In color and size of crops it is comparable to the Miami clay loam, unless it would be that the silt loam averages a shade lighter. The methods used in improving the Miami silt loam are identical with those used for the Miami clay loam. For the texture and a more detailed description of this type, see reports under Franklin and Union counties, where its most extensive areas are found.

MIAMI LOAM.

This type is a warm, well aerated and very productive soil, with its main areas in the outwash plains of Wayne and Rush counties. It resembles the Huntington loam in that it has originated from material which has been assorted by water, in that it is generally underlain at from 4 to 6 feet by a bed of either sand or gravel, and in that it is a very early soil in the spring and can be cultivated much sooner than the Miami clay loam or the Miami silt loam after a heavy rain. A more detailed description of this type will be found in the reports for Wayne and Rush counties.

HUNTINGTON LOAM.

Although fine, medium and coarse sand, gravelly and silt loams occur in the stream bottoms, the Huntington loam is by far the leading type over the bottoms of this area covered by the Wisconsin drift. In one instance it is found for some distance beyond this moraine, where it comprises the various terraces of Whitewater River in southern Franklin County. With exception of the Wabash loam, in Henry and Randolph counties, there exist only very limited areas of other bottom land types, scarcely any being of sufficient extent to be mapped. Along the smaller streams the bottoms are generally narrow, thus receiving a relatively large amount of wash from the upland. This develops an impure form of Huntington loam, running higher in clay than the average type.

The surface soil of the Huntington loam is generally a medium to a dark brown loam of 7 to 12 inches deep, but in places changing very little in texture until a depth of 2 feet, or even more, are reached. Immediately beneath the surface soil is often a heavy loam with considerable gravel or sand intermixed. The amount of gravel and sand continues to increase downward until at a depth ranging between 3 and 6 feet, where beds of nearly pure gravel or sand may be expected. In general the more loose and lighter varieties of the type are found as one approaches a stream, while the heavier phases occur near the upland. The first bottom is ordinarily more sandy than the second. Both the surface and subsoils vary greatly in texture, only remaining uniform over very small areas. The reason of this can be readily understood from a brief description of the origin of the Huntington loam.

Since the Huntington loam is almost always underlain by either stratified beds of gravel or sand, it is evident that its subsoils, from which it has been largely derived, were laid down by water; and since these beds of gravel have the same rock composition as the glacial drift of the surrounding country, they, undoubtedly, have been transported from the drift to the terraces by stream work. This work can be seen best at the time of a heavy rain, when innumerable little streams are rushing down the slopes with their loads of mud, sand and gravel, which they carry to the brook. This brook, like the rills of the hillside, deposits some of the heavier material wherever its current slackens; but succeeds in getting a portion of it to a larger stream. Each stream, no matter what its size may be, deposits the coarser material where the current is swiftest and the finest where it is more sluggish; so we may find boulders under the stream current, gravel just outside of the current, coarse sand beyond the gravel, silt well out in the flood-plain, and possibly clay beyond that. Where the velocity becomes less, coarse sand is deposited over the gravel and medium on the coarse, etc., thus developing a stratification.

All farmers of this locality are familiar with the fact that the bottom land is often considerably above the maximum extents of the greatest floods, and this question naturally arises: What relation exists between these high bottoms (terraces), the flood plain and the streams? At some time in the past the flood plains of the streams were located where the highest terraces are at present, thus leaving these terraces as the remnants of former flood plains. More than 99 per cent. of the terraces of this area received the material of which they are composed from the gravel, sand, silt and clay depositions taking place as stream currents slackened.

The normal development of the class of terraces, described above, takes place in the following manner: The valley plain or flood plain is formed when the steep gradient of the stream's course gives way to the gentler. This junction first occurs at the head of the valley, and then farther and farther up as the stream works back into the land. After awhile this advance becomes sufficient that the stream loses much of its load on reaching the head of its valley plain. It will then sink its channel into the flood plain farther down. When the flood plain stage is reached, meandering will likely take place. The meandering belt is narrower than the flood plain but continues to widen until it becomes sufficient in extent to hold the waters of ordinary floods; at which time a new flood plain is formed and the remnants of the old are left as terraces. At a later stage in the stream's history, erosion becomes less at the head, a smaller quantity of material is carried and the channel is deepened. Other factors, such as an uplift, an increase in the volume of a stream, the removal of a dam or the recession of falls, might also account for terraces, but would be classed as accidental causes.

At the melting of the Wisconsin ice sheet great floods were formed, which were heavily loaded with drift, and it was the deposition from this increased supply which built the flood plains high upon the sides of the valleys. When later the ice retreated, and the excessive supply became exhausted, streams began to cut or degrade their channels. The outcome of this has been some of the high gravel terraces of the Whitewater River.

For agricultural purposes the Huntington loam ranks high as a corn producer, forty-five bushels to the acre being probably a general average. When the land overflows in the early spring, but does not interfere with the growing season, corn often averages seventy bushels to the acre. The sediment deposited by the floods is a great replenisher for the land. Wheat, oats and hay all do better than they do on the Wabash loam, but often lodge and do not properly mature. This soil is used, near the larger towns, for gardening, owing to the fact that it is earlier than the Miami clay loam. The main difficulties with bottom lands are that they dry out badly in droughts, are exceedingly weedy where they are flooded, especially during a wet season, and are not benefited for ten or more years by a manure or commercial fertilizer like the Miami clay loam, two or three years being about as long as the improvement can be noticed. This seems to be due to the sandy subsoil, which permits the water to flow away through this natural underdrainage with the plant foods in solution.

WABASH LOAM.

The Wabash loam most often occurs as stretches of black land in the Huntington loam bottoms. These have a very high percentage of organic matter and make excellent corn land. They mark the sites of old bayous, swamps, or pondings of streams, where vegetation has accumulated in the presence of water. Sometimes these vegetal accumulations have not decomposed or become sufficiently mixed with other soils to show the earthy character—in which case they might be termed muck. The general texture of the Wabash loam is much like that of the Huntington loam, except for the high content of organic matter, and sometimes clay. Along some of the streams of Randolph and Henry counties this seems to be the leading bottom land type.

This type of bottom land is a better corn land than the Huntington loam, because of its high supply of humus, but not as good for wheat. Sixty-five bushels of corn to the acre is an average crop for the better class of farmers. A more complete discussion of the Wabash loam is taken up under Randolph and Henry counties.

WABASH SILT LOAM.

This type is similar in topographical occurrence and derivation to the Wabash loam, but runs higher in silt and clay. It has a very limited occurrence in Henry and Randolph counties, under which it is described in more detail.

MUCK.

This soil appears in both the bottom lands and the uplands of Randolph and Henry counties. It is an impure form of peat; a light, chaffy, partially decomposed vegetal matter, which in its natural state is deemed worthless in these seven counties, but when underdrained, mixed with other soils and properly cared for, it becomes equal to the Miami black clay loam for corn and has no equal for onions. Something more of its physical properties, how to improve it and the crops raised on it are treated in the reports of the counties in which it is found.

OTHER SOILS.

Since the Oak Forest silt loam, the limestone slope clay loam (both upland soils), together with the Hamburg loam, a bottom land soil, are confined, almost exclusively to Franklin County;

they are not discussed in this part of the report, but are described in the report for Franklin County.

CHEMICAL ANALYSES OF SOILS.

Ten samples of soils were obtained from the more typical developments of the various types and were sent to Dr. R. E. Lyons, Professor of Chemistry at the University of Indiana, for chemical analyses. The results of these analyses appear in the following table:

CHEMICAL ANALYSES OF SOILS.

Collector, Soil Sample, Description.	Taylor. Oak Forest Silt Loam Subsoil.	Taylor. Oak Forest Silt Loam Soil.	Taylor. Limestone Slope Clay Loam Soil.	Taylor. Huntington Loam Soil.	Taylor. Miami Black Clay Loam Soil.	Taylor. Miami Clay Loam Soil.	Taylor. Miami Loam Soil.	Taylor. Miami Clay Loam Soil.	Taylor. Miami Silt Loam Soil.	Taylor. Miami Clay Loam Soil.
Laboratory Numbers	31	32	33	34	35	36	37	38	39	40
Reaction to litmus	Acid.	Acid.	Neutral.	Acid.	V. F. Acid.	Acid.	V. F. Acid.	Neutral.	Neutral.	V. F. Acid.
Moisture from air dry at 105° C.	2.36	1.83	3.30	1.69	3.07	1.97	2.19	2.38	1.60	2.54
Total soil nitrogen	.052	.162	.198	.184	.235	141.	.242	.286	.169	.079
Carbon dioxide					1.557					2.773
ANALYSES OF FINE EARTH DRIED AT 105°C.										
Volatile and organic	2.488	3.409	5.480	3.813	7.129	4.008	5.079	6.850	3.921	5.996
Insoluble in 1.115 HCl	88.894	89.991	81.209	89.844	78.667	88.632	86.819	83.303	88.526	77.689
Soluble silica	.173	.161	.175	.132	.124	.142	.092	.133	.101	.112
Ferric oxide ($Fe_2 O_3$)	2.539	2.117	4.599	2.538	3.431	2.480	2.616	3.539	2.633	4.329
Alumina ($Al_2 O_3$)	4.784	2.555	5.398	2.183	5.911	3.150	3.052	3.012	2.846	7.169
Phosphoric acid anhydride ($P_2 O_5$)	.110	.130	.421	.180	.169	.121	.237	.146	.118	.115
Calcium oxide (Ca O)	.084	.349	.851	.338	2.309	.349	.575	.986	439	2.912
Magnesium oxide (Mg O)	.487	.378	.759	.319	.757	.448	.431	.804	.554	.715
Sulphuric acid anhydride ($S O_3$)	.043	.035	.037	.043	.043	.050	.056	.074	.037	.051
Potassium oxide ($K_2 O$)	.250	.230	.382	.259	.421	.180	.251	.291	.341	.319
Sodium oxide ($Na_2 O$)	.265	.183	.164	.199	.489	.195	.309	.378	325	.314
Total	100.117	99.538	97.475	99.848	99.450	99.755	99.517	99.516	99.841	99.721

In the above table samples 31 and 32 were obtained from the Oak Forest silt loam of Franklin County. This soil and subsoil run very low in lime (CaO) and organic matter. It is the lightest colored soil of the area of survey. Number 33 was procured from the residual soil of the Cincinnati limestone. It is dark colored and has a high content of organic matter. Number 34 represents the leading bottom land type. Number 35 belongs to the dark brown to black soil of the Miami series, which leads all others of the upland types in production of corn. Number 36 is of the lighter colored soil of the Miami clay loam, commonly called "white beech land," while number 40, which is commonly known as "sugar tree land," is of the medium brown color. Number 38 was taken from a special soil of the sugar tree variety of the Miami clay loam, which is particularly well adapted to the growing of the *"American Beauty Roses." Number 37 is a typical sample of the Miami loam and 39 of the Miami silt loam.

CLIMATE.

The climatic conditions of this portion of Indiana are generally favorable for the growing of crops. The rainfall is well distributed throughout the year, 39.51 inches being about the normal annual average; droughts are rare, extreme temperatures seldom occur, and the growing season ranges from five to six months, no killing frosts occurring during this period, while the winters are seldom severe.

Mauzy, which is located near the center of the area, had its warmest month since 1882 in July, 1901, with a mean temperature of 80.2°, and its coldest month in January, 1884, with a mean of 14.2°. The coldest winter (December, January and February) was that of 1884-85, with a mean temperature of 19.3°, and the mildest, that of 1889-90, with a mean of 37.6°. The warmest summer (June, July and August) was in 1901, with a mean temperature of 75.6°, and the coolest in 1883, with a mean of 66.0°. The highest temperature recorded was 108°, on July 22, 1901, and the lowest 26°, on January 6, 1884. The wettest year was 1883, with a total precipitation of 57.31 inches, and the dryest, 1895, with 27.05 inches. The greatest monthly precipitation was 10.67 inches, in March, 1898, and the least, 0.26 inches, in August, 1889.

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*See page 77.

NORMAL MONTHLY AND ANNUAL TEMPERATURE AND PRECIPITATION.

MONTH.	CAMBRIDGE CITY.		CONNERSVILLE.		FARMLAND.		MAUZY.		RICHMOND.		GREENSBURG.	
	Temperature. °F.	Precipitation. Inches.	Temperature. °F.	Precipitation. Inches.	Temperature. °F.	Precipitation. Inches.	Temperature. °F.	Precipitation. Inches.	Temperature. °F.	Precipitation. Inches.	Temperature. °F.	Precipitation. Inches.
January	26.6	3.00	27.5	3.00	26.5	2.69	25.5	3.29	26.9	3.00	29.8	2.00
February	25.1	2.30	29.5	3.40	28.9	3.17	28.2	3.75	29.2	2.64	25.1	2.71
March	39.0	4.08	38.8	3.58	37.6	3.02	36.9	3.75	36.8	3.56	41.6	5.83
April	50.8	3.36	51.2	3.07	50.5	3.22	50.4	3.13	50.3	3.05	53.4	3.48
May	60.7	3.82	61.6	4.10	61.1	4.48	61.0	4.30	60.6	3.15	63.8	3.10
June	70.6	4.22	71.6	4.19	70.8	3.80	70.5	4.47	70.7	4.14	74.3	4.58
July	74.5	3.23	74.7	2.93	73.7	3.46	73.4	2.86	74.7	3.24	75.8	3.95
August	72.2	3.15	71.8	3.90	71.2	3.72	70.6	2.79	71.0	4.23	74.9	1.98
September	65.3	3.29	65.5	2.59	65.1	3.37	64.1	2.88	65.7	2.76	66.6	4.59
October	53.3	1.90	52.9	2.21	52.8	1.77	51.4	2.40	53.2	2.40	58.2	2.93
November	40.1	3.65	40.7	3.88	....	3.50	40.2	4.03	40.6	3.70	45.8	3.53
December	30.9	2.67	32.1	2.82	32.3	2.57	30.2	3.31	31.2	2.81	30.4	2.80
Year	50.7	38.57	51.5	38.67	....	38.77	50.2	40.96	50.9	38.68	53.4	41 41

DATES OF FIRST AND LAST KILLING FROSTS.

	Cambridge City.		Connersville.		Farmland.		Mauzy.		Richmond.		Greensburg.	
	Last in Spring.	First in Fall.	Last in Spring.	First in Fall.	Last in Spring.	First in Fall.	Last in Spring.	First in Fall.	Last in Spring.	First in Fall.	Last in Spring.	First in Fall.
1904	May 16	Oct. 7	May 16	Oct. 7	May 16	Oct. 27	May 16	Oct. 23	May 16	Oct. 7	April 21	Oct. 23
1905	April 23	Oct. 12	April 18	Oct. 12	April 22	Oct. 12	April 22	Oct. 12	May 1	Oct. 12	April 22	Oct. 12
1906	May 11	Oct. 10	May 10	Oct. 10	May 10	Oct. 10	May 10	Oct. 10	May 11	Oct. 11	May 9	Oct. 11
1907	May 28	Oct. 9	May 28	Oct. 29	May 21	Oct. 14	April 21	Oct. 12	May 28	Oct. 9	April 24	Oct. 12
1908	May 2	....	May 1	Oct. 12	April 17	Sept. 3	May 2	Oct. 2	May 1	Oct. 2	May 1	Oct. 2
Average	May 10	Oct. 9	May 8	Oct. 12	May 5	Oct. 7	May 6	Oct. 12	May 11	Oct. 8	April 27	Oct. 12

SNOWFALL AND NUMBER OF RAINY DAYS FOR THE YEAR.

	Cambridge City.		Connersville.		Farmland.		Mauzy.		Richmond.		Greensburg.	
	Total Snowfall in Inches.	Number of Rainy Days.	Total Snowfall in Inches.	Number of Rainy Days.	Total Snowfall in Inches.	Number of Rainy Days.	Total Snowfall in Inches.	Number of Rainy Days.	Total Snowfall in Inches	Number of Rainy Days.	Total Snowfall in Inches.	Number of Rainy Days.
1904	27.6	115	34.5	105	....	108	33.5	113	....	95	....	115
1905	19.1	110	14.4	89	26.7	101	29.7	125	10.2	100	25.7	124
1906	37.5	93	41.4	109	42.7	101	46.3	129	32.6	107	39.4	137
1907	....	106	5.3	105	....	116	18.3	135	11.9	118	19.7	135
1908	14.5	82	18.1	105	11.6	100	21.9	104	12.8	99	17.9	90
Average	24.7	101	22.7	103	27.0	105	29.9	121	16.9	104	25.7	120

GROWING AND USES OF ALFALFA.

Alfalfa is little more than passing through its initiatory stages in this part of Indiana. Few of the fields exceed five acres, and the average is not over two and a half. It is being raised successfully on all of the types of land represented in this area except the Oak Forest silt loam, where it has not had a fair trial. The best crops of alfalfa have been grown on the Miami black clay loam underlain by a gravelly yellow clay and covered by the wash from the upland. A splendid example of such conditions is found on the farm of Dr. Clark, one-half mile south of Economy.

In April, 1903, Dr. Clark, after carefully inoculating with alfalfa dirt and preparing the ground of a five-acre field, which was well tiled, sowed his alfalfa seed. The next year he cut two tons of hay, and the following the same amount. Because of the poor stand, which was found to be due to a poor grade of seed, he again broke up the land in April, 1906. This time he inoculated with sweet clover soil and used great care to obtain a good seed. After getting his seed-bed into as good condition as he knew how, he sowed his seed, and the result was a most excellent stand. On June 8, 1908, he cut six tons of hay from these five acres; on July 17, six tons, and on August 8, eight tons. He could have cut another crop, but instead turned his sheep into the field. Later in the fall he scattered manure over the ground with a manure spreader. His crop on June 15, 1909, was eleven tons; on August 2, eight tons, on September 16, twelve tons, and another good crop could have been taken off, but the sheep were again permitted to pasture on it. The roots of this alfalfa are covered with the little nitrogen tubers that are developed by the minute organisms known as bacteria.

Dr. Clark informed the writer that his sheep received no feed except alfalfa, that the old ewes kept fat, and in January, 1908, when they dropped their lambs their udders were large and contained abundance of milk. The lambs were large and sound and all lived. In May, 1908, these lambs weighed ninety-six pounds. The doctor says that he only has to feed his horse one-half as much alfalfa as other hay, and by cutting it up, sprinkling a little bran over and pouring hot water on that it makes a very good feed for chickens, causing them to lay better than any feed he has ever tried.

Where the Miami clay loam or Miami silt loam is well underdrained, good seed is used and proper preparation of the soil is made, a stand invariably follows. For the area under consideration no better description of alfalfa raising on the Miami clay loam can be given than to relate the experience of Oliver La Fuse, the leading alfalfa grower of Union County.

A three acre field, partly Miami black clay loam and partly Miami clay loam, was selected. Across both of these soils a gravel road had once passed, but had been abandoned thirty years previously, thus permitting the gravel to become thoroughly mixed with the soils. In the latter part of April, 1902, Mr. La Fuse sowed his alfalfa seed, but he did not get a healthful growth. The leaves turned yellow after it began to grow. The second year he got about three tons of hay from the field. In April, 1903, he procured 800 pounds of alfalfa dirt, and, after pulverizing, scattered it over the field with a shovel. No apparent difference in the growth of the alfalfa could be seen until late in September, when streaks of a dark green color began to show, these being due to the unequal distribution of the inoculation dirt. Upon examining the roots of the alfalfa growing in the streaks, little tubers were found to be developing, when nothing of the kind had been seen before. Later the darker streaks began to widen, and finally this color covered the entire field. In 1905 twelve tons of hay were taken off in three cuttings, and it was noticed that where an old road had been, on the Miami clay loam, the crop had doubled that on either side and was also much better where this road had crossed the Miami black clay loam, thus showing the effect of a loose, warm, well aerated soil. In 1906 fifteen tons were obtained from the three acres.

Probably more alfalfa is raised on the Huntington loam than on all of the other soils combined. This seems to be due to its being easy to get a good stand on this warm, sandy soil, with its natural underdrainage. The roots have a loose, well aerated subsoil to penetrate, which enables them to get their supply of nitrogen at a considerable depth as well as at the surface. The most successful alfalfa grower on the Huntington loam which the writer met in the area surveyed was John Martin, of Franklin County. His farm is situated two miles west of Brookville, the county seat of Franklin County. The land on which Mr. Martin grows alfalfa is a first bottom that overflows during the time of the freshets in the spring, and is in some cases old gravel bars that were considered waste land, being entirely too gravelly for corn, wheat or oats. After planting in almost all months between April and October, Mr. Martin considers the best method and time to plant is to break the ground immediately after the wheat is taken off. Then, by dragging his ground every two weeks until September, he obtains a good seed-bed and gets rid of his weeds. At this time the seed is sown. By the next spring the alfalfa is ready for cutting and the farmer has not been deprived of his land like he would have been had he sown in April or May. In that event he should not take off any cutting the first year, but leave it lay as a mulch to protect the roots and enrich the land. Mr. Martin gets an average yield of four and a half tons to an acre, while the general run of farmers get about three tons.

As a feed for cows and horses alfalfa, in Mr. Martin's estimation, has no equal. When a change is made from other feed to alfalfa, in a very few days an increase in the flow of milk, and the amount of butter that can be made from a pound of milk is noted.

The size of crops and the growing of alfalfa on the Miami loam resembles that of the Huntington loam, while the Miami silt loam, in this respect, is more like the Miami clay loam. Good crops of alfalfa are in the reach of all, if the proper care is exercised. In brief, the chief requirements are: (1) A well underdrained land; (2) a soil that is warm, loose and open, so the air can circulate through it; (3) a good seed-bed, free from weeds; (4) a careful inoculation with either alfalfa or sweet clover dirt, good seed, and the land in a high state of fertility. If the land is a clay or silt loam, a few loads of crushed limestone sand or local gravel can be very profitably scattered over it. This gives a looser texture and adds a material that will decay in time and supply lime. If the ground is first bottom, one should be careful and not plant too near the ground-water level, since as soon as the roots get to the water the alfalfa will begin to die.

CORN.

The crop that is grown most, yields the best and brings the largest returns in the area of survey is corn. On the other hand, there is no crop so small, when compared with what it really should be. This fact impressed the writer very strongly while visiting almost every square mile of the country designated and noting that the best class of farmers were getting crops that would average 40 per cent. better than the general run. Neither the ground nor the natural facilities for improving it were any better than those of their neighbors.

One of the leading difficulties in the year 1909 was that the land was too wet to cultivate, this giving the weeds a chance to encroach upon the corn. Another difficulty was that it was very late in the spring before the corn could be planted. The best farmers overcame both of these obstacles by having their land tiled, so they were able to plant a couple of weeks before their neighbors and tend their corn when it needed it most. In 1908 the crop average was very low on account of the drought, but the best farmers in general got good crops. They accomplished this by keeping up a shallow and level cultivation, and so conserved the moisture; or, more properly speaking, their stirring of the surface allowed the moisture in it to evaporate and create in the upper interstices of the soil partial vacuums which brought the water up from below by capillary attraction. I found that some of these farmers had cultivated their corn every other week from the time they had planted until the husk began to turn yellow, and the man that raised the best corn crop in the State for 1908 went through his corn every week. He used a lapped board drag for his shallow cultivation, except after a rain, when he used a 1½-inch spike drag.

A neglect to replenish the soil is another common cause of poor corn. The best farmer believes in giving nourishment to his land as well as to his stock. He feeds almost everything that he raises on the place and in this way gets a large portion of the plant food back from the droppings. Hog men generally aim to feed their hogs over the poor portions of the farms. A careful rotation is practiced, and green manuring is resorted to. Good farmers are often found buying hay and plowing under clover. By a careful selection of their typical soils, which they have had analyzed by the State Experimental Station at Purdue, and also by trying various commercial fertilizers on special rows of corn or over particular plats of ground, they have been able to get the fertilizer that will supply the plant food which is lacking in their soils. Many farmers are very careless in breaking the land in the spring, merely skimming over the surface, instead of setting the plow down to a good depth and turning up, at least, all of the plow soil. Some of the more progressive farmers make it a rule to plow into the subsoil slightly each time and in this way get a greater amount of plow soil so that the corn roots will have a larger scope from which to obtain their nourishment. Too much care cannot be exercised in getting a good seed-bed after the breaking has been completed.

Matters that are much neglected and at the same time rank among the most important in obtaining a yield of corn, are the selecting, breeding and testing of seed corn. In fact, these are of sufficient consequence that the foremost corn growers of the United States say that an increase of yield, ranging from twenty-five to forty bushels to the acre can be realized in five or six years by observing them in practice. These leading corn growers maintain that the seed should be selected in the field before cutting, that the ear should be about 4 or 4½ feet from the ground and should come from a hill that has produced three good stalks. The corn should then be ranked or hung up in a dry place, where there is a free circulation of air, in order that it will thoroughly dry before the cold weather sets in.

Some farmers through breeding of corn can guarantee it to grow if true to type. By means of a careful record they know the dam and sire of an ear and know almost exactly what it will produce to the acre. A simple method of keeping a record is to take a box 20x40 inches and 3 inches deep, filled with dirt, and divide it into squares 2x2 inches by drawing a string back and forth across it. Number the squares, then take three grains from an ear, one from each end and one from the middle; turn the ear and in the same manner select three more grains. By planting the six grains in one of the squares and numbering the ear, one has his record when the corn comes up. A box 20x40 inches will test 200 ears, which will plant about fifteen acres. This method gives a reasonable assurance that corn will grow in every hill. Suppose corn fails to grow in every tenth hill, which is a common occurrence, it means that one acre is lost in every ten.

Other very important factors in corn raising or doing anything else in the agricultural line is to keep in touch with what the leading agriculturists are doing through good farm papers, by attending farmers' institutes, fairs and lectures, or by visiting and investigating the methods of the most progressive farmers of your own vicinity and adjacent vicinities.

HOW TO AVOID THE WASHING OF THE LAND FROM THE HILLSIDES.

In the more hilly portions of the section of country under discussion, erosion, or washing, has rendered worthless a high percentage of the hillside land. In some cases the farms which were once reported to produce fair crops have been so cut up and washed that they have sold for $2 per acre. The reason for such deterioration in the land has been due largely to careless plowing. Instead of plowing as near as one can conveniently at right angles to the steepest slope, farmers often plow almost with the slope, giving the water after a rain a gutter in which to flow. Crops that necessitate the ground being bare for long periods, like corn and tobacco, should not be raised so much on the hillsides, but, instead, blue grass, alfalfa or something that will hold the soil. Underdrainage is also a great help in keeping the land from washing, large volumes of water being carried off through the tiles that would otherwise flow off on the surface.

HOW TO MAKE A SOIL OUT OF AN EXPOSED SUBSOIL.

How to get into a high state of cultivation a Miami clay loam or Miami silt loam subsoil that has been exposed to the surface on account of the soil being washed away has been a very difficult problem for farmers to solve. The consensus of opinion of leading farmers seems to be to (1) see that the land is well underdrained; (2) then put straw or something on for humus; (3) sand or gravel plowed in is also a good thing to make the soil more porous and better aerated; (4) apply a manure dressing; (5) and if a stand of clover is obtained it should be plowed under without cutting it either for hay or seed. By pursuing a treatment about like the one given above, farms that would not produce an average of ten bushels of corn to an acre, are today yielding sixty.

A special treatment given by Wm. A. Lewis of Williamsburg, some years ago, to one and one-half acres of subsoil, occupying the site of an old brickyard, may assist someone in developing a soil out of subsoil. Mr. Lewis, when he had completed the tiling, broke this ground with a three-horse sulky plow, after which he put on a coating of wood ashes, then applied five loads of plaster sand. He next added seven cords of rotted wood (chip manure), which he procured at a sawmill. When two years had elapsed, giving the chip manure, straw and sand a chance to become well mixed with the ground, this one and one-half acre was as productive as any other part of Mr. Lewis' farm.

AGRICULTURAL METHODS AND CONDITIONS.

In order to consider the cultural methods generally practiced, it is necessary to divide the surveyed area into two divisions the larger of which comprises eighty-five per cent. of the seven counties and the smaller fifteen per cent. With exception of some very limited areas of the limestone slope clay loam, and the Hamburg loam, all of the soil types of the larger division occur on the Later Wisconsin drift and have originated from it; while the type occupying the surface of the Illinoian drift makes up the smaller division.

Later Wisconsin Drift and Soils. Throughout the Later Wisconsin drift area, where the Miami series occupy the upland and the Huntington and Wabash loams the bottom lands, there have been marked advancements in cultural methods. In spite of the fact that the pioneers had the new and strong virgin soils on which to grow their crops, it is not uncommon to find the present generations getting better crops from the same fields. Especially is this true for corn. By going back four or five decades, we find the farmer turning his ground with a breaking plow, harrowing once and sometimes not at all. Rotation was hardly ever thought of, corn being grown upon the same field for twenty consecutive years, and the same was true of wheat. The benefits derived from tiling, systematic stock feeding, selection of seed, green manuring and commercial fertilizers were almost unknown. Today, the average farmer has gotten out of the old rut and is using, to some extent, the more advanced methods; but he yet falls far short of complying with the requisites necessary to get the best crops from the soil.

The best farmers make it a rule to rotate corn, wheat and clover, generally using the clover as a green manure; but the great majority could not be said to follow any system of cropping. A good many raise corn for two or three years, then wheat or oats, followed by clover and timothy, which is cut for hay and seed. What is left of the clover is pastured, after which corn is again planted. In other cases the corn is followed directly by clover or timothy, because of frequent failures in their wheat and oats crops. Some grow corn as long as possible, then follow with oats and once in a great while clover is grown, while others alternate corn and oats and then in every four or five years introduce clover. Timothy is often grown instead of clover, because of heaving, which is due to the undrained condition of the ground.

As a hay, clover is preferable to timothy for improving the land, since it takes the nitrogen out of the atmosphere and puts it into the soil. As a clover hay the little red clover is considered best, but as a green manuring crop the big English clover is generally liked better on account of the great amount of organic matter that it adds to the soil. When the soils do not run too high in organic matter, wheat is grown instead of oats as a nurse crop for clover, since it draws less upon both the moisture and the available plant foods of the soil, giving the clover a better show after the grain is taken off. A hay that is far richer in nutrition, yields more tons to the acre and supplies the nitrogen to the soil as well as any of the other clovers, is alfalfa. By a proper preparation of the soil of the Miami clay loam, Miami silt loam, Miami black clay loam, Huntington loam, or Miami loam, a stand is almost sure to follow. Farmers of this area will find themselves highly repaid if they will grow it.

The stable manure is almost always scattered over the corn ground and the old fork method of spreading it is rapidly giving away to the manure spreaders, which pay for themselves in a few years. Commercial fertilizers are used by two-thirds of the farmers of this area in growing wheat, but not near so much for corn. The few farmers, who are trying different commercial fertilizers on various plats of land or on certain rows of corn, and in addition are having their soil analyzed by the Purdue Experimental Station to learn whenever it is lacking in plant foods, are realizing excellent results. But many seem to have no conception as to what their land needs in the way of a commercial fertilizer and use it without any system. If it happens to have some of the plant foods needed, it meets their approval; but if not, all brands are considered injurious to the ground.

The rule seems to be that the poor farmers sell their corn and hay at the elevators or to the better farmers who feed it in addition to what they themselves raise. The average farmers sell a small part of their hay and grain, except wheat. Wheat by all three classes, is almost always sold at the elevators.

Of late years the growing of tomatoes has received some attention, especially in Henry County, where over 200 acres were devoted to this crop in 1908. Some five or six canning factories have been established in this county. An average yield ranges from six to eight tons per acre.

With exception of north central Henry County, very few potatoes are raised for the outside markets. Crops range from seventy-five to 150 bushels to the acre.

During the last decade there have been steady advances in the value of land. This has been due partly to the increase in prices and demand for farm products, but also to numerous improvements. Taking the area as a whole, the farm improvements are above the average for the State of Indiana. The average farm dwelling is a neatly painted two-storied frame building, while the barns are large and substantially built. Fences are generally good, mostly being wire, but some hedges and a few rail fences are found. Several million rods of tile lie beneath the surface of this area, yet it is not one-fifth of what is needed.

About sixty-five per cent. of the farmers own the land they cultivate. More renting is done on shares, under a five-year contract, than by cash. When rented on shares, the landowner generally furnished one-half of everything except labor, and gets one-half of the net income. From $3.50 to $6.00 per acre is the usual cash rent. Owing to a common practice of cash renters in getting all they can from the soil without replenishing, it is considered very unadvisable for land owners to rent for cash.

There seems to be a growing tendency toward smaller farms and more intensive farming. Experienced farm hands are rare and many farmers claim that they can realize more from an eighty-acre farm, where they can attend to almost everything themselves, than they can from a 160-acre farm, where it is necessary to do considerable hiring. It is especially difficult to get hired help during harvest, when it is needed most. Where labor is hired by the month or year, from $18.00 to $22.00 per month is about the average wage, while during harvest from $1.50 to $2.50 per day is the customary rate.

The live stock interest centers largely in hogs, farmers turning off, annually to the 100 acres, all the way from 20 to 125 head. These consist largely of Duroc and Poland-China, and a few Chester White and Berkshire. One or two farmers in almost every neighborhood, will fatten each year from ten to twenty young steers. Very few farmers are in the dairy business on a large scale, although almost every farmer has, at least, two or three cows for butter and milk. Dairy herds consist principally of Jerseys and some Holsteins, while the beef cattle are Shorthorns, Herefords and Angus, the former predominating. In each county there are a few men making a specialty of raising horses, but the ordinary farmers raise very few for the outside markets. Probably more Percherons are found than any other breed. About one farmer out of six has from ten to thirty head of sheep, the Shropshire blood predominating. The few mules raised are used mostly to supply the local demand for work animals of this type.

Almost every farm has a few apple trees and sometimes a few pear, peach, cherry and plum trees, but generally little attention is given to them other than to have enough fruit for the home supply. Much better yields can be realized by giving the trees the proper attention.

There is some difference in the agricultural value of the various soil types. Of the upland soils, the Miami black clay loam is the best for corn but the poorest for wheat, while the Miami clay loam and Miami silt loam are good for general farming purposes. The Miami loam is about as good as the Miami clay loam and Miami silt loam for wheat and oats, but better for corn. Of the bottom land the Wabash loam and Wabash silt loam are the best for corn, and the Huntington loam for general farming. The land ordinarily ranges from $65.00 to $125.00 per acre, the Miami black clay loam demanding the best prices, the Miami loam the next best followed by the Huntington loam, and this in turn by the Miami clay loam and Miami silt loam.

Illinoian Drift Soil. Over the one representative of the Illinoian drift soil (the Oak Forest silt loam), the cultural methods, being practiced, are little in advance of the forefathers. There is no system of rotation, very little clover is grown and tile are very exceptional. The land is badly worn out and is in a cold, clammy and sour state. By using considerable fertilizer wheat is grown, which is the principal crop. Corn yields are very low and oats only fair. Timothy is the leading hay. Very little stock is raised and consequently the amount of manure is meagre.

The buildings, fences and general farm improvements are poor, except for a few neighborhoods. Where the land is badly cut up by stream valleys not over five per cent. is cultivated. Such land sells as low as $2 per acre, while the best farms will bring $60.

By tiling, using lots of lime to correct the sourness, growing clover, incorporating humus by means of green manuring crops and more stable manure, by raising more stock and feeding them over the farms, practicing a judicious rotation of crops, selection of seeds, and a careful cultivation, this type will produce crops almost as good as the Miami clay loam and Miami silt loam.

RANDOLPH COUNTY.

Immediately north of Wayne County, south of Jay and bordering the Ohio line on the east is Randolph County. It has an area of 450 square miles.

The first settlement in Randolph County was made in April, 1814, by Thomas W. Parker in sec. 28 (16 N., 1 W). A considerable number of land entries were made in 1814 and 1815, but the act creating the county was not approved until January 10, 1818. As early as 1815 both a school and church existed, and in 1818 Winchester was selected as the county seat.

Many of the early settlers were transient and gave very little attention to agriculture, but turned their attention to trapping, hunting and bartering. But some men came to stay and these made clearings, built cabins and planted corn. One of these men, Henry W. Way, planted an orchard west of Winchester, prior to 1820. In these early days, salt sold for $18 per barrel, corn 10 cents per bushel, oats 12 cents, pork ¾ cents per pound and beef 1½ cents. Good milk cows were worth $7 apiece.

There is one thing that the people of Randolph County can be especially proud of, and that is the fact that in 1856 the first tile ever made in the State of Indiana were burnt at the brickyard of Elisha Martin, situated south of Winchester. In 1881 there were seventeen tile factories in the county turning out 100,000 rods annually. Since that time there has been a steady increase in the demand for tile, and today Randolph County boasts of over 1,000,000 rods of tile lying beneath her splendid farm land.

Although agriculture, by many odds, is the leading industry of the county, yet its largest towns have some very good manufacturing plants. At Winchester, the county seat and a town of 6,000 inhabitants, are the works of the Woodbury Glass Co., which are said to be the largest of their kind in the world. It gives employment to 550 men. Union City, in the east central part of the county, with a population of 4,000 on the Indiana side and 1,000 on the Ohio, has two carriage works, one wheel factory and a back stay factory, which give employment to 1,000 men. In the north central portion of the county, is Ridgeville with its large stone quarry and a brush and broom plant. Besides these towns already named are Farmland, Lynn and Saratoga, all of which are prosperous and growing, with populations ranging from 700 to 1,200.

Out of 900 miles of road in Randolph County, about 325 are gravel or macadam. Although the county is rather deficient in its supply of gravel for road building, yet it has an inexhaustible supply of limestone, in the northern portion, that is being used extensively for road building.

The railway facilities are excellent. Two divisions of the Big Four cross it from east to west, one through the center and the other across the southern third. The G. R. & I. bisects it from north to south; the P. C. & St. L. crosses the northwestern quarter and the C. C. & L. the southwestern. An interurban traction line passes through the center of the county from east to west.

As an agricultural county, Randolph takes its place among the best of the State. In 1908 over 27,000 acres of wheat, 86,000 of corn, 26,000 of oats, 1,200 of rye, 29 of buckwheat, 21,000 of clover, 450 of potatoes, 120 of tomatoes, 600 of tobacco, 11,000 of timothy, and 110 of alfalfa were harvested. On January 1, 1908, there were on hands 9,800 horses and colts, 220 mules, 7,400 dairy cattle and 5,000 beef cattle. Over 70,000 hogs and 9,000 sheep were sold during the same year. The tillable land of Randolph comprises about seventy-six per cent of the total area, while the cleared land in pasture is about thirteen per cent. and the woodland in pasture about eleven per cent.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	Estimates of Well-Informed Farmers as to the Annual Average Crops Through a Series of 10 Years, Together With Some Statistical Averages for 1908.																				
						Bushels Per Acre.												Tons Per Acre.								
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Franklin	Miami clay loam	Farmers				50	37			14			30						1½							
	Miami black clay loam	Farmers				65	40			13																
	All types occurring	Statistical Report	14,000	9,885	1,578			35			18			19			1⅓			1			1⅕			
Green	Miami clay loam	Farmers				60	38			14			35													
	Miami black clay loam	Farmers				70	44			11			25													
	All tpyes occurring	Statistical Report	18,916	4,576				36			16			19			1⅑			1¼			1⅑			2
Green's Fork	Miami clay loam	Farmers				55	35		19	17			35						1½							
	All types occurring	Statistical Report	24,939	20,732				32½			18½			20			1			1¼			1⅓			2
Jackson	Miami clay loam	Farmers				60	40																			
	All types occurring	Statistical Report	18,423	15,633				34½			16			21			1			1			1			3
Monroe	Miami clay loam	Farmers				60	35						35													
	Miami black clay loam	Farmers				70	40						30													
	All types occurring	Statistical Report	15,726	9,148				35			21			24			1½						1⅓			
Nettle Creek	Miami clay loam	Farmers				50	30		15	12			40													
	All types occurring	Statistical Report	20,145	17,464				36½			15⅓			19			1⅙			1⅕			1			
Stoney Creek	Miami clay loam	Farmers				55	35			14			30			1½			1½							
	Miami black clay loam	Farmers				60	40						30			1½			1½							
	All types occurring	Statistical Report	16,829	13,852				39½			20			16			1⅑			1¼			1⅓			

West River	Miami clay loam	Farmers	....	....	.....	50	32	....	20	15	....	..	35	....	..	..	..	..	..	..	..	.	..	..	..	..
	Miami black clay loam	Farmers	....	....	.....	60	40	....	..	14	....	..	35	....	..	..	..	..	..	..	..	..	..	..	..	..
	Huntington loam	Farmers	....	....	.....	50	40	....	..	15	....	..	..	....	..	..	..	..	..	..	..	..	..	..	..	..
	Wabash loam	Farmers	....	....	.....	70	45	....	..	13	....	..	..	....	..	..	..	..	..	..	..	..	..	..	..	..
	All types occurring	Statistical Report	25,037	20,490	.....	..	....	31½	..	..	15	..	..	18½	..	..	1½	..	..	1¼	..	..	1	..	..	..
Ward	Miami clay loam	Farmers	....	....	.....	55	35	....	25	13	....	..	40	....	..	2	..	..	1½	..	..	..	..	..	..	..
	Miami black clay loam	Farmers	....	....	.....	60	40	....	..	..	....	..	..	....	..	..	..	..	..	..	..	..	..	..	..	..
	All types occurring	Statistical Report	23,324	21,000	.....	..	....	30	..	..	15	..	..	24½	..	..	1	..	..	1⅑	..	..	1⅑	..	..	1
Washington	Miami clay loam	Farmers	....	....	.....	45	30	....	..	15	....	..	35	....	..	..	..	..	1½	..	..	..	..	..	..	..
	Miami black clay loam	Farmers	....	....	.....	70	40	....	..	14	....	..	35	....	..	..	..	..	1½	..	..	..	..	..	..	..
	All types occurring	Statistical Report	....	....	.....	..	....	40	..	..	17½	..	..	19	..	..	1	..	..	1⅕	..	..	1	..	..	1⅓
White River	Miami clay loam	Farmers	....	....	.....	55	35	....	18	15	....	..	35	....	..	..	..	..	1½	..	..	1½	..	..	..	..
	Miami black clay loam	Farmers	....	....	.....	70	40	....	..	13	....	..	33	....	..	..	..	..	..	..	..	..	..	..	..	..
	All types occurring	Statistical Report	29,739	22,058	.....	..	....	....	..	..	19	..	..	24	..	..	1	..	..	1½	..	..	1¼	..	..	2
Wayne	Miami clay loam	Farmers	....	....	.....	60	40	....	..	15	....	..	25	....	..	2	..	1½	..	..	..	..	..	..	4½	..
	Miami black clay loam	Farmers	....	....	.....	70	45	....	..	12	....	..	25	....	..	2	..	..	..	..	..	..	..	..	..	..
	All types occurring	Statistical Report	23,301	21,035	.....	..	....	41	..	..	19	..	..	24½	..	..	1	..	..	1	..	..	1⅕	..	..	1
Totals and averages for Randolph County		....	230,379	175,873	.....	60	38⅓	35½	19	14	17½	..	3	21	..	1¾	1⅙	..	1½	..	..	..	..	..	..	..

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	TAKEN FROM STATISTICAL REPORTS FOR 1908.						ESTIMATES OF FARMERS AND STATISTICAL REPORTS FOR 1908.				Estimates of Farmers as to the Selling Price of Land per Acre.
			Stock of Various Kinds on Hand Jan. 1, 1909.						Stock of Various Kinds Turned off Annually for Each 100 Acres of Land.				
			Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	
Franklin	Miami clay loam	Farmers							35			10	$70 to $90.
	Miami black clay loam	Farmers							40				$75 to $100.
	All types occurring	Statistical Report	408	17	350	214	632	1,173	22	½			
Green	Miami clay loam	Farmers							30	1			$70 to $100.
	Miami black clay loam	Farmers							40	1			$75 to $125.
	All types occurring	Statistical Report	710	11	593	697	898	2,635	31	½			
Green's Fork	Miami clay loam	Farmers							35	1½	½	2	Av. $75.
	All types occurring	Statistical Report	956	53	738	129	429	1,486	12½	⅗			Av. $100.
Jackson	Miami clay loam	Farmers							45	1	1	¼	Av. is $100.
	All types occurring	Statistical Report	727	17	528	419	336	1,366	15	1			
Monroe	Miami clay loam	Farmers							35	1	7	6	$70 to $100.
	Miami black clay loam	Farmers							45				
	All types occurring	Statistical Report	591	2	395	700	937	2,666	28½	⅗			
Nettle Creek	Miami clay loam	Farmers							30		2	5	$40 to $80.
	All types occurring	Statistical Report	755	13	474	403	652	3,299	33⅓	2½			
Stoney Creek	Miami clay loam	Farmers							30		5	7	
	Miami black clay loam	Farmers							40				
	All types occurring	Statistical Report	824	11	587	644	1,192	4,419	36	1			

West River	Miami clay loam	Farmers							35	1	2	5	$50 to $80.
	Miami black clay loam	Farmers							50				$60 to $100
	Huntington loam	Farmers											
	Wabash loam	Farmers											
	All types occurring	Statistical Report	1,029	54	716	666	1,111	3,964	36⅔	6/7			
Ward	Miami clay loam	Farmers							40	2	2	1½	$65 to $115.
	Miami black clay loam	Farmers											
	All types occurring	Statistical Report	760	6	520	359	260		8½	⅓			
Washington	Miami clay loam	Farmers							35	2	3	5	$5 to $90.
	Miami black clay loam	Farmers							45				$75 to $110.
	All types occurring	Statistical Report											
White River	Miami clay loam	Farmers							35		3	4	$70 to $100
	Miami black clay loam	Farmers							40				Av. is $100
	All types occurring	Statistical Report	122	15	927	622	1,119	9,363	31	6/7			
Wayne	Miami clay loam	Farmers							35	2	1	4	Av. is $85.
	Miami black clay loam	Farmers							40				Av. is $100.
	All types occurring	Statistical Report	923	20	788	237	334	3,227	23½	⅓			

PHYSIOGRAPHY AND GEOLOGY.

The surface formations of this county belong to two geological periods. The Niagara limestone, which is found outcropping at various places in the channels of the Mississinewa and White Rivers, is Silurian in age; while the Wisconsin drift, covering the entire county, is Pleistocene.

Taken as a whole, this is the most level of the seven counties of which this paper treats. A small moraine of less than a mile in width and ranging between 25 and 50 feet in height enters the State at Union City and follows the north bank of White River entirely across the county entering Delaware County a short distance north of Windsor. The topography north of this ridge is a gently undulating plain sloping gradually to the south bank of the Mississinewa River, which lies 6 miles north. This plain is dotted with numerous small shallow basins, which are now Miami black clay loam areas, but in the past were small lakelets, ponds and marshes. North of the Mississinewa one again encounters a rather pronounced morainic area, extending from east to west across the north end of the county. The strongest morainic belt is located in the southern tier of townships. It has a breadth of 5 or 6 miles and carries knolls and ridges varying from 30 to 50 feet in height. It is also the principal watershed and divide between White and Whitewater Rivers. Between Martindale Creek and Green's Fork, is what is known as the "Summit," with an altitude of 1,234.4 feet, which is the greatest measured in the State. Hills south of this point are estimated to be 50 feet higher. Between this heavy moraine and White River is another almost level plain, with the frequent occurrences of dark colored areas (Miami black clay loam) occupying depressions in the light colored soils.

In the southern part of the county, where the surface is rolling, these old kettle basins, occupied by the dark colored soil, are rare. This is not due to the basins never having been developed in these portions, because the pronounced moraine would indicate that many were present immediately after the recession of the ice; but rather to the fact that many streams and their tributaries worked their heads back into this moraine, and thoroughly drained at a time sufficiently prior to the present, that decomposition has had a chance to decompose almost all of the organic matter, that once collected in the ponds and marshes.

SOILS.

The soils of the Miami series extend over almost all of the upland of the county. Of these, the Miami clay loam is the most extensive and next to it is the Miami black clay loam. Quite limited areas of the Miami loam are found along West River, Green's Fork and the East Fork of Whitewater River. In the bottoms are found the Huntington loam, Wabash loam and Wabash silt loam; while very small areas of muck occur in both bottom and upland. The following table gives the extent of each of these types.

AREAS OF DIFFERENT SOILS.

Soil.	Square Miles.	Per Cent.
Miami clay loam	382.0	84.9
Miami black clay loam	50.0	11.1
Miami loam	1.0	.2
Huntington loam	6.0	1.3
Wabash loam	10.0	2.2
Wabash silt loam	.5	.1
Muck	.5	.1
Total	450.0	99.9

MIAMI CLAY LOAM.

The Miami clay loam contains more clay and is more uniform in Randolph County than it is in any of the other counties treated in this report. In general, it consists of a clay loam of a light or medium gray color and having a depth ranging from 7 to 12 inches. Underlying this is from 1 to 2 feet of a medium to dark brown and sometimes a yellowish brown subsoil. At the top, this subsoil is generally a silt or clay loam, which becomes more clayey as it occurs deeper in the section, grading into a sandy clay at the bottom. This, in turn, is underlain by a gravelly or sandy clay of a little lighter color.

Although the Miami clay loam is the predominating type in all parts of the county, yet it occurs most typical and covers the highest percentage of area over the glacial ridges and rolling country It is always found occupying the higher land.

It is reported by many farmers that the Miami clay loam only produces about one-half as much corn as the Miami black clay loam. Inquiry reveals that most of the tile is put under the Miami black clay loam and the Miami clay loam is left with a poor underdrainage. Such land yields from twenty to forty bushels of corn to the acre, depending upon how it is farmed; but when tiled and properly cared for, sixty bushels are not uncommon. Wheat ranges from twelve to twenty-five bushels, but an average is about fifteen, while oats average thirty to thirty-five, clover one to one and one-half tons and from one to two bushels of seed, and timothy one to one and one-half tons. The selling price of land per acre is from $60 to $90.

The following table shows the results of the mechanical analyses of samples of the Miami clay loam:

MIAMI CLAY LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
66a	2 miles west of New Lisbon.	Soil, 0 to 10 inches.	.6	1.3	2.5	6.7	7.8	61.0	20.0
66b	First subsoil of 66a	Subsoil, 10 to 30 inches.	.2	.6	1.6	3.8	4.4	52.3	40.1
66c	Second subsoil of 66a	Subsoil, 30 to 42 inches.	1.8	2.1	2.8	5.8	6.9	45.4	35.4
31a	½ mile south of Randolph	Soil	2.0	2.0	3.2	7.7	9.2	51.4	24.7
31b	Subsoil to 66a	Subsoil	.5	.8	2.3	9.1	10.7	59.7	17.0
47a	2 miles east and ½ mile north of Arba	Soil, 0 to 9 inches	1.0	1.9	3.0	9.8	11.7	42.7	31.0
47b	First subsoil to 47a	Subsoil, 9 to 23 inches.	1.3	2.7	3.8	8.0	9.4	47.7	28.0
47c	Second subsoil to 47a	Subsoil, 23 to 36 inches.	4.9	3.2	4.6	9.2	18.1	36.4	24.7
54a	2½ miles north and ¾ mile west of Arba	Soil, 0 to 11 inches	.7	1.4	1.6	6.2	6.9	55.0	29.0
54b	First subsoil to 54a	Subsoil, 11 to 35 inches.	1.2	1.6	2.8	7.2	8.3	43.4	35.1
54c	Second subsoil to 54 a	Subsoil, 35 to 41 inches.	3.6	2.9	4.4	8.8	10.0	36.6	33.1
11a	1½ miles south of Pleasantview.	Soil	2.0	1.7	3.2	6.8	8.0	50.7	29.6
11b	Subsoil to 11a	Subsoil	1.5	2.1	3.5	8.0	9.6	49.0	27.0

MIAMI BLACK CLAY LOAM.

The low flat gently undulating plains both north and south of the Union City ridge contains a larger area of Miami black clay loam than any other county of the surveyed area. Some of this land is yet undrained and much of it has been drained during the past decade.

The texture is very much like that given in the general discussion. The surface soil, ranges from 9 to 14 inches deep, is a clay loam of a black color, and sometimes the subsoil continues to a depth of 3 feet with about the same color, but the texture changes to a clay of a heavy, tough nature. A more common case is for the soil at 1½ to 2 feet to grow lighter in color and take on a drab appearance. A little deeper the drab color becomes streaked with a bright yellow and carries iron concretions. A rather striking characteristic of both the surface soil and subsoil in occasional low flat areas is the low content of sand and gravel.

Difficulty is often encountered in plowing this soil, because of the tough, cohesive nature, but if taken when moisture conditions are favorable, it is not difficult to put it in good tilth. After being well tiled and cultivated for awhile it becomes loose and granular.

As in other counties, the Miami black clay loam in Randolph, leads all other types as a corn producer, but falls short in wheat. The better class of farmers average sixty-five bushels of corn per acre, while the average yield is about forty. Wheat averages from ten to fifteen, oats about thirty-five and clover from one to two tons. Almost all of the corn is converted into beef and pork on the farms. Some corn is raised for ensilage and used largely for fattening cattle.

Miami black clay loam is changing hands at prices ranging from $75 to $140, depending on improvements.

The following table shows the results of mechanical analyses of samples of this soil.

MECHANICAL ANALYSIS OF THE MIAMI BLACK CLAY LOAM.

Number.	LOCALITY.	Description.	Authority.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
5a	1½ miles west of Lynn.	Soil, 0 to 10 inches.	U. S. Bureau of Soils.	.0	.7	1.0	5.0	8.7	61.7	23.2
5b	Subsoil of 5a...	Subsoil, 10 to 36 inches.........	U. S. Bureau of Soils.	.6	.7	.7	2.6	10.9	59.1	25.4
32a	1 mile south of Randolph.	Soil, 0 to 14 inches.	Taylor.........	.7	.5	1.0	5.0	8.0	59.0	24.8
32b	Subsoil of 32a..	Subsoil, 14 to 36 inches.	Taylor.........	.6	.1	.2	4.9	5.7	47.3	38.9
16b	5 miles northeast of Farmland.	Subsoil, 12 to 36 inches.	Taylor.........	5.6	1.2	1.7	2.4	2.8	50.8	37.0

HUNTINGTON LOAM.

The Huntington loam of this county differs very little in texture from the general run of the seven counties, unless it would be that its color is a shade darker and it is more often associated with the Wabash loam, frequently grading into it or containing large spots of it. Owing to the flat nature of much of the county, the higher bottoms are not very much above the flood plains. In many cases, on account of the absence of a bank or old bluff, one can scarcely tell, without boring, just where the Miami clay loam or Miami black clay loam leaves off and the Huntington loam begins.

On this type the better class of farmers are getting about fifty-five bushels of corn to the acre while the average get forty.

The difference in production is due to the manner of cultivation, selection of seed and nursing the soil. Wheat averages about fifteen bushels and oats about thirty-five. The selling price of land ranges from $60 to $110 per acre.

WABASH LOAM.

The Wabash loam occurs as a black bottom land soil, running high in organic matter. It has a little more clay and is darker than the Huntington loam, but otherwise the texture is much the same.

A characteristic section of the Wabash loam, taken 1 mile southwest of Fairview from the second bottom of the Mississinewa River, shows at the surface 10 inches of a black loam, that breaks up into small irregular lumps. At the bottom this grades into 1 foot of a drab loam, with a tinge of red. The 2 feet underlying this are either a gravelly or sandy loam. Often the limestone pebbles are completely disintegrated and fall to pieces about like a lump of soft sugar. This characteristic causes them to be frequently taken for sandstone. The lower foot of the section is found to be stratified beds of gravel and sand. More or less silt loam and even clay loam patches intersperse the Wabash loam.

As a corn producer this type is superior to the Huntington loam, but is not as good for wheat. The better farmers get as high as eighty bushels of corn to the acre on good years, but average about sixty-five, while the ordinary farmer will not exceed an average of forty-five. The selling price of land is a little higher than that of the Huntington loam.

The results of the mechanical analyses of the fine earth of this type are given in the table below.

MECHANICAL ANALYSIS OF THE WABASH LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
13a	1 mile southwest of Fairview.	Soil, 0 to 12 inches.....	3.0	7.3	10.8	15.4	17.9	33.6	10.7
13b	First subsoil to 13a........	Subsoil, 12 to 22 inches.	2.3	7.5	11.4	9.7	11.3	41.0	16.0
13c	Second subsoil to 13a......	Subsoil, 22 to 46 inches.	.4	6.3	7.7	8.4	9.5	53.8	13.0

WABASH SILT LOAM.

Along Dismal Creek, Greenville Creek and a few other small streams occurs a heavy silt loam or clay loam of 1½ feet in depth. It contains a high percentage of organic matter and has a black color. The soil is difficult to break, unless taken at the right time, because of its sticky and adhesive qualities. It will form clods which will not pulverize until moistened. If allowed to dry without stirring, the surface cracks. The soil is very much like the Miami black clay loam and has originated under almost similar circumstances; the Miami black clay loam having been formed in lakes and ponds; and the Wabash silt loam in ponded stream valleys, where the vegetation accumulated in the presence of water.

At a depth of 1½ feet the color becomes a drab and the clay loam gives place to a silty clay, which at a depth of 3 feet grades into a still lighter colored clay loam, carrying many iron concretions. This, at a depth of 4 or 5 feet, is underlain by either stratified sand or gravel.

For agricultural purposes this land is comparable to the Miami black clay loam. Corn averages, by the best farmers, about sixty-five bushels to the acre. In order to get the best yields, tiling is often necessary.

The results of the mechanical analyses of this soil are seen in the following table:

MECHANICAL ANALYSES OF THE WABASH SILT LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
51a	½ mile west and ¼ mile north of Bartonia.	Soil, 0 to 16 inches....	.3	1.5	2.5	8.4	9.9	47.3	20.4
51b	Subsoil of 51a............	Subsoil, 16 to 36 inches.	.5	1.1	2.6	7.0	8.0	47.7	32.1

MUCK.

There are a few very limited areas of muck in the county, most of which occur in undrained depressions, but a few in the poorly drained portions of the stream bottoms. This muck is an impure form of peat, resulting either from a concentration of the inorganic matter by decomposition in the presence of the atmosphere or a mixing with the underlying formation. It is often referred to as a light chaffy soil. The muck* of this locality has had its derivation, mainly, from the partial decomposition of grasses and sedges in the presence of water, and is the black variety.

The thickness of the muck beds range from 2 inches to 2 feet. In the upland the subsoils are similar to those of the Miami black clay loam, while in the bottom lands they resemble the Wabash silt loam.

In this county the muck land, as a soil, seems to rank low in the estimation of the farmers, but the time will come when it will take its place among the best. It is in a stage today, that the Miami black clay loam soils were a few centuries ago. All it lacks is a mixing with other soils, and then it will, if properly handled, grow sixty-five bushels of corn to the acre. Onions, peppermint, celery and potatoes all do exceedingly well on the muck. In northern Indiana, where muck is a common soil, 350 bushels to the acre is considered an average crop for onions, 150 bushels for potatoes, 2,400 dozen for celery and thirty pounds of oil for peppermint.

MIAMI LOAM.

The Miami loam along the East Fork of Whitewater River, Green's Fork and West River of Wayne County follows the valleys of these streams northward into southern Randolph County. Outside of these limited areas, no others of sufficient size to map, were found. For texture, subsoils, colors, occurrences, crops, selling price and other characteristics, these soils are almost identical with the Miami loam of Randolph County.

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*Thirty-first Ann. Rep. Geol. Sur. of Indiana, 1906. p. 82.

WAYNE COUNTY.

HISTORY OF SETTLEMENT AND INDUSTRIES.

Wayne County lies in the east central part of the State of Indiana on the Ohio line, and has an area of 409 square miles. It was formed in 1810. The first court was held in 1811, and as early as 1821, a newspaper was published at Richmond. In 1828 an Agricultural Fair was held at Centerville and at the first State Fair, Wayne County took more than half of the high class premiums. A Horticultural Society was organized at Richmond in 1855.

Since these early beginnings, developments in all lines have been very great. With its excellent transportation facilities by both railroad and wagon road, its numerous manufacturies and above all its extensive areas of improved farming land; Wayne County ranks high among the counties of the State.

Although Wayne County has Richmond with its 23,000 people and numerous manufacturies and also Cambridge City and Hagerstown with their varied plants and occupations, yet agriculture, by some odds, remains as its leading industry. In 1908 there were over 30,000 acres of wheat sown, 51,000 acres of corn, 8,600 of oats, 500 of rye, 25 of tomatoes, 24 of tobacco, 150 of potatoes, 13,000 acres of clover cut for seed, 9,000 acres for hay, 9,000 of timothy for hay and 230 of alfalfa. On January 1, 1909, there were in Wayne County about 7,478 horses and colts, 431 mules, 5,893 dairy cattle, 6,814 beef cattle, 29,784 hogs and 7,500 sheep. The township averages for the various crops will be found in the table on a succeeding page. About seventy-one per cent. of the land in Wayne County is being tilled, fifteen is cleared land in pastures, twelve per cent. in woodland pasture and two per cent. in woodland that is not in pasture.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	Estimates of Well-Informed Farmers as to the Annual Average Crops Through a Series of 10 Years, Together With Some Statistical Averages for 1908.																				
						Bushels Per Acre.												Tons Per Acre.								
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Abington	Miami clay loam	Farmers				55	35			16																
	All types occurring	Statistical Report	13,387	7,877	1,726			32			12½			7½			1			1⅕			1⅑			
Boston	Miami clay loam	Farmers				60	40		26	18		50	35													
	Miami black clay loam	Farmers				75	45		20	15																
	All types occurring	Statistical Report	13,344	9,710	2,082			38⅔			16			17			1½			2			1⅓			2½
Center	Miami clay loam	Farmers				60	40		20	15			30			1			1½							
	Miami loam	Farmers				70	45		20	16																
	All types occurring	Statistical Report	24,153	15,997	3,665			36⅐			14⅓						1¼						1			
Clay	Miami clay loam	Farmers				55	37			15																
	All types occurring	Statistical Report	11,641	8,275	1,961			38			16			13⅔			1⅓			1⅙			1			2
Dalton	Miami clay loam	Farmers					35			14																
	Huntington loam	Farmers				55	40			12																
	All types occurring	Statistical Report	9,947	6,878	1,965			35			12½			11			1⅑			1⅛			1⅑			
Franklin	Miami clay loam	Farmers				50	35		18	12																
	All types occurring	Statistical Report	17,964	14,640	2,806			36½			16½			14¼			1⅕			1¼			1⅓			1⅞
Greene	Miami clay loam	Farmers				45				15																
	All types occurring	Statistical Report	15,318	12,706	2,581			36			16¾			12			¾			2⅕			1			

Harrison	All types occurring	Statistical Report	10,490½	7,871½	2,056			33			17¼			16			1⅕			1¼			1⅐			1⅕
Jackson	Miami clay loam	Farmers				50	45		20	18			30			1			1½			1½				
	Miami loam	Farmers				60	50		18	15																
	All types occurring	Statistical Report	16,245	13,958	2,049			38¼			17⅘			13⅔						1¼			1¼			1½
Jefferson	Miami clay loam	Farmers				50	35			12																
	Miami loam	Farmers				60	45																			
	All types occurring	Statistical Report	15,659	11,017	2,727			41			16½			16½			1⅖			1⅛			1⅕			2½
New Garden	Miami clay loam	Farmers				55	40		24	16			35													
	Miami loam	Farmers				60	42		20	14		48	35													
	All types occurring	Statistical Report	14,632	12,476	1,846			32½			17⅓			10			9/11			1⅐			1⅔			
Perry	Miami clay loam	Farmers				48	32		15	12			30													
	All types occurring	Statistical Report	10,613	8,990	1,451			40			14½			17			1⅙			1⅕			1			
Washington	Miami clay loam	Farmers				50	40		18	15																
	Miami loam	Farmers				70	50		18	14																
	Huntington loam	Farmers				70	50																			
	All types occurring	Statistical Report	26,459	22,232	3,327			40			18½			14⅔			1⅕			2¼			1⅛			2
Wayne	Miami clay loam	Farmers				60	40		20	15		38	30													
	Miami loam	Farmers				60	45		20	15																
	All types occurring	Statistical Report	28,697	18,699	9,834			36			21			15			1 7/10			1⅗			1⅗			2
Webster	Miami clay loam	Farmers					35																			
	All types occurring	Statistical Report	9,273	6,782	1,195			33½			18			12½			1⅖			1⅙			1⅛			
Totals and averages for Wayne County			237,823½	178,108½	41,271	57	43	36½	20	15	16⅓	45	32	13		1	1⅕		1½	1⅓			1⅕			2

LAND, CROP AND STOCK REPORT—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Taken from Statistical Reports for 1908.						Estimates of Farmers and Statistical Reports for 1908.				Estimates of Farmers as to the Selling Price of Land per Acre.
			Stock of Various Kinds on Hand Jan. 1, 1909.						Stock of Various Kinds Turned off Annually for Each 100 Acres of Land.				
			Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	
Abington	Miami clay loam	Farmers	....	....	....	....	....	....	....	....	....	....	$35 to $125.
	All types occurring	Statistical Report	339	20	276	263	643	1,744	24	1½	2	1⅓	....
oston	Miami clay loam	Farmers	....	....	....	....	....	....	65	....	4	....	$50 to $100.
	Miami black clay loam	Farmers	....	....	....	....	....	....	100	....	4	....	Av. of $100.
	All types occurring	Statistical Report	....	24	359	528	413	2,654	34½	....	2⅔	3	....
Center	Miami clay loam	Farmers	....	....	....	....	....	....	35	....	5	....	Av. of $80.
	Miami loam	Farmers	....	....	....	....	....	....	40	....	6	....	Av. of $100.
	All types occurring	Statistical Report	776	17	584	528	532	2,135	25½	⅓	1	1	....
Clay	Miami clay loam	Farmers	....	....	....	....	....	....	50	....	....	....	$50 to $110.
	All types occurring	Statistical Report	248	18	220	181	441	1,833	48	½	1	2	....
Dalton	Miami clay loam	Farmers											$30 to $80.
	Huntington loam	Farmers	....	....	....	....	....	....	30	....	2	5	$70 to $115.
	All types occurring	Statistical Report	310	10	303	195	338	880	29	5/9	3½	3½	....
Franklin	Miami clay loam	Farmers	....	....	....	....	....	....	30	....	2	10	$65 to $100.
	All types occurring	Statistical Report	565	30	536	1,298	292	3,209	28	⅓	1 9/10	⅚	....
Greene	Miami clay loam	Farmers	....	....	....	....	....	....	30	....	1	3	....
	All types occurring	Statistical Report	454	19	168	631	584	1,820	37	3⅔	1⅔	2	....

Harrison	All types occurring	Statistical Report	241	14	...	265	380	1,478	24½	⅕	2	2⅔	...
Jackson	Miami clay loam	Farmers	...	...	...	...	...	...	40	...	4	...	$70 to $100.
	Miami loam	Farmers	...	...	...	...	...	...	60	...	...	...	Av. of $100.
	All types occurring	Statistical Report	521	42	418	434	908	2,277	30⅔	½	1⅔	2½	...
Jefferson	Miami clay loam	Farmers	...	...	...	...	...	...	30	...	2	...	$60 to $85.
	Miami loam	Farmers	...	...	...	...	...	...	40	...	2	...	$70 to $175.
	All types occurring	Statistical Report	531	28	484	576	912	2,641	31½	⅔	1⅔	2¼	...
New Garden	Miami clay loam	Farmers	...	...	...	...	...	...	35	...	2	...	$45 to $110.
	Miami loam	Farmers	...	...	...	...	...	...	45	...	3	...	...
	All types occurring	Statistical Report	434	18	435	201	487	1,097	33½	⅔	1⅔	2	...
Perry	Miami clay loam	Farmers	...	...	...	...	...	...	40	1	4	...	$60 to $85.
	All types occurring	Statistical Report	247	51	214	55	822	1,153	35	½	½	8½	...
Washington	Miami clay loam	Farmers	...	...	...	...	...	...	...	...	...	...	...
	Miami loam	Farmers	...	...	...	...	...	...	60	...	...	...	Av. of $100.
	Huntington loam	Farmers	...	...	...	...	...	...	...	...	...	...	Av. of $100.
	All types occurring	Statistical Report	631	84	384	819	68	5,107	...	½	2¼	1⅙	...
Wayne	Miami clay loam	Farmers	...	...	...	...	...	...	50	...	...	...	$80 to $110.
	Miami loam	Farmers	...	...	...	...	...	...	45	...	...	...	$90 to $120.
	All types occurring	Statistical Report	1,854	46	1,173	543	274	2,256	18	1⅓	2	¼	...
Webster	Miami clay loam	Farmers	...	...	...	...	...	...	...	...	...	...	...
	All types occurring	Statistical Report	327	10	339	297	268	...	33	4/7	1⅙	1	...
Totals and averages for Wayne County		...	7,478	431	5,893	6,814	7,362	29,784	1,252	1	2½	3	$30 to $125.

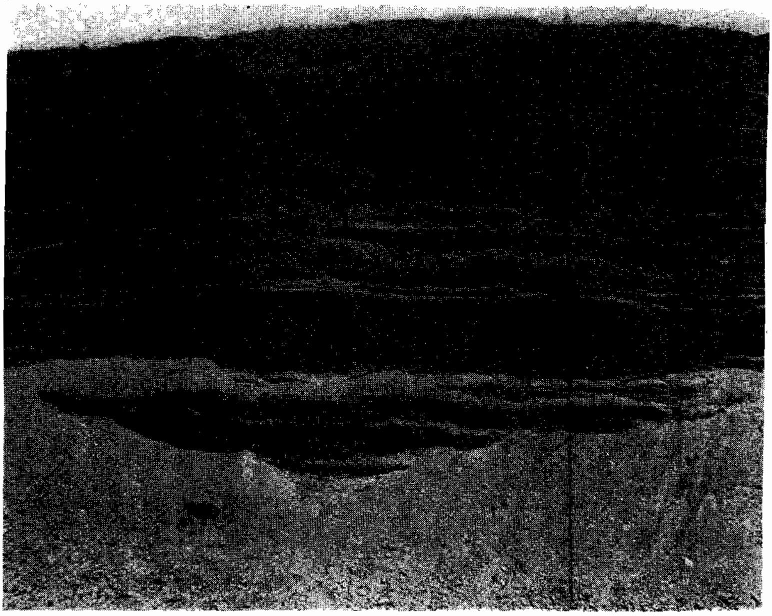
PHYSIOGRAPHY AND GEOLOGY.

The surface features of Wayne County are controlled largely by several glacial lobes and intervening valleys, all of which have a northeast and southwest direction. Only one of these lobes crosses the county, it entering north of Bethel, passing between Richmond and Centerville and crossing into Union County west of Abington. A difference in elevation ranging from 100 to 150 feet, exists between the summits of the ridges and valley floors; while the general elevation of the county is almost equal to that of Randolph County, the highest county in the State. The maximum elevation, which is in the north part of the county, is about 1,200 feet, and the minimum, in the south portion is a little less than 1,000. The broad valleys, which characterize the various Forks of West Whitewater River, are cut in a sheet of old drift, over which at a subsequent time, the Later Wisconsin moraine was deposited Extensive outwash plains seem to occur along these valleys, between the fluvial terraces and upland, presenting low flat areas underlain largely by either gravel or sand. The East Fork of the Whitewater River has cut its channel into the Cincinnati limestone, while some of the streams close to the Ohio line have cut into the Niagaga limestone.

The geological epochs represented in the formations of this county are the Cincinnati limestone and shales of the Ordovician period, the Niagara limestone of the Silurian, the Later Wisconsin drift and an older drift of the Pleistocene.

A zone of drift extending along the northern third and eastern seventh of the county is underlain by the Niagara limestone; while the drift covering the remaining portion is underlain by the Cincinnati formation. The drift blanket, with exception of that in the southeastern part of the county, ranges from 100 to 150 feet in thickness.

Ripple marks in Richmond limestone, about five miles southwest of Richmond, Indiana. The distance from crest to crest is about two feet to two feet and six inches. (Hole.)



Beds of stratified gravel and sand found in the G. R. and I. gravel pit about one mile northwest of Richmond. Note the cross-bedding at about the center.

A bed of hardpan as it appeared in a cut along the Pennsylvania Railway, one and one-half miles west of Centerville.

SOILS.

There are five soil types found in Wayne County, the Miami clay loam, Miami silt loam, Miami loam and Miami black clay loam occupying the upland, and the Huntington loam the bottom lands. The following table shows the relative extent of each of these types.

AREAS OF DIFFERENT SOILS.

SOIL.	Square Miles.	Per Cent.
Miami clay loam	254	62.0
Miami silt loam	25	6
Miami loam	55	13.4
Miami black clay loam	15	3.5
Huntington loam	60	16.1
Totals	409	100.0

MIAMI CLAY LOAM.

Like in Henry and Rush counties the Miami clay loam occurs both as sugar tree and white beech lands, but more frequently as an intermediate between these. The subsoil of the sugar tree variety is a gravelly or sandy clay or clay loam, while that of the white beach is a heavy, tough clay with very little grit. A section of the Miami clay loam taken 3 miles due south of Centerville shows 4 inches of an ash gray soil, with very little organic matter or grit; grading into 5 inches of a pale yellow clay, mottled with yellow spots of iron hydrate. Underlying this are 5 inches of a sandy drab clay with a bluish tinge. The clay is tough and heavy and is penetrated with difficulty. Two feet of a fine sandy loam, with a light yellow color and containing some gravel, occurs at the bottom of this section. Quartzite, quartz, limestone, granite gneiss and other rocks are found in the gravel. Glacial striations are found on much of the limestone. Another section occurring 2 miles northwest of Fountain City, which is about an average for the county, has from 4 to 7 inches of a light medium gray soil, grading into from 2 to 6 inches of a soil with a lighter color and about the same texture. From 8 to 18 inches deeper the subsoil is a heavy, tough dark brown clay, containing some limestone pebbles. It does not crumble readily in the hand, but the light brown subsoil underlying it does. It also contains limestone pebbles and has a very noticeable amount of fine sand.

Although looked upon as a very undesirable soil a few decades ago, a Miami clay loam farm today, if properly improved, is even more desirable than one in the stream bottoms. A careful inquiry from the leading farmers of the county concerning the Miami clay loam reveals the fact that the better farms produce on and average about fifty-three bushels of corn to the acre, while the average farm produces about thirty-five. Fifteen bushels is an average wheat and thirty-three oats crop. Clover yields one bushel of seed and one and one-fourth tons of hay to the acre, timothy one and one-fourth tons of hay and alfalfa two tons.

Among the main needs of the farms of the Miami clay loam are tile, green manure, better cultivation, a careful selection of seed, a systematic crop rotation, the feeding of more stock over the land and a more intelligent utilization of commercial fertilizer.

About every farmer uses all of his stable manure on his farm and is aware of the fact that there is no land in the county that is helped as much and shows the effects as long as the Miami clay loam. It is reported by farmers that the effects of stable manure on this ground can be seen for twelve years. The following table gives the results of the mechanical analyses of typical samples of this type.

MECHANICAL ANALYSES OF THE MIAMI CLAY LOAM.

Number.	Locality.	Description.	Analyst.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
33a	3 miles south of Centerville.	Clay loam, 0 to 4 inches.	U. S. Bureau of Soils.	.4	2.3	1.7	5.2	5.0	70.7	14.4
33b	Upper subsoil of 33a.	Clay loam, 4 to 9 inches.	U. S. Bureau of Soils.	.2	1.2	1.8	4.6	3.4	67.8	20.6
33c	Second subsoil of 33a.	Sandy clay, 9 to 14 inches.	U. S. Bureau of Soils.	.4	2.3	3.5	10.6	7.6	40.2	35.1
33d	Third subsoil of 33a.	Fine sandy loam 14 to 38 inches.	U. S. Bureau of Soils.	1.9	5.0	5.4	15.9	12.1	38.7	20.7
36a	2 miles northwest of Fountain City.	Clay loam, 0 to 9 inches.	U. S. Bureau of Soils.	.4	2.9	3.3	11.8	14.1	50.5	16.5
36b	Subsoil of 36a.	Sandy clay, 9 to 36 inches.	U. S. Bureau of Soils.	1.2	2.5	2.6	7.7	7.9	50.4	27.5
2	Central part of section 23 (12 E., 15 N.)	Surface clay loam, 0 to 10 inches.	A. E. Taylor....	.5	.4	.8	2.2	2.5	72.1	21.5
50a	2 miles west of Abington.	Soil, 0 to 9 inches.	A. E. Taylor. ..	.8	1.4	2.5	5.3	6.5	68.3	14.0
50b	Subsoil of 50a.	Subsoil, 0 to 36 inches.	A. E. Taylor....	1.2	1.5	3.7	7.2	10.3	53.7	32.1
35a	2 miles south of Hagerstown.	Soil, 0 to 11 inches.	A. E. Taylor....	1.5	3.8	8.2	6.8	18.8	45.6	13.0
57a	2 miles west of Williamsburg.	Soil, 0 to 10 inches.	A. E. Taylor....	1.7	2.1	4.2	10.6	12.6	52.0	15.5
57b	Subsoil to 57a.	Subsoil, 0 to 36 inches.	A. E. Taylor....	1.8	1.5	2.7	7.1	8.2	41.3	40.1

MIAMI LOAM.

The plow soil of the Miami loam varies between a medium and dark brown and has an average thickness of 11 inches. It contains more organic matter and sand, less silt and has a coarser texture than the Miami clay loam. From 1 to 2 feet of the surface the subsoil varies between a dark reddish brown and a light or medium yellow loam, becoming more sandy and gravelly as it is found deeper in the section. Beds of gravel and sand are often found at depths of 4 to 6 feet.

This type in Wayne County occurs between the Huntington loam, which comprises the bottom lands along the stream courses, and the Miami clay loam, which covers the lobate moraines; and beyond the terminals of the lobate moraines. The gravel, sands, rock flour and other material from which the Miami loam has been derived, and which at present comprises largely the lower subsoil, were likely a portion of the outwash from the lobate moraines at the time the ice was melting, thus having the topographical position at present of an outwash plain. The evidence pointing to such an explanation would be (1) the fact that the soil is sandy and becomes more and more so as one goes down, (2) that beds of pure gravel and sand are a rather frequent occurrence at 4 to 6 feet, showing the sorting work of water; (3) that many of the limestone pebbles contain glacial striæ, indicating that they were not carried very far by the water; and (4) that the topographical relations to the lobate moraines are just right for outwash plains. The surface of the Miami loam is generally very level with a slight grade upward toward the ridges and extending up on the side of the ridges for a short distance, but in cases, especially west of the East Fork of the Whitewater River, this soil reaches far up the side of the ridge, with considerable surface slope. In places it is very difficult to tell where the higher terraces leave off and the outwash plains begin, because of the close similarity in color, texture and topography.

The timber growing on this soil is the rock maple, black walnut, red and yellow beech and other trees that do best when they have a loose, warm soil and subsoil, so that their roots can readily penetrate downward. This gravelly and loose condition of the subsoil gives a natural drainage so that very little tiling is needed.

The Miami loam is very early, warm and well aerated. Corn crops average about forty-four bushels to the acre, while the more prosperous farmers get about sixty. Wheat averages sixteen bushels and oats thirty-five. For trucking purposes this land is especially well adapted and should be more extensively used for this purpose, especially in the vicinity of Richmond, where there is a good market for garden products. Potatoes yield well, one farmer reporting 200 bushels to the acre, and alfalfa grows about the same as on the Huntington loam. Stable manure and commercial fertilizer are applied to this soil and show good effects for a few years, but not for so long a period as where they are put on the Miami clay loam.

On an average, for each 100 acres, forty hogs and two beef cattle are turned off, annually, by the farmers of the Miami loam. Very few sheep, horses or mules are raised for the market.

Owing to the natural underdrainage, high fertility and warm condition of the ground, the farms for value, rank next to the Miami black clay loam, in the vicinity of Boston; ranging from $75 to $150 per acre and having an average selling price of about $115. The results of the mechanical analyses of samples of the Miami loam are given in the table below.

MECHANICAL ANALYSES OF MIAMI LOAM.

Number.	LOCALITY.	Description.	Analyst.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sond.	Very Fine Sand.	Silt.	Clay.
30a	2½ miles south of Fountain City.	Surface........	U. S. Bureau of Soils.	1.0	2.9	4.3	12.3	5.9	57.3	16.2
30b	Subsoil of 30a.	Subsoil.........	U. S. Bureau of Soils.	1.2	3.9	4.5	13.9	4.9	47.8	23.4
34a	3½ miles west of Green's Fork.	Surface.........	U. S. Bureau of Soils.	.4	2.2	2.4	4.4	4.8	72.5	12.9
34b	Subsoil to 34a.	Subsoil.........	U. S. Bureau of Soils.	.8	2.8	3.0	4.9	7.3	62.3	19.0

HUNTINGTON LOAM.

The predominating type of the first and second bottoms is the Huntington loam. Its occurrence, texture, subsoil and general characteristics are similar to those given for the Huntington loam in the general discussion, page 23.

The principal developments in the bottom lands are along the West Fork of the Whitewater River, Green's and Noland's Forks; while those along the East Fork of the Whitewater River are small and subjected to floods. All other streams of the county have bottoms of some size, but the soils of the smaller of these are generally mingled with the wash from the upland; and cannot be classed as typical Huntington loam.

For agricultural purposes the second bottoms are considered better than the first. This is due to the more sandy or gravelly condition of the latter, which cause them to be affected more seriously by droughts; and also by the high waters which flood them. On account of the floods, corn is often the only grain raised. The average corn yield for the Huntington loam during a period of ten years is thirty-eight bushels to the acre, while the best farmers get about sixty. This average is a little lower than that of the Miami loam, but higher than the Miami clay loam. Wheat does not do as well as on the Miami clay loam, only averaging about twelve bushels to the acre. This soil resembles the Miami loam for holding commercial fertilizers or manure and also as a suitable soil for gardening.

The original timber growing on this soil consisted of sycamore, ash, elm, and water maple on the first bottoms, while rock maple, black walnut, red beech and yellow beech grew on the second bottoms.

The value of the farms of this type range from $10 to $115, but the average selling price is about $100 for the second bottoms and $60 for the first.

The following table shows the results of the mechanical analyses of a sample of this type.

MECHANICAL ANALYSES OF THE HUNTINGTON LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
45	First bottom south of Milton.	Soil, 0 to 14 inches....	3.7	4.4	7.1	18.3	20.9	36.8	9.8

MIAMI BLACK CLAY LOAM.

The principal occurrence of the Miami black clay loam in Wayne County is found in the southeast corner, where between 8 and 9 square miles of surface are more than half covered by this type. Many other occurrences in the form of basin-like depressions in the Miami clay loam are found in all different parts of the county, but few exceed thirty acres in extent.

The texture is about the same as described in the introduction. In most cases the soil has been cultivated for some time and is tiled, thus having passed beyond that early stage when its cohesiveness and tendency to puddle make plowing very difficult.

With its very high percentage of humus, its richness in other plant foods, its granular and loose texture and warm nature, the Miami black clay loam stands first as a corn producer. The average corn crop for the better class of farmers is about sixty-five bushels, while the general average is forty-five. Wheat averages fifteen bushels and oats forty per acre. Clover ranges from one to two tons to the acre, when the drainage is sufficient to prevent heaving.

Very few farmers having Miami black clay loam farms sell their grain, unless it would be wheat; but instead feed it to stock. An average of one hog to the acre is sold from these farms annually. The average selling price of the type is about $110 per acre, although where well improved it sells for as as much as $150.

The following table gives mechanical analyses of typical samples of the Miami black clay loam.

MECHANICAL ANALYSES OF THE MIAMI BLACK CLAY LOAM.

Number.	Locality	Description.	Analyst.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
39a	½ mile sout of Economy.	Soil, 0 to 7 inches.	U. S. Bureau of Soils.	1.3	4.8	5.4	14.6	13.2	39.9	20.5
39b	Subsoil to 39a	Subsoil, 7 to 14 inches.	U. S. Bureau of Soils.	1.0	3.0	4.5	12.9	9.4	46.9	22.1
39c	Second subsoil to 39a.	Subsoil, 14 to 36 inches.	U. S. Bureau of Soils.	.8	2.9	3.7	12.7	14.7	37.1	27.8

MIAMI SILT LOAM.

This type is found in the eastern central and southeastern part of the county, and is an extension of the Miami silt loam area of Union County. The texture, crops and general characteristics of the part lying south of Richmond are about the same as they are in Union City, but northeast of Richmond the soil has a medium brown color and is generally underlain by a sandy clay, which grades into a sandy loam. Sometimes a bed of gravel is found within 4 to 5 feet of the surface.

The topography of the area lying northeast of Richmond is rather broken and the pronounced ridges and hills are decidedly morainic in both their appearance and composition. Gravel and sandpits are numerous near the summits of the ridges. When the gravel is close to the surface the crops are liable to die during a drought. This soil is easy to work, is of a warm nature and often has a good natural underdrainage.

The following table gives mechanical analyses of typical samples of the Miami silt loam.

MECHANICAL ANALYSES OF THE MIAMI SILT LOAM.

Number.	Locality.	Description.	Analyst.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
38a	1 mile north, 3 miles east of Economy.	Surface, 0 to 6 inches.	U. S. Bureau of Soils.	.6	1.9	2.5	8.4	9.2	59.6	17.5
38b	Subsoil to 38a.	Subsoil, 6 to 36 inches.	U. S. Bureau of Soils.	1.2	2.8	3.3	10.0	9.6	47.7	25.2
16a	2 miles southwest of Boston.	Silt loam, 0 to 10 inches.	A. E. Taylor....	.1	.3	.8	2.2	2.5	77.0	17.3

HENRY COUNTY.

Henry County, with an area of 395 square miles, is found in the east central part of the State. It was created in 1821. By autumn of the same year 100 houses had been erected within its confines. From this time up until a few years ago there was a steady growth in population, due largely to agricultural developments, but during the last few years some large plants have been erected at Newcastle, causing it to grow from a place of 3,500 to one of 9,000 and take its rank as the most enterprising town of its size in the State.

The factories located at New Castle are those of the Maxwell-Brisco Automobile Co., furnishing employment for 2,200 men; the Indiana Rolling Mill Co., with 300 workmen; the French & Sons Piano Co., and the Hoosier Kitchen Cabinet Co. Another industry, in which New Castle is said to be without a rival, is the growing of the American Beauty Roses. Four very capacious greenhouses, for growing these particular flowers, have been built.

Henry County has six steam railways, three electric railways and 500 miles of graveled wagon road.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	Estimates of Well-Informed Farmers as to the Annual Average Crops Through a Series of 10 Years, Together With Some Statistical Averages for 1908.																				
						Bushels Per Acre.												Tons Per Acre.								
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Blue River	All types occurring	Statistical Report	13,169	10,973	1,882			34			11¾			17½			1⅑			1⅑			1⅙			⅓
Dudley	Miami clay loam	Farmers				55	35																			
	Miami black clay loam	Farmers				65	45																			
	All types occurring	Statistical Report	18,894	16,963	1,838			40			18			19			9/10			1¼			1⅓			3⅓
Fall Creek	Miami clay loam	Farmers				60	38																			
	Wabash loam	Farmers				70	45																			
	All types occurring	Statistical Report	13,994		1,605						16½			26½			1½			2			1¾			
Franklin	Miami clay loam	Farmers				50	30		18	15																
	Huntington loam	Farmers				60	40		20	12																
	All types occurring	Statistical Report	13,826	11,979	1,506			33			22½			35			1			1⅓			1⅓			
Greensboro	All types occurring	Statistical Report	7,652	6,029	755			47			17			16			1¼			1⅓			1⅓			
Harrison	Miami clay loam	Farmers				50	33			12																
	Miami black clay loam	Farmers				70	45			8																
	Huntington loam	Farmers				70	40			11																
	All types occurring	Statistical Report	20,847	16,503				44½			15⅓			15			1⅕			1⅐			1⅔			
Henry	Miami clay loam	Farmers				60	35			13			35					2	1½			1½				
	Miami black clay loam	Farmers				65	45			12			35													
	Huntington loam	Farmers								12																
	Wabash loam	Farmers				65	45																			
	All types occurring	Statistical Report	15,665	13,545	1,681			44½			16¾			17⅔			1			1½			1½			3

Jefferson	Miami clay loam	Farmers				50	30			13									1½							
	Miami black clay loam	Farmers				70	45			10									1½							
	All types occurring	Statistical Report	17,376	14,631				43½			17			23½			1			1¼			1¼			
Liberty	Miami clay loam	Farmers								11																
	All types occurring	Statistical Report	25,316	21,006	4,159			43			16½			20			9/10			1⅕			1⅛			1½
Prairie	Miami clay loam	Farmers				55	37			13								2				1½				
	Wabash loam	Farmers				60	40																			
	All types occurring	Statistical Report	24,534	15,670				35½			12			18			1⅓			1⅙			1¼			
Spiceland	Huntington loam	Farmers					42																			
	All types occurring	Statistical Report	13,156	10,380	2,848			40			20			20			1⅑			1 8/9			1			1¼
Stoney Creek	Miami clay loam	Farmers				45	32		17	13																
	All types occurring	Statistical Report	12,791	11,041				35			14			21½			1½			1⅙			⅚			
Wayne	Miami clay loam	Farmers				55	32			14			30													
	All types occurring	Statistical Report	13,065	11,136	1,836			34½			15			19			1⅐			1⅓			2½			
Totals and averages for Henry County			210,285			30	38½	40	18	12	13½		32	20			1⅐		1½	1⅓		1½	1⅔			2

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	TAKEN FROM STATISTICAL REPORTS FOR 1908.						ESTIMATES OF FARMERS AND STATISTICAL REPORTS FOR 1908.				Estimates of Farmers as to the Selling Price of Land per Acre.
			Stock of Various Kinds on Hand Jan. 1, 1909.						Stock of Various Kinds Turned off Annually for Each 100 Acres of Land.				
			Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	
Blue River	All types occurring	Statistical Report	432	6	362	302	500	1,701	41	1	2	1¾	
Dudley	Miami clay loam	Farmers											$75 to $115.
	Miami black clay loam	Farmers											$100 to $150.
	All types occurring	Statistical Report				539	1,067	2,290			2		
Fall Creek	Miami clay loam	Farmers											Av. of $90.
	Wabash loam	Farmers											Av. of $65.
	All types occurring	Statistical Report	505		428	385	403	2,337	33	⅔	2½	2⅔	
Franklin	Miami clay loam	Farmers											$60 to $70.
	Huntington loam	Farmers											Av. $100.
	All types occurring	Statistical Report	628	22	393	2,965	402	3,020	27½	⅘	2	½	
Greensboro	All types occurring	Statistical Report	338	13	197	58	403	1,811	51	1⅓	3	3½	
Harrison	Miami clay loam	Farmers											$65 to $100.
	Miami black clay loam	Farmers											Av. of $100.
	Huntington loam	Farmers											
	All types occurring	Statistical Report	585	10		315	687	3,485	30	2½			
Henry	Miami clay loam	Farmers											Av. of $90.
	Miami black clay loam	Farmers											Av. of $100.
	Huntington loam	Farmers											
	Wabash loam	Farmers											
	All types occurring	Statistical Report	649	32	4,399	440	794	1,906	36⅔	1	2	3	

tured it, conveying the water in a northwesterly direction to the White River. Blue River was left as a small creek which was entirely too small to keep the old river channel open. The result was that the old valley remained as a catchment basin for the numerous intermittent streams along its sides, but had no stream of sufficient size to carry the water away. A marshy condition began to develop, and a large amount of vegetation accumulated in the presence of water, which is seen today in the muck beds and the dark Wabash silt loam and Wabash loam soils that cover the surface. Shortly after Buck Creek captured the upper portion of Blue River, a new tributary of Buck Creek began to work its head southward over the floor of Blue River Valley. It has now succeeded in advancing one mile down the valley, changing the slope of the valley plain from south to north. The divide between this tributary and the one extending up the valley from Blue River is steadily advancing southward.

SOILS.

The soils of the area are divided naturally into two groups—upland and bottom land. The Miami clay loam and the Miami black clay loam are found in the upland division; the Huntington loam, Wabash loam, Wabash silt loam and muck in the bottom land division. The following table shows the extents of these various types:

AREAS OF DIFFERENT SOILS.

Soil.	Square Miles.	Per Cent.
Miami clay loam	340	86.1
Miami black clay loam	30	7.6
Huntington loam	15	3.8
Wabash loam	6	1.5
Muck	4	1.0
Total	395	100.0

Miami Clay Loam.

Among the soils of every civil township of the county the sugar tree, white beech and intermediate varieties of the Miami clay loam are represented. The former, a medium brown soil of a somewhat gritty nature, is found occupying some of the morainic ridges and outwash plains, but not so much the valley slopes, as is the case in counties where the lobate moraines have had much to do with the present topography. The latter is found associated with the Miami black clay loam and covering gently undulating surfaces.

It has a light to ashy gray color and appears very much like a soil of the Miami clay loam, which is found in the bluffs and brakes of Blue River at various places, but is especially well developed immediately south of Newcastle. It is frequently termed a white oak soil, because the white oak is and has been the predominating timber. Where the soil has been largely carried away by the surface wash, and the subsoil is a stiff, compact clay, a scrubby growth of the white oak occurs, which is pointed to as conclusive evidence for a poor soil. The white oak land covers most of northern Prairie and Stony Creek townships, where the surface is broken by glacial ridges, hills and stream valleys. Taking the county as a whole, the intermediate land extends over a larger area than all other soils combined.

The subsoils of the Miami clay loam are very much like those given in the general discussion. The sugar tree variety is underlain by a clay, which becomes more sandy as it occurs deeper, while the white beech may have for its subsoil a sandy clay, grading into a fine sandy loam, or a very compact clay, with some gravel and sand. The white oak variety has a subsoil much like the white beech. The subsoil of the intermediate phase is generally a brown to yellow, somewhat mottled, stiff, tenacious clay loam, but may grade into a sandy clay.

The sugar tree soil has a depth of 9 to 12 inches, and is the most productive, while the intermediate ranges from 8 to 11 inches and is second in productiveness. The white beech land is from 6 to 10 inches in depth and the white oak from 4 to 10. There is little difference in the fertility of the latter two, except that the white oak soil, because of its topographical position, is more liable to erosion wash and hence loses much of its plant foods. An average corn crop for either the white beech or white oak is thirty bushels, while the intermediate produces about thirty-five bushels and the sugar tree thirty-eight. Tomatoes on the sugar tree and intermediate varieties, after manuring well, produce an average of eight tons to the acre. Wheat, on all the different varieties of the Miami clay loam, range from 11 to 16 bushels, depending on the preparation of the ground and the commercial fertilizer.

The sugar tree variety of the Miami clay loam, as it occurs in portions of Henry County, is particularly adapted to the growing of the American Beauty Rose. Among greenhouse companies it is second to none for this purpose, and it is shipped for hot-house beds as far as New Jersey. Heller Bros., leading stockholders and managers of the South Park Floral Company, at Newcastle, gave the writer the following description of how they prepare the sugar tree compost for the American Beauty hot-beds:

They select a sugar tree soil that has been in pasture for twenty or more years without having been plowed. From this they strip off the upper 3 or 4 inches with as much of the blue grass and roots as can be gotten. The soil is then taken and stacked up in the open air to a height of 20 or 24 inches. Upon this is put from 6 to 10 inches of cow manure, the amount depending on the organic matter in the soil and the straw in the manure. Another 20 to 24 inches of dirt are added and then from 6 to 10 inches of manure; and so the process is continued until the pile has attained a height of 5 or six feet. After standing for six months, 100 pounds of Armour's Bone Meal is mixed with 10 cubic yards of the contents of this pile, which completes the compost. The roses grown on this compost are expressed by the thousands of dozens to numerous points within a radius of 300 miles, while the slips are shipped to all countries of the world.

Of all the soils in Henry County none are neglected as much as the Miami clay loam. Only a small percentage of farms are in a high state of fertility. These few, through tiling, rotating corn, wheat and clover, green manuring, stock feeding and using commercial fertilizer, have been made to produce, on an average, sixty bushels of corn to the acre, twenty of wheat and forty of oats. Where clover is grown solely to plow under, the big English gives the best general satisfaction. This is due to the great amount of organic matter it supplies the soil with, and the tendency it has to develop a more open texture.

The selling price of the Miami clay loam is from $65 to $125 per acre. Farms for cash, rent from $3 to $5 per acre, but most of them are rented on shares.

The following table gives the mechanical analyses of typical samples of this type of soil:

MECHANICAL ANALYSES OF THE MIAMI CLAY LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
28	2 miles southwest of Springport.	Soil, 0 to 12 inches....	.7	1.4	3.1	8.0	9.2	61.0	16.2
29	Subsoil of number 28.......	Subsoil, 12 to 36 inches.	.5	1.1	2.5	7.3	8.6	62.7	17.3
33	1½ miles northeast of Sulphur Spring.	Soil, 0 to 10 inches....	1.2	1.6	3.6	9.4	11.0	50.0	23.2
34	Subsoil of number 33.......	Subsoil, 10 to 36 inches.	1.4	2.8	5.0	11.5	13.5	42.9	21.3
41	½ mile south of Luray...	Soil, 0 to 8 inches......	1.2	1.9	3.4	8.3	9.1	64.5	11.2
55	1½ miles east of Grant City..	Soil, 0 to 7 inches......	1.2	1.2	2.3	5.5	6.2	68.5	14.4

MIAMI BLACK CLAY LOAM.

The leading areas of the Miami black clay loam are found in Dudley, Greensboro and Jefferson townships. As in Rush County, these represent the best drained land of the county. The plow soil is from 10 to 18 inches deep and is from a dark brown to a black in color. The texture is a loose, granular clay loam, where it is well underdrained and has been cultivated for several years. Otherwise it may be of a sticky, plastic nature, giving much difficulty in plowing. The subsoil may be a dark brown to a black clay loam, becoming more clayey as the depth increases until 2 or 2½ feet beneath the surface, where it grades into a drab clay that gives place to a brown or yellow clay at 3½ or 4 feet. In other cases the drab, with a bluish tint, may be within 2 feet of the surface, or it may be absent altogether; in which event the brown to yellow clay is found immediately beneath the dark brown soil, except for a few inches of contact material, consisting of black clay loam mottled with brown or yellow clay loam. As one goes downward in that section, the gravel and sand, ordinarily, becomes more and more abundant, but in rare cases, a clay, almost free from grit, may continue to a depth of 2½ or 3 feet. The origin, other textural relations, dffiiculties and methods of correcting the same are discussed under the descriptions given for Randolph and Rush counties and in the general discussion.

The Miami black clay loam of Henry County is generally poor wheat ground, nine to ten bushels per acre being about the average. The heaving of the wheat can be remedied by a better underdrainage. Oats range from twenty-five to forty bushels. Corn, for which the land is especially adapted, will average forty-eight bushels to the acre, while the leading farmers will get from sixty to seventy-five. The quality of the grain and grass raised is inferior to that of the Miami clay loam. This is noted when stock will invariably select the blue grass of the Miami clay loam when given their choice. The selling price of this land ranges from $75 to $150 per acre.

HUNTINGTON LOAM.

This type is best developed in the second bottoms along Blue River and Big Flat Rock Creek. It is also found in the first bottoms, but most often in an impure form, because of its close association with the Wabash loam. The most common occurrence is 10 to 18 inches of a medium to dark brown loam at the surface, grading into a slightly light colored sandy clay or heavy loam of 1 to 2 feet, which grades into a bed of sand or gravel at from 3 to 6 feet. The origin and texture are taken up in the general discussion.

The underdrainage of this type is the best of any in the county, which results in its being very early and quick to dry off after a heavy rain. The Miami black clay loam alone excels it in corn, but in no other crop. The average corn crop is about forty-two bushels, while wheat is eleven to thirteen and oats from twenty-five to forty. The value of this type varies from $65 to $150 per acre.

WABASH LOAM.

This type is generally found along streams where ponding has occurred in the past. It frequently grades into a silt loam and muck, and almost always is associated with Huntington loam. Its main occurrence is in the first bottoms of Blue River, Flat Rock and Little Fall creeks.

The surface soil is a dark brown to black loam, gravelly loam or silt loam of 10 to 18 inches. It becomes slightly heavier with depth, and the texture appears rather silty, due in part to a very high percentage of organic matter. Below the surface soil the amount of sand and gravel increases and the color becomes lighter as one gets deeper in the section until a bed of either sand or gravel is reached from 4 to 6 feet. In special cases the gravel and sand beds are at the surface, but this happens over very limited areas.

The soils covering the bottoms of the Old Blue River Valley, which is located between the place where Blue River turns from the east to the south and the Delaware County line, are almost as often a silt loam as a loam, and in cases are clay loam and muck. The loam is found occupying the higher portions of the bottoms, while the silt and clay loam seem to be in the lower areas. The silt loam is almost identical with that found in the Dismal Creek bottom of Randolph County, with the exception that it is not so well drained. The tough, sticky nature makes it very hard to plow. In many places the ground water level during a wet season is often within 5 or 6 inches of the surface. As soon as the corn roots get below this level the blades begin to turn yellow. Even where the ground water level is sufficiently low the swampy condition keeps the land too wet for cropping. The corn production of much of this land might be tripled if tiling, dredging and cultivation were properly attended to.

For corn yields the Wabash loam, where not flooded or too wet, is superior to the Huntington loam, but inferior for quality, while the wheat and oats crops are smaller.

For selling price the Wabash loam will not equal the Huntington, except where underdrainage is good, in which case it is as high-priced as any land in the county.

MUCK.

No other county in the surveyed area has as extensive beds of muck as Henry, nor is there any other county where the farmers are so well acquainted with the methods of improving it.

The muck beds are best developed in Blue River Valley from two to four miles north of Newcastle and in the old Blue River Valley north of where Blue River turns from the east to the south. These beds in derivation and composition are much like those of Randolph County, except that in the southern area a great deal of iron has been carried in solution from the numerous little springs that dot the valley slopes. This has been precipitated as a hydrate in the muck, which gives it a red color. When a heavy wind blows over the dried surface, great clouds of the light chaffy soil rise into the air. These have a red color which can be detected for several miles.

If the native sod is merely broken up and cultivated scarcely any crop at all can be raised unless it would be onions; but when once mixed with the other ground it becomes a most excellent soil for both corn and onions. One farmer stated that he could not get over ten bushels of corn to the acre and that was exceedingly poor. One year when the blades were turning yellow, about August 1, he put a shovel full of clay loam around each hill. The blades again took on the green color and the corn crop turned out well. After that he made a practice of spreading the clay loam over his muck the same as he would manure on the clay loam ground. The result has been that his muck produces seventy-five bushels of corn to the acre.

W. E. Ferris, a farmer one mile north of Newcastle, built dams on the hillsides adjoining the muck beds and at times of freshets opened them, allowing the water to wash the soil and subsoil from the slopes down onto the muck. This mixture of wash and muck produced seventy-five bushels of corn to the acre and 500 bushels of onions. Muck has been used on the clay loam as a manure with splendid results..

The results obtained by mixing the muck and clay loam or a clay loam subsoil seem to be due to the fact that a typical muck soil of Indiana when dry contains 3-10 per cent. of potash, the same amount of phosphoric acid, and from 3½ to 4 per cent. of nitrogen, while a clay subsoil has about 2 per cent. of potash and 1-10 per cent. each of phosphoric acid and nitrogen. This indicates that the muck runs very low in potash and high in nitrogen, while the clay has a fair amount of potash, but becomes in a few years deficient in nitrogen. This mixture also interferes with the capillary action, which keeps the muck wet, and so permits it to dry out. Various organic acids of the muck break down the complex silicates of the clay loam and subsoil and thus leave the plant food in an available form.

RUSH COUNTY.

Through the St. Mary's treaty of 1818 a large part of the land of central and northern Indiana was acquired from the Pottawattamie, Miami and Delaware tribes of Indians. This extensive tract, which was known as the "New Purchase," was designated by the legislature of 1820 as Delaware County. Out of this tract were formed both Henry, Rush and eighteen other counties. The organization of Rush County became effective in 1822. The county was named in honor of Dr. Benjamin Rush.

Rushville, which was only a rude clearing in the forests eighty-five years ago, is now a thriving town of over 5,000 inhabitants. Its industries are varied, being distributed among a number of shops and small factories. The other towns are small, ranging in population from thirteen to 700.

In the early days Rush County was almost an unbroken forest, but after long months of hard toil by the sturdy pioneers, together with the labor of subsequent generations, these forests have been replaced by some of the best farming land in the State of Indiana. Improvements of all kinds are common, the railway and wagon road facilities being especially good.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	Estimates of Well-Informed Farmers as to the Annual Average Crops Through a Series of 10 Years, Together With Some Statistical Averages for 1908.																				
						Bushels Per Acre.												Tons Per Acre.								
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Anderson	Miami clay loam	Farmers				60	40		25	18																
	Miami black clay loam	Farmers				65	45			14																
	Al types occurring	Statistical Report	22,190	18,301	2,541						17						1⅕			1⅐			1⅛			1¼
Center	Miami clay loam	Farmers				60	40		20	15			35			1½			1½			1½				
	Miami black clay loam	Farmers					50			12																
	All types occurring	Statistical Report	19,610 1/12	15,552½	2,735 7/12			42			16			15			1⅙			1⅒			1	⅒		1
Jackson	Miami clay loam	Farmers				60	40																			
	All types occurring	Statistical Report	14,045½	11,511	1,587			48			19			19			1⅑			1⅑			1⅑			2½
Noble	Miami clay loam	Farmers				60	40		20	15																
	Miami black clay loam	Farmers				65	50			13																
	All types occurring	Statistical Report	20,637	17,207	2,646			45			13			18			¾			1¼			1⅓			2
Orange	Miami clay loam	Farmers					35		20	15																
	Huntington loam	Farmers					50			13																
	All types occurring	Statistical Report	21,686½	17,678	3,635½			49			18			18						1			1¼			
Posey	Miami clay loam	Farmers				50	35		18	15																
	Miami black clay loam	Farmers				70	50			15																
	All types occurring	Statistical Report	21,088	18,498	1,745			38			15			15			1			1⅑			1⅓			1¼
Ripley	Miami clay loam	Farmers				50	35			15						1½			1½			1½				
	Huntington loam	Farmers				60	45		15																	
	All types occurring	Statistical Report	20,438	15,509	3,275			35			17			14			1			1¼			1⅕			1⅓

Richland	Miami clay loam	Farmers	...	...	...	...	35	...	..	15	...	..	..	...	..	..	..	..	..	...	..	..	...	..	..	...
	Miami black clay loam	Farmers	...	...	...	...	40	...	..	8	...	..	..	...	..	..	..	..	..	...	..	..	...	..	..	...
	All types occurring	Statistical Report	17,933	14,106	2,967	...	...	42	..	..	15	..	..	22½	..	..	1⅓	..	..	1⅙	..	..	1¼	..	..	2½
Rushville	Miami clay loam	Farmers	...	...	...	60	40	...	18	15	...	..	..	...	..	..	..	..	..	...	..	..	...	..	..	...
	Miami black clay loam	Farmers	...	...	...	65	45	...	..	14	...	..	..	...	..	..	..	..	..	...	..	..	...	..	..	...
	Huntington loam	Farmers	...	...	...	60	45	...	18	15	...	..	..	...	..	..	..	..	..	...	..	..	...	..	..	...
	All types occurring	Statistical Report	26,595	18,644	3,153	...	...	47	..	...	15	..	..	22	..	..	1	..	1⅓	1⅓	..	..	1½	..	..	1
Union	All types occurring	Statistical Report	21,138	14,814	3,529	...	...	44	..	...	18	..	..	18	..	..	1½	..	..	$\frac{8}{9}$	..	..	1⅙	..	..	1½
Washington	Miami clay loam	Farmers	...	...	...	50	35	...	..	15	...	..	35	...	..	1½	..	..	1½	...	..	1½	...	..	..	...
	Miami loam	Farmers	...	...	...	60	50	...	..	15	...	..	35	...	..	..	..	..	..	...	..	..	...	..	..	...
	Miami black clay loam	Farmers	...	...	...	70	50	...	..	15	...	..	35	...	..	..	..	..	..	...	..	..	...	..	..	...
	All types occurring	Statistical Report	18,158	14,498	1,577	...	...	42	..	...	21½	..	..	39	..	..	1	..	..	⅘	..	..	1½	..	..	1½
Walker	Miami clay loam	Farmers	...	...	...	...	40	...	17	13	...	..	..	...	..	..	..	..	..	...	..	..	...	..	..	...
	All types occurring	Statistical Report	14,444	9,948	1,608	...	...	45	..	...	18	..	..	19	..	..	1¼	..	..	1¼	..	..	1¼	..	..	3
Totals and averages for Rush County		...	237,963	186,266	30,998	60¼	42½	43⅓	19	14¼	17	..	35	20	..	1½	1⅙	..	1½	1⅕	..	1½	1⅙	..	..	$1\frac{8}{11}$

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	TAKEN FROM STATISTICAL REPORTS FOR 1908.						ESTIMATES OF FARMERS AND STATISTICAL REPORTS FOR 1908.				Estimates of Farmers as to the Selling Price of Land per Acre.
			Stock of Various Kinds on Hand Jan. 1, 1909.						Stock of Various Kinds Turned off Annually for Each 100 Acres of Land.				
			Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	
Anderson	Miami clay loam	Farmers	....	....	....	....	....	....	35	....	5	....	Av. of $100.
	Miami black clay loam	Farmers	....	....	....	....	....	....	60	....	2	....	Av. of $100.
	All types occurring	Statistical Report	858	77	383	468	546	3,124	35¼	¼	2	1	....
Center	Miami clay loam	Farmers	....	....	....	....	....	....	35	1	1	8	$90 to $120.
	Miami black clay loam	Farmers	....	....	....	....	....	....	40	....	....	....	$90 to $125.
	All types occurring	Statistical Report	829	41	392	708	1,279	3,994	23	⅚	4	4	....
Jackson	Miami clay loam	Farmers	....	....	....	....	....	....	....	....	....	....	Av. of $100.
	All types occurring	Statistical Report	492	37	266	579	515	4,196	43	¾	3⅔	2	....
Noble	Miami clay loam	Farmers	....	....	....	....	....	....	50	....	....	....	Av. of $90.
	Miami black clay loam	Farmers	....	....	....	....	....	....	80	....	....	....	Av. of $110.
	All types occurring	Statistical Report	534	36	301	320	150	4,025	28	½	1	1½	....
Orange	Miami clay loam	Farmers	....	....	....	....	....	....	....	....	....	....	....
	Huntington loam	Farmers	....	....	....	....	....	....	....	....	....	....	....
	All types occurring	Statistical Report	754	60	440	451	439	3,087	24½	½	1¼	1	....
Posey	Miami clay loam	Farmers	....	....	....	....	....	....	40	....	....	....	Av. of $90.
	Miami black clay loam	Farmers	....	....	....	....	....	....	40	....	....	....	$100 to $125.
	All types occurring	Statistical Report	791	30	411	584	992	4,266	32	⅔	3½	2	....
Ripley	Miami clay loam	Farmers	....	....	....	....	....	....	35	1	1	....	$60 to $100.
	Huntington loam	Farmers	....	....	....	....	....	....	....	....	....	....	$75 to $125.
	All types occurring	Statistical Report	851	147	466	686	1,450	4,414	34	⅓	3⅕	3⅕	....

Richland	Miami clay loam	Farmers	......	......	......	......	......	......	35	1	3	......	Av. of $90.
	Miami black clay loam	Farmers	......	......	......	......	......	......	60	......	......	......	Av. of $100.
	All types occurring	Statistical Report	684	60	285	614	757	3,576	44	1	3	$1\frac{1}{3}$	......
Rushville	Miami clay loam	Farmers	......	......	......	......	......	......	......	......	......	......	$90 to $110.
	Miami black clay loam	Farmers	......	......	......	......	......	......	80	......	......	......	$100 to $125.
	Huntington loam	Farmers	......	......	......	......	......	......	......	......	......	......	......
	All types occurring	Statistical Report	1,114	51	686	731	744	4,357	$42\frac{1}{2}$	$\frac{1}{3}$	$2\frac{1}{5}$	$1\frac{3}{4}$	......
Union	All types occurring	Statistical Report	711	105	424	455	735	4,960	34	$\frac{1}{2}$	$2\frac{1}{4}$	2	......
Washington	Miami clay loam	Farmers	......	......	......	......	......	......	35	1	2	2	Av. of $80.
	Miami loam	Farmers	......	......	......	......	......	......	75	1	......	......	Av. of $100.
	Miami black clay loam	Farmers	......	......	......	......	......	......	100	1	......	......	Av. of $100.
	All types occurring	Statistical Report	678	34	......	401	341	9,314	36	$1\frac{3}{5}$	$1\frac{1}{9}$	$1\frac{1}{2}$	
Walker	Miami clay loam	Farmers	......	......	......	......	......	......	......	......	......	......	......
	All types occurring	Statistical Report	699	8	410	422	611	3,805	44	$1\frac{1}{2}$	4	2	......
Totals and averages for Rush County		......	8,995	586	4,464	6,419	8,559	53,118	45	$\frac{7}{8}$	$2\frac{4}{9}$	$2\frac{1}{2}$	$60 to $125.

PHYSIOGRAPHY AND GEOLOGY.

The surface rocks of this county belong to three geological periods. The Laurel limestone and Waldron clay, which are found outcropping 200 yards above the bridge in Big Flatrock River at Moscow, belong to the Niagara and are Silurian in age. Advancing upstream from these outcrops, one soon finds the Laurel limestone passing below drainage and the Devonian limestone appearing in the bed of the creek. The drift, which covers the surface of the entire county, was left by the Later Wisconsin ice invasion. This drift is underlain by the Illinoian drift. Both of these drifts are Pleistocene in age.

A very good idea of the thicknesses of the glacial drift (Illinoian and Pleistocene), the limestone underlying it (Devonian, Niagara and Cincinnati), and the shale (Cincinnati) beneath this limestone, together with the depth to the Trenton limestone, can be gotten from the following well records, which W. A. Mull, a gas well contractor living in Rushville Township, kindly furnished the writer. A study of this table will point out something of the surface topography before the ice invasions. Although the surfaces in many of these cases are almost at the same altitudes, yet the distance to the limestone may vary fifty feet or more, indicating the presence of an old valley filled with glacial drift.

RECORDS OF GAS WELLS IN RUSH COUNTY.

No.	CIVIL TOWNSHIP.	Locality.	Thickness of Drift in Feet.	Thickness of the Niagara and Devonian Limestones in Feet.	Thickness of the Cincinnati Shale in Feet.	Depth to the Top of the Trenton Limestone in Feet.
1	Jackson	Center of section 18 (14 N., 10 E.)	70	65	715	850
2	Jackson	N. E. corner of section 19 (14 N., 10 E.)	84	....	....	....
3	Jackson	200 feet west of No. 2	169	00	715	884
4	Jackson	Center of section 15 (14 N., 9 E.)	31	104	715	850
5	Posey	S. E. corner of section 30 (14 N., 9 E.)	90	38	737	865
6	Posey	S. E. quarter of section 36 (14 N., 8 E.)	43	72	745	860
7	Posey	At Arlington	65	55	739	859
8	Walker	N. W. corner of section 11 (13 N., 8 E.)	78	57	730	865
9	Walker	N. E. quarter of section 8, (13 N., 9 E.)	78	47	770	895
10	Walker	Just north of Manilla	100	60	730	890
11	Walker	S. E. corner of 28 (13 N., 9 E.)	87	53	746	886
12	Walker	N. W. corner of 20 (13 N., 9 E.)	135	15	717	867
13	Walker	At Manilla	141	11	715	867
14	Walker	At Homer	55	55	745	855
15	Orange	Center of section 20 (12 N., 9 E.)	20	100	750	870
16	Orange	Section 18 (12 N., 9 E.)	19	46	800	865
17	Orange	S. E. quarter of section 5 (12 N., 9 E.)	65	35	780	870
18	Orange	S. E. corner of section 33 (12 N., 9 E.)	11	108	751	870

RECORDS OF GAS WELLS IN RUSH COUNTY—Continued.

No.	CIVIL TOWNSHIP.	Locality.	Thickness of Drift in Feet.	Thickness of the Niagara and Devonian Limestones in Feet.	Thickness of the Cincinnati Shale in Feet.	Depth to the Top of the Trenton Limestone in Feet.
19	Noble	At New Salem	65	40	813	918
20	Anderson	N. E. corner of section 36 (13 N., 9 E.)	60	40	750	850
21	Anderson	Section 18 (12 N., 10 E.)	None.	100	725	825
22	Anderson	North central part of section 30 (13 N., 10 E.)	40	60	740	840
23	Rushville	At Rushville	47	23	773	843
24	Rushville	Section 27 (13 N., 9 E.)	177	20	673	870
25	Rushville	N. W. quarter of section 23 (13 N., 9 E.)	135	36	694	865
26	Rushville	N. W. quarter of section 18 (13 N., 10 E.)	90	36	714	840
27	Rushville	Section 2 (13 N., 9 E.)	40	60	770	870
28	Center	N. E. quarter of section 29 (15 N., 10E.)	92½	30½	752	875
29	Center	Central part of section 17 (15 N., 10 E.)	84	43	743½	870½
30	Washington	S. E. corner of section 34 (15 N., 10 E.)	90	45	716	851
31	Noble	Central part of section 20 (13 N., 11 E.)	80	..	..	..
32	Noble	S. W. quarter of section 21 (13 N., 11 E.)	97	..	..	..
33	Noble	S. E. quarter of section 20 (13 N., 11 E.)	90	..	..	..
34	Anderson	Section 20 (12 N., 9 E.)	63	..	..	..
35	Walker	Central part of section 17 (13 N., 9 E.)	117	..	..	..

Taken as a whole the surface of Rush County is a gently undulating plain, broken by the valley of the Big Blue River in the northwestern corner, the rather shallow valley of Big Flat Rock traversing the county from the northeastern corner to the southwestern and a few glacial kames and ridges in the vicinities of Mays, Hamilton Station, Homer and the southeast corner. The altitude, which is 1,100 feet in the northeastern part of the county, gradually becomes less in a southwesterly direction until it falls below 900 feet in the southwestern part. The glacial topography yet remains very evident throughout the county, but especially in places where the natural surface drainage did not reach large areas, which were swamps a few decades ago. These, today, are occupied by black land that leads all others for raising corn.

SOILS.

Six types of soil occur in Rush County. Of these, the four of the Miami series are found in the upland, while the Huntington and Wabash loams are bottom land soils. The following table shows the extent of each of the six types.

AREAS OF DIFFERENT SOILS.

Soil.	Square Miles.	Per Cent.
Miami clay loam	279.0	68.6
Miami silt loam	40.0	9.8
Miami black clay oam	40.0	9.8
Miami loam	7.0	1.8
Huntington loam	35.0	8.6
Wabash loam	5.0	1.3
Oak Forest silt loam	0.3	....
Total	406.3	99.9

MIAMI CLAY LOAM.

In Rush County are found all variations of the Miami clay loam, from the cold, clammy white beech soil to the loose, warm sugar tree variety, but the intermediate phases are by far the more common. The white beech variety has its principal development in the northwestern half of Ripley Township, where it is popularly termed "the beech." Here it occurs as a thin, ashy gray land, with a very little organic matter and is underlain by a tough drab or brown clay. Often following the course of the larger streams or occupying portions of the glacial ridges is the medium brown sugar tree variety, with a sandy or gravelly clay subsoil. This ground is warm and has a fair amount of organic matter. It is earlier than the lighter colored and is especially well adapted for seed beds. As a rule the Miami clay loam seems to be more silty as it appears farther south. It averages from 7 to 10 inches in depth, the white beech variety being the thinner soil. In the southeastern corner of section 9 (15 N., 9 E.) the writer, in a deep cut, obtained the following section of the formations underlying a typical Miami clay loam soil.

SECTION FROM THE NORTHEASTERN CORNER OF RIPLEY TOWNSHIP.

	Feet.	*Inches.*
Medium brown soil	0	8
Brown clay loam	0	10
Sandy clay	2	0
Gravelly or sandy clay, very compact and having a drab color, but grading into a sandy yellow clay	12	0
Blue to dark gray hardpan, impervious in nature and containing some gravel and sand	12	0
Stratified beds of gravel and sand	6	0
Gravelly blue clay, very compact	10	0

This type is used more for general farming purposes than any of the others. It is not as good for corn yields as the darker colored ground, but will excel in quality of grain, and for wheat and oats it is superior in both yield and quality. To obtain the best results from this soil, great care must be exercised, and the better class of farmers have learned this. Through tiling, green manuring, rotation of crops, careful cultivation and using commercial fertilizer they claim to have doubled their production of corn and to have greatly increased the wheat and oats yields. This class of farmers will average from fifty-five to sixty bushels of corn to the acre, twenty bushels of wheat and forty of oats, while their neighbors, with the same kind of land, average about thirty-five of corn, fourteen of wheat and thirty of oats. Taken as a whole, the Miami clay loam is far from being in a high state of productiveness.

The stock raising industry varies greatly over this type. Where the land is best improved and is most productive, hogs seem to be the leading market product, while on some of the poorer land a good many sheep are raised. It is quite obvious that the best farmers sell scarcely any grain, but feed it to stock, and thus, through the droppings, get considerable of the plant food back into the ground. The less successful farmers are selling their grain and are sorely neglecting the replenishment of the soil.

The results of the mechanical analyses of this soil are found in the table below.

MECHANICAL ANALYSES OF MIAMI CLAY LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
14	3 miles souhtwest of Gowdy	Soil, 0 to 10 inches	1.1	2.2	4.1	8.7	10.3	57.1	16.2
4	1 mile north of Arlington	Soil, 0 to 11 inches	1.7	1.7	2.2	2.6	3.0	67.7	21.1
15	2½ miles northeast of Moscow	Soil, 0 to 12 inches	.8	1.4	2.9	6.7	7.9	61.4	18.3
75	2½ miles northwest of Carthage	Soil, 0 to 8 inches	.3	.9	3.2	11.4	13.4	60.2	11.7
78	Subsoil of number 75	Subsoil, 0 to 36	.6	1.2	2.5	6.3	7.0	64.2	19.0
60	4 miles south of Glenwood	Soil, 0 to 10 inches	2.6	.9	1.0	1.9	3.8	76.0	18.3

MIAMI BLACK CLAY LOAM.

Probably no square mile in Rush county is without some areas of Miami black clay loam. These may not cover more than a quarter of an acre, yet they occupy the sags, have the black color and contain the proper ingredients to produce some of the banner corn crops of the State. No other county under consideration in this report has such general distribution of this type, although Randolph alone will surpass it for area. As these dark areas will not average over five acres in extent, and seldom exceed thirty acres, more or less wash from the Miami clay loam, with which they are inclosed, finds its way over the surfaces. This is a great help to the Miami black clay loam, furnishing it with essential food ingredients, giving it more body and enabling it to produce a better class of grain.

A common section of the Miami black clay loam covered by the Miami clay loam wash shows 4 to 6 inches of medium to dark brown clay loam of a loose, warm nature at the surface, underlain by 6 to 10 inches of a black clay loam, running very high in organic matter. Beneath this is a dark brown to black clay or clay loam grading into a drab clay, which at a depth of 2 feet is streaked more or less with yellow. At 3 feet the yellow clay predominates, and below this is a sandy yellow clay. In other cases, such as in the outwash plain in the vicinity of Raleigh, the surface soil may vary from a clay loam to a loam, and this at 1 foot is underlain by a sandy clay that becomes more and more sandy and gravelly until it grades into a bed of gravel, which is found from 4 to 6 feet beneath the surface. A less frequent occurrence is that of a pure Miami black clay loam at the surface, becoming lighter as the depth increases, until at 2 feet it grades either into a bluish drab or a yellow clay. It seems the drab with the bluish tint is most often found where the subsoil has recently been beneath the groundwater level and the yellow color where it has been above for some time, so that the iron has had a chance to oxidize.

More attention has been given to the Miami black clay loam in the way of underdrainage than any other soil. This fact, together with careful cultivation for some years, has put a large acreage of this land into a splendid condition for farming. The water being drained out, the tendency to puddle and stick to the plow are not so prevalent as in the new soil. Taking an average of a number of estimates from leading farmers of the county as to the size of the crops raised on this soil when the ground is well improved and cared for, it was learned that one could expect sixty-five bushels of corn, fifteen of wheat, thirty-five of oats, one and a half to two tons of clover and one and a half of timothy. With exception of the wheat, most of the grain raised on this type never leaves the farms, but is fed mostly to hogs. Where farms are composed entirely of Miami black clay loam, from seventy-five to 100 hogs to each 100 acres are turned off annually.

Some farmers experience much difficulty in growing wheat and clover on account of the soil heaving, which exposes the roots and kills the plants. A good underdrainage will remedy the trouble.

The selling price of the Miami black clay loam is from $75 to $150 per acre.

The following table gives the results of the mechanical analyses of this type.

MECHANICAL ANALYSES OF THE MIAMI BLACK CLAY LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
8a	1½ miles east of Gowdy.....	Soil, 0 to 12 inches.....	.9	1.2	2.2	9.9	5.8	65.5	20.0
8b	First subsoil to 8a.........	Subsoil, 12 to 24 inches	1.3	1.5	3.0	7.0	8.2	58.6	20.7
8c	Second subsoil to 8a.......	Subsoil, 24 to 36 inches	.4	1.4	4.8	16.0	18.8	49.2	10.0

MIAMI LOAM.

A large area composed partly of Miami loam and partly of Miami black clay loam is found in the northeastern quarter of the county, with Middle Fork as its eastern boundary, Shankitank as its western, a well marked moraine as its northern, and Big Flat Rock, where it runs almost east and west in the northern part of Union Township, as its southern. Almost the entire area has a natural underdrainage, being underlain with sand and gravel in from 3 to 7 feet of the surface.

The soil of the Miami loam is a medium to a dark brown loam, silt loam or sandy loam, averaging from 9 to 14 inches in depth. It contains more organic matter than a sugar tree variety of the Miami clay loam and less than a Miami black clay loam, but this decreases with depth, and the color becomes correspondingly lighter. Its close association with the Miami black clay loam necessitates considerable variation in texture.

The subsoil is most commonly a light brown sandy clay in the upper portion. With increase in depth the ground becomes lighter, grading into light medium yellow at about 2½ feet. At this depth the material is a sandy or gravelly clay, with a dark brown mottling of iron stain or concretions and highly decomposed limestone pebbles, which appear like little pockets of very fine sand. As one goes farther down in the section he finds a rapid increase in sand and gravel.

Like in Wayne County, this type seems to occur as an outwash plain, the source of supply being from the morainic ridges bordering it on the north and west. The surface is very level, but there is a gentle slope upward toward the ridges, especially the one to the north.

This area is spoken of as the garden spot of Rush County. The gravelly subsoil and light character of the Miami loam, together with its high content of organic matter, makes it a very early and productive land. Only portions of it have to be tiled, and then the tile draw the water nicely for fifteen rods, while the Miami clay loam bordering it will not draw well for more than six rods. Corn averages on this type fifty bushels to the acre and wheat fifteen. As a general rule farmers are selling annually seventy-five hogs to the 100 acres, 1 horse, and a few cattle and sheep. Land sells for $100 per acre.

Where commercial fertilizer, green manure or barnyard manure is used on the land the results cannot be noted for more than two or three years. The effect of these on the adjacent Miami clay loam are very evident for ten years or more. Notwithstanding this difference, the farmers of the Miami loam say that it pays them to replenish their soil.

A few very small areas of Miami loam are found covering glacial kames in the vicinity of Homer and Hamilton Station.

The following table shows the results of the mechanical analyses of this soil:

MECHANICAL ANALYSES OF THE MIAMI LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
11	5 miles southeast of Rushville.	Soil, 0 to 13 inches.....	2.5	2.9	4.0	8.2	9.7	59.7	13.7

Miami Silt Loam.

This type, which occurs in the southeastern corner of the county, is similar in texture, color and general characteristics to that found in northern Union County, described on page 110. The boundary between this type and the Miami clay loam is only an approximate one, based on the mechanical analyses and the silty nature, as noted in the field. The crops and selling price of this land are about the same as for the Miami clay loam of Rush County.

The following table shows the results of the mechanical analyses of this type:

MECHANICAL ANALYSES OF THE MIAMI SILT LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
18	3 miles southeast of Richland	Soil, 0 to 9 inches......	1.2	1.4	1.9	5.0	5.7	71.0	13.6
20	2½ miles south of Richland..	Soil, 0 to 10 inches.....	1.0	1.6	2.8	5.2	6.2	72.1	10.8

OAK FOREST SILT LOAM.

The small area of the Oak Forest silt loam in the southeastern corner of the county is an extension of the same type of Franklin County. For a full description of this soil see page 122.

HUNTINGTON LOAM.

The principal areas of this type are seen in the terraces and flood plains of Big Flat Rock, Little Flat Rock and Big Blue Rivers. For texture and crops the similarity between these and the Huntington loam, as described under the general discussion, is close. A slight difference occurs in that the Wabash loam patches appear very frequently, which necessitates the mapped area of Huntington loam to average somewhat darker in color and a little higher in organic matter than the ordinary run of the seven counties. The common occurrence is that of a medium to dark brown loam, underlain by a fine sandy loam, which grades into a sandy loam and this in turn to a fine sand.

The crops of the Huntington loam approach those of the Miami loam and Miami black clay loam, forty-five to fifty bushels being common for corn and thirteen or fourteen for wheat. The selling price is about $90 to $100 per acre.

The following table shows the results of the mechanical analyses:

MECHANICAL ANALYSES OF THE HUNTINGTON LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
25	1½ miles south of Moscow in the terrace of Big Flat Rock River.	Soil, 0 to 15 inches.....	2.5	4.0	6.3	8.7	10.5	54.2	14.0

WABASH LOAM.

The bottoms mapped as Wabash loam contain a predominance of the black loam, but also have areas of silt loam and clay loam. The Huntington loam occurs frequently too, but comprises only a minor portion of the land. For texture, subsoil, crops and the various characteristics of this type see the Wabash loam descriptions of Henry and Randolph counties, where the occurrences are much more extensive.

FAYETTE COUNTY.

Fayette County was established by the General Assembly of the State of Indiana December 28, 1818, and named at the same time in honor of General Lafayette. About fourteen years previous to this time John Conner had started a trading post, at which Connersville, the county seat, was laid out in 1813. From this time until the present the growth of the county has been steady and substantial. Today four railroads and one interurban traction line are found within its limits. Out of 386 miles of wagon road, about 290 are improved with gravel.

Fayette County covers 215 square miles, and in 1900 had a population of 13,495. Within its boundaries are about 128,718 acres of soil, 82,732 of which are being tilled, 21,000 are in pasture, 11,000 in woodland pasture, and 8,500 are in woodland that is not pasture. In 1908 about 19,000 acres were in wheat, 24,000 in corn, 6,000 in oats, 4,300 in timothy, 4,100 in clover, and 100 in alfalfa. On January 1, 1909, there were in the county 3,554 horses and colts, 301 mules, 2,366 dairy cattle, 2,978 beef cattle, 19,901 hogs, and 4,355 sheep. There were sold during 1908 about 30,500 hogs.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	ESTIMATES OF WELL-INFORMED FARMERS AS TO THE ANNUAL AVERAGE CROPS THROUGH A SERIES OF 10 YEARS, TOGETHER WITH SOME STATISTICAL AVERAGES FOR 1908.																				
						Bushels Per Acre.												Tons Per Acre.								
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Columbia	Miami clay loam	Farmers					40			10																
	Oak Forest silt loam	Farmers					25			10																
	Huntington loam	Farmers					40			15																
	All types occurring	Statistical Report	14,092$\frac{1}{10}$	6,003	2,027			34			13						1½			1⅕			1			2
Connersville	Miami clay loam	Farmers				47	35		22	15																
	All types occurring	Statistical Report	15,713	11,156	2,096			38⅓			14½			19			1			1⅕			⅞			
Fairview	Miami clay loam	Farmers				50	37		20	18																
	All types occurring	Statistical Report	11,607	9,614	1,933			49			17½						$\frac{8}{9}$			1⅔			1⅓			
Harrison	Miami clay loam	Farmers				45	34		20	12																
	Huntington loam	Farmers				60	45		20																	
	All types occurring	Statistical Report	16,667	8,750	974			23½			13			16⅓						1¼			1⅓			$2\frac{5}{7}$
Jackson	Miami silt loam	Farmers				50	30		20	14			30													
	Huntington loam	Farmers					35			13																
	All types occurring	Statistical Report	17,159	7,776	3,017½			30½			13¼			11			1⅐			1⅑			$\frac{8}{9}$			1⅑
Jennings	Miami clay loam	Farmers				60	30		20																	
	All types occurring	Statistical Report	11,838	10,118	1,721			32			12⅕			9			1⅙			1⅛			1⅕			

Orange	Miami clay loam	Farmers				42	30			11								2	1½			1½				
	Oak Forest silt loam	Farmers					20		20	13																
	Huntington loam	Farmers					37		20	12																
	All types occurring	Statistical Report	13,433	8,828	3,411			31			11½						1½			1⅐			1⅕			1¼
Posey	Miami clay loam	Farmers				52	38		25	12						1½										
	All types occurring	Statistical Report	17,415	9,834	2,466			40			15			13			⅜			1⅓			1⅙			2¼
Waterloo	Miami clay loam	Farmers				52	33		20	14																
	Huntington loam	Farmers				60	40																			
	All types occurring	Statistical Report	10,794	8,653¼	2,000			41⅔			14⅙			6			1			1⅕			1⅓			
Totals and averages for Fayette County			28,718⅒	82,732¼	19,645½	52	38	35½	20½	13	14	..	30	12½	.	1½	1⅛	2	1½	1⅙	..	1½	1	..	..	1⅘

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Taken from Statistical Report for 1908.						Estimates of Farmers and Statistical Reports for 1908.				Estimates of Farmers as to the Selling Pri of Land per Acre.
			Stock of Various Kinds on Hand Jan. 1, 1909.						Stock of Various Kinds Turned off Annually for Each 100 Acres of Land.				
			Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	
Columbia	Miami clay loam	Farmers											
	Oak Forest silt loam	Farmers							15	2		8	$10 to $25.
	Huntington loam	Farmers							35				
	All types occurring	Statistical Report	344	14	222	161	492	1,242	12	½	⅔	1	
Connersville	Miami clay loam	Farmers											$45 to $50.
	All types occurring	Statistical Report	457	62	395	313	353	2,784	24½		1		
Fairview	Miami clay loam	Farmers							30			10	Av. of $45.
	All types occurring	Statistical Report	384	15	211	242	663	1,737	25	⅖	2	4½	
Harrison	Miami clay loam	Farmers							35				$20 to $110.
	Huntington loam	Farmers											
	All types occurring	Statistical Report	584	27	326	518	452	3,157	....	½	⅘	..1⅓	
Jackson	Miami silt loam	Farmers							15–30		1	5	$8 to $75.
	Huntington loam	Farmers							15		1		$15 to $50.
	All types occurring	Statistical Report	405	55	355	373	416	2,363	17	⅓	1⅕	2⅕	
Jennings	Miami clay loam	Farmers											
	All types occurring	Statistical Report	382	18	14	259	476	1,838	36¾	½	1⅕	3	

Orange	Miami clay loam	Farmers							30	1	3	10	$60 to $80.
	Oak Forest silt loam	Farmers							15				$12 to $30.
	Huntington loam	Farmers							20				$30 to $40.
	All types occurring	Statistical Report	369	24	285	452	608	1,401	21¼	½	2⅕	2⅓	
Posey	Miami clay loam	Farmers											$60 to $80.
	All types occurring	Statistical Report	374	31	327	270	575	3,283	38	½	1⅘	2	
Waterloo	Miami clay loam	Farmers							40				$65 to $90.
	Huntington loam	Farmers							35				$75 to $100.
	All types occurring	Statistical Report	255	55	231	389	328	2,096	31⅔	⅕	2⅚	1¾	
Totals and averages for Fayette County			3,554	301	2,366	2,978	4,355	19,901	30	⅗	1½	4⅓	$8 to $100.

PHYSIOGRAPHY AND GEOLOGY.

Traversing the county almost centrally from north to south is the large valley of the West Fork of Whitewater River. Its width varies from one to two miles and its lower bottom is from 100 to 200 feet below the adjacent uplands. This valley, together with the valleys of many tributary streams, has developed a deeply dissected surface over the greater part of the county. In the eastern part of the county what areas have escaped the eroding power of streams have generally been found by the tributaries of the East Fork of the Whitewater River, which occurs in Union County about one mile east of the eastern boundary of Fayette County. The only gently rolling surface is found in Posey and Fairview townships and the western half of Orange.

With the exception of a small district in the southern part of the county, situated on either side of the Whitewater, where the Illinoisan drift appears as the surface formation, the Later Wisconsin drift covers the entire county. The southern boundary of this drift on the west side of Whitewater is marked by a morainic ridge entering Fayette County from northwestern Franklin County and continuing north in a northeasterly direction to a point along the Whitewater about four miles south of Connersville. Here it meets a morainic ridge on the east side, which extends south into Franklin County, also marking the southern limit of the Wisconsin drift. From the point four miles south of Connersville, along Whitewater, an interlobate moraine was formed, which extends northward into Wayne and Henry Counties. In the upland the moraine is seldom less than 50 feet in thickness and is generally 100 or more.

In addition to these drifts, which belong to the Pleistocene period, are outcrops of the Laurel limestone of the Silurian in the southwestern part of the county and of the Cincinnati limestone and shales of the Ordovician in the western portion.

SOILS.

There are eight soil types found in Fayette County, six of which are upland and two bottom. The Miami series, which is by far the most extensive, occurs as the Miami clay loam, Miami silt loam, Miami loam and Miami black clay loam, and has had its derivation from the Later Wisconsin drift. With the exception of some small spots of Miami black clay loam in the western and northwestern portions of the county, some very limited areas of the Miami loam along the slopes of Whitewater and the Miami silt loam of the southeastern quarter of the county; the Miami clay loam covers all of the area except Jackson and Columbia townships. The southern half of Columbia and a small area in southwestern Jackson have the Oak Forest silt loam as the surface soil. The first and second terraces along the West Fork of Whitewater are mantled with the Huntington loam, while the bottoms of the smaller valleys contain an impure form of the same type. On a very few narrow valley floors in Columbia and Jackson Townships, where the limestone talus has accumulated extensively, the bottom land soils would be more properly termed Hamburg loam.

The following table shows the extent of each of the types:

AREAS OF DIFFERENT SOILS.

SOIL.	Square Miles.	Per Cent.
Miami clay loam	149.5	69.5
Miami silt loam	34.0	15.8
Miami black clay loam	1.0	.5
Miami loam	1.0	.5
Oak Forest silt loam	12.0	5.5
Huntington loam	16.0	7.4
Hamburg loam	1.0	.5
Limestone slope clay loam	.5	.2
Total	215.0	99.9

MIAMI CLAY LOAM.

The type is very closely allied to its occurrences in Union, southern Rush and southern Wayne Counties. It is a light brown or ash-gray clay loam or silt loam, with a depth of 6 to 11 inches. When rubbed between the fingers it imparts a smooth feeling, which is indicative of a high percentage of silt.

The subsoil is a brown or yellow clay loam, becoming a sandy clay at a depth of 2½ feet. This subsoil, because of the hillside wash, often appears as the plow soil. In such cases the crops yield poorly and the land may be classed as untillable. Many farmers remember when these hillsides produced as well as any of the upland, but through careless plowing and cropping, so as to leave the land bare, the soil has been carried down into the bottoms. A few suggestions from successful farmers as to how to improve a soil of this character have been taken up in the general discussion. Blue grass and crops that hold the soil should be grown on the slopes instead of corn.

There are a number of farmers on the Miami clay loam who hold that tiling is not necessary where there is sufficient slope for the water to run off from the surface, but those who have experimented along this line are of an entirely different opinion. They find that it not only makes a decided difference in the surface wash, but that it drains the water from the little intervening spaces between the grains of dirt and so permits the air to circulate more readily. This facilitates the conveying of the nitrogenous foods to the roots of the leguminous plants, which results in a richer soil and better yields. In one case in the northeastern part of Waterloo Township the corn crop was more than tripled by tiling a rolling surface which would ordinarily be said to drain itself.

An average corn crop for this type is about thirty-three bushels to the acre, while the leading farmers are getting fifty-five and sixty. Wheat averages fourteen and oats thirty. Clover ranges between one and two tons and timothy from one to one and a half tons. The selling price of land is from $10 to $110 per acre.

The following table gives the mechanical analyses of typical samples of this type:

MECHANICAL ANALYSES OF THE MIAMI CLAY LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
14a	3 miles east of Falmouth....	Soil, 0 to 10 inches.....	1.2	1.8	3.4	5.5	1.0	65.5	16.3
14b	Subsoil to 14a.............	Subsoil, 10 to 30 inches	.6	.8	1.3	2.4	2.2	65.7	27.3
21	2 miles southwest of Columbia.	Soil, 0 to 7 inches......	.6	.8	1.2	2.4	2.6	78.6	16.0
26	1½ miles east of Connersville.	Soil, 0 to 10 inches.....	.3	.7	1.4	2.1	2.4	78.3	18.1
28	2½ miles north of Springerville.	Soil, 0 to 11 inches.....	1.1	2.4	2.1	2.7	3.6	68.1	19.2
23	Just east of Fayetteville....	Soil, 0 to 10 inches.....	2.9	.6	.4	2.5	2.9	77.1	18.1
10	6 miles west of Connersville..	Soil, 0 to 11 inches.....	1.8	1.2	1.7	3.3	3.9	68.4	20.0
45	3 miles southeast of Fayetteville.	Soil, 0 to 10 inches.....	.6	.6	.7	1.2	.1	79.5	18.0

MIAMI SILT LOAM.

This type is an extension of the Miami silt loam areas of Union and Franklin Counties. It has a similar texture, color and subsoil, and bears about the same relation to the Miami clay loam. It differs, however, from the Union County soil in that a larger percentage of its area occurs on a decidedly rolling surface, thus permitting a large amount of wash, which has left either a very thin soil or has uncovered the subsoil. This results in smaller crops and cheaper land. The average farmer is getting about thirty-two bushels of corn and fourteen of wheat to the acre, while the best farmers get fifty of corn and seventeen of wheat.

The mechanical analyses of the Miami silt loam is found in the following table:

MECHANICAL ANALYSES OF THE MIAMI SILT LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
36a	2 miles northwest of Everton	Soil, 0 to 8 inches......	.7	.6	.6	.9	1.1	81.4	14.3
36b	Subsoil of 36a.............	Subsoil, 8 to 36 inches..	.05	.05	.1	.4	.4	72.8	28.1
30	2½ miles northeast of Everton.	Soil, 0 to 9 inches......	.8	.7	.9	1.9	2.3	79.8	14.3

MIAMI LOAM.

This soil occupies a very limited area along the Whitewater in the northern portion of the county. It is similar in texture and general characteristics to the same type in Wayne County, except that it is found on steeper slopes and has been subjected to greater surface wash.

MIAMI BLACK CLAY LOAM.

Since stream erosion has been the prevalent factor in shaping the topography of Fayette County, most of the old marshes, lakes and ponds, remnants of the glacial epoch, have long since been drained, and the organic matter which accumulated in them has been thoroughly decomposed or dissolved out of the soil. A very few of these basins have yet left traces in the scattered, isolated and small spots of black land occupying the sags in Orange, Fairview and Posey Townships. These spots are known as the best corn land in the county.

For a description of the texture, derivation and crops raised on the Miami black clay loam, see the description under the general discussion in Henry and Wayne counties.

OAK FOREST SILT LOAM.

The Oak Forest silt loam is a type having its main development in Franklin County, in the report of which it is described more fully. The limited areas in southern Fayette County are found on the ridge summits. Owing to the ridges being narrow and high the soil is badly washed and is as likely to have been replaced by the silt loam subsoil as it is to be present. The soil is considered the poorest of the county, being an ashy gray silt loam that is cold, sour and very deficient in organic matter and lime.

The improvements of this soil are very poor, tiling, green manuring and crop rotation being almost entirely neglected. Very little stock is raised, the grain being sold. Corn crops range from seventeen to twenty-five bushels to the acre and wheat from ten to eighteen. The selling price of this land is from $10 to $25 per acre.

The Oak Forest silt loam, with tile, green manure, lime, stable manure, stock fed over it, crops rotated and care taken in the cultivation of crops and the selection of seeds, has been made to more than double its production.

LIMESTONE SLOPE CLAY LOAM.

This type, because of its location on the hillsides, is cultivated but little, and should not be on account of wash. It should be kept in blue grass, alfalfa or some crop that will hold the soil, instead of tobacco or corn, which some farmers seem to be inclined to grow.

A more complete description of this soil, as to its texture, crops and cultivation, will be found in the Franklin County report.

HUNTINGTON LOAM.

A few rather impure areas of Huntington loam are found in the smaller valleys of the county, but by far the more important occurrences are in the first and second terraces of the broad Whitewater Valley. The farms situated on these terraces are considered superior to those of the upland. With their natural underdrainage through the gravel beds, which are generally within from 3 to 5 feet of the surface, and the loose open brown loam or sandy loam, this soil is the earliest of all the types. Corn is planted two weeks earlier than on the upland and can be tended several days sooner after a heavy rain. The result is that the average farmer is getting forty bushels of corn to the acre, while the best farmers get sixty, as against thirty-three for the average farmer and fifty-five to sixty for the best on the upland. Wheat does not do well on the first bottom, but sometimes yields twenty bushels to the acre on the second.

The first bottom is not as desirable land as the second. This is in part due to the damage done by the floods, and partly to a more sandy and gravelly texture, with beds of sand or gravel near to the surface, which causes it to suffer more from droughts. Often old bars of sand and gravel are encountered on the first bottom which are classed as worthless, but which might make a very good alfalfa soil. The most desirable land of both bottoms is found north from Connersville.

For a more complete discussion of the Huntington loam, see page 23.

The following table shows the results of the mechanical analyses of samples of this type:

MECHANICAL ANALYSES OF THE HUNTINGTON LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
34	First bottom of Whitewater River south of Connersville.	Soil, 0 to 16 inches.....	3.5	4.6	7.4	18.0	21.2	36.1	10.0
16	First bottom west of Waterloo.	Soil, 0 to 16 inches.....	11.8	11.8	6.5	9.3	10.9	38.0	11.8

UNION COUNTY.

HISTORY OF SETTLEMENT AND INDUSTRIES.

Union County, situated on the Ohio State line, south of Wayne and north of Franklin County, with an area of 162 square miles and a population of about 7,000, was originally owned by the Miami Confederacy of Indians. On September 24, 1804, John Templeton and Joseph Hanna entered the first 640 acres along the East Fork of Whitewater River, in what is now New Harmony Township. The county was not established until about 1821.

Besides the Rude Bros. Manufacturing Company's plant at Liberty, there is scarcely any other industry of note in the county other than agriculture. But what the people lack in manufacturing they make up in farming. No other county of the surveyed area averages as well in crops and general farm improvements. Harrison Township has several farmers that are getting more than ninety bushels of corn to the acre, a number of others that are producing more than seventy-five, while the average for the township is about fifty. This gives Harrison first place for corn among the seven counties under consideration.

Out of approximately 102,600 acres, as shown by deeds, 80 per cent. is tillable, 13 per cent. is in woodland pasture and 6½ per cent. in wood land that is not pasture. About 20,500 acres were in wheat in 1908, 24,000 in corn, 4,700 in clover, 1,750 in timothy, and 38 in alfalfa.

There has been a great improvement in railway facilities since two or three years ago, at which time the C., H. & D. alone traversed the county from northwest to southeast. Now the Chicago, Cincinnati and Louisville crosses the western third from north to south. For wagon road transportation the county takes first rank in the area of survey, 90 per cent. of the roads being graveled. For future road building and repairing there is great abundance of gravel in the terraces and flood plains of the East Fork of Whitewater River and fair deposits along Silver and Hannah's Creeks. An examination of the gravel of this county showed the general run to be 85 per cent. limestone, 10 crystallines, 3 shale, 1.5 chert and 1.5 slate.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Section of Township Under Consideration.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	Estimates of Well-Informed Farmers as to the Annual Average Crops Through a Series of 10 Years, Together With Some Statistical Averages for 1908.																				
							Bushels Per Acre.												Tons Per Acre.								
							Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
							Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Brownsville	36 (15 N., 13 E.)	Miami clay loam	Farmers				50	40			12			30													
	27 (12 N., 2 W.)	Miami clay loam	Farmers				55	38		20	15			40													
	25 (12 N., 2 W.)	Miami clay loam	Farmers				60	45		25	18																
	Township	All types occurring	Stat. Rept	18,209	13,990	3,922			30			19			30						1⅜			1⅐			
Center	16 (11 N., 1 W.)	Miami silt loam	Farmers				60	45			17						1¼			1½							
	Township	All types occurring	Tp. Assessor				65	48			19																
	13 (11 N., 1 W.)	Miami blk. clay loam	Farmers				70	50		25	18		40	35													
	Township	All types occurring	Stat. Rept	17,403	14,990	2,353			41			20						1²⁄₇			1½			1⅛			2½
Harrison	13 (12 N., 1 W.)	Miami blk. clay loam	Farmers				80	60																			
	Township	All types occurring	Stat. Rept	19,063¾	16,006	2,996			45½			19			30						1¼			1½			
Harmony	13 (13 N., 13 E.)	Miami silt loam	Farmers					40																			
	Township	All types occurring	Stat. Rept	14,720	9,120	5,205			25½			14						1½			1⅒			1			
Liberty	W. half of Twp	All types occurring	Tp. Assessor				50	40			18			35													
	E. half of Twp	All types occurring	Tp. Assessor																								
	Township	All types occurring	Stat. Rept	15,809	11,867	3,689			33			14			16			1⅒			1½			1⅒			2
	25 (14 N., 13 E.)	Miami silt loam	Farmers				40	30			10																
	24 (14 N., 13 E.)	Huntington loam	Farmers				50																				
	6 (13 N., 14 E.)	Miami silt loam	Farmers				55																				
	21 (11 N., 2 W.)	Miami loam	Farmers				55	35																			
Union	10 (10 N., 1 W.)	Miami silt loam	Farmers				55	40			18			28												4	
	Township	All types occurring	Stat. Rept	17,390	15,008	1,989			40		19½				20			1⅖			1⅖			1⅒			1¼
Totals and averages for Union County				102,594	80,981	20,154	57.3	42½	36	23.3	16.4	17.2		33.6	24			1.28			1.3			1.1			1.9

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Section of Township Under Consideration.	Soil Type as Determined by Mechanical Analyses.	Authority.	TAKEN FROM STATISTICAL REPORTS FOR 1908.						ESTIMATES OF FARMERS AND STATISTICAL REPORTS FOR 1908.				Estimates of Farmers as to the Selling Price of Land per Acre.
				Stock of Various Kinds on Hand Jan. 1, 1909.						Stock of Various Kinds Turned off Annually for Each 100 Acres of Land.				
				Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	
Brownsville	36 (15 N., 13 E.)	Miami clay loam	Farmer							20			8	$60 to $125.
	27 (12 N., 2 W.)	Miami clay loam	Farmer							40				
	25 (12 N., 2 W.)	Miami clay loam	Farmer							60				$60 to $125.
	Township	All types occurring	Statistical Report	605	65	324	678	744	2,561	22	½	3	3½	
Center	16 (11 N., 1 W.)	Miami silt loam	Farmer							50				
	Township	All types occurring	Twp. assessor							65				$120 to $140.
	13 (11 N., 1 W.)	Miami black clay loam	Farmer							100				
	Township	All types occurring	Statistical Report	594	49	591	476	601	3,400	35⅕	⅙	1	1¾	
Harrison	13 (12 N., 1 W.)	Miami black clay loam	Farmer							100				$125 to $150.
	Township	All types occurring	Statistical Report	459	53	339	772	496	4,347	39	⅔	2½	5	
Harmony	13 (13 N., 13 E.)	Miami silt loam	Farmer											
	Township	All types occurring	Statistical Report		82	369	221	620	1,477	22	⅓	⅓	2	
Liberty	W. half of Twp.	All types occurring	Twp. assessor							30		6		$60 to $125.
	E. half of Twp.	All types occurring	Twp. assessor											$20 to $30.
	Township	All types occurring	Statistical Report	387	21	408	245	694	2,067	23		⅓	2½	
	25 (14 N., 13 E.)	Miami silt loam	Farmer											
	24 (14 N., 13 E.)	Huntington loam	Farmer											
	6 (13 N., 14 E.)	Miami silt loam	Farmer											
	21 (11 N., 2 W.)	Miami loam	Farmer							20			8	
Union	10 (10 N., 1 W.)	Miami silt loam	Farmer											$45 to $65.
	Township	All types occurring	Statistical Report	547	47	445	171	1,287	3,274	35½	½	½	2	
Totals and averages for Union County				2,592	317	2,576	2,563	4,442	14,565	43.9	.43	1.9	4.09	

PHYSIOGRAPHY AND GEOLOGY.

The topography in the eastern and western halves of Union County varies greatly. Immediately east of a line drawn due north and south through Liberty is a slightly rolling surface, becoming more and more level farther east until a distance of three miles is reached. East of this we find a gently undulating plain containing rather extensive areas of the dark colored soils. This topography is due largely to glaciation. Although the surface west of this line, which passes through Liberty, is also covered by the Later Wisconsin drift, yet the surface features are mainly due to erosion. The valley of the East Fork of the Whitewater River, which traverses the western quarter of the county from north to south, has a depth of more than 100 feet, while the valleys of Hannah's, Silver and Richland Creeks, which join it on the west, and Ellis, Turkey and Simpson, on the east, are 50 feet below the adjacent uplands. In preglacial times the valley of the East Fork was 200 feet deeper than today. This has been learned by borings which have gone down through 200 feet of fluvial material before reaching the bed rock.

An older drift seems to underlie the Later Wisconsin, as was apparent when a well at Liberty, below the till formation at a depth of 35 feet, passed through a bed of swamp muck, containing leaves. A similar experience was met two miles south of Brownsville, where a well passed through swamp muck below gravelly drift at 20 or 30 feet. These indicate a glacial topography overridden by the Later Wisconsin ice sheet. The combined thicknesses of the two drifts are from 20 to 40 feet on the upland.

The Ordovician period is represented by the Cincinnati limestone and shale, which outcrop in the valley of the East Fork of Whitewater River.

SOILS.

Five soil types were recognized in this county. Of these, four were upland and one bottom.

The following table shows the extent of each of these types:

AREAS OF DIFFERENT SOILS.

SOIL.	Square Miles.	Per Cent.
Miami silt loam	117.0	72.7
Miami clay loam	19.0	11.7
Miami black clay loam	14.5	8.9
Miami loam	3.5	2.2
Huntington loam	8.0	4.9
Total	162.0	99.9

MIAMI CLAY LOAM.

The Miami clay loam as mapped in Union County is almost as frequently a silt loam as a clay loam, especially is this true as it approaches the southern limit. It resembles very closely in texture and color the type, as it is found in Wayne County, but differs in that it runs lower in clay, is more silty and has not so much of the dark brown subsoil. The subsoil nearest the surface is generally a brown clay loam, which grades into a sandy clay or sandy loam deeper down. For sizes and kinds of crops, fertility and value it is about the same as the Miami silt loam bordering it on the south.

The following table shows the results of the mechanical analyses of the Miami clay loam:

MECHANICAL ANALYSES OF THE MIAMI CLAY LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
11a	Southeastern corner of section 13 (12 N., 2 W.)	Surface...............	.9	.9	1.4	4.2	4.6	67.0	20.8
11b	Subsoil of 11a.............	Subsoil...............	.7	1.2	1.9	3.2	3.2	67.4	22.3

MIAMI SILT LOAM.

The northern portion of the Miami silt loam area, as mapped, is very closely associated with the Miami clay loam. In fact, these two areas are so closely intermingled that, without a great amount of detail soil boring it would be impossible to tell just where the one begins to predominate over the other. However, the majority of mechanical analyses made of the samples representing soils south of the boundary line as given indicate that the Miami silt loam covers the greater area, while north of it the Miami clay loam is the leading type.

In the northern part of the county the surface soil is from 7 to 11 inches in depth and varies in color from a light gray to a medium brown, according to the amount of organic matter present. The upper part of the subsoil is often a sandy clay, which at about 17 inches grades into a fine sandy loam. In the southern part of the county both soil and subsoil are almost identical with the type as it appears in Franklin County.*

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*See p. 120.

The large amount of gently rolling surface, the adaptability to a great diversity of crops, the natural productiveness and ability to withstand drought makes the Miami silt loam a splendid soil for general farming purposes. Corn yields of sixty bushels to the acre and wheat of twenty-two are about the average for the better farmers that have their places well tiled. The average farmer realizes about forty-two bushels of corn and sixteen of wheat. An average crop of oats is about thirty-five bushels, while clover yields one and one-fourth bushels of seed and from one to two tons of hay. Timothy hay crops are about the same. Although a few of the foremost farmers carry on a systematic crop rotation, the common rule is to follow the corn with either wheat or oats, and these in turn by either clover or timothy. When both the clover hay and seed are taken off and the field has been pastured for a year or two, it is again planted to corn. If in the spring the wheat outlook is not promising, corn is likely planted for the second year. There is much room for improvement in systematic cropping.

The principal timber growing in this area has been black walnut, rock maple, red oak, white oak, red beech, white beech and hickory.

Land sells from $30 to $125 per acre, depending upon improvements and location.

Farmers living on this type average annually for the market about thirty-five head of hogs, one or two beef cattle and a few sheep. More live stock would keep the farms better manured and give a larger profit.

The following table shows the results of the mechanical analyses of the soil and subsoil of this type:

MECHANICAL ANALYSES OF MIAMI SILT LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
10a	1½ miles uorth of Billingsville.	Surface	.5	1.1	1.7	3.7	4.5	70.0	18.4
		Subsoil	1.6	2.1	3.2	9.0	11.5	48.0	23.0
13	East central part of section 13 (11 N., 1 W.)	Surface	.2	.2	.7	2.2	2.5	77.6	16.4
		Subsoil	.2	.5	.9	1.8	2.1	71.5	23.3
17	East central part of section 34 (12 N., 1 W.)	Surface	1.3	1.2	1.4	4.0	4.7	72.7	14.4
		Subsoil	.2	.5	1.0	2.1	2.8	65.2	28.4
18	2 miles north of Liberty	Surface	1.8	1.8	2.9	5.6	6.4	66.6	14.7
		Subsoil	2.2	1.5	2.6	4.7	5.0	60.0	25.5
25	2 miles northwest of Beechy Mire.	Surface	1.0	.1	.6	1.2	3.5	76.0	17.1

MIAMI BLACK CLAY LOAM.

The Miami black clay loam areas occurring all along the eastern border of the county, start about five miles north of the Wayne County border and extend southward to the southeastern corner of Franklin County. The most extensive developments are in the northeastern quarter of Harrison Township. Here it is that corn crops of over a hundred bushels to the acre have been grown and a hog turned off, each year, for every acre of land.

When well drained this land is a dark brown to black granular clay loam. It runs very high in organic matter and occupies the sags or lower areas. It is generally, at a depth of two feet, underlain by a brown to yellow clay or clay loam, but in cases the subsoil is a drab clay with a bluish tint. In all other textural relations, whether the occurrence is in a drained or undrained area, it is very similar to the general type as taken up in the opening discussion of this report.

Wheat by the advanced farmers is grown successfully in this county, which is rather exceptional for this type. This class averages about twenty-five bushels to the acre, while the ordinary run get about twelve. This better class of farmers are practicing a three years' rotation of corn, wheat and clover, and claim that it is very beneficial to their soil. Tiling to some extent has been done on about all of this kind of land.

Farms situated on this type are selling at $100 to $150 per acre.

The following table gives a mechanical analysis of the soil of this type:

MECHANICAL ANALYSIS OF THE MIAMI BLACK CLAY LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
14a	In the north central part of section 13 (12 N., 1 W.)	Soil..................	.8	1.2	2.0	4.6	5.6	72.0	13.4

MIAMI LOAM.

This occurrence in Union County is only an extension of the Miami loam found on either side of the East Fork of Whitewater River in Wayne County. Its texture and characteristics are taken up in detail under the Miami loam for Wayne County.

Huntington Loam.

The Huntington loam is found for the most part along the East Fork of Whitewater River, and to a lesser extent in the bottom of Dubois, Hannah's, Silver and Richland Creeks. The texture is about the average run for the seven counties, which is treated in the general discussion. However, the wash from the hillsides in the smaller valleys has produced an impure type.

On account of numerous floods much of the first bottom along the East Fork has become undesirable and is selling in cases as low as $10 per acre where it would be worth $75 if it were not for the overflows. The old settlers say that years ago when the stock grazed along the river and would not permit the growing of the heavy heath now occurring on either side that crops were damaged very little by floods. The heath is a barrier that slackens the velocity of the currents and holds the water back.

Where the land is free from floods corn crops of forty to fifty bushels to the acre are grown, while wheat will run about fifteen. Land of this kind will bring $75 and $100 per acre.

FRANKLIN COUNTY.

The first settler of Franklin County erected his cabin at New Trenton in 1803. Eight years later the county was organized, and in 1819 a newspaper, known as the Brookville Enquirer and Indiana Gazette, was started at Brookville. Advancements have been slow in a large portion of Franklin County. The railway facilities are poor, only 15 per cent. of the wagon roads are improved, and agricultural methods and conditions are not as good as those of the other counties of the area of survey.

Brookville, a town of about 3,000 inhabitants, is the county seat and the leading manufacturing center. Among the chief manufacturers is the Thompson & Norris Paper Co., which employs ninety-eight men; the Brookville Furniture Co., with sixty-five employes; the Brookville Buggy Co. and the Freis & Sons Tiling and Brick Co.

Oldenburg, with a somewhat smaller population than Brookville, is noted for its large Catholic school. The other towns of the area are small country villages. Southwest of Laurel are several stone quarries, and another is situated east of Peppertown.

Franklin County has a population of 17,000 and covers an area of 394 square miles. There are about 210,000 acres of land in farms. In 1908 nearly 30,000 acres were in wheat, 31,000 in corn, 3,000 in oats, 12,000 in clover, 9,000 in timothy, 5,000 in potatoes, 41 in tobacco and 140 in alfalfa. In the orchards of the county there were over 20,000 apple trees, 7,000 peach, 2,000 cherry, 1,000 pear and 1,000 plum. There were approximately 5,000 head of horses on hand January 1, 1909, 400 mules, 5,000 dairy cattle, 4,000 beef cattle and 19,000 hogs. About 31,000 hogs and 3,500 sheep were sold during 1908.

Franklin County probably has more standing timber than any of the six others. Among the trees still standing can be seen the black walnut, white oak, red oak, burr oak, chestnut oak, black oak, sycamore, red elm, white elm, slippery elm, hickory, pignut, shelbark, white beech, yellow beech, red beech, white ash, blue ash, black ash, hoop ash, hackberry, yellow poplar, white poplar, rock maple, white maple, red or swamp maple, butternut, wild cherry, honey locust, buckeye, blue gum, mulberry, red cedar, sweet gum, linden and cottonwood.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	ESTIMATES OF WELL-INFORMED FARMERS AS TO THE ANNUAL AVERAGE CROPS THROUGH A SERIES OF 10 YEARS, TOGETHER WITH SOME STATISTICAL AVERAGES FOR 1908.																				
						Bushels Per Acre.												Tons Per Acre.								
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Bath	Miami black clay loam	Farmers				60	45																			
	All types occurring	Statistical Report.	11,694	8,769				52			21			16			1½			1⅙			1⅛			
Blooming Grove	Miami silt loam	Farmers				55	30		15	12																
	All types occurring	Statistical Report.	13,884	7,503				19⅓			13⅔						2			1			1			
Butler	Oak Forest silt loam	Farmers				35	22		15	12			25													
	All types occurring	Statistical Report.	19,029½	13,036¼				26½			8½			9½			1½			1			1			2¾
Brookville	Miami silt loam	Farmers				55	35			15			30													
	Oak Forest silt loam	Farmers				35	23			14																
	Huntington loam	Farmers				60	35																		4½	
	All types occurring	Statistical Report.						35			16			12			1½			1¼			1¼			2
Fairfield	Miami silt loam	Farmers				40	27		20	14																
	Huntington loam	Farmers					35		15	12																
	All types occurring	Statistical Report.	9,857	4,700				24			14						1¼			1¼			1½			2½
Highland	Oak Forest silt loam	Farmers				30	20		20	13		25	15						¾			¾				
	Huntington loam	Farmers				70	35		15	10																
	All types occurring	Statistical Report.						25			14			10			1½			1			1			1
Laurel	Oak Forest silt loam	Farmers				40	22			12			18													
	All types occurring	Statistical Report.	18,349	5,084				22			14			10			1¼			1⅓			1			2

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	ESTIMATES OF WELL-INFORMED FARMERS AS TO THE ANNUAL AVERAGE CROPS THROUGH A SERIES OF 10 YEARS, TOGETHER WITH SOME STATISTICAL AVERAGES FOR 1908.																				
						Bushels Per Acre.												Tons Per Acre.								
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Metamora	Oak Forest silt loam	Farmers				30	20			12			25													
	All types occurring	Statistical Report	12,552	6,609				38			11						2						1			3
Posey	Oak Forest silt loam	Farmers				40	22		20	14																
	Hamburg loam	Farmers				50	35		20	14																
	All types occurring	Statistical Report	10,737	4,675				25			11½						1¾			1⅕			1			
Ray	Oak Forest silt loam	Farmers				40	20			14			20													
	Hamburg loam	Farmers				45	30			12																
	All types occurring	Statistical Report	25,012	16,177				17			12						1¼			⅘			⅘			
Salt Creek	Oak Forest silt loam	Farmers				35	18			14																
	Hamburg loam	Farmers				45	37			11																
	All types occurring	Statistical Report	17,355	11,833				23⅔			12			11			1⅓			1			1			1½
Springfield	Miami silt loam	Farmers				55	35		17	14						1½										
	Hamburg loam	Farmers				45	35			12															4	
	All types occurring	Statistical Report	21,633	15,925				36⅔			17			9			1½			1⅕			1			
Whitewater	Miami silt loam	Farmers				45	30		15	13															4	
	Hamburg loam	Farmers				50	40																			
	Limestone slope clay loam	Farmers				55	35																			
	All types occurring	Statistical Report						32			12						1½			1			1			2
Totals and averages						55	29	29	18	11½	13	25	22	11		1½	1⅓		¾	1⅛		¾	1⅑		4	2

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	TAKEN FROM STATISTICAL REPORTS FOR 1908.						ESTIMATES OF FARMERS AND STATISTICAL REPORTS FOR 1908.				Estimates of Farmers as to the Selling Price of Land per Acre.
			Stock of Various Kinds on Hand Jan. 1, 1909.						Stock of Various Kinds Turned off Annually for Each 100 Acres of Land.				
			Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	
Bath	Miami black clay loam	Farmers	...	...	...	...	...	...	60	...	...	...	Av. of $100.
	All types occurring	Statistical Report	335	17	257	133	...	2,635	35½	½	...	3½	...
Blooming Grove	Miami silt loam	Farmers	...	...	...	...	...	...	15	...	...	10	$2 to $60.
	All types occurring	Statistical Report	396	14	396	361	...	1,081	15½	⅕	...	5½	...
Butler	Oak Forest silt loam	Farmers	...	...	...	...	...	...	...	1	...	...	$4 to $20.
	All types occurring	Statistical Report	361	40	450	379	...	411	3⅐	⅕	...	⅘	...
Brookville	Miami silt loam	Farmers	...	...	...	...	...	...	30	...	...	...	$15 to $125.
	Oak Forest silt loam	Farmers	...	...	...	...	...	...	...	...	...	...	$3 to $18.
	Huntington loam	Farmers	...	...	...	...	...	...	30	1	2	4	Av. of $100.
	All types occurring	Statistical Report	...	...	...	...	...	...	...	...	...	...	...
Fairfield	Miami silt loam	Farmers	...	...	...	...	...	...	...	...	...	...	$10 to $60.
	Huntington loam	Farmers	...	...	...	...	...	...	...	...	...	...	$20 to $75.
	All types occurring	Statistical Report	209	8	296	219	...	744	17⅙	½	...	3	...
Highland	Oak Forest silt loam	Farmers	...	...	...	...	...	...	10	...	2	...	$15 to $30.
	Huntington loam	Farmers	...	...	...	...	...	...	...	...	...	...	...
	All types occurring	Statistical Report	...	...	...	...	...	...	...	...	...	...	...
Laurel	Oak Forest silt loam	Farmers	...	...	...	...	...	...	15	...	...	15	Av. of $10.
	All types occurring	Statistical Report	279	29	28	366	...	671	2	¼	...	1½	...

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	TAKEN FROM STATISTICAL REPORTS FOR 1908.						ESTIMATES OF FARMERS AND STATISTICAL REPORTS FOR 1908.				Estimates of Farmers as to the Selling Price of Land per Acre.
			Stock of Various Kinds on Hand Jan. 1, 1909.						Stock of Various Kinds Turned off Annually for Each 100 Acres of Land.				
			Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	
Metamora	Oak Forest silt loam	Farmers											$10 to $40.
	All types occurring	Statistical Report	182	4	316	424		491	5	⅛		3⅓	
Posey	Oak Forest silt loam	Farmers							15		2	14	$5 to $25.
	Hamburg loam	Farmers											
	All types occurring	Statistical Report	179	12	158	142		551	9	⅙		2	
Ray	Oak Forest silt loam	Farmers											$3 to $60.
	Hamburg loam	Farmers											$20 to $60.
	All types occurring	Statistical Report	604	29		582		512	4½	⅐		¾	
Salt Creek	Oak Forest silt loam	Farmers							12		1½		$3 to $25.
	Hamburg loam	Farmers											
	All types occurring	Statistical Report	319	16	219	450		592	2			1	
Springfield	Miami silt loam	Farmers							35		1	8	$30 to $100.
	Hamburg loam	Farmers											
	All types occurring	Statistical Report	688	74	566	225		3,712	29½	¼		1⅛	
Whitewater	Miami silt loam	Farmers							30		3		$20 to $90.
	Hamburg loam	Farmers											$15 tu $35.
	Limestone slope clay loam	Farmers									1	12	
	All types occurring	Statistical Report											
Totals and averages													$2 to $125.

PHYSIOGRAPHY AND GEOLOGY.

The surface formations of Franklin County are largely made up of two glacial drifts belonging to the Pleistocene period. The older of these is the Illinoian. All of Laurel Township, part of Whitewater and all of the surface lying west of Whitewater River and its West Forks, with the exception of the steep slopes, stream terraces and some later drift in Posey Township, are covered by the Illinoian drift soils.

The surface of the Illinoian drift is that of a gently undulating plain deeply dissected by stream valleys, differences of 300 feet in altitude being common between the floors of the valleys and the tops of the ridges. It seldom exceeds thirty feet in thickness, and generally plays out entirely along a steep slope where washing has been a prominent factor. Its surface appears as a light gray silt deeply oxidized. In fact, decomposition has been so complete that the limestone boulders and gravel are almost entirely absent, having been dissolved. Granite gneisses, diorites, basalts, quartzites and others of the crystalline group are occasionally present, but nowhere in such numbers as in the Later Wisconsin drift. No dark colored land or other indications of undrained depressions occur on this drift, showing that complete oxidation of the vegetal accumulations has taken place subsequent to the drainage of all kettle basins, sloughs and marshes.

The Later Wisconsin drift varies from 10 to 60 feet in thickness. The undrained swamp areas and Miami black clay loam dottings are present in the northeast quarter of the county, and also a great variety of boulders. A few kames occur two or three miles south of Blooming Grove. Like the older drift, it is a gently undulating surface considerably cut up by stream valleys in the eastern part, while in the western and northwestern portions of the county it is comparatively level.

The limestone outcropping in the hilltops west of Laurel and north of Brookville belongs to the Silurian period, while the blue limestone and shale appearing at the surface on almost all of the steep slopes south of the Laurel outcrops, are the Cincinnati formations of the Ordovician period. An oil well drilled one mile north of Buena Vista passed through 34 feet of Illinoian drift, 105 feet of Niagara and Cincinnati limestones and 706 feet of Cincinnati shale before reaching the Trenton limestone.

SOILS.

On account of the Illinoian drift being the surface formation over the large part of Franklin County instead of the Later Wisconsin, as in the case in the other six counties of the survey, and the Cincinnati limestone being the formation from which the limestone slope soil has been derived, we meet some quite different types than those mapped in the other counties. The land derived from the Illinoian drift is known as the Oak Forest silt loam, while that from the Later Wisconsin is the Miami silt loam or Miami black clay loam. The Huntington loam is the main bottom land, 95 per cent of which occurs in the terraces and flood plains of Whitewater River and its forks. The bottom land soils of the many narrow valleys along the smaller streams will be known as Hamburg loam, owing to their typical development in the vicinity of the village of Hamburg.

The following table shows the extent of each of these soils:

AREAS OF DIFFERENT SOILS.

SOIL.	Square Miles.	Per Cent.
Miami silt loam	140	35.5
Miami black clay loam	10	2.5
Oak Forest silt loam	195	49.5
Limestone slope clay loam	24	6.1
Huntington loam	20	5.1
Hamburg loam	5	1.3
Total	394	100.0

MIAMI SILT LOAM.

This soil as it appears at the surface is a light brown or dark gray to almost white silt loam extending to a depth of 6 to 11 inches. It generally has a loose, flour-like feel, and the content of organic matter is very small, but in some localities where it is associated with the Miami black clay loam the color is dark and the amount of organic matter high. Where there is considerable wash the soil is frequently more sandy than when found in the gently undulating plains.

Below the plow soil, and continuing to a depth of 2 or 3 feet, a mottling of white and yellow frequently occurs, the white color often being a residual matter left when the limestone pebbles are, or have been, in the process of decomposition. At a depth of 13 inches the subsoil takes on a light brown color. It is more clayey than the surface soil and becomes more so at a depth of 16 inches, where it is a clay loam. Below this the clayey character plays out, and at 18 inches a silt loam or a sandy clay is found, which continues to a depth of 3 feet.

Twenty-five years ago much of this land was considered to be fit for little more than grazing purposes. Corn crops of twenty bushels to the acre were as good as could be expected, but since tiling, crop rotation and green manuring have been put into practice the corn yields have more than doubled. A very progressive farmer in Whitewater Township says that some years ago his farm would not produce over twenty-five bushels of corn to the acre, but since tiling his land to a depth of 4 feet in the Miami black clay loam and 3½ feet in the Miami silt loam he can be reasonably certain of at least sixty bushels of corn to the acre. He keeps up a careful rotation of corn, wheat and clover, plows under crops of clover, and cultivates his corn to a depth of 2 inches every few weeks until it is silked out. By a careful selection of seed he will be able to continue to increase his yields.

By using commercial fertilizer farmers realize an average wheat production of fifteen bushel to the acre. Oats average about thirty bushels and clover or timothy one ton.

The following table shows the results of the analyses of the Miami silt loam:

MECHANICAL ANALYSES OF THE MIAMI SILT LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
25a	½ mile southwest of Springfield.	Soil, 0 to 10 inches....	.9	1.3	2.1	7.0	8.3	68.0	12.6
25b	First subsoil of 25a........	Subsoil, 10 to 22 inches.	.2	.3	.6	1.4	1.7	67.2	29.0
25c	Second subsoil of 25a......	Subsoil, 22 to 36 inches.	.1	.3	1.5	6.0	7.0	69.2	16.2
80a	2½ miles southeast of Blooming Grove.	Soil..................	1.4	1.1	1.6	2.1	2.5	74.9	16.4
80b	First subsoil of 80a	Subsoil...............	.4	.5	1.0	2.4	2.8	75.4	18.9
80c	Second subsoil of 80a......	Subsoil...............	.3	.3	.5	1.6	1.9	72.3	23.8

MIAMI BLACK CLAY LOAM.

Many of the Miami black clay loam areas have, only in the last two decades, been reclaimed from the marshes. By careful tiling this soil has become the best for corn and most valuable of any in the county. A corn crop of sixty bushels to the acre is about an average for the better class of agriculturists, but wheat does not do as well as on the light-colored soils.

The soil occurs as a heavy loam or clay loam, with a depth varying between 11 and 16 inches. The color to a depth of 1½ feet is black, but below this grades rapidly into a heavy clay loam, which at 2 feet or a little deeper often grades into a sandy clay or loam. In other textural properties it bears a close resemblance to the Miami black clay loam soil treated in the general discussion.

The surface of the Miami black clay loam is practically level. Its occurrence is found in all parts of the Miami silt loam area, but most especially in Bath, the eastern half of Springfield and the eastern quarter of Whitewater townships. The average selling price of the land is about $100 per acre.

The following table gives the results of the mechanical analyses of typical samples of this soil:

MECHANICAL ANALYSES OF THE MIAMI BLACK CLAY LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
66a	1½ miles northwest of Bath..	Soil, 0 to 14 inches.....	.5	2.0	4.2	8.0	9.8	72.9	25.2
66b	Subsoil, of 66a...........	Subsoil, 14 to 36 inches.	.5	.8	.1	3.4	4.0	62.1	27.8

OAK FOREST SILT LOAM.

A casual observer might pass from the Miami silt loam to the Oak Forest silt loam without noting the change, but upon more careful examination the latter would be found to be a shade lighter in color, to contain less organic matter, less crystalline rocks, to have very few limestone pebbles or boulders, and to be underlain by a light colored subsoil, which has more segregations of yellow iron stains and iron concretions.

The average surface soil of the Oak Forest silt loam is a light ashy gray silt loam, with a depth varying between 4 and 8 inches, but on slopes the pale yellow mottled silt loam subsoil occurs at the surface over large areas. By tasting the soil or subsoil almost invariably one detects a very tart taste, which indicates sourness. This soil and subsoil resemble very closely the Scottsburg silt loam of Scott County, Indiana.

No land in the seven counties under consideration has been so sadly neglected. Rarely is it tiled and very seldom is green manuring practiced. There is no systematic cropping. Corn is planted about the 1st of June, the land not being sufficiently dry earlier.

Often the corn has not time to ripen before the autumn frosts. More care should be exercised in the selection of seed and cultivation. Judging by the results that a few progressive farmers have realized by using up-to-date methods in carrying on their farming, there remains no doubt but that this land can be made to yield fifty bushels of corn to the acre. Oats average about twenty-five bushels to the acre and wheat, by using commercial fertilizer, fifteen.

Many farmers say they cannot build their soil up by plowing under clover, because they cannot get a stand. Upon examining a number of clover fields the writer found that where manure had been stacked in little piles over the fields the clover grew heavy and the soil was not sour. The same held true wherever the manure had been heavily applied, but where thinly or not at all the acid had not been neutralized and the soil was sour. Tiling or an application of lime will also sweeten the soil. As a hay, timothy is grown more than clover.

Small fruit orchards are found on most of the farms and a few extensive fruit farms. One of these, which is owned by D. O. Secrest, is situated three miles east of Andersonville. Fifteen years ago ninety acres of this farm were set out to apple trees, which were planted thirty feet apart. They yield 25,000 bushels in a good year. Peach trees were set out between the apple trees over twenty-two acres of the ninety. These in 1906 produced 2,000 bushels. One acre set out to pear trees thirty feet apart yields 600 bushels in an average year.

The following table shows the results of mechanical analyses of typical samples of this soil:

MECHANICAL ANALYSES OF THE OAK FOREST SILT LOAM.

Number.	LOCALITY.	Description.	Authority.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
57a	1½ miles southwest of Oak Forest.	Soil, 0 to 4 inches.	U. S. Bureau of Soils.	.4	2.0	2.1	5.1	2.3	69.8	17.7
57b	First subsoil to 57a.	Subsoil, 4 to 10 inches.	U. S. Bureau of Soils.	.6	2.3	2.6	5.3	3.1	70.3	15.6
57c	Second subsoil to 57a.	Subsoil, 10 to36 inches.	U. S. Bureau of Soils.	.5	1.6	1.6	4.1	2.3	68.6	21.0
55	1¼ miles west of Huntersville.	Soil, 0 to 10 inches.	A. E. Taylor....	1.2	2.0	3.1	6.7	7.7	62.0	17.5
71	2 miles northeast of Heimond.	Soil, 0 to 6 inches.	A. E. Taylor....	1.5	1.6	2.8	5.2	6.0	70.0	14.0

LIMESTONE SLOPE CLAY LOAM.

This is the only residual soil of the area. It occurs as a dark brown to black silt loam, averaging from 8 to 16 inches in thickness. It contains a high percentage of organic matter, and to this may be attributed the dark color. With increased depth the color becomes lighter, the subsoil at 20 inches having a light to medium brown color, while at 2 feet it is a light brown with a reddish cast. The subsoil from 18 to 30 inches is more clayey than that at the surface, but below this may become rather sandy.

Although the above section is the most common, yet where the limestone is very close to the surface we find a black clay, changing very little in texture until the bed-rock is reached. In this case the soil has had its derivation wholly from the decomposition and disintegration of the limestone.

Owing to the topographical position on the main valley slopes, limestone slope clay loam grades into the Miami silt loam or Oak Forest silt loam at the upper portion of the slopes, while at the base it borders the Huntington loam or Hamburg loam. The origin of an average section seems to be mostly from the weathering of the Cincinnati limestone, to some extent from the wash of the silt loam above it, and in a few cases from the decomposition and disintegration of the underlying Cincinnati shales or the Laurel limestone. The effect that slumping, freezing, thawing, chemical reaction between the calcium carbonate of the limestone and the organic acids of the soil and other processes of disintegration are having upon the Cincinnati limestone can be partly determined by the fact that Mr. E. R. Quick, living one and a half miles south of Brookville, in 1883 gathered a large amount of limestone talus from a hillside where today there is fully as much as then.

This type seems to be especially rich in plant foods, and is known, locally, as the tobacco soil, 1,000 pounds to an acre often being realized. No soil in the county is as well adapted to blue grass. Corn also does well and alfalfa gives as good yields as on the bottom land. Probably the first alfalfa grown in the county was sown by Herman Muller, living a few miles east of Cedar Grove, about twenty-four years ago. It yielded from four to five tons per acre. Where the limestone is close to the surface and the soil is so full of the fragments that it is considered untillable, and would be classed as a stony clay or stony clay loam, alfalfa has grown well.

Owing to the very steep slopes upon which the limestone slope clay loam occurs the soil wash is very great, and a decade will leave the fields almost bare and worthless unless great precaution is taken. More care should be given when plowing so that the water cannot run in the furrows. Crops like tobacco and corn are dangerous to the preservation of the soil, because they leave the ground bare for a considerable interval. In the long run blue grass and alfalfa would be more profitable, since they would hold the soil in place.

The following table gives the results of the mechanical analyses of typical samples of the limestone slope clay loam:

MECHANICAL ANALYSES OF THE LIMESTONE SLOPE CLAY LOAM.

Number.	LOCALITY.	Description.	Authority.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
61a	1 mile southeast of Brookville.	Clay loam, 0 to 8 inches.	U. S. Bureau of Soils.	.0	.8	.8	2.3	3.7	65.4	26.8
61b	First subsoil of 61a.	Clay loam, 8 to 15 inches.	U. S. Bureau of Soils.	.1	.6	.6	1.7	1.2	64.5	31.1
61c	Second subsoil of 61a.	Clay loam, 15 to 29 inches.	U. S. Bureau of Soils.	.0	.5	.6	1.5	2.1	64.0	31.1
61d	Third subsoil of 61a.	Clay, 29 to 39 inches.	U. S. Bureau of Soils.	.0	.5	1.0	3.0	5.6	62.7	27.2
61aa	3 miles northwest of New Trenton.	Clay, 0 to 16 inches.	U. S. Bureau of Soils.	.0	.5	.7	2.4	.7	49.8	45.6
82	3 miles north of Cedar Grove.	Soil, 0 to 12 inches.	A. E. Taylor....	.2	.2	.4	2.8	4.2	67.4	24.4

HUNTINGTON LOAM.

For texture and colors of the Huntington loam and its subsoils the occurrences in Franklin County are much like those described on page 23 of the general discussion, but the topographical* occurrence differs somewhat from the other counties in that the upper terraces are so much higher above the flood-plains than in the other six counties. The fourth terrace, which has its development on the east side of Whitewater Valley, south of Brookville, is 100 feet above the bed of the river. At the surface it is a rich farming loam of 7 to 17 inches, grading into a fine sandy loam and at 2 feet into a sandy loam. At 2½ feet it is a fine sand. Underlying this is 10 to 20 inches of a tough yellow clay containing gravel, and lower down occurs boulder clay of a bluish gray color. The third ter-

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*E. R. Quick 3d Bull. of the Brookville Nat. Hist. Soc., pp. 26–29.

race is about 75 feet above the stream bed and is more sandy than the fourth, while the second is the most extensive and furnishes a splendid grade of farming land. The first terrace averages about 20 feet above low water mark and also takes its rank, in many places, as a most excellent farm land. Four miles south of Brookville a well was drilled in this terrace to a depth of 150 feet before bed-rock was reached.

The best farmers of the Huntington loam raise an average corn crop of sixty bushels, wheat fourteen, and alfalfa four and a half tons. This soil is well adapted to tobacco, but it is not considered equal to the limestone slope clay loam. Although the land is very porous, and manures will leach away rapidly, yet the application of stable manure, green manures and commercial fertilizer is reported to pay well for increasing the production.

The selling price of this type varies from $50 to $125 per acre.

The following table gives mechanical analyses of this type:

MECHANICAL ANALYSES OF THE HUNTINGTON LOAM.

Number.	LOCALITY.	Description.	Authority.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
65a	1½ miles southeast of Brookville.	Loam, 0 to 7 inches.	U. S. Bureau of Soils.	2.3	18.9	11.8	10.0	1.1	45.4	9.7
65b	First subsoil of 65a.	Fine sandy loam, 7 to 17 inches.	U. S. Bureau of Soils.	1.2	18.1	12.9	9.8	1.4	41.5	14.6
65c	Second subsoil of 65a.	Sandy loam, 17 to 28 inches.	U. S. Bureau of Soils.	1.2	18.5	12.6	9.2	1.1	39.3	17.2
65d	Third subsoil of 65a.	Fine sand, 28 to 40 inches.	U. S. Bureau of Soils.	1.4	27.1	21.2	14.0	1.1	15.9	18.8
71	Near Laurel in Whitewater bottoms.	Soil, 0 to 11 inches.	Taylor.	10.2	13.4	7.5	8.3	9.7	39.5	10.1

HAMBURG LOAM.

Found in the bottoms of the narrow valleys of the smaller streams on the west side of Whitewater River and its West Fork; is a mixture of limestone talus, which has washed down from the valley sides, with the wash from the Oak Forest silt loam. On the east side of Whitewater the limestone talus is mingled with the wash from the Miami silt loam. The texture varies from a loam to a stony loam.

Where there is a widening of the bottoms, so that agriculture can be carried on, crops equal to those produced on the Huntington loam are obtained, but these areas are very limited and comprise only small portions of farms.

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Acknowledgment.—I wish to express my appreciation to the many farmers and county officers that have helped me in the preparation of this report, and especially to Milton Whitney and J. E. Lapham, of the U. S. Bureau of Soils, for their assistance in both my field and laboratory work.

ARTHUR E. TAYLOR.

A SOIL SURVEY OF VANDERBURGH, GIBSON AND PIKE, AND PARTS OF WARRICK AND SPENCER COUNTIES, INDIANA.

BY

CHAS. W. SHANNON.

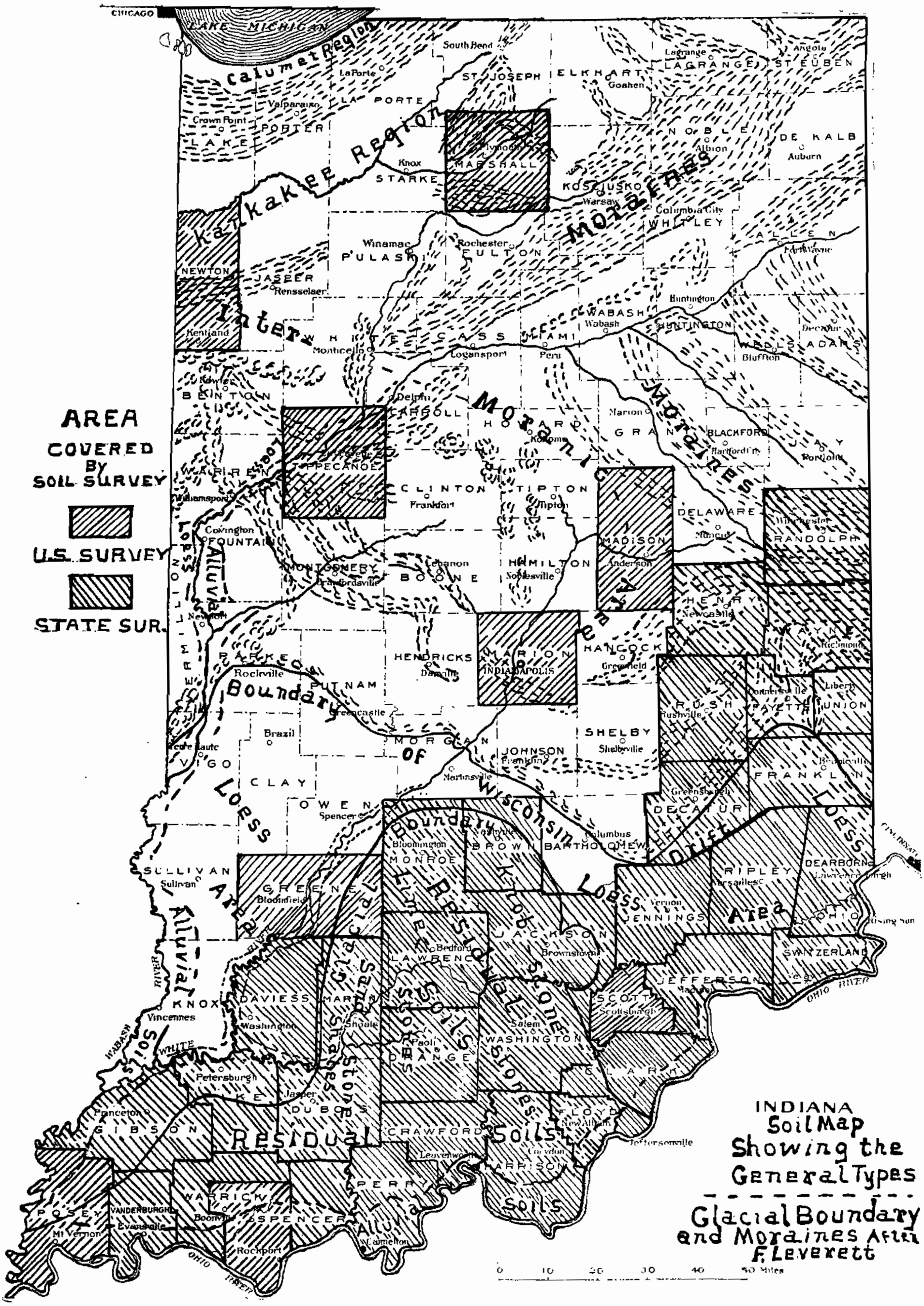
Soil Survey of Vanderburgh, Gibson and Pike, and Parts of Warrick and Spencer Counties, Indiana.

BY CHAS. W. SHANNON.

The counties included in this survey are situated in the southwestern corner of Indiana, and occupy an area of about 1,865 square miles. Posey County, in the corner of the State, and a part of Warrick and Spencer counties, known as the Boonville area, have been surveyed by the United States Bureau of Soils, and the counties adjoining on the north and east, with the exception of Knox, have been covered by former soil surveys made by the State.

This part of the State is an important one from several standpoints. The natural resources consist of clay for brick and tile, stone for macadam, coal, oil and gas in abundance, and various types of soil of great fertility. The area has a good water supply for domestic and manufacturing purposes, and several streams, including the Ohio, Wabash, White and Patoka rivers, are capable of furnishing great water power, and may also be made navigable for many miles.

The city of Evansville as a manufacturing and commercial center, together with the other county seats, and numerous villages, with their various enterprises, furnish a rather high percentage of town population. The average population, both town and country, for the entire area, is ninety-five per square mile, and taking out the town and city population, which amounts to about 104,800, the rural population is about forty per square mile.



INDIANA
Soil Map
Showing the
General Types
Glacial Boundary
and Moraines After
F. Leverett

THE POCKET.

The counties of Gibson, Vanderburgh and Posey are located in the part of the State which is commonly known as the "Pocket." There is a general impression throughout this State and adjoining states, among people who have not visited this section of Indiana, that the county is very poor and in a backward condition. The stories about "Hooppole Township, Posey County," are responsible for the false impression which has gone out concerning this part of the State. It is an error which should be corrected in the minds of the people. There is no better land in the State than much of Posey, Gibson and southern Vanderburgh counties. The soils are fertile, the improvements are good and the crop production takes the lead in the State in several cases. The following paragraph will explain the prevalent story:

"In the early days men who went from Indiana to California, when in answer to the question, 'Where are you from?' said 'Indiana,' the reply would be 'A Hoosier from Posey County, Hooppole Township.' Much of such slang was originated by the Pittsburg coal boatmen. 'Hooppole Township' came to be used in this way. In the early boating days of this county Mt. Vernon was a head center for the gathering of flatboat crews. At one time a large coal flat had landed at that point from Pittsburg, and a large number of the boatmen had gone up into the town and filled up on fighting whisky. They soon raised a disturbance and started out to clear out the town. At that time there were some large cooper shops in the lower edge of the village next the river, and some twenty-five or thirty coopers were working there. As the boatmen and the citizens were having the battle these coopers, with stout hooppoles, went to the relief of the officers who were trying to quell the disturbance, and with their formidable weapons gave the Pittsburg boatmen a chastising which they remembered for all time afterwards. Hence the name of 'Hooppole Township, Posey County.' "*

PHYSIOGRAPHY AND GEOLOGY.

The area of this survey brings in many physiographic features and geological workings which have not been met with in other parts of the State covered by the soil survey. The entire surface area, with the exception of the eastern part of Spencer County, has been influenced, directly or indirectly, by glaciation. The sur-

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*"Wm. M. Cockrum's Pioneer History of Indiana." Page 409.

face deposits then are of three classes, glacial, interglacial and post glacial or recent. At least three ice sheets have added material to this area. The Illinoian Sheet, however, is the only one which has actually advanced over the area. The Iowan sent down by its waters a large amount of fine material which was scattered over the surface, by the work of water and wind, and forms the loess which covers almost the entire area. The Later Wisconsin sheet did not reach the area, but the streams leading out from its edge carried large amounts of material which have been deposited in low flat plains, low terraces and dunes of sand and fine gravel. Long preglacial and interglacial periods of weathering and erosion chiefly made the topography of the region.

The surface rocks over the entire area are those of the Coal Measures. The following sections of a few feet will show the depth of the surface deposits and the nature of the immediate underlying formation:

Section of Well Near Oakland City.

		Feet.	Inches.
1.	Surface	4	0
2.	Sandstone	19	0
3.	Coal VII	1	6
4.	Sandstone	125	0
5.	Coal V	4	4

Section of Drilling at Owensville.

		Feet.	Inches.
1.	Surface, clay	8	0
2.	Sandstone	2	0
3.	Coal	0	2
4.	Clay parting	0	10
5.	Black shale	2	6
6.	Gray shale	8	6

North Part of Area Gibson and Pike County Line.

		Feet.	Inches.
1.	Loess and river sand	20	0
2.	Pebbly fluviated drift	8	0
3.	Soft white and yellow sandstone	30	0
4.	Soft laminated sandstone	22	0

Stimpson's Spring, Four Miles West of Evansville.

		Feet.	Inches.
1.	Loess and soil	3	0
2.	Merom rock	6	0
3.	Siliceous shale, with nodules	13	0
4.	Upper hard blue limestone	3	2

The physiography and geology of the area have been fully worked out by the United States Geological Survey and the material published in the Patoka and Ditney folios of the Geological Atlas of the United States. The geological history of the surface deposits and the physiographic relations are discussed in the parts quoted from these folios in the following pages.

The parts of Indiana included in the Patoka Quadrangle comprises almost the whole of Vanderburgh, Posey and Gibson counties and the southern part of Knox County. The Ditney Quadrangle includes nearly the whole of Pike County and parts of Gibson and Vanderburgh and the principal part of Warrick and Spencer counties and a part of the western side of Dubois and the western margin of Perry.

PLEISTOCENE DEPOSITS.

"The deposits which in North America characterize the Pleistocene period as a whole are of three classes and embrace (1) those whose deposition was associated, either directly or indirectly, with the presence of the great ice sheets which at several stages during the period covered large portions of the northern half of the continent, (2) those which are deposited through the ordinary influences of wind and water in the intervals between the stages of glacial invasion, and (3) those which have been deposited by similar agencies since the disappearance of the ice of the latest advance. The first are known as Glacial, the second as Interglacial, and the third as Postglacial or recent deposits. The materials of these deposits cannot always be referred to a single definite class, however, for in many instances the deposition has continued through more than a single stage.

GLACIAL AND INTERGLACIAL DEPOSITS.

"*Definitions.*—The glacial deposits consist of materials which have been picked up or dragged along on the bottom of the ice sheet during its southward movement or transported by its associated streams. The material has all been moved from its original location, and is therefore known under the name of drift. This drift was frequently deposited directly by the ice, being either set free by the melting of the portion into which it had been frozen; or simply left behind as a sheet beneath the ice, as the friction between it and the overridden surface became so great as to cause lagging and lodgment. The drift liberated by either of these methods usually consist of a heterogenous mixture of the grades of material ranging from clay to large boulders, and is known as till. Drift which was not deposited directly from the ice sheet, but which was taken up and transported by glacial streams and finally deposited in more or less stratified masses, is known as stratified or modified drift.

"*Glacial Stages.*—While not usually apparent from superficial study of the drift, a detailed examination of its structure and its general distribution and associations shows that instead of there being a single sheet formed by one ice advance there are in reality several distinct drift sheets, each of which represents a separate ice advance. The intervals of deglaciation or disappearance of ice between the advances are made apparent by the presence of soils, by beds of peat and marl, by the weathering of certain zones now buried in the midst of the drift deposits. The sheets themselves differ markedly in extent, and often in color, composition and other physical properties, and these differences, together with the morainal ridges marking the various positions of the ice margins, form the basis for the subdivision of the glacial period in North America into nine divisions, as follows:

Outline of Glacial Stages.

1. Pre-Kansan or sub-Aftonian glaciation.
2. Aftonian deglaciation.
3. Kansan glaciation.
4. Yarmouth deglaciation.
5. Illinoian glaciation.
6. Sangamon deglaciation.
7. Iowan glaciation.
8. Peorian deglaciation.
9. Wisconsin glaciation (latest stage).

"Of the drift sheets of the different stages described, only one, the Illinoian, has been proved to occur within the area of the Ditney quadrangle, though the existence of the earlier one is suspected. A soil zone older than the Illinoian till, the weathered zone of the Sangamon stage, the silt deposits (loess) of the Iowan, and the early part of the immediately following stages, and the terraces and dunes of stratified materials of the Wisconsin stage are, however, well represented in the area.

PRE-ILLINOIAN DEPOSITS.

"*Pre-Illinoian Soils.*—Logs, more or less carbonized on the exterior, coal streaks (lignite), zones of black muck, etc., have been deposited in wells, at considerable distances below the surface, at a number of points. Among these wells may be mentioned (1) one occurring just north of the east-west road at the point where it crosses the line separating sections 31 and 32, T. 1 N., R. 8 W. (three miles west and one and a half miles south of Petersburg); (2) wells along the main road leading north from Oakland City to Dongola, and about one mile north of the former; and (3) a deep well near the center of the western border of section 31, T. 1 S., R. 9 W. (three and a half miles north and one mile west of Francisco). The records are given below.

Record of Well (1), Southwest of Petersburg.

	Feet.
Blue mud	0–61
Logs of wood, lumps of coal (lignite), etc	61–62
Gravel (giving abundant but muddy water)	62–63
Soft clay (no pebbles reported)	63–98
Sandstone (water abundant on top, but tastes of ferrous sulphate)	98

RECORD OF WELLS OF GROUP (2) NORTH OF OAKLAND CITY.

Wells are from 23 to 45 feet deep and strike "black muck" at about the level of the Patoka flats. They do not go into this, however, and none have encountered rock.

Record of Well (3), Northwest of Francisco.

	Feet.
Dirt and sand	0– 12
"Ash loam"	12– 16
Blue clay	16– 76
Quicksand	76–106
Coal (lignite), 4 inches	......
Gravel (with water)	......

"The coaly or more probably lignitic material of the last well, occurring as it does over 100 feet below the present flood-plain of the Patoka River, points to an origin at a time when the land stood at a higher level than at present, presumably not long before the first of the Pleistocene ice invasion. The logs and lignites of the first well clearly occur under a thick filling of till, and their occurrence at the level of the present White River flats, and about

35 feet above the rock bottom, suggests that the till may have been deposited over a river flat standing at an elevation not far from the level of the present flood-plain. The conditions north of Oakland City appear to be similar. After penetrating 20 to 45 feet of probable drift the wells enter black muck at about the level of the Patoka flats. It is recognized, however, that in either case it is also possible to suppose that the lignite and muck zones simply mark time intervals in a compound drift sheet.

"*Possibly Pre-Illinoian Drift.*—At a number of points south of the known limits of the Illinoian till, there are shown on the Areal Geology map deposits of highly oxidized sands and gravels containing round pebbles of quartz and fragments of flint and jasper, supposedly derived from the older limestones to the east and north. Crystalline rock fragments of Canadian origin, though rare, are occasionally found. The material is clearly stratified and is prevailingly sandy, the pebbles forming a relatively small proportion of the mass. The color of the upper beds is usually a deep red, but lower down in the sections the red colors give place to browns. The materials are partially cemented. Some of the pebbles are coated with a bronze-colored film of iron oxide, but the coating is generally lacking on a considerable number of the pebbles, being in this respect in contrast with the universal staining exhibited by the pebbles of the supposed Tertiary gravels which cap some of the hilltops near Shoals, to the northeast of the quadrangle, near Tell City and Cannelton to its southeast, near Princeton to the west of the quadrangle, and at points in Illinois and Kentucky.

"The gravels generally appear to be only a few feet thick, and are exposed only on the tops or sides of the hills. They reach a considerable thickness on the south slope on the hill southeast of Littles, between it and the Patoka River, however, and appear to constitute nearly the entire mass of the high hill on the south side of the Patoka valley two miles southwest of Wheeling, the hill, in fact, exhibiting many of the features of kame moraine. A section in a small ravine just east of the road at the crest of the hill showed nearly 30 feet of partially cemented stratified sands and gravels under a 10-foot coating of loess, while minor exposures are to be seen on each of the roads leading to the crest. The gravel and sand is red at the top, but downward grades through brown to a yellowish-buff color. The stratification at the exposures in the ravine is nearly horizontal, but along the road on the northeast side of the hill and the sands show a delta structure, with pitch to the south.

"Though the gravels are nowhere exposed, it seems likely that they constitute a portion of the filling, shown by the wells to be at least 50 feet deep, and possibly nearly 100 feet in places, which separate the valley of the South Fork of the Patoka River from Hurricane Creek just north of Oakland City. Single weathered pebbles and small boulders of northern derivation have been found at a number of points along the roadsides nearly as far south as Boonville, but though suggestive of glacial origin their significance is not established.

"The gravels occur at all levels, from near that of the stream beds, or perhaps even below, up to the crests of the hills having elevations of 500 feet or more, and they are found over considerable areas in the quadrangle. Their arrangement and distribution are such that it seems impossible to explain them through the ordinary processes of stream deposition and there appears to be no conclusive evidence of the existence of ponded waters during their deposition. On the other hand, the occurrence is in harmony with the conditions of deposition along the margin of an ice sheet, and at least a portion of the deposits, which in character seem to be a unit throughout the area, appears to be of the nature of a kame moraine.

"Accepting the view that the gravels are glacial in origin, their age remains to be determined. Their color and general weathered aspect give them an appearance much older than the ordinary Illinoian drift, but this may be due to the fact that their material is mainly sandy, a composition which in this region seems to be associated with high oxidation. Careful search was made for exposures that would show the relations to the Illinoian till, but no case was noted where a highly colored soil till or gravel rested below one of less advanced oxidation. Drift exposures showing deep red colors at the top are common, but the color is present only in the sandier varieties, and grade off, both downward and laterally, into the unoxidated portions. An examination of the pebbles seems to show that there was no great difference in the degree of weathering of the two types of drift. The general absence of the gravels on the top of the Illinoian till would seem to have more weight than their absence from beneath it, as gravels in the latter position would naturally suffer extensive erosion if not complete removal, becoming incorporated in the mass of the later till sheet laid down by the overriding ice. An the other hand, tills often thin out, and in places practically disappear as the outer limits reached by the ice sheets are approached, the deposits at the outer margin sometimes consisting mainly, if not wholly, of stratified materials. The evidence, therefore, must be regarded as indecisive, but it seems probable on the whole that the date of origin of the gravels is earlier than that of the till, though both may belong to the same general invasion. The limits of the supposed glacial gravels are shown on the Areal Geology map, and their southern border is regarded provisionally as marking the limits of the farthest ice advance, though the possibility of a transient advance nearly as far as Boonville is suggested by the finding of the isolated northern fragments previously mentioned.

"*Possibly Pre-Illinoian Loess.*—In a section afforded by the banks of the Old Wabash and Erie Canal at the divide, one mile southwest of Francisco, some of the features are suggestive of a loess of a period earlier than at least a portion of the Illinoian stage. The section is as follows:

Section of Bank of Wabash and Erie Canal, Southwest of Francisco.

	Feet.
Light colored, loess-like clay	4
Yellow sand, very fine and distinctly though irregularly stratified	1
Black clay (gumbo)	1
Dark clay (stained by vegetable matter)	3
Light clay (like loess)	6
Disintegrated shaly sandstone	7

"The question whether the yellow sand may not represent the pumpings of a hydraulic dredge has presented itself, but the present condition of the exposure is such that this question could not be decided with certainty, and the long period which has elapsed since the cutting of the canal makes it possible to obtain trustworthy information in regard to its construction. The irregularities in the stratification are suggestive of dredgings, but the general occurrence and apparent relations to the other beds make it probable that the sand is a natural deposit laid down by the overflow of glacial waters during a late stage of the Illinoian invasion. If so, the loess beneath it is distinctively older than that particular stage of the invasion, and if the gumbo is an indication of a long time interval it is much older; but whether it is to be regarded as belonging to an earlier stage of the same invasion or to an earlier invasion is not clear.

"At a point some five miles west of Wheeling, and outside the limits of the quadrangle, a clay with abundant pebbles of the type characterizing the Illinoian drift was found overlying a true loess carrying the common loess fossils, which in turn rested on an oxidized drift sheet. It could not be determined, however, whether both of the supposed drifts, together with the included loess, are to be regarded as Illinoian, or whether the lower belongs to an earlier stage of glacial occupation.

ILLINOIAN DRIFT.

"*Till Sheet.*—The only deposits known to have been laid down by the direct action of the ice within the area of the Ditney quadrangle during the Illinoian invasion are those belonging to the till sheet deposited beneath the ice of that invasion by the melting of the basal debris-laden layer, or by the lodgment of debris, as previously explained.

"The matrix, or the body of the till, thus deposited consists, in the region under consideration, of a more or less sandy clay, which was derived partly from old soils or earlier drift sheets and partly from grinding and pulverizing of fragments of sandstones, shales, limestones, etc., which had been torn from the parent ledges by the action of the overriding ice. In this clayey matrix are imbedded angular or moderately well-rounded fragments of rock varying from mere chips to large pebbles, and even to boulders several feet in diameter. Rock fragments showing surfaces that are smoothly polished or striated by friction with overridden rocks are much less common than in many glaciated areas, especially those of harder rocks, but a considerable number have been observed within the limits of the quadrangle. The fragments were generally much less than an inch in diameter, and were mainly of hard rocks, such as outcrop at points far to the east, northeast or north, many having been derived even from beyond the Great Lakes. Many varieties of rock are represented, the more common being granite, diorite, quartzite, quartz, flint and jasper, the first three, and possibly the fourth, being derived from the Great Lakes region or beyond, and the remainder probably mainly from Silurian and Carboniferous limestones to the northeast.

"The soft sandstones and shales underlying the till in this region, and probably furnishing the larger part of the materials of the finer portions of the till, are not commonly represented by pebbles or boulders, though a few fragments of somewhat massive sandstone and of limestone have been noted. The pebbles known to have been derived from the Great Lakes region or beyond are almost universally well rounded, but the flinty pebbles from the limestone areas, though they have lost their sharp edges, still present a rather angular appearance. The local boulders, being of relatively soft and friable materials, generally exhibit considerable rounding. The weathering of the granite and diorite pebbles and boulders varies greatly, some hardly being stained even on the exterior, while others are almost completely disintegrated. A weathered zone reaching an eighth or a quarter of an inch inward from the surface is perhaps a fair average. It seems probable that the variation in the extent of weathering is due largely to differences in composition or to the stage to which incipient weathering had advanced at the time of the removal of the fragments from their parent ledges.

"The texture of the finer portions of the till varies greatly, depending upon the nature of the rock from which it was principally derived. Where shale appears to have furnished the larger part of the material the till is generally very clayey and is of a gray or blueish-gray color in its unoxidized portion. Where the sandstones have furnished much of the material the till is sandy and varies in color from a very deep buff in the moderately oxidized portions to a deep red in the upper and the more strongly weathered parts. The limestones in the Ditney area appear to have been of too limited development to have had a marked influence upon either the color or the composition of the till. The till within the quadrangle is usually oxidized to a depth of 7 to 10 feet, or even more, the oxidized portions being rarely seen, except in unusually deep cuts. In the oxidized portions the color is ordinarily deep buff to brown, but reddish tints are very common in the sandier varieties. The red type of till frequently gave evidence of incipient cementation by iron oxide, but the solidification was usually less marked than in the stratified sandy layer formed as an original deposit by the glacial streams or from the reworking, by water, of the red till.

"Sections giving acute measurements of the thickness of the till are uncommon, and are generally so located as to give only minimum thicknesses. Wells have afforded data of great value as to depth to the rock, but usually little information can be obtained as to the exact nature of the materials penetrated. In general the thickness, though showing great variation, may be said to be considerable. Broad, plateau-like plains standing from 60 to 70 feet or more above the river flats occur along the south side of the White River Valley, in the northern portion of the quadrangle. The surface is in places almost absolutely flat over considerable areas, but is in general broken from place to place by rock hills and knolls which rise like islands above it, or by sharp ravines that have been cut into its mass by the streams since its completion. A somewhat broken plain of nearly the same elevation is found on the north side of the White River, indicating in all probability that the great drift plain was originally continuous across the present valley of White River, and continued for several miles northward. Its thickness along White River probably reached 150 feet or more, for records of wells dug several miles back from the river on the south show in cases no rock down to a depth of 100 feet. In general, however, the thickness of the till of the drift plains is less than 50 feet, though it shows marked and somewhat sudden variations, due to the existence of a rather rugged rock topography beneath the accumulation of till. The material composing the plain is usually till, but deep sections reveal the presence of considerable quantities of stratified materials in places, especially along the bluffs bordering the White River Valley in the extreme northwestern portion of the quadrangle.

"As the boundary marking the limits of the Illinoian till is approached the till plain is seen to be less perfectly developed. Rock begins to show through it with greater frequency, and it finally diminishes to a relatively thin mantle, which conforms to the contour of the rock surfaces. In general the till appears to continue with a thickness of several feet almost if not quite to the outer limits of its occurrence, though occasional areas of rather small size are found some distance back from the margin where no till appears to have been deposited. No prominent hills of till, such as are known to occur a few miles to the west of the quadrangle, have been noted within its area, though occasional low swells, apparently of till, have been observed at several points.

"*Outwash Gravels, Sands and Silts.*—Since more or less water was continually being set free by the melting of the ice sheet, and on flowing from its margin carried with it a considerable portion of the detritus previously held by the ice, the sands and gravels deposited by these waters are commonly found in more or less intimate association with the tills along the ice margin and for considerable distances down the valleys leading away from it. It is possible that some of the lower deposits and gravels described as occurring outside the limits of the Illinoian till sheet may have been deposited when the ice stood in the position indicated by the boundary of the till sheet, but those deposits which occur as cappings to hills that themselves constitute pronounced elevations were apparently deposited in connection with an ice advance extending well beyond the limits of the till sheet. The principal overwash deposits are doubtless usually confined to the lower portions of the valley, where they are now frequently hidden beneath later silts. They are known to reach a considerable thickness in the lower portion of the valley of Little Pigeon Creek, where they have completely buried a rock topography of considerable irregularity. The deposits here, as in other places removed from the influence of strong currents, appear to be largely composed of bluish silt, but near the ice margin, as along the Patoka Valley, they are often, according to well records, sandy and even pebbly.

"*Deposits of Glacial Lake Patoka.*—During the maximum development of the Illinoian ice sheet its margin lay across the Patoka River, in the central part of the Ditney quadrangle, probably in the region between Dongola and Winslow. From here the margin extended, with a number of irregularities, northeastward to the vicinity of Otwell, crossing East White River not far from the northeast corner of the quadrangle. The waters draining into the preglacial Lower Patoka Valley being deprived of their outlet, accumulated as a glacial lake in this valley and its tributaries. To this the name of Lake Patoka has been applied. Into it flowed the silt-laden streams issuing from the ice front, and in it were deposited many feet of glacial sediments. Their thickness at the lowlands bordering Flat Creek is 75 to 120 feet or more. At Otwell a boring sunk by Dr. W. M. DeMotte to a depth of 119 feet failed, it is said, to reach rock. Another boring made by William Bell between Flat Creek and the headwaters of Mud Creek, six miles west of Otwell, is stated to have reached rock at a depth of 78 feet, while several others at short distances to the north and east are reported to have reached it at depths of 75 to 80 feet. The surface deposits of the Lake Patoka area, like those of the surrounding regions, consist of from 5 to 10 feet of loess. Below this in most sections in this portion of the lake is considerable thickness of sand, while below the sand and continuing to the hard rock is what is commonly called a blue mud. In the portion of the Patoka Valley in the western third of the quadrangle, which became covered by the waters of the lake as the ice retreated, few deep wells have been sunk. A well 70 feet deep in the eastern half of Sec. 33, T. 1 S., R. 9 W. (one and a half miles south of Oatsville), however, gave the following section:

Section Shown by Record of Well Near Oatsville.

	Feet.
Surface	6
Soft yellow sand	3
Easy drilling (probably sandy clay)	47
Very tough clay	10
Easy drilling (probably sandy clay)	4
(Rock was not reached).	
Total	70

"The record already given in the discussion of the pre-Illinoian soils of the well northwest of Francisco shows an even greater depth of sediment. In the enlargement of Lake Patoka, which occurs in the northeastern portion of the quadrangle, the deposits seem to have built up to an elevation of about 500 feet.

"The deposits of the lake stand, as has been stated, at an altitude of about 500 feet above sea, and the outlets should therefore be found at that height. Divides of approximately that elevation do, in fact, occur at a number of points south and southwest of Oakland City, the lowest (apparently about 495 feet) being one mile north of Somerville, along the railroad. Like the Francisco divide, they have few features suggestive of outflowing streams. Whether the supply, and therefore the outflow, of the Patoka waters was slight, whether the outflow occurred at a number of points of the same elevation, and therefore had little effect at any single one of them, whether there was a general submergence of the region to about the 500-foot level, or whether the waters, as Mr. Leverett has suggested, escaped beneath the ice is not established.

"Lower than any of these divides, however, is that on the line of the abandoned Wabash and Erie Canal, one mile southwest of Francisco. This divide is at an altitude of 460 feet, or about 40 feet lower than the waters of Lake Patoka are known to have stood. The presence of yellow sand in the section at this point, previously described, would seem to indicate a temporary outlet of glacial waters across the col at the point. As there is, however, no indication of any marked westward slope of the surface of the Patoka deposits, and no evidence in the shape of deposition or erosion features, either in the lake or at the divide, or of any strong currents, such a difference of level of 40 feet in the width of a quadrangle would demand, it seems clear that the Francisco divide was not the site of the outlet, except, perhaps, in the closing stages, when the ice had retreated westward from the point at which it had previously rested, supposedly between Dongola and Winslow.

"*Deposits of Glacial Lake Pigeon.*—From the point at which the ice margin crossed the Patoka it continued southwestward to the limits of the quadrangle, and then southward, parallel with but just outside of the border. A little west of the center of the western boundary it crossed the valley then occupied by waters flowing from the region now drained by Big Creek, Smith Fork, and the eastern headwaters of Pigeon Creek, in the west-central portion of the area. The result was the formation of a lake similar to, but smaller, than Lake Patoka, in which deposits of similar nature were laid down.

"In the case of Lake Pigeon the water rose until it formed an outlet over a divide two miles east of Elberfeld. This divide was probably at first somewhat reduced, through the agency of the overflowing waters, but to what extent has not been determined. Its original level must, however, have been less than 435 feet, which is the elevation of the present rock divide between Pigeon and Bluegrass creeks, otherwise the overflow would have been in the valley of the Bluegrass Creek. The col east of Elberfeld is now buried beneath an unknown thickness of silts which gradually accumulated and filled up the glacial lake nearly or quite to the level of its waters, and which extended down its outlet as far as the Ohio. The silt of the lake, taken in connection with a somewhat marked drift barrier formed along the ice margin to the westward, had the effect of permanently diverting the waters of Big Creek, Smith Fork and Pigeon Creek from their old western outlet into the channel beginning east of Elberfeld and leading southward to the Ohio.

"*Stream Deposits.*—In this region deposits of the Illinoian streams are mostly covered by recent alluvium. Near the western border of the quadrangle, however, there are remnants of low terrace, consisting of silt 10 to 15 feet or more above the recent alluvium of the Patoka River bottom. These become more prominent to the westward, and are there believed to be of late Illinoian age. Deposits of similar nature, and probably belonging to the same category, occur at a few feet elevation above the alluvial bottoms at other points in the quadrangle, but they are too indefinite to admit of mapping.

SANGAMON DEPOSITS AND WEATHERED ZONE.

"*Erosion and Local Deposition.*—Studies of the erosion features of the Sangamon stage in other regions have shown that the streams were broad and sluggish, with only shallow and rather poorly defined channels, and that the deposition was very slight in amount. In the Ditney region, however, the erosion was locally of considerable importance, probably removing 80 to 100 feet of Illinoian till from the valley of the White River and possibly even greater amounts of material along the Ohio River. Deposition during the Sangamon stage was probably limited to a few unimportant secondary deposits, produced by the reworking of the Illinoian drift by the agency of the streams. It is thought that some of the gravel possibly on the borders of the valleys may be of this type, but the evidence is not conclusive. In many localities in Iowa and Illinois, and to less extent in Indiana, peaty beds of black muck which were deposited in this interglacial stage have been noted and described, but with the exception of the gumbo, of doubtful significance, at the Francisco divide nothing of that sort was seen in the quadrangle. However, a black soil, possibly belonging to the Sangamon stage, occurs, it is reported in Sec. 15, T. 1 S., R. 5 W., three miles south of Jasper and just east of the limits of the quadrangle.

"*Weathered Zone.*—Though important deposits of the Sangamon stage are lacking, the interval between ice advances is nevertheless well represented by the Sangamon weathered zone. This zone marks the top of the Illinoian drift, and is recognized by the leached and the weathered character of that portion of the deposits. Where the overlying loess is of considerable thickness its lower part is usually but little oxidized and its appearance is in somewhat marked contrast with that of the weathered zone upon which it rests.

IOWAN LOESS.

"Following the formation of the weathered zone soils, and possibly silts, of the Sangamon stage, a considerable thickness of fine, almost structureless silt, known as loess, was deposited as a mantle over nearly the entire surface of Iowa, Illinois and Indiana, and in portions of many other states to the east, south and west. This loess has been traced as far back as the edge of the drift sheet of the Iowan ice invasion in northern Illinois, but stops at or near its border, apparently indicating that the deposition took place during the stage of glacial occupancy.

"Its composition varies considerably at different points, but the loess is generally characterized by about 70 per cent. of silica, largely quartz, and a considerable amount of feldspathic material, in addition to the calcareous portion. Two analyses of loess from near Terre Haute, some distance north of Ditney area, and a third of loess from near Princeton, just west of the quadrangle, are given below.

"The first sample (No. 1) is from a point 10 inches, the second (No. 2), from a point 22 inches, and the third (No. 3, from Princeton) from a point at least 30 inches below the surface. The analyses were made for the Indiana geological survey and first appeared in its Twentieth and Twenty-first Annual Reports.

ANALYSES OF IOWA SILT FROM NEAR TERRE HAUTE AND PRINCETON, IND.

[Nos. 1 and 2 by Prof. W. A. Noyes; No. 3 by Prof. Robert Lyons.]

CONSTITUENT.	No. 1.	No. 2.	No 3.
	Per Cent.	*Per Cent.*	*Per Cent.*
SiO_2	79.77	72.87	71.20
Al_2O_3	9.95	11.25	18.56
Fe_2O_3	3.39	6.75	1.34
FeO			.15
TiO_2	.70	.95	.88
CaO	.67	.69	.14
MgO	.26	1.06	.52
Na_2O	1.08	.39	1.26
K2O	2.05	2.26	.32
H.2O	2.55	4.24	6.30
Total	100.42	100.46	100.67

"The amount of calcium carbonate ($CaCO_3$) present depends largely upon the amount of weathering to which the loess has been subjected, and consequently the calcium carbonate is present in minimum amounts near the surface. In the determinations of the CO_2 of the $CaCO_3$ at New Harmony, a few miles west of the limits of the quadrangle, a sample taken 2 feet below the surface is reported to have given but 0.229 per cent. CO_2, while one taken 10 feet below the surface gave 6.032 per cent. The Terre Haute and Princeton samples are of the leached type.

"In texture this loess is clayey, but the presence of fine grit is easily detected. The following mechanical analyses, made by Prof. Milton Whitney, of the Department of Agriculture, gives some idea of the size of the grains of the surface loess in eastern Illinois, and probably present fairly well the composition of the loess of the Ditney area. Where the grains exceed 0.1 mm. they are usually concretions of iron oxide or of lime. These concretions frequently reach a diameter of an inch or more, and are all shapes, tubular types, however, being especially common among the iron-oxide variety.

MECHANICAL ANALYSES OF THE IOWAN SILT IN EASTERN ILLINOIS.

Diameter in Millimeters.	Conventional Name.	Galatia; 1–18 Inches from Surface.	Near Greenup; 2–15 In. from Surface.	Moweaqua; 2–18 Inches from Surface.
		Per Cent.	*Per Cent.*	*Per Cent.*
2 -1	Fine gravel	0.00	0.30	0.00
1 - .5	Coarse sand	0.00	1.05	0.08
.5 - .25	Medium sand	0.02	3.42	0.77
.25 - .1	Fine sand	0.30	3.30	0.11
.1 - .05	Very fine sand	5.21	6.47	4.88
.05 - .01	Silt	57.75	55.48	52.50
.01 - .005	Fine silt	12.78	11.70	12.15
.005 - .0001	Clay	20.36	14.90	22.10
	Total mineral matter	96.42	96.62	92.59
	Organic matter, water loss	3.58	3.38	6.61
	Loss by direct ignition	6.01	3.11	5.73

"In color the loess is ordinarily buff or brown, but gray, yellow, and red are common colors. Mottling is very common. The gray colors are usually found some distance below the surface, but are sometimes within a foot or two of the top of the ground. In the Ditney area loess fossils have been discovered only in this type of loess. In one case, just outside the limits of the area to the west, fossils were found in gray loess within 3 feet of the surface, showing the clay to be very impervious to water and extremely resistant to both leaching and oxidation.

"In the Ditney region the loess of a bright-red type occurs, as a rule, only outside the limits of the Illinoian drift sheet. The color is most markedly red at the bottom, but gradually becomes lighter upward, frequently in the thicker exposure being the ordinary brown or buff of the top. The red color is most common where the loess rests on sandstone, but red loess has also been noted, upon both shale and limestone. In some localities there appears to be a gradual transition from sandstone through disintegrated sandstone into red loess, and also from till into loess, but in such instances it is probable that the loess, or more properly loess-like silt, is either a secondary deposit or has been partly reworked or modified through the action of the roots of trees and shrubs penetrating to the partly decomposed rocks or till beneath.

"The large pebbles of northern material found outside the recognized drift border may possibly have been derived from the loess itself, being dropped, it may be supposed, by floating ice during a period of submergence, when the waters would have reached an elevation of at least 500 feet. There is other evidence, in the shape of divides silted with loess-like material and of elevated flats of similar silts, that there may have been standing water up to this elevation during the deposition of the loess, but sufficient evidence has not yet been obtained to establish this fact.

"An indistinct banding frequently occurs in the loess because of the greater amount of moisture held by certain portions, but no sandy or pebbly layers, or in fact any reliable evidences of stratification, were seen in the area.

"The thickness of the loess is extremely variable, but the amounts appear on the whole to be greater in the vicinity of prominent streams, in which places the loess sheet sometimes reaches a thickness of 10 or 12 feet or more. The mantle on the upland plains is generally 5 to 8 feet thick. On the slopes and on some hilltops it is much thinner, and in some places is wanting.

Wisconsin Deposits.

"The ice sheet of the Wisconsin stage did not reach the Ditney area, and there are therefore no deposits of this stage covering the general surface of the region. Every stream, however, which led either directly outward from the ice margin or was fed by tributaries heading at the ice front carried considerable amounts of glacially derived materials, which were deposited as broad, flat plains of sand or fine gravel. Of the streams in the vicinity of the Ditney quadrangle, only the Wabash and White Rivers head in the region occupied by the ice, though the Ohio received the drainage of a number of other streams heading near the ice front and bringing down quantities of glacial sediments, which were deposited as broad flats on either side of the river. The Wabash River was also the outlet of a large glacial lake in the region of the Great Lakes.

"In the Ditney area the Wisconsin sediments seem to be confined to the flats deposited by the White River along the northern edge of the quadrangle just west of Petersburg, and to a narrow strip belonging to the Ohio flats west of Midway, in the southeastern part of the area. They are entirely free from loess. The deposits west of Petersburg consist mainly of fine sand, and are in the form of a terrace standing about 10 feet above the flood-plain which has been cut out of the river since Wisconsin times. The top and more especially the inner margins of the terrace are marked by sand dunes formed by the action of the winds before vegetation has covered the surface. With the exception of this area, the flats along the White River are composed of recent-alluvium. The deposits west and south of Midway include both sands and gravels and appear to reach considerable thickness. As in the case of deposits along White River, they are in the form of a wide, ill-drained plain or terrace, which stretches to the Ohio, about ten miles to the south, and which also stands a number of feet above the adjacent flood-plain. The plain is several feet lower than the earlier and high alluvial deposits of the valley of Little Pigeon Creek, from which it is separated by an escarpment about 15 feet high.

RECENT DEPOSITS.

"Under Recent Deposits are included those which have accumulated since the disappearance of the last, or Wisconsin, ice sheet. The time since this ice retreat has been relatively short, and but little work has been accomplished in the Ditney region. In the smaller valleys there have probably been more or less additions to the glacial fillings through the downward creeping or wash of the loess from the hillsides. In the larger valleys the streams have been busy in cutting out flood plains a few feet below the level of the glacial stream fillings, but these are still too small to accommodate the waters at the time of excessive floods, and the second bottoms are still overflowed at times and doubtless receive more or less silt from the overflowing waters.

"The flats along White River, on the northern border of the quadrangle, are composed chiefly of recent alluvium. The low terrace just west of Petersburg is an exception, and is a remnant of the gravels of the Wisconsin stage. There has been probably no change in the altitude of the land since Wisconsin time, and the process of deposition appears to have been essentially continuous, though occasional deposits at a slightly higher level than those now forming have been noted.

RELIEF.

"The Ditney quadrangle exhibits four rather distinct types of topography: (1) Rugged uplands, (2) rolling uplands, (3) upland plains, and (4) river flats. The last two resulted from accumulation of unconsolidated material in relatively recent geologic times, while the first two, which embrace by far the greater part of the area, have resulted from the action of stream erosion upon the hard rocks. The resistance of these rocks to erosion has been very nearly the same throughout the quadrangle, the resulting relief depending, therefore, upon the relations of the surface to the drainage lines.

"The general rule that the larger the stream the more will the surface of the adjoining areas suffer reduction to low and rounded forms holds good within the quadrangle, except where alterations were effected in the drainage system through the influence of the Pleistocene ice invasion. Among exceptions of this nature is the broad, open valley near Otwell, evidently formed by a large stream, but now occupied by a small creek. The Patoka River from east of Velpen to beyond Winslow, on the other hand, occupies a narrow, steep-sided valley altogether disproportionate to the large size of the stream. The explanation of both lies in the deflection, through the indirect agency of the ice, of the large stream formerly occupying the Otwell Valley into the bed of a smaller stream heading not far from Velpen. Similar disproportions between the sizes of the streams and their valleys, likewise due to the influence of the ice invasion, exist in Pigeon and Bluegrass creeks in Greer and Campbell townships, the former, the larger, flowing in a narrow valley, while the latter flows in one which is broad and open.

"*Rugged Uplands.*—In the group designated rugged uplands are included the highest hills and ridges of the quadrangle. The type is best developed in the eastern half of the area, especially in the region between Flat Creek on the north and the valley of Pigeon Creek on the south, but is represented in the western half of the area by a number of more or less isolated peaks rising a hundred feet or so above the level of the surrounding regions. The hills are characterized by relatively sharp summits and the ridges by long, even crests sometimes extending for distances of two to seven miles with change of elevation of only 20 to 40 feet, a feature that is more noticeable because of the fact that the ridges, as a rule, are sharp and narrow and are characterized by steep slopes, which are cultivated only with difficulty. The minor channels, which are exceedingly numerous, are more or less V-shaped and are separated from one another by equally sharp divides. They exhibit steep descents in their upper courses.

"The elevation to which the higher points of the uplands rise is nearly uniform throughout the area of the quadrangle, and appears to indicate that they are but the remnants of an old surface, almost a plain in character, which once extended over the whole of the Ditney area. Within the limits of this area the highest portion of the upland level is in a region a little to the east and northeast of the center, near the point from which the drainage diverges, and where a considerable number of the crests stand at elevations of from 600 to 640 feet above sea level. Isolated hills of similar elevation, however, are found at various points throughout the quadrangle. Among these may be mentioned McGregor and other hills about three miles west and one mile north of Somerville (elevation 600 feet); Kennedy Knob, one mile northwest of Somerville (600 feet); the hill one and one-half miles southeast of Somerville (620 feet); Snake Knob and several other hills to the northeast, north, and northwest of Lynnville (620 to 640 feet); Big Ditney Hill, three miles north and one and one-half miles east of Millersburg (660 feet); and Little Ditney Hill, about three miles northwest of the same village (600 feet).

"The level now represented by the upland crests appears, as stated, to have been a part of a broad, flat, or gently undulating plain of the kind known to geologists as a peneplain, which was developed over a large portion of the Mississippi Basin at a period when the land stood much nearer sea level than at present, and which was subsequently raised to its present level and eroded by streams until only the scattered remnants mentioned are left. Its development is considered in greater detail under the heading, "Physiographic Developments," p. 6. In addition to the high upland level just described, there appear to be other remnants in the shape of long, even crests or of land surfaces at lower levels, for there are a number of rather extensive crests or flats shown by rock hills at an elevation of about 500 feet, while ridges and hills of intermediate elevations are common. Though the evidence is not conclusive, it seems probable that subsequent to the formation of the first a second peneplain was developed at an elevation of from 100 to 150 feet below the former. It was probably much less perfectly developed, however, and it seems likely that in this region it was generally confined to the areas bordering the main drainage lines.

"*Rolling Uplands.*—In this class are included the lower and less rugged upland surfaces. The hills are generally much smaller than in the previous group. Their altitudes seldom exceeds 550 feet, and they usually exhibit smooth, gently rounded forms. The valleys are broad, relatively shallow, and are characterized by gently curving cross-sections, by the low pitch of their streams, and by broad, flat divides. The rolling uplands are best developed in the vicinity of the older drainage lines, especially in the southern and western portions of the quadrangle, the time since the ice invasion being far too short for the development of rounded topography by erosion in the regions bordering streams that were forced into new channels at that time.

"A rolling upland surface appears to exist between the White and Patoka Rivers, in the northwestern portion of the quadrangle, but it is largely buried by deposits laid down during the ice invasion, and is now represented mainly by low, rounded hills projecting here and there through the deposits mentioned.

"*Upland Plains.*—The upland plains consist of broad, flat, or gently undulating surfaces standing at an elevation of about 500 feet and composed of deposits which accumulated during the period of the ice invasion. These deposits are of two distinct types. Those of the first type, including those forming the broad, flat uplands in the vicinity of Flat Creek, in the northeastern portion of the quadrangle, where laid down as stratified clays, sands, and gravels by streams issuing from the ice sheet into a broad lake, known as glacial lake Patoka, which then existed in this region. The deposits thus laid down constitute in places an almost featureless plain, above which the bordering uplands or occasional hills rise like bluffs or islands from a sea. Deposits of the second type, known as till, are composed of a heterogeneous mass of clay and sand with some pebbles, which are formed beneath the ice sheet during its occupancy of the region. These are best developed along the south side of the White River flats, in the northwestern portion of the area. The plain extends southward for several miles, but is more or less broken by rock hills which project above its surface, and by streams which have eroded deep channels in its mass.

"*River Flats.*—All of the rivers and large streams, and also many of the minor streams, flow through broad, flat plains of silt or very fine sand, which are generally overflowed every spring. Wells sunk for water show that the silts are often of considerable thickness, varying from a few feet in the minor valleys up to 100 feet or more in some of the larger ones. The river flats are widest in those streams which still occupy their original valleys, and are narrowest in those which are forced into new channels during the ice invasion. The flats bordering the principal streams vary but little in elevation throughout the quadrangle, being in general between 380 and 400 feet above sea level. Between the elevation of the flats of Pigeon Creek at the southern border of the quadrangle

(390 feet), distant ten miles or less from the Ohio, and the elevation of the Patoka flats (400 feet) north of Oakland City and seventy-five miles or more from the Ohio, there is a difference of only 10 feet. The meanders of the stream are exceedingly pronounced, and by their resistance to the free flow of the water give rise to annual overflows which cover the adjacent flats to depths of several feet. These conditions are very favorable to changes in the courses of streams, and bayous and abandoned channels are common."*

The above description shows well the physiographic and geological features not only of the Ditney quadrangle, which covers the eastern half of this survey, but also that of the western half in general. Points concerning the western part not included above, will be given at various places throughout the report from the description of the Patoka quadrangle.

DRAINAGE.

The drainage from the entire area finds its way into the Ohio. In the eastern part Anderson River, Crooked Creek and Little Pigeon Creek flow directly into the Ohio, also Pigeon Creek in Vanderburgh County, and numerous smaller streams. The Wabash forming a part of the western boundary of the area and also of the State in this part, is the second largest river and is of much importance as a drainage way for the western and northern parts of the area. White River forms the northern boundary across the eastern half of Gibson and western Pike, where the two forks join and the east fork forms the boundary over the eastern half of Pike. The river receives no large tributaries in this part of its course. The Patoka flows entirely through the northern part of the area, it has no tributaries and is a very meandering stream, with a valley varying in width from four or five miles, to narrows where the bluffs extend down to the river on each side, as at Patoka. The and the material carried by the streams from the ice front. Good artificial drainage systems are being worked out in the river flats.

The water supply in the low lands is obtained at moderate depths, the uplands often have a deficiency of water during the summer months. The sources of supply are streams, springs, wells, artificial ponds and cisterns. Springs are numerous in the sand hills bordering the Wabash Valley. The drift hills between the

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*"Description of Ditney Quadrangle" in Ditney Folio.

White and Patoka rivers also furnish some springs. A few artesian wells with weak flow have been put down. In many places the people use cisterns to obtain water for domestic use. Artificial ponds in the compact loess also furnish water for stock.

CLIMATE.

The southwestern part of the State is not subject to severe winters or excessive heat in summer. There are no marked peculiarities in the climatic conditions, and the rainfall is usually well distributed throughout the year. The records from the stations at Evansville, Mt. Vernon, Princeton and Marengo will furnish data of value concerning temperature, precipitation and frosts.

The climatic conditions for the part of the area surrounding Princeton, Gbson County, Indiana, was furnished by Elisha Jones, who has acted as Signal Service Reporter for twenty-six years.

The coldest weather recorded at Princeton was on January 5, 1884, with 24° below zero. The highest temperature recorded was 120°. The greatest amount of snowfall in one year was 5 feet 7 inches during the winter of 1880-1881.

The Patoka hills north of Princeton, with an average elevation of about 640 feet, are well supplied with fruit trees, and they seldom fail to produce a crop because of weather conditions. The average time for the first wheat cutting in the county for twenty-six years was June 14, and the earliest was June 2d. And in the summer of 1910 it was June 20th. The greatest yearly rainfall in twenty-six years was 58 inches, the least yearly rainfall was 27 inches. and the greatest amount of rainfall reported for 24 hours was 10½ inches.

It will be noted from the following table that the average temperature for December, 1909, was much lower than for December, 1908.

	Dec. 1908.	Dec. 1909.	Year 1908.	Year 1909.
Highest Temperature	67°	62°	98°	102°
Lowest Temperature	14°	—4°	5°	—4°
Average Temperature	35°	26°	56°	58°
Rainfall and Melted Snow	1.5 in.	3.7 in.	40.5 in.	39.5 in.
Snowfall	2. in.	6 in.	14 in.	......

December, 1909, was the coldest December for many years, the first snow was on the 7th. The first to cover the ground in 1908 was on Christmas Eve.

The tables of records from the Mt. Vernon Station, just to the southwest of the area of the present survey, was prepared by Chas. M. Spencer, Co-operative Observer, Mt. Vernon, Indiana.

MEAN MONTHLY TEMPERATURE, MT. VERNON, INDIANA, 1901 TO 1909 INCLUSIVE.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Mean.
1901.........	35.2	30.7	40.	51.	63.7	77.	84.6	77.6	70.	57.8	41.7	29.4	54.8
1902.........	31.7	26.1	46.2	55.2	73.5	76.	83.6	77.1	66.9	59.4	54.7	34.4	58.3
1903.........	33.	33.3	49.5	58.8	68.7	67.3	80.1	79.3	70.4	58.1	43.2	30.1	36.1
1904.........	28.2	23.2	46.1	36.	66.3	74.4	76.6	77.4	52.2	55.2	43.4	34.2	57.3
1905.........	24.9	22.7	50.1	55.1	70.	79.9	75.5	80.	72.5	57.9	46.7	35.4	64.2
1906.........	37.	31.8	34.9	59.5	67.	75.9	77.6	80.3	75.4	77.8	45.3	37.8	58.4
1907.........	39.7	34.2	54.1	47.2	63.7	71.5	81.7	81.9	70.5	56.6	44.8	37.4	57.
1908.........	33.4	33.7	49.7	55.9	69.3	76.7	77.5	79.6	73.6	57.6	48.	38.9	57.4
1909.........	33.	39.3	45.1	54.2	63.6	75.4	75.9	79.6	67.4	56.	59.9	28.2	56.8
Mean.........	33.1	31.	46.	52.5	67.3	75.	79.1	79.3	68.7	59.6	37.5	36.	......

MAXIMUM TEMPERATURE (MONTHLY), MT. VERNON, INDIANA, 1901 TO 1909 INCLUSIVE.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1901................	66	68	80	51	84	102	109	98	98	84	76	64
1902................	61	53	76	87	96	100	104	100	91	81	81	62
1903................	65	69	78	90	92	92	100	100	99	83	77	51
1904................	55	57	75	73	96	96	96	96	96	82	69	60
1905................	74	52	84	87	95	100	95	99	93	89	75	57
1906................	69	72	60	91	93	97	97	98	96	89	75	71
1907................	66	69	86	83	86	93	101	100	97	88	68	64
1908................	57	62	78	86	96	100	98	101	98	87	74	69
1909................	72	69	65	84	88	93	96	103	94	96	81	78

MONTHLY PRECIPITATION, MT. VERNON, INDIANA, 1901 TO 1909, INCLUSIVE.

	Januray.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1901.........	1.39	.80	3.74	2.79	.88	3.71	1.56	2.39	.91	2.28	1.78	4.07	27.63
1902.........	2.63	.82	2.91	2.23	2.24	4.27	1.73	1.48	2.46	2.87	4.90	6.02	34.56
1903.........	2.90	5.19	4.47	4.67	3.72	4.02	2.06	7.17	.74	1.05	.51	.61	38.13
1904.........	3.37	1.25	8.76	4.61	4.63	4.10	4.36	1.36	4.64	.10	.60	4.25	41.99
1905.........	3.75	.70	3.18	4.14	4.20	3.21	10.64	2.14	3.22	8.14	4.50	3.72	51.54
1906.........	6.75	1.75	8.22	2.92	.57	3.05	6.05	3.49	9.08	2.95	6.30	6.70	57.33
1907.........	9.26	1.63	4.20	3.20	5.02	3.72	5.83	10.04	3.32	3.38	4.82	4.57	58.99
1908.........	1.52	8.32	3.63	6.46	5.52	1.54	2.18	1.38	.82	T	2.76	2.12	36.25
1909.........	3.60	6.45	3.93	4.38	3.75	2.95	10.25	.14	2.63	4.09	3.56	3.12	49.85

MINIMUM TEMPERATURE (MONTHLY), MT. VERNON, INDIANA, 1901 TO 1909, INCLUSIVE.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1901	13	10	14	30	38	51	56	57	36	59	16	—8
1902	5	4	14	31	39	48	51	52	36	33	33	7
1903	2	—4	24	27	31	41	56	54	39	30	13	3
1904	—9	5	27	23	47	57	56	59	44	26	22	9
1905	—7	—13	28	28	51	56	95	99	93	29	22	14
1906	6	—4	5	36	40	53	58	55	56	29	39	12
1907	3	6	27	25	39	49	57	56	43	29	20	19
1908	11	7	28	26	39	50	58	60	40	50	21	15
1909	0	2	22	27	34	55	56	53	38	27	25	—2

NORMAL MONTHLY AND ANNUAL TEMPERATURE AND PRECIPITATION.

MONTH.	Evansville.		Princeton.		Marengo.	
	Temperature.	Precipitation.	Temperature.	Precipitation.	Temperature.	Precipitation.
	°*F*.	*Inches*.	°*F*.	*Inches*.	°*F*.	*Inches*.
January	35.4	3.41	30.7	2.96	33	4.9
February	32.3	2.98	32.9	3.23	35	6.5
March	44.6	4.84	42.3	4.33	44	5.3
April	57.0	3.55	54.7	3.37	56	5.4
May	67.0	4.38	64.1	3.67	65	5.2
June	76.3	4.67	74.6	4.35	74	5.4
July	79.6	3.54	76.9	2.83	77	4.0
August	78.4	2.09	75.1	2.64	75	4.2
September	71.9	2.48	68.2	3.16	69	4.0
October	59.2	2.87	55.4	2.16	57	3.1
November	45.0	3.67	42.9	3.82	45	5.4
December	35.8	3.02	35.3	3.15	36	4.2
Year	56.8	41.50	54.4	39.67	56	57.6

The frost records kept by the station at Mt. Vernon are more complete. The occurrences of the last killing frost in spring and first in fall during nine years are given in the following table:

DATES OF KILLING FROSTS.

YEAR.	Mount Vernon.		YEAR.	Mount Vernon.	
	Last in spring.	First in fall.		Last in spring.	First in fall.
1893	Mar. 29	Oct. 29	1899	Apr. 10	Sept. 27
1894	May 19	....	1900	Apr. 12	Nov. 8
1895	May 14	Oct. 1	1901	Apr. 21	Oct. 17
1896	Apr. 4	Oct. 19			
1897	Apr. 20	Oct. 29	Average date	Apr. 17	Oct. 20
1898	Apr. 7	Oct. 27			

From the above table it appears that, at least along the Ohio River, there is an average period of one hundred and eighty-six days during which tender vegetation is safe from damage by freezing. This period is probably subject to local variation, due to differences of elevation or other physiographic features. There is usually adequate rainfall for the crops grown, and injury from drought is very uncommon, even to crops maturing late in the year.

SOILS.

The area presents a very great variety of soil types. The general descriptions given below will show the origin, texture, and character of the various soil types. The types will be fully discussed under the various counties in which they occur, and the most complete descriptions being given in the report of the county where drainage features have been much modified by the glacial sheet the type is best developed.

The soils of the area may be divided into the following groups: (1) Soils of the River Bottoms; (2) Soils of the Terraces or Second Bottoms; (3) Loess Soils; (4) Till or Boulder Drift; (5) Sand Hill Soils; (6) Lake Plain Soils; (7) Residual Soils.

SOILS OF PATOKA QUADRANGLE.

Descriptive Terms Used in This Folio.	Soil Names Used by H. W. Marean, Bureau of Soils (Ms. of report for 1902).	Geologic Equivalents.
Residual soils.		Steep slopes of Carboniferous deposits.
Drift soils.		Steep slopes of morainal deposits.
Common loess soils.	Miami silt loam.	Common loess.
Marl-loess soils.		Marl-loess.
Sand-hill soils.	Miami sand.	Earlier and later dune sands and Wisconsin terrace deposits (in part).
River sands and gravels.	Miami sandy loam. Yazoo sandy loam (in part).	Wisconsin terrace deposits (in part) and upper and lower flood-plain deposits (in part). Natural levees.
River silts.	Yazoo sandy loam (in part). Yazoo loam. Yazoo clay.	Upper and lower flood-plain deposits (in part).
Lake and subordinate stream silts.	Memphis silt loam (stream)	Older stream silts.
	Waverly silt loam (lake or swamp).	Glacial lake deposits (in part)
Swamp deposits.	Griffin clay.	Abandoned channel deposits. Swamp deposits.

"The soils of the Patoka quadrangle may be divided into nine very distinct classes, shown in the first column of the accompanying table, which gives the types recognized by the United States Geological Survey. By the refined methods of physical and chemical analyses some of these soils may be still further subdivided. These subdivisions, which are the results of detailed studies by Mr. H. W. Marean of the Bureau of Soils of the United States Department of Agriculture, are given in the second column. The third column states briefly their occurrence in relation to the geologic formations and surface deposits shown on the accompanying geologic map. The mechanical analyses and many of the details in the following description as to the productiveness are the results of the careful examination by the Bureau of Soils.

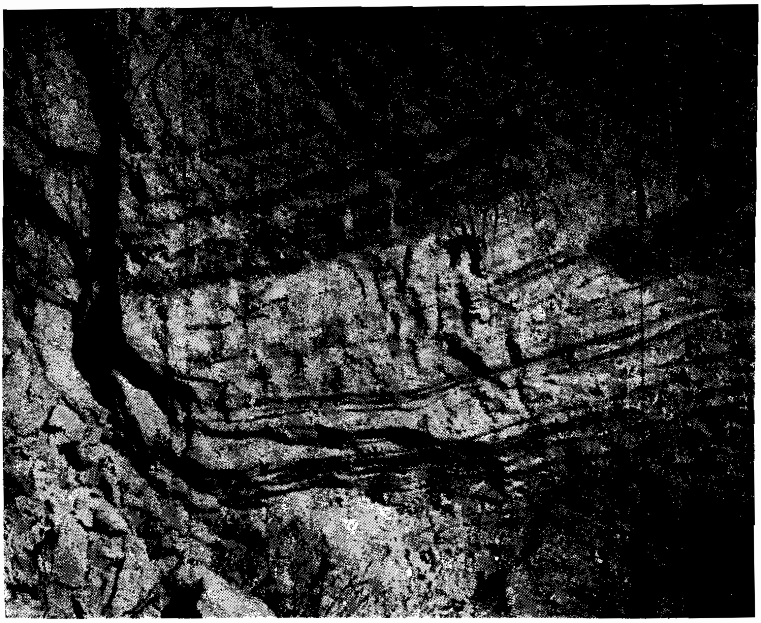
"*Residual Soils.*—Although the rock underlies the loess and drift at very moderate depths over the larger part of the uplands, it has been removed only on the steep bluffs and the sides of the sharper ravines. The soils of this type are usually stony, sandstone fragments predominating, though occasional shale soils were noted. The slopes on which they occur are generally too steep for cultivation and are covered with moderate growths of timber.

"*Drift Soils.*—As in the case of the residuary soils, it is only where the slope of the land is so steep that the coating of loess has been removed that the drift soils are found at the surface. The soils are generally sandy or even gravelly, but clayey types are not uncommon. Because of their limitation to steep bluffs and the sides of ravines they are never cultivated, but are generally timbered.

MECHANICAL ANALYSES OF LOESS SOILS FROM A POINT 1 MILE NORTH OF MOUNT VERNON, POSEY COUNTY, IND.

Diameter in Millimeters.	CONVENTIONAL NAME.	0–8 Inches from Surface.	8–36 Inches from Surface.
.0001– .005	Clay	13.68	9.10
.005 – .05	Silt	81.82	84.16
.05 – .1	Very fine sand	3.86	5.92
.1 – .25	Fine sand	.36	.50
.25 – .5	Medium sand	.08	.12
.5 –1.	Coarse sand	.14	.10
Total mineral matter		99.94	99.90
Organic matter, water		2.47	.34

"*Common Loess Soils.*—The common loess forms the immediate surface over the entire quadrangle, except on the river and stream flats and over the narrow belts of sand and marl-loess hills along the



U. S. Geological Survey.

Stratification in fossiliferous marl loess, near New Harmony, Indiana.

U. S. Geological Survey.

Stratification in the later sand dunes, near Mount Carmel, Ill.

borders of the Wabash Valley. It is generally of a light-buff to reddish-brown color, though becoming pale at times. The upper 9 inches is usually fairly open, but below the limit it is more plastic, tenacious and clayey. Under cultivation it becomes ashy gray in color. The materials of the loess were originally derived from diverse materials that were scattered over wide areas and it thus contains all the essential ingredients of an unusually fertile soil. It gives good yields of corn, wheat, clover, timothy, and would probably make good tobacco land. Fruit, especially apples, and some garden vegetables are raised. The average yield of wheat is said to be about twenty bushels and of corn from thirty-five to forty bushels per acre. The accompanying mechanical analyses by the Bureau of Soils indicate the physical character of the soil.

"*Marl-loess Soils.*—The marl-loess soils lie in two belts, one on each side of the Wabash Valley. They do not occur over the entire area mapped as marl-loess, but only along the edges of the belts next the river, the remaining portions being covered with common loess. In color the marl-loess is a pale yellow or straw color. It is also in somewhat marked contrast with the loess of the common type in composition, frequently carrying 5 per cent. or more of $CaCO_3$, while the latter generally contains less than 1 per cent. It weathers to a deep reddish brown and frequently shows abundant lime, even at the immediate surface, while in the common type the lime is rarely present at the surface. Its soil is superior to that of the common loess, with which it is sometimes mixed as a fertilizer, with some success. The following analysis, taken from the Thirteenth Annual Report of the Indiana Geological Survey (p. 46), gives a fair idea of its character:

CHEMICAL ANALYSIS OF LOESS, POSEY COUNTY, IND.

CONSTITUENT.	Amount.
Combined moisture	1.35
Soluble organic matter	.30
Insoluble silicates	73.30
Carbonic acid	10.00
Lime	6.80
Magnesia	3.78
Alumina and peroxide of iron	2.80
Chlorine	.12
Loess and alkalies	1.55
Total	100.00

"*Sand-hill Soils.*—The sand hills of the quadrangle are of two types, the first including the relatively fine white sands extending from Keensburg westward to Bonpas Creek, and the second embracing the wider interrupted belt of coarse sands extending along the eastern border of the Wabash flats from near Hazelton to the southwestern limits of the quadrangle. In general these sand hills are so porous and are so well drained that they are poorly adapted to general farm crops, but large quantities of watermelons are grown, 500 to 1,000 car loads being shipped annually from Posey County. Stock peas are raised in small amounts, and wheat does well if it follows melons in rotation. Mr. H. W. Marean, of the Bureau of Soils, believes that alfalfa might profitably be introduced.

"*River Sands and Gravels.*—In this class are included the areas of coarser materials of both the lower and upper levels of the Wabash and White River flats. These areas, being limited to original depositional elevations, are of slight extent as compared with the areas of fine silts filling the intermediate depressions. In general the soils consist of buff sandy or gravelly loams which nearly always contain considerable quantities of fine silts and in places are mixed with considerable quantities of vegetable matter, giving almost black colors. In general the sandy soils are most common near the immediate banks of the rivers, where additions are constantly being made by overflow or through the action of wind.

"The higher portions of the sand and gravel flats will yield an average of twenty-five bushels of wheat per acre, and will afford good crops of clover or timothy. About forty bushels of corn per acre may be obtained. The sandier upper portions in places yield good crops of melons.

"*River Silts.*—By the term river silts is meant those finer deposits which have been mentioned as occupying the original depressions of the Wabash and White River flats. The material is largely what may be termed a coarse silt. While much finer than the sand of the preceding class of soils, it is coarser than the clayey silts of the smaller streams. These silts appear to be composed of particles which, as compared with those of the clay soils, are only moderately weathered. They constitute, next to the loess, the most important soils of the quadrangle, comprising the larger portion of the Wabash and White River flood-plains. Owing to the very recent drainage of much of the area of the flats, large tracts are still timbered. The cleared areas produce large crops of corn, averaging forty-five bushels per acre. The lower portions, next the river, are subject to annual overflow and are never troubled with drought. They include some of the best corn lands in Indiana and Illinois.

"An analysis of the river silts near Mount Vernon shows 2.42 per cent. of organic matter, 66.70 per cent. of silt from .05 to .005 millimeters, and 28.42 per cent. from .005 to .001 millimeters in diameter. This soil is frequently underlain by a gravel layer which is of great assistance in draining.

"*Lake and Subordinate Stream Silts.*—This class embraces the silt deposits of all streams except the Wabash and White Rivers and the broad drift flats marking the old lake beds. Most of the material is derived from the erosion and redeposition of the loess and is therefore exceedingly fine and clayey. The material is generally strongly weathered and leached of its lime. The stream silts are generally overflowed annually and are frequently wet throughout the year in places. Where artificial drainage has not been established the old lake flats are also very wet. Corn is the best crop, yielding fifty bushels per acre in places. Good crops of grass can also be grown.

"In the class of subordinate stream silts may also be included the clayey soils of some of the low terraces bordering many of the streams of the quadrangle, especially in the southern half.

"*Swamp Deposits.*—In this class are included the black silts, mucks, and peaty deposits that occur in the various depressions of the flood-plains and on the broad drift flats. The depressions of the flood-plains are of two types, the broad, shallow depressions, representing incomplete upbuilding of the plains, and the relatively narrow bayous and other abandoned stream channels. The broader depressions are usually filled by the slow accumulation of ordinary river silts, which are washed in at times of flood, and which are mixed with accumulations of leaf mold, etc., giving a black color to the whole. Occasional cypress ponds and swamps, in which the accumulations are almost entirely of vegetable matter, are found on the Wabash flats, especially northeast of Mount Carmel, on the Indiana side of the Wabash. The bayous are generally filled with silts mixed with large quantities of leaves, logs, etc.

"Many depressions in the surface of the drift flats marking the beds of the old glacial lakes have been occupied by shallow water bodies even up to within the memory of many of the present inhabitants. The soil of these portions consists of a black muck containing more or less silt washed in from the surrounding areas. The soil is very fertile and after drainage yields as high as fifty bushels of corn, twenty-five bushels of wheat, one and one-half to two tons of clover, or one and one-half tons of timothy to the acre.

The higher portions of the flats are characterized by the redeposited loess soils of the previous class.''—Patoka Folio.

''*Soils of the River Bottoms.*—In this group is included the soils of the lowest portion of the bottom lands, or those subject to at least annual overflow. In the quadrangle they are best developed along the Patoka River, where they reach a breadth of several miles in places. Similar flats also border Pigeon, Little Pigeon, Blue Grass, Cypress Creeks and other streams. The soils generally consist of clay or almost impalpably fine sands, are whitish in color and 'cold,' being saturated with water in the winter and spring months and parched by drought in summer. Although portions of the bottom lands have long been under cultivation, large areas still remain forested, the most common timber being elm, red maple and gum; but where a considerable portion of sand is present beech, sugar-maple, overcup oak, and tulip trees also occur. Within the last few years somewhat extensive areas have been reclaimed for agricultural purposes by drainage ditches.''

''*Soils of the Terraces or Second Bottoms.*—The soils of this group are limited principally to a narrow belt along the south side of White River west of Petersburg. They are composed of medium grained sand deposited by the river during the Wisconsin stage of the glacial invasions. They are much coarser in texture than the soils of the river bottoms, and not being subject to overflow are not so wet and cold as the former. The dune sands southwest of Petersburg may be placed in this group. Wheat seems to be the principal crop.''—Ditney Folio.

VANDERBURGH COUNTY.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Vanderburgh County was organized in 1818, and named in honor of Henry Vanderburgh, a Captain in the Revolution and a man of prominence in the early history of the Northwest Territory and a judge of the first court formed in the Indiana Territory. In 1814 parts of Gibson and Warrick counties were taken to form Posey County, and then, later, parts of the three counties were taken to form the present area of Vanderburgh County.

The civil townships are: Pigeon, Knight, Scott, Armstrong, Perry, Union, Center and German.

Evansville, the county seat, was first settled in 1816 by Hugh McGary, and was named after Gen. R. M. Evans, one of the first inhabitants. It is located on the Ohio River. It is about 180 miles southwest of Indianapolis and about 200 miles from Louisville, by river. In 1850 the population was 5,000, in 1900, 59,000, and at the present time about 70,000, the second largest city in the State. The railroad facilities are good, six steam roads and four interurban lines and about thirty miles of street railway. The river traffic also keeps the city in touch with many important points. The following paragraphs from the Report of the Department of Statistics for 1907-1908, will show the class of business enterprises and the opportunities for development in Evansville:

"Through the Evansville business organization the city has secured some of its 275 factories, which include twenty-one furniture factories, eight foundries, three pottery, terra cotta and fire-clay products, eight brush and broom, three mattress and bed springs, four stove and furnace plants, six agricultural implement manufacturing establishments, four automobile, seven brick and tile, six wholesale meat packing houses, four awnings, tents and sails, one canning factory, eighteen carriage and wagon factories, four carpet, three leather belting and hose, six harness factories, six men's clothing, nine women's clothing, eight box factories, wooden and paper, and six railroad repair and car shops, and employ 9,500 men with an estimated pay roll of $30,000 weekly.

"Beneath Evansville and its surrounding country is a fine vein of coal, which is too deep, however, to be profitably mined, when it can be bought for sixty cents per ton. The Business Men's Association is ready to encourage any metal, wood or textile manufacturing establishment, and a factory site will be given free. Evansville claims to have the three essentials of a successfully conducted industrial enterprise which are as follows: an abundance of low-priced fuel, plenty of good labor and a location which assures quick transportation and low rates."

Howell, a suburb of Evansville, to the southwest, has a population of 2,000. The L. H. & St. L. and L. & N. railroads pass through the town and twelve passenger trains daily. The industries are the L. & N. repair shops and two chair factories. The town has three miles of street railway and other improvements which should enlarge growth in this place.

Staser (50), Englefield (200) and Erskine are stations north of Evansville on the E. & T. H. Railroad. Oakdam (25), Green River Road, Inglehart, McCutchensville, St. George, Straightline Jc., and Belt Yard are stations along the E. & I. Railroad northeast of Evansville. Martin, Armstrong (75), (creamery located here), Wilcox and Hillside are stations on the line of the Illinois Central, in the northwestern part of the county. North Howell and Belknap are on the L. & N. west line, and Cypress, a lumber station, Vaughn and Rahm are stops and switches along the south line of L. & N. St. Joseph (40) and Kasson (100) in the west side of the county, Zipp (120) in the central part, and Earle (45) in the central eastern part, are villages located some distance from the railroads and furnish trading centers for the surrounding population.

General.—In 1830 the population of Vanderburgh County was 2,610; in 1840, 12,000; and at the present time is estimated to be about 82,000; of this number Evansville is estimated to have about 70,000, and the town and village population is about 2,600, and the rural population would then be about 9,400. The area of the county is 236 square miles. The total population gives the number per square mile 348. The rural population allows six square miles for area occupied by cities, towns and villages, is about forty-two persons to the square mile. The greatest length of the county is nearly twenty-four miles and the greatest width a little less than fourteen miles. The total farm area, 142,287 acres, of which 120,619 acres are improved; the assessed value of farm lands and improvements is $5,560,140; and the total value of taxable property in the county is $41,988,810. Land varies in price from $35 in the rough parts to $150 per acre in the Ohio bottoms.

The county produces annually about 800,000 bushels of corn, an average of thirty to forty bushels per acre; wheat 450,000 bushels, an average yield of fourteen bushels per acre; oats, 25,000 to 50,000, yielding from ten to twenty-five bushels per acre; timothy, 11,250 tons or about one and one-third tons per acre; alfalfa is increasing in acreage, in 1908 over 100 acres being grown; clover, 9,000 tons, a yield of one and one-quarter to one and one-half tons per acre, and produces about 500 bushels of seed.

From 650 to 750 acres of potatoes are grown, yielding from fifty to eighty bushels per acre; tomatoes, only a very small area, from fifty to sixty-five acres yielding from fifty to 110 bushels per acre; peas, 300 to 500 acres; apples, from 3,000 to 4,500 bushels; and in 1908 the county ranked seventh in the number of pear trees, having 11,855; only five or six acres of tobacco are grown; no melons for the market, and a very limited amount of truck farming is carried on, considering the opportunities for good market and excellent transportation.

Transportation Facilities.—The transportation facilities for all parts of the county are excellent. The railroads leading out from Evansville are the E. & T. H., E. & I., the Peoria Division of Illinois Central, the St. Louis Division of the Southern, the Ohio Valley, the L. & N. and the St. Louis Division of the L. & N.; the Evansville and Princeton Traction Line, the E. & Mt. V., the E. & S. & N. to Newburg and Boonville, the E. & E. to Rockport and Newburg Suburban Line. The river traffic is of great importance to the county.

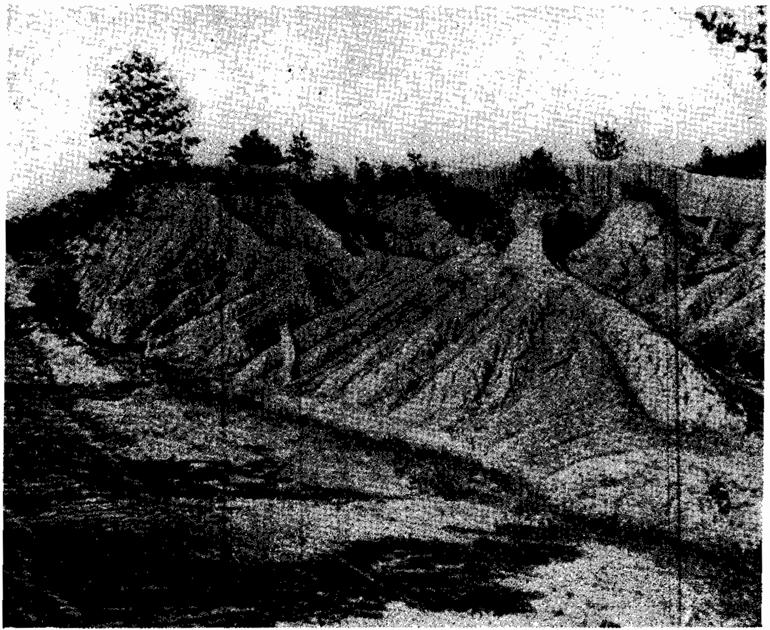
There are in the county 600 miles of public roads, with about 140 miles improved. The material used is limestone from the road metal quarry at Milltown, and from small local quarries and from the Ohio River gravel.

PHYSIOGRAPHY AND GEOLOGY.

In general the topography of the county is that of a fairly level tableland crossing the northern part, the Ohio River bottoms from two to five miles wide along the south and the wide bottoms of Pigeon and other creeks, with intervening upland somewhat broken. The upland is from 150 to 350 feet above low water on the Ohio. Evansville is 378 feet above sea level; and the low water mark is 326 feet; Erskine's, 381 feet 6 inches; Inglefield, 466 feet; Elliot, 410. The surface rocks are chiefly of the upper or Barren Coal Measures. The surface everywhere, except for a few small outcropping areas, is covered with the upland loess and alluvial deposits. In the upland the covering over the surface rock varies from a few inches to fifty feet.

U. S. Geological Survey.

Exposure of the Inglefield sandstone, near Inglefield Station, Ind.



U. S. Geological Survey.

Characteristic recent erosion topography in Till.

SOILS.

The soils of the county are divided into the two general groups, the upland and the bottom land. These groups comprise five distinct types.

The following table shows the extent of the various types:

	Square miles.
Loess—Miami silt loam	135
Reworked loess—lake plain	6
Alluvial—	
(1) Lower Ohio bottoms	45
(2) Smaller stream deposits	15
(3) Older stream silts	35
Total	236

1. COMMON LOESS SOILS. (MIAMI SILT LOAM.)

This type is the most extensive soil in the county, covering all the uplands. In general the surface of the area upon which it occurs is gently rolling, but in places becomes considerably broken, and on the steeper slopes the loess has been washed away. The soil varies in color from gray to reddish yellow. The subsoil is more clayey and has a yellow to red color. The soil is principally a silt loam, with the silt as the principal constituent throughout the depth. Some fine sand is present and a small percentage of clay.

The soil is very uniform throughout the county, and has a high degree of fertility. Wheat yields from fifteen to twenty bushels per acre; corn, thirty to forty. The area is well adapted to fruit growing and several pear orchards have been planted, and apples and small fruits are now receiving attention. The area would be a most valuable one in which to engage in fruit growing.

The following table shows the results of mechanical analysis:

MECHANICAL ANALYSES.

LOCALITY.	Description.	Organic Matter and Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt and Clay.
Near Bauer's.	Surface	1.50	.50	.30	1.20	3.50	92 +
	Subsoil	2.20	.40	.15	.80	4.10	93
2 Miles E. Staser	Surface	1.20	.55	.40	2.50	4.10	90
	Subsoil	2.00	.50	.25	1.15	4.35	92 +
West of Inglefield.	Surface	1.85	.40	.50	2.10	3.45	91 +
	Subsoil	1.95	.50	1.50	3.00	5.30	88 +

Chemical Analysis of Surface of Loess.

Laboratory number	43
Reaction to litmus	V. F. acid
Moisture at 105° C	2.17
Total soil nitrogen	.104
Carbon dioxide	......

Analysis of Fine Earth Dried 105° C.

Volatile and organic matter	3.035
Insoluble in (1.115 sp. gr.) HCL	88.456
Soluble silica	.010
Ferric oxide (FE_2O_3)	2.542
Alumina (Al_2O_3)	4.735
Phosphoric acid anhydride (P_2O_5)	.164
Calcium oxide (CaO)	.247
Magnesium oxide (MgO)	.493
Sulphuric acid anhydride (SO_3)	.022
Potassium oxide (K_2O)	.236
Sodium oxide (Na_2O)	.205
Total	100.145

Chemical Analysis of Subsoil of Loess.

Laboratory number	44
Reaction to litmus	V. F. acid
Moisture at 105° C	3.09
Total soil nitrogen	.059
Carbon dioxide	.887

Analysis of Fine Earth Dried at 105° C.

Volatile and organic matter	3.563
Insoluble in (1.115 sp. gr.) HCL	84.405
Soluble silica	.012
Ferric oxide (FE_2O_3)	4.153
Alumina (Al_2O_3)	4.706
Phosphoric acid anhydride (P_2O_5)	.174
Calcium oxide (CaO)	1.372
Magnesium oxide (MgO)	.949
Sulphuric acid anhydride (SO_3)	.021
Potassium oxide (K_2O_3)	.296
Sodium oxide (Na_2O)	.201
Total	99.852

2. Lake Plain Soil.

This type covers an area of about ten square miles in the northern part of the county, being divided into two principal areas—that lying in the northwest corner, along Flat Creek, and a smaller area lying about Staser. The surface is generally level. This soil is also of loess origin and is composed of silts, sand and fine gravel

Farm view in edge of Ohio River valley, southwest of Howell, Vanderburgh County.

Melon field in sand dune area, West Owensville, Gibson County.

with a very small amount of clay. Most of the residual is very fine, having been eroded and redeposited from the loess. In most parts there is a high organic content, and the soil is of very dark color, is loamy and easily tilled. Corn is the principal crop, but in the better drained parts the wheat crop gives good yields. Hay is also grown to a considerable extent. See description of this type under Gibson County.

3. The Alluvial Soils.

The alluvial soils consist of three types: (1) That of the lower Ohio bottoms (Yazoo Clay and Miami Sandy Loam); (2) the smaller stream deposits; (3) older stream silts.

Soils of the Ohio Bottoms.—The principal soil is the same type as that found in a large area of the Ohio bottoms in Posey County, and has been designated as the "Yazoo Clay" in the soil survey of that county by the U. S. Bureau of Soils.

The soil is entirely an alluvial soil, and since the area is subject to overflows much material is added from year to year. The surface soil is a brown clay loam of great fertility and very easily cultivated. A small amount of organic material is contained in the soil and gives a good condition to the soil. The subsoil is more compact and at a depth of a few feet grades into a sandy clay or sand. This type of soil occupies all the great bend of the Ohio southwest of Evansville north to Bayou Creek and the greater part of the lower bottoms southeast of Evansville. The land is owned chiefly by farmers living in the uplands or by persons in Evansville and is rented, usually cash rent, ranging from $5 to $15 per acre, or in a few instances demanding even a higher price in some areas of the best parts of the great bend. Corn is grown almost exclusively and yields from 40 to 100 bushels per acre. Wheat grows well but is an uncertain crop because of the danger from overflows. Timothy and clover yield well. Land sells at prices ranging from $60 to $150 per acre, but there is little changing hands at any price. There is but very little timber land left and all the ponds and low lying tracts are being drained. The farms have but few permanent residents, and there are no towns within the area. The surface is level, with a gradual slope to the uplands, but the line is usually marked by a decided change in elevation. Near the upland the soil is more clayey, and this part is apt to be wet, and often contains bayous and swamps, but when drained out and put under cultivation it has a good state of tilth.

In the eastern part of the county the clay loam is separated from the river by a narrow strip of sandy loam termed the "Miami Sandy Loam." In color and general appearance this type very closely resembles the former, but upon examination it will be found that the sand content is high, and, although the drainage conditions are good and a large amount of organic matter is present, the productiveness varies considerably. Corn and wheat are the principal crops. The area is small, but might be made to give good returns on special crops.

The following table shows the results of mechanical analysis:

Locality.	Description.	Organic Matter and Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt and Clay.
"Yazoo Clay." From U. S. Survey. One Mile E. Mt. Vernon.	Surface.......	2.60	.02	.02	.06	1.50	99
	Subsoil.......	2.27	.01	.02	.14	3.06	96.76
"Yazoo Clay." Five Miles S. W. Howell.	Surface.......	2.20	.10	.20	.15	1.70	98
	Subsoil.......	2.05	.10	.40	.20	3.50	96
Miami Sandy Loam. 4 Miles S. E. Evansville.	Surface.......	1.50	2.00	7.50	40.00	15.00	34
	Subsoil.......	1.55	1.60	10.40	42.50	12.00	22

Smaller Stream Deposits.—These soils occupy the valley of the smaller streams and are composed of silt and sands, with level, gently undulating surfaces and subject to overflows. The soil, while containing a limited area, is of great agricultural value. The surface soil varies in color from light yellow to brown, and has a varying amount of organic matter. The subsoil contains a larger amount of clay than the surface and becomes somewhat mottled in appearance, but still retains its silty character.

The soil is derived from material washed in from the uplands and mixed with decaying vegetable matter; this process is going on continually and the soil is thus kept in a good, fertile condition. The soils slope gradually to the stream but some artificial drainage is usually needed to secure the best results.

Corn yields about fifty bushels to the acre, wheat twelve to eighteen bushels, and grass makes an excellent growth. Some sorghum and a little tobacco are grown.

Older Stream Silts.—These soils are composed chiefly of fine silts containing a small percentage of fine sand and some clay. They occupy the upper valleys of some of the streams in the western side of the county, chiefly the tributaries of the South Fork of Big Creek and a large area north and east of Evansville and extending to the north along the eastern part of the county. The surface is comparatively level. Artificial drainage is required to obtain the best results. The soil is very fertile and gives good yields—corn fifty bushels, wheat twelve to twenty-five bushels, clover and timothy one and a half to two tons per acre. Some truck farming is carried on in this region.

The material of which these soils is formed is supposed to be largely of pre-Wisconsin age, but mixed with material of more recent date. The larger areas are but slightly influenced by material from the uplands at the present time. The deposits show the work of overloaded streams in building up their beds. They consist largely of reworked loess with a marked clayey texture, but in places sandy and gravelly streaks occur.

SUMMARY.

Vanderburgh County is a prosperous agricultural region. The past few years have made marked developments, especially in the central and northern parts of the county. Good, substantial farm improvements have been made, and the increased demand for products by the growth of Evansville has stimulated an interest in intensive farming.

Farms range in size from 20 to 2,000 acres, but the average is from sixty to eighty acres. There is considerable variation in price, but all classes are on the increase. In parts where the land is farmed by the owners, improvements are good and prices high.

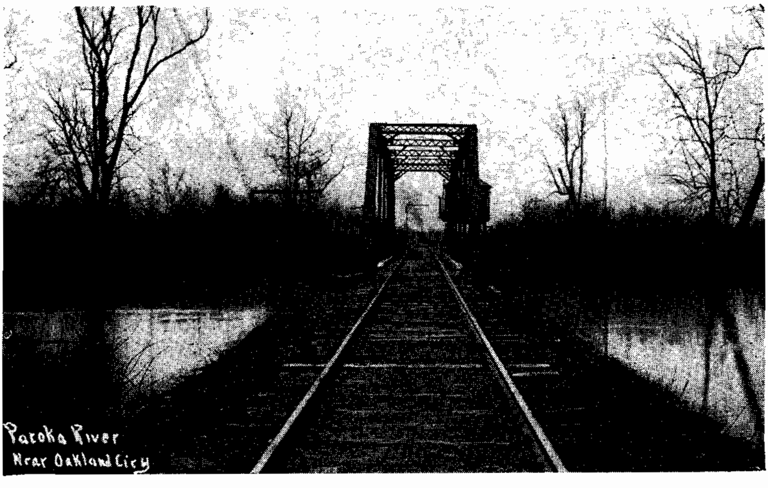
The river floods are rarely late enough to injure the corn crop. The regions about the bayous and swamps are often flooded until late in the year. These places are difficult to drain, but it is gradually being accomplished. In the higher parts of the bottoms some excellent improvements are found.

Corn is grown almost exclusively in the bottoms, but in the uplands various crops are grown and attention given to crop rotation. The most common is wheat followed by clover, which is used for hay and pasture for two or three years, and then followed by corn, and then wheat drilled in the corn, although some fall plowing is done for wheat. Stable manure and straw are well applied to the soils and the use of commercial fertilizers is not extensive.

There is excellent opportunity within the county for the establishment of manufacturing industries, creameries, canning factories, flour mills, etc., outside the city of Evansville, within easy reach of the raw material and still have good transportation facilities.

The soils have good natural fertility and are able to withstand drouth, and crop failures would not be expected except locally in unusual seasons.

Patoka River at Patoka, Ind., showing rock exposures and mill dam. The river valley, several miles wide in places, narrows here, the bluffs coming down to the stream on both sides.



Patoka River and railroad bridge near Gibson and Pike County line, north of Oakland City, Indiana. Showing wide valley.

GIBSON COUNTY.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Gibson County was organized in March, 1813. The territory had been previously included in the County of Knox. Since the first organization portions of Gibson County have been taken off, and have assisted in forming the counties of Posey, Vanderburgh, Pike, Warrick and Dubois.

The county was named in honor of General John Gibson, a soldier of the French and Indian and Revolutionary wars. He was secretary of the treasury from 1801-1816, and on numerous occasions was acting-Governor in the absence of Governor Harrison.

At the first division of the county into civil townships five were formed. The present townships are White River, Patoka, Montgomery, Wabash, Johnson, Barton, Columbia and Center.

The seat of justice was located February 14, 1814. The commissioners drew lots for the privilege of naming the county seat, and Captain William Prince was the lucky person.

Princeton, the county seat, is located a little north of the center of the county, twenty-seven miles north of Evansville. It has a population of about 8,000. In 1850 the population was about 800. Two railroads and an interurban line furnish the means of transportation. The Southern Railroad shops are located here. Sawmills, flour mills, machine shops, metal sewer works, a canning factory, glass factory and coal mining make up the principal industries. The town is making good progress and the improvements are good. The water supply comes from the Patoka River. The good agricultural community surrounding Princeton adds much to the business of the town. Financial assistance and free sites will be given industries seeking location.

Oakland City is situated near the eastern edge of the county, fourteen miles east of Princeton, and has a population of 2,100. Two railroads cross here, giving good transportation facilities to the town and surrounding country; there are fourteen passenger trains daily. The oil field recently developed in the locality has added much to the business of the town. There is an unlimited supply of coal and gas, and free factory sites will be given. A brick plant, planing mill, bent wood and heading factories are the principal industries. The water supply is from an artificial lake.

Fort Branch, on the main line of E. & T. H. and on Mt. Vernon branch of E. & T. H., also on Southern Indiana traction line, seven and one-half miles south of Princeton, has a population of 1,350. It is twenty miles north of Evansville and has fourteen passenger trains daily, and hourly interurban service. The present industries are a foundry and bridge works, a brick and tile factory and concrete works. The city is near the center of the county. The town is willing to assist in securing business enterprises. Clay works, canning factories and creameries would find a good location here.

Owensville, with a population of 1,300, is situated on the Mt. Vernon branch of the E. & T. H. Railway, eleven miles southwest of Princeton and in the center of the county. It is the center of the melon industry, ranking next to Decker, in Knox County. The present industries are sawmills, tile factories and flour mills.

Patoka, the oldest town in the county, is situated on the banks of the Patoka River, three miles north of Princeton. The town was formerly called Smithfield, and was platted in 1813 as Columbia, but was later given the name Patoka. In 1813-1814 the "black plague" swept over the town and greatly depleted the population, causing the defeat of the town for the county seat. The hotel and stage station for the stage line from Evansville to Vincennes was located here. The town now has a population of 700. The town is on the E. & T. H. Railway and has ten trains daily. It is the present terminal of the Southern Indiana traction line. The Patoka bluffs afford noted picnic grounds for neighboring towns and the surrounding country.

Hazleton, situated on the south bank of White River, six miles north of Patoka, has a population of 700. The second settlement in the county was made here, also the second ferry was established here and was a noted stage station in early days. It has ten passenger trains daily.

Francisco, on the Southern Railway, eight miles east of Princeton, has a population of 400. It is one of the towns which flourished during the time when the Wabash and Erie Canal was in operation, but has outlived most of the towns which sprung up at that time. Dongola, situated on the south bank of the Patoka, was another canal town which gave substantial growth, but ceased with the canal. The present industries of Francisco are two tile factories and a creamery. The town bids fair to grow, and some good opportunities may be had here by business enterprises.

Fetters is a lumber station and shipping point. Passenger trains do not stop here. A ferry crosses the Wabash giving good connection with Mt. Carmel, which is the chief trading place for the western part of the county.

St. James village is situated about a quarter of a mile west of station of same name. It has a population of 850.

Haubstadt, three miles south of Ft. Branch on the line of E. & T. H., and also on the line of the Traction Company, has a population of 300. It was formerly known as Haub's Station and was an old stage stand.

King's, three miles south of Princeton, has a population of about 150. The traction station is one-half mile west of the E. & T. H. Railway station. It affords a shipping point for timber brought in from the east part of the county and for grain and stock from the excellent surrounding agricultural community.

McGary, Mount, and Knowles, are stations and shipping points in the Mt. Vernon Branch of the E. & T. H. Railroad.

Somerville, in the southeastern part of the county on the E. & T. H. Railroad, has a population of about 100. It is the only town of importance in Barton Township and good roads lead out in all directions and large quantities of corn, wheat, oats, etc., are marketed here. Mackey and Buckskin are other stations south of Somerville.

The place known as Buenavista, on the river northeast of Hazleton, was laid out as a town in 1848, but ceased when Hazleton was founded. A ferry was established here about 1800, and was known as Decker's Ferry.

The Pioneers.—The pioneers of Gibson County will not be forgotten. Their labors have been crowned with success, even more than could have been anticipated. The honor of being the first white settler within the present limits of Gibson County belongs to John Severn, Sr., a native of Wales, who came to America several years before the Revolution. He located in Virginia. He had done considerable surveying and assisted the government surveyors in Maryland and Kentucky. About 1789-1790 he penetrated the wilderness of the Northwest Territory and settled on the south of the Patoka, near the place now known as Severn's Bridge. They lived for a few years after their arrival in a cave dug out of the side of the bluffs.

Next followed the Hazletons, who established a ferry on White River, where the town of Hazleton is now located. Daniel Robb, a noble of Ireland, settled near the same place in 1800. The Hargroves, McClures, Montgomerys, Smiths, McGarys, Cockrums, Ralstons, Neeleys, Mounts, Woods and many others added much to the pioneer history of the county. Gen. Robert M. Evans was one of the most conspicuous men in the early history of the county. The Woods and Montgomery families were the largest families coming into the county. It is related that at early elections in the county these two families could elect any officer by their combined vote.

In 1816 Gibson County had a population of 5,330. In 1880 22,742, composed of persons of English, Scotch, Irish, German and French descent, with a considerable colored population. The present population is more than 30,000.

Military Donations, Locations and Surveys.—A portion of the land south of White River, in the north part of the county, was divided by the general government into militia donations, locations and surveys. These surveys were made between the years 1794-1802. These donations were originally made to a company of 128 militia men, of 100 acres each to the man, laid off in 100-acre plots. These lands were given for services rendered in one of the Indian wars. The persons were allowed to locate in the land or dispose of same in any way they cared. There were other locations which were given for various purposes to parties holding claims against the general government. William Rector was surveyor-general of the United States Survey, and under his supervision a portion of the county was laid out in sections, between 1801-05, and the balance at a later period.

The greatest length of the county from east to west is forty-eight and one-half miles, and north to south the greatest distance is about twenty miles. It has a total area of 490 square miles.

Transportation Facilities.—In the early days the stage line from Evansville to Vincennes carried many passengers. The first means for the transportation of surplus production were rafts and flatboats on the Wabash and up White and Patoka rivers. From 1832 to 1856 river traffic was quite active. The portion of the Erie Wabash Canal within the eastern part of the county also furnished a way of transportation for much of the county's products. But with the coming of the railroad the canal boat and stage coach gave way to better methods.

Patoka River, though not now a navigable stream, had its day of steam-boating. During high waters boats of small tonnage ran up as far as the town of Patoka and two small boats built on the river above Patoka, one for steam trade, the other for moving flats and barges, operated for some time.

At the present time the county has fairly good transportation facilities. The main line of the Evansville and Terre Haute Railroad runs north and south through the county. The Evansville and Indianapolis line, crossing the southeastern side, is also operated by the E. & T. H. This line was built in 1854-56, and was known as the ''Straight Line.'' The main line of the E. & T. H. was built in 1849-53. The Mt. Vernon branch across the southwestern, south of the county, was built in 1882. The St. Louis division of the Southern was built across the county from east to west about 1875. This line intersects the E. & T. H. at Princeton and E. & I. line at Oakland City. The Peoria division of the Illinois Central also touches the southwestern corner of the county. The Evansville and Southern Indiana interurban line, extending from Evansville to Patoka, adds much to the accommodations of the traveling public, and in the marketing of vegetables, fruits and melons from agricultural communities along the line.

The county has 1,350 miles of public road, with about 150 miles improved. The gravels of the terraces and flood-plains of the Wabash and along the bluffs of the Patoka are used as road metal. The greater part of the road material, however, is limestone shipped over the Southern from Milltown, Ind. In the northern part of the county near Hazleton, some river gravel is used. The first improved roads were built in 1899, and the county is making rapid progress in that line, and the people are well pleased with the investments in improved roads. In the sandy area in the western part of the county the roads are improved by addition of straw, hay, twigs and clay, otherwise they often preclude economic hauling because of the loose sand.

Agricultural Societies.—The Gibson County Horticultural and Agricultural Society was organized September 19, 1857. In 1852 a fair was gotten up by the merchants and farmers and the first fair was held about the Court House Square. No admission was charged and the premiums amounted to $30. The second fair was held in 1853 and $70 were paid as premiums. In 1856 the third fair was held, with 410 entries and premiums amounting to $225.

In 1857 the fair grounds were purchased and a fair held; there were 700 entries, with premiums amounting to $850, receipts $1,500. Fairs have been held every September since. The grounds are located at the northwestern limits of the city and contain twenty-three acres, several halls for exhibits, and several hundred stalls for stock are on the grounds. The agricultural and horticultural exhibits are good, the number of stock shown each year is large and the good of the county is materially advanced each year by the fair, which is considered the best in the State from an agricultural standpoint.

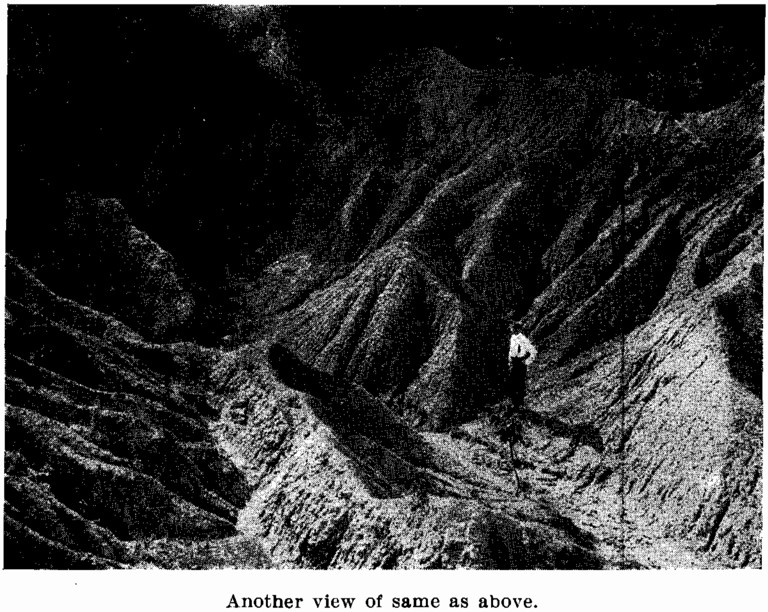
General.—The total taxable property of the county amounts to $18,818,155, and the farm lands and improvements to $8,844,105. The total farm area comprises 278,830 acres, of which 242,145 acres are improved. The average price of land is about $65 per acre. The mineral resources are coal, clay, gas and oil.

The county produces annually, according to the statistics of 1907 and 1908, 2,000,000 bushels of corn, an average yield per acre of about thirty-five bushels; wheat, 750,000 bushels, with an average yield of twelve bushels per acre, and ranking second in the State in 1908 as the total average of wheat, having 60,000 acres, and ranking sixth in the total yields; oats, 150,000 bushels, an average yield of about eighteen bushels per acre; a large acreage of timothy is grown each year, and yields about one and one-third tons per acre; alfalfa growing is beginning to receive attention, and about 300 acres were grown in 1908. The clover crop ranks among the leading counties of the State, with an average of 10,000 to 12,000 acres, yielding from one and one-half to two tons per acre and producing 500 to 1,500 bushels of clover seed.

Large crops of cow-peas are grown, especially in the sandy acres. They make very rank growth and are the principal source of stock food. From 20,000 to 50,000 bushels of potatoes are grown annually, but that is a small amount, considering the adaptability of the soils and the ready market for potatoes. The average yield is about fifty bushels per acre. About 100 acres of tomatoes are grown, yielding about 100 bushels per acre. The county ranks among the first in the growing of peas, watermelons and cantaloupes. About 1,200 acres of peas are grown annually. From 1,500 to 1,800 acres of watermelons and from 500 to 800 acres of cantaloupes, ranking first in the State in the production of both. A few acres of onions are grown and give a good yield. No tobacco is grown for the market. In 1908 the county produced about 10,000 bushels of apples. Considerable attention is being given to the growing of pears, there being about 25,000 trees at the present time.

The number of live stock raised is rapidly on the increase. The value of pure bred stock is beginning to be realized.

Erosion in loess and under drift down to residual materials. Southeast of Princeton.



Another view of same as above.

Dairying is beginning to be a paying business. Butter making by the farmers is the chief use of the milk at the present time. Francisco has the only creamery within the county. Some milk is shipped to Evansville.

The rapid growth and development within the county in the past few years has placed the county among the leading counties of the State. The growth of the county is shown by the increase of population from 5,417 in 1830, and 11,000 in 1850, to more than 30,000 at the present time. During the last twenty-five years the corn crop has been doubled. Large areas formerly too wet for cultivation are being reclaimed and the wide range in the adaptability of the soils make all crops give good returns. Considerable attention is given to crop rotation and crop fertilization, and as a result most of the land is in good condition. The yield per acre of wheat has declined considerably since the years 1879-85. This is no doubt due to the increased acreage, and the attempt of some farmers to grow wheat for a number of years on the same land without proper fertilization, and also due to the low yields of wheat which come from run-down rented lands. The wheat yield at the present time, while not so high as some other counties, is pretty regular from year to year.

In the areas of the best soil types the land is owned chiefly by those who live upon it, and most of the settlers are considered well-to-do. The thrift of the farmers is shown in the economy of the land, the permanent improvements and general rural advantages.

PHYSIOGRAPHY AND GEOLOGY.

In general the topography may be said to be broken in the eastern part, with deep ravines, and elevated tracts with level surface areas and other places rolling and hilly. The central part is fairly level, or gently undulating, and the west and north sides have a very large area of bottom land. The entire surface is covered with the loess deposits reworked into many soil types. The underlying formations everywhere are the coal measures. The drainage is by Patoka, White and Wabash Rivers and Pigeon Creek in the southeastern part, and Black River in the southwestern part. The natural resources are coal, oil, limestone for road metal, and loess clays.

The various types of topography are given under the following heads: (1) Rugged Uplands, (2) Rolling Uplands, (3) Upland Plains, and (4) River Flats. The first two types have been produced by the action of stream erosion upon the hard rocks of the geological formations, and the results of erosion have been about the same throughout the county. The third and fourth types have been formed by the accumulation of loose material in recent geological times.

"*Rugged Uplands.*—In the group designated rugged uplands are included the highest hills and ridges of the quadrangle. The type is developed on both the drift and the rock hills, the former being most conspicuous in the region north of Patoka and the latter in the region north, northeast, and east of Princeton and in the area between Big Creek and the eastern edge of the quadrangle. In the latter area ridges several miles long, with moderately uniform crests, are numerous. As a rule, they are sharp and narrow and are characterized by steep slopes, which are cultivable only with difficulty. The minor channels, which are exceedingly numerous, are usually more or less V-shaped and are separated from one another by equally sharp divides. In their upper courses they exhibit steep descents.

"In the Ditney quadrangle, which is immediately east of the Patoka, the higher points of the uplands rise to nearly uniform elevations of from 600 to 640 feet, and are believed to be the remnants of an old surface, almost a plain in character, which once extended over the whole of this region. In the Patoka quadrangle, however, owing to the greater maturity of the drainage, the reduction is more complete, only an occasional peak rising to the 600-foot level. The hills on which the Princeton standpipe is built rise to 610 feet, those on the Petersburg road, two miles north of the same city, to 645 feet, those north of Maxams station, southeast of Princeton, to 625 feet, and that northeast of St. Joseph to 605 feet.

"*Rolling Uplands.*—In this class are included the lower and less rugged upland surfaces. The hills are generally much smaller than in the previous group. Their altitude seldom exceeds 550 feet, and they usually exhibit smooth, gently rounded forms. The valleys are broad and relatively shallow, showing gentle curves in cross-section, and are characterized by the low pitch of their streams, and by broad, flat divides. The rolling uplands are best developed in the vicinity of the older drainage lines, especially in the region west of the Wabash River. The Claypole, Gordon, Mumford, Foots Pond, and other hills projecting above the Wabash flats are to be classed in this type in part, although the flatter portions of their tops belong to the group next to be described. The sand hills along the eastern border of the Wabash flats, the rock hills southeast of Hazleton, around Owensville, and along Big Creek, and the morainal ridges between Princeton and Fort Branch, southeast of Owensville, and near Poseyville and Cynthiana belong in the main to the rolling uplands, though the steeper portions approach the previous class in ruggedness.

"*Upland Plains.*—The upland plains consist of broad, flat, or gently sloping surfaces standing at an elevation of 500 feet or less and composed of deposits that accumulated during the period of the ice invasion or of loess or marl-loess deposited at a later period. The drift deposits are limited to the sloping drift plains east of the Princeton-Fort Branch moraine, the similar drift plains southwest of Fort Branch, and a few flat hilltops of the Mount Carmel quadrangle, where the rock is at no place far from the surface.

"The most conspicuous of the upland plains are the broad level or gently sloping marl-loess flats along the east side of the Wabash Valley south of the Black River and the smaller flats of the same material southwest of Mount Carmel, on Mumford, Foots Pond, and Claypole hills, and at points near Owensville and Hazleton. These marl-loess flats lie at a maximum elevation of 500 feet above sea level or about 120 feet above the Wabash bottoms. They frequently exhibit floor-like flats at this altitude, although sloping terraces, as in the Mumford Hills and along the north side of Big Creek, are more common.

"*River Flats.*—All of the rivers and large streams, and also many of the minor streams, flow through broad, flat plains of silt or of sand and gravel, which are generally overflowed, at least in part, each spring. Wells sunk for water show that the thickness of these silts and sands ranges from a few feet in the minor valleys to 150 feet or more in the valleys of the Patoka and Bonpas Creek. No deep wells are known in the portion of the Wabash or White River flats lying within the quadrangle, but the thickness of the deposits is probably 200 feet or more. In the process of the upbuilding of this considerable thickness of sediments the minor hills and valleys have been entirely obliterated, only the higher prominences rising as 'islands' above the flats. The general level of these flats is very uniform, being a little over 400 feet above the sea in the higher portions of the Wabash flats at the northern edge of the quadrangle, and about the same in the White and Patoka river bottoms. There is, however, a gentle slope southward to a 370-foot level at the southwest corner of the quadrangle. The low rate of fall has led to the development of meanders, which, because of their resistance to the free flow, cooperate with it in giving rise to annual overflows that cover all but the higher portions of the adjacent flats to depths of several feet. This frequent overflow leads to many changes in the courses of streams, and bayous and abandoned channels are common." *

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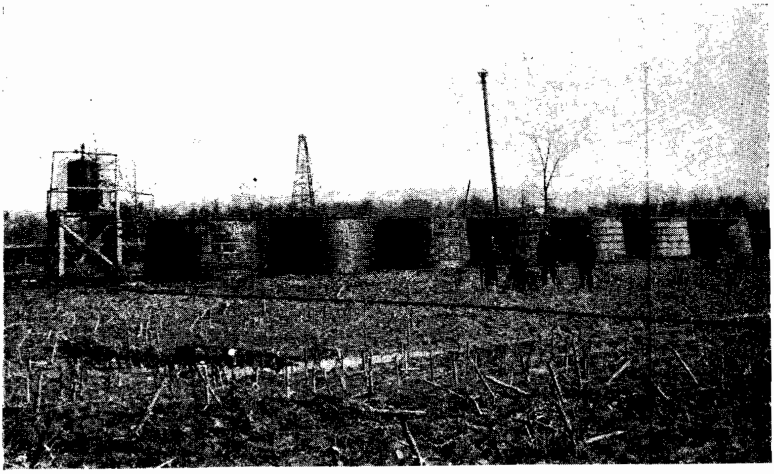
*Description of Ditney quadrangle.

View in oil field, showing tanks and pumping station, and the general topography of the land.



View in oil field, as above, near Oakland City, Indiana.

SOILS.

Gibson County has a great variety of soil types, with a wide range in adaptability. All the ordinary crops are grown, many special crops, truck farming and fruit growing, and each finds a soil specially suited to its needs—the loess soils of the uplands for wheat, sand hills for melons—corn along the stream bottoms and river flats and on the lake plains. The soils all have a marked degree of natural fertility. Fertilizers are not used extensively except on the areas where special crops are produced.

The following table will give the area of the various types:

	Square miles.
Miami silt loam—	
Common loess	302
Marl loess	10
Lake plain	27
Sand dunes and ridges	30
Alluvial—	
Upper flood plains	75
Lower flood plains	42
Swamp deposits	4

COMMON LOESS. (MIAMI SILT LOAM).

The common loess soil cover the greater part of the county, and has but little relation to the character of the topography. It varies greatly in depth, but is usually from 5 to 10 feet thick. This soil is a fine, silty material containing considerable clay. It varies in color from brown, or reddish to gray and is often mottled on fresh surfaces. The lime content is usually much lower than in the Marl-loess. Lime concretions are rare, while small iron concretions are abundant in places; there are but few ordinary pebbles found in the loess in its natural condition. The great mass of the loess is supposed to be of wind origin, the material having been derived from the Marl-loess deposits of the Wabash valley.

In their natural position the loess soils are usually of a buff color, but when exposed to the air in cultivation the color becomes ashy gray and in texture becomes more compact. All crops grow well upon the loess soils. The rolling upland topography of the common loess area permits of good drainage conditions and the soil is kept in good condition.

For further information concerning common loess soils, see Vanderburgh county and description of Boonville area.

Soil samples Nos. 45 and 46 were made up of equal samples from several locations of the loess area, thoroughly mixed and part taken for chemical analyses and part for mechanical analyses. The sample No. 50 was taken near Princeton. The chemical analyses were made by Dr. R. E. Lyons, Bloomington, Indiana.

The Marl-loess occurs along the immediate border of the Wabash valley and does not extend far back except at a few points. The soil is usually of a light yellowish color, easily tilled and is productive. This type has been more fully described in the foregoing pages of the report.

Mechanical Analyses of Common Loess.

LOCALITY.	Description.	Organic Matter.	Gravel.	Coarse Sand.	Medium. Sand.	Fine Sand.	Very Fine Sand.	Clay and Silt.
No. 45. Mixed Samples. No. 46.	Surface....	1.50	.0	.50	.75	.95	4.10	92+
	Subsoil....	.60	.50	.75	.60	1.05	4.85	91+
Clay Pit South Side Princeton.	Surface....	2.10	.10	.20	.50	.75	6.00	90
	Subsoil....	.50	.25	.50	.80	1.10	7.50	89

Chemical Analysis of Surface of Loess.

Laboratory number	45
Reaction to litmus	V. F. acid
Moisture at 105° C	2.41
Total soil nitrogen	.125
Carbon dioxide	.....

Analysis of Fine Earth Dried at 105° C.

Volatile and organic matter	3.655
Insoluble in (1.115 sp. gr.) HCl	88.395
Soluble silica	.031
Ferric oxide (FE_2O_3)	3.211
Alumina (Al_2O_3)	3.391
Phosphoric acid (P_2O_5)	.156
Calcium oxide (CaO)	.279
Magnesium oxide anhydride (MgO)	.398
Sulphuric acid anhydride (SO_3)	.036
Potassium oxide (K_2O)	.245
Sodium oxide (Na_2O)	.254
Total	100.051

Chemical Analysis of Subsoil of Loess.

Laboratory number	46
Reaction to litmus	Acid
Moisture at 105° C	3.54
Total soil nitrogen	.074
Carbon dioxide	.....

Analysis of Fine Earth Dried at 105° C.

Volatile and organic matter	3.398
Insoluble in (1.115 sp. gr.) HCl	84.721
Soluble silica	.073
Ferric oxide (FE_2O_3)	4.641
Alumina (Al_2O_3)	5.283
Phosphoric acid (P_2O_5)	.145
Calcium oxide (CaO)	.231
Magnesium oxide anhydride (MgO)	.477
Sulphuric acid anhydride (SO_3)	.029
Potassium oxide (K_2O)	.372
Sodium oxide (Na_2O)	.192
Total	99.562

No. 50. Common Loess.	No. 1. Princeton.
SiO_2	71.20
Al_2O_3	18.56
Fe_2O_3	1.34
FeO	.15
CaO	.14
CO_2	......
TiO_2	.88
MgO	.52
Na_2O	1.26
K_2O	.32
H_2O	6.30
Total	100.67

Chemical Analysis of Surface Marl Loess.

Laboratory number	47
Reaction to litmus	Acid
Moisture at 105° C	1.21
Total soil nitrogen	.074
Carbon dioxide	.....

Analysis of Fine Earth Dried at 105° C.

Volatile and organic matter	1.882
Insoluble in (1.115 sp. gr.) HCl	92.086
Soluble silica	.022
Ferric oxide (FE_2O_3)	2.202
Alumina (Al_2O_3)	2.314
Phosphoric acid anhydride (P_2O_5)	.139
Calcium oxide (CaO)	.334
Magnesium oxide (MgO)	.333
Sulphuric acid anhydride (SO_3)	.017
Potassium oxide (K_2O)	.159
Sodium oxide (Na_2O)	.208
Total	99.696

Chemical Analysis of Subsoil Marl Loess.

Laboratory number	48
Reaction to litmus	V. F. acid
Moisture at 105° C	3.66
Total soil nitrogen	.071
Carbon dioxide	2.137

Analysis of Fine Earth Dried at 105° C.

Volatile and organic matter	4.718
Insoluble in (1.115 sp. gr.) HCl	79.856
Soluble silica	.083
Ferric oxide (FE_2O_3)	4.612
Alumina (Al_2O_3)	6.864
Phosphoric acid anhydride (P_2O_5)	.128
Calcium oxide (CaO)	1.901
Magnesium oxide (MgO)	.683
Sulphuric acid anhydride (SO_3)	.022
Potassium oxide (K_2O)	.382
Sodium oxide (Na_2O)	.242
Total	99.491

LAKE PLAINS.

For the origin and nature of the Lake Plains Soils, see descriptions of Lake Plains in preceding pages and also following in descriptions of Patoka Lake Plain in Pike county. The lake plain soils in Gibson county are more fertile than that of the Patoka Lake plain.

MIAMI SAND.

The above term is applied to the dune sands and parts of the terrace deposits extending along the eastern border of the Wabash flats, from near Hazleton, in a southwestern direction to the Posey County line near which the type reaches its maximum width. The area varies in width from about one-fourth of a mile to almost four miles, and is almost continuous across the county, and extends into Posey County, varying in width from one-fourth of a mile to a mile to a distance of several miles below New Harmony.

The soil varies from a medium to coarse sand, of a dark reddish brown on freshly exposed surfaces and becomes light color on leached areas. Small percentages of silt and clay are found in the soil and in places becomes quite loamy and grades gradually into the silt loams of the uplands; the clay content increases with depth. The coarse sand is in some places interbedded with fine or marly sand, very similar in texture to the marl loess, and where vertical faces have been exposed shows traces of stratification, but never the perfect stratification of the marl loess.

The sand hills have a typical dune topography, somewhat influenced by surface agencies and the original forest growth. The sand has a maximum thickness of about one hundred feet. Some variation in texture and color occur with depth. The material is chiefly a quartz sand with rounded grains, carrying also some silt clay and imperfect fragments of shells.

With the exception of some large kettle-like depressions the area is well drained. In fact the sand hills are so porous and perfectly drained as to be poorly adapted to general farm crops, but large quantities of watermelons and cantaloupes are grown. Formerly the sand areas were considered of little value, but the good profits derived from melon cultivation has made the price of land take a big advance. In 1908 Gibson County ranked first in the production of watermelons and cantaloupes, having an area of 2,500 acres devoted to their growing, lying chiefly within the sand areas adjacent to the Wabash bottoms. Considerable acreage of cow-peas as a forage crop and garden peas for canning factories are grown. Some wheat is grown, and it is stated that it does well where it follows melons in rotation; but corn, on account of late maturing, suffers from drought. Clover is grown on a very limited area, and alfalfa culture is being introduced.

The origin of the sands of this area is difficult to determine. It may have been transported to its present position as the loess soils of the uplands. The roundness of the quartz grains and the traces of stratification in the subsoil would lead to the conclusion that the material was deposited in water. Others believe it to be wind blown sand of a later geological age than the loess.

The following paragraph from the "Patoka Folio," U. S. G. S., gives some information as to the origin and formation: "The upper flood-plains are bordered by broad and originally forested dune belts, apparently composed of sands derived from the surface of the flats. The muck and a part of the surface silts are undoubtedly of recent origin, but as important dunes are nowhere forming under the conditions now existing in this region, it is thought that they represent an accumulation at a period of greater depositional activity, when broad, bare flats, possibly extending over the greater part of the present width of the valley, were exposed to the sweep of the winds, and when the rate of dune accumulation probably precluded the existence of a vegetable mantle. These conditions are believed to have characterized the latter part of the Wisconsin Stage and possibly extended into Recent time. It is thought, however, that the covering of the flood plain and dunes with vegetation probably took place immediately upon the subsidence of the floods that are supposed to have attended the Wisconsin ice retreat, but it is considered safer to class both the flood-plain and dune deposits as transitional rather than with either the Wisconsin or Recent stages.''

The following table shows the results of mechanical analysis of the Miami sand:

MECHANICAL ANALYSES OF MIAMI SAND.

No.	LOCALITY.	Description.	Organic Matter.	Gravel, 2 to 1 mm.	Coarse Sand, 1 to 0.5 mm.	Medium Sand, 0.5 to 0.25 mm.	Fine Sand, 0.25 to 0.1 mm.	Very Fine Sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
7128	3 miles northwest of Poseyville.	Medium sand, 0 to 8 inches.	1.08	0.00	2.34	23.04	52.60	8.60	8.88	3.68
7126	4 miles west of Mount Vernon.	Medium sandy loam, 0 to 7 inches.	.60	.00	2.54	20.50	61.54	4.78	6.82	4.12
7127	Subsoil of 7126......	Medium sand, 7 to 36 inches.	.22	.00	2.04	25.70	50.54	3.78	13.78	4.10
7129	Subsoil of 7128......	Medium sand, 8 to 36 inches.	.52	.14	2.74	21.32	54.70	7.36	8.84	4.74

U. S. SOIL SURVEY, POSEY COUNTY, IND.

No.	LOCALITY.	Description.	Organic Matter.	Gravel, 2 to 1 m m.	Coarse Sand, 1 to 0.5 mm.	Medium Sand, 0.5 to 0.25 mm.	Fine Sand, 0.25 to 0.1 mm.	Very Fine Sand, 0.1 to 0.05 mm.	Clay and Silt.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.* *P. ct.*
60	2½ miles west of Princeton. Surface.	Medium sand, 0 to 6 inches.	.80	.00	3.00	27.00	50.00	10.00	9.10
61	2½ miles west of Princeton. Subsoil.	Medium sand, 6 to 36 inches.	.00	.00	2.5	30.00	47.5	7.5	12.2
62	4 miles southwest of Owensville. Surface.	Medium sand, 0 to 6.	.50	.50	2.8	30.00	45.00	8.5	12.5
63	4 miles southwest of Owensville. Subsoil.	6 to 36.............	.00	.50	2.8	28.00	48.5	6.5	13.50

Watermelon field in sand area east of Hazelion near Pike County line.

Preparing cantaloupes for market, east of Hazelton, Ind.

SWAMP DEPOSITS.

Several areas of this type are found in the county, with a total area of about 2,500 acres. These include the soils of the low situations of the flood-plains and the beds of the old glacial lakes of the broad drift flats. In these areas there is little or no natural drainage and the soils are always more or less saturated with water. The material contained in these deposits consist of the silts, mucks and peat. The broader depressions are usually filled by the slow accumulation of river silts washed in at times of floods, and are mixed with large amounts of vegetable matter consisting of roots, leaves, etc., giving a black color to the deposit. The bayous and abandoned stream channels are filled with silts containing a very large percentage of leaves, grass, logs, mosses, etc., in various stages of decomposition, and the addition of mineral matter brought in by the waters of high elevation.

On the flood-plains the soil, with its mass of partly decayed vegetable matter mixed with silt and clay, forms a spongy incoherent mass of varying depth. The amount of organic matter diminishes over the edges of the deposit, and the surface is thus almost level. Most of these areas have recently been drained by artificial ditches, and are being placed under cultivation. Such soils do not as a rule yield good crops of corn under continuous cropping, but the best value would probably be derived from the growing of timothy, millet and other forage crops, with an occasional crop of corn.

In the depressions of the drift flats, many of which have been filled with water until recently the soil consists of a black muck containing more or less silt washed in from surrounding areas. The soil is said to be very fertile and after drainage yields as high as fifty bushels of corn, twenty-five bushels of wheat, one and one-half to two tons of clover, or one and one-half tons of timothy to the acre.

RECLAMATION OF BOTTOM LANDS.

"*Ditches.*—One of the notable features of the surface of the quadrangle is the existence of numerous wide flats bordering the present rivers and larger creeks and also occupying areas that are supposed to have once contained the larger lakes, such as those north of the Patoka River, southwest of Princeton, east of Cynthiana, and about Poseyville. The flats of both types originally included extensive undrained areas, shallow lakes of considerable size remaining in the depressions throughout the year, even within the memory of many of the present inhabitants. Within the last forty years, however, and especially during the last decade, numerous ditches have been dug and the lake areas have been drained, and some of the finest crops of the region are raised where the waters formerly stood. Even now, however, though large areas, especially on the Wabash flats, have been drained by the McCarty, Blair, Stunkle and other large ditches built by county aid, many square miles of bottom land within the quadrangle are yet to be reclaimed for agricultural purposes. These undrained areas support a heavy growth of timber, which is now being rapidly cut off, both by lumbermen and farmers.

"*Dikes.*—The lowlands along the Wabash and White rivers are protected in some places from the scour of the overflowing waters in times of flood by systems of dikes or levees. The most important of these are located near Grayville, one on each side of the river. The one on the south extends along the neck inclosed by the sharp loop of the river on which Grayville is located and has doubtless been of importance in delaying the formation of a cut-off at this point. The second dike extends along the west bank of the river from a point about a mile south of Cowling to the southern portion of the area in the southward loop east of Grayville.

SUMMARY.

Gibson County is in a prosperous agricultural condition. The county is large, has great wealth, and the farming population, for the most part, are progressive people, as is evidenced by the appearance of the homes, farms and general conditions throughout the county. All crops are grown successfully. The melon industry, however, has made the county famous. A superior quality of melons is grown on the sandy soils, and find ready markets in St. Louis, Louisville, Indianapolis, Chicago, Pittsburg and other large markets. The sand areas were formerly considered of little value, but at the present time but little can be bought for less than $100 per acre, and there is little desire to sell at any price. Three varieties of cantaloupes are grown, chiefly nutmegs, netted Rockyfords and large netted. There is a good sale for all these varieties. They are marketed in baskets, which hold on the average about eighteen melons, and the yield is from 200-400 baskets per acre. The cantaloupe season begins about July 15, and they bring about 50 cents per basket to the grower; later in the season the price drops to 20 and 25 cents per basket, according to season and quality. The baskets cost the growers about 4 or 5 cents. Some shipments are made loose in the car, also sometimes hauled loose in wagons to surrounding markets, but the price obtained is usually lower, and there is considerable loss from rough handling. In hauling to the cars the growers haul from 85 to 150 baskets. Cantaloupes average about $60 per acre to the grower.

Watermelon shipments begin about August 1. They are hauled in wagons to the market and about 100-125 is the usual load. The first cars shipped bring the grower about 22 cents each. In shipping early cars the melons are graded and the light weights are rejected. The sizes ranging from 15 pounds to 30 pounds make up the best shipments. Watermelons yield on the average 200 to 300 per acre, with an occasional yield of 800 to 1,000 or a carload per acre. The principal fertilizer used is well rotted stable manure. The melon crop is usually plowed three or four times in cultivation and additional care is used in keeping down the weeds and grass. Large numbers of refuse melons are fed to hogs.

In the Wabash flats it is plainly noticeable that drainage is the essential thing to secure good crops. Along the public roads where grading has been done and a ditch has been left at each side, the corn growing next to the road is a good color, makes excellent growth and would appear to yield 60-75 bushels per acre, but going from three to four rods from the roadside the corn dwindles to no value. Furrowing through the fields every eight or ten rods would be very beneficial to yield well. The soil seems to be very fertile and with a proper system of ditches and tile drainage the value of the land will be greatly increased. Large areas from which all salable timber has formerly been removed has been allowed to grow up in very dense second growth, not so much as yielding pasture except it be for goats and sheep. Marsh grasses of several varieties are very abundant, but none of these are of much value as forage or pasture. Blackberries are abundant and are gathered and marketed by many people at prices ranging from 8 to 15 cents per gallon.

In the area lying between the wet lowlands and the sand dunes and ridges the soils are in good condition and yield good crops. Tile drainage has greatly benefited the area. Corn is the principal crop, and many farmers would prefer the corn crop rather than the oil leases where the pipes and cables have been placed over the fields in such a manner as to prohibit successful cultivation.

The county was formerly covered with a heavy forest growth. Some good timber yet remains, and considerable tracts of small growth are found in parts of the county. Practically all the trees of this region are of value as timber, and those which usually indicate a good quality of soil. Fifty or more species may be found in any wooded tract, and in some location one class of trees will predominate, and in other locations different species will take the lead.

The soil conditions of the county should be carefully studied and a series of investigations made as to their needs. The soil is naturally productive, but by the continual cropping, the soils are depleted unless the proper attention is given to the rotation of crops and the methods of cultivation.

PIKE COUNTY.

Pike County was organized in 1817. Prior to this time the territory was included in Gibson, Knox and Perry counties, and at the first organization of the county it was made to include much more than at the present time; it was later divided to form Dubois County, and the latter in 1820 gave part of its territory to help form Martin County.

The county was named in honor of Gen. S. M. Pike, who fell at the capture of York in 1813. Among the early settlers were the Brentons, McIntires, Stewarts, Meads, Cares, Finns and others whose names have a place in the history of the county.

The civil townships are Clay, Madison, Washington, Jefferson, Logan, Patoka, Marion, Monroe and Lockhart.

The first settlement made in the county was made at Oak Springs in 1800, by Woolsey Pride. The first postoffice in the county was kept at the Springs about 1811, by Hosea Smith. This location was on an old Indian "Trace" leading from Vincennes to Louisville. The first mill was built by Henry Miley in 1824. In 1828 a tanyard was started in Petersburg, with a capacity of $1,200 worth of leather annually; it continued in operation for fifty years or more.

Petersburg, the county seat, is situated in the northern side of the county one mile south of White River. It was laid out in 1817, and was named after Peter Brenton, who made the principal donation for the purpose of obtaining the county seat. The first court house was built in 1818, another in 1830 and another in 1868. The first business enterprises established were a horse mill and a carding machine. The present population is 2,250. The E. & T. H. Railway passes through the town. There are six passenger trains daily. Several rural routes go out from the postoffice to serve the surrounding county. A glass factory, brick factory, two flour mills, two sawmills, a pearl button factory and two grain elevators, employing about 300 men, make up the leading business enterprises.

The town has a good location on an elevated tract on the east side of Prides Creek, and is surrounded by fertile soil.

There are numerous opportunities for new establishments—canning factories, creameries, clay works, etc. New enterprises will be assisted, and cheap fuel is available. White River is the source of water supply.

Winslow, with a population of 1,100, is situated ten miles southeast of Petersburg, and is on the line of the Southern Railroad, and has six passenger trains daily. The town is about one mile north of the railroad station. Six rural routes go out from the town. Two flour and feed mills are located here. There is considerable workable timber in the surrounding county, and workable deposits of clay are available, and steam coal may be had at a very moderate price. Natural gas has been found and some oil developments are being carried on at the present time.

Otwell, situated near the eastern edge of the county about twelve miles east of Petersburg, has a population of about 300. It is near the center of the Patoka Lake Plain, which forms a good agricultural region. It is a prosperous village, considering it has no transportation facilities. The road running from Jasper, in Dubois County, to Petersburg, passes through Otwell, and is a much traveled highway. A flour mill, sawmill and creamery are located here.

Velpen, seven miles east of Winslow on the Southern, has a population of 240. Several small industries are carried on here. It is a good shipping port for farm products and timber.

Ayrshire station is about one mile west of Winslow station, and has a population of 150.

Hartwell Junction is about four miles east of Winslow and has a population of about 200. The railroad here sends a branch line a few miles in length down to Cabel, which has a population of 125. Augusta, a little more than a mile to the west of Cabel, has a population of 260.

General.—In 1830 Pike County had a population of 2,464, in 1850 about 6,500, and at the present about 20,500.

The greatest length of the county is twenty-two miles from north to south, and the greatest width is twenty-one miles from east to west, with a total area of 336 square miles. The total farm area of the county is 200,724 acres, of which 172,700 acres are improved. The value of farm lands and improvements is estimated at $3,766,275, and the value of its taxable property is $7,265,880. Land varies in price from $15 to $80 per acre. The mineral resources are coal, clay, gas and oil.

The county produces annually, according to the latest statistics, about 1,000,000 bushels of corn, an average yield of about thirty bushels per acre; wheat, 275,000 bushels, with an average yield of ten to twelve bushels per acre; oats, 75,000 bushels, an average yield of about ten bushels per acre; timothy, 12,000 acres, with a yield of one and a half tons per acre; alfalfa grows well but has only been tried since about 1905, but in 1909 about 125 acres were found in alfalfa meadow; clover is a good growing crop and about 4,000 acres are grown, with a yield of one and a half tons per acre and about 600 bushels of seed. A few acres of cow-peas are grown, and their cultivation has proven very beneficial to the upland soils.

Potatoes are grown only for local use, having an acreage of about 150 acres and yielding fifty bushels per acre. The yield is excellent under good conditions and many potatoes for the market might be raised in this county. Only a few tomatoes have been grown in the county and the yield was only fair, being about sixty bushels per acre. In the growing of peas the county ranks high, in 1907 holding seventh place in the State in acreage of peas grown, having at that time about 975 acres. From sixty to seventy-five acres of watermelons are grown each year; a few cantaloupes are grown in some parts of the county, but so far they have received but little attention. Some tobacco is grown for the market, the yield is good and the acreage from seventy-five to 200 acres.

In 1908 the county ranked ninth in the State in the acreage of tobacco, having in that year 206 acres. The county yields from 3,000 to 10,000 bushels of apples each year and ranks tenth in the State in the number of peach trees, having at the present time about 30,000 trees.

Recently more attention is being given to stock raising. In the eastern part dairying is receiving considerable attention. Hog raising is now becoming an important occupation, and the number of sheep kept is gradually increasing. Large tracts of the rough upland soil is practically unused and would afford excellent grazing.

Transportation Facilities.—Two railroads cross the county, the E. & I. from north to south, and the St. Louis division of the Southern from east to west. There are at present twelve passenger trains daily on these roads. The northeastern corner and the southern part of the county are shut out from railroad transportation, and all produce to be shipped must be hauled twelve to fifteen miles to the railway stations.

There are 1,200 miles of public roads in the county, with about forty miles improved. Good road material is very scarce, and the first improvement was made in 1902. Improvement has been made chiefly with limestone with a top dressing of gravel from the sand bars of White River, northeast of Petersburg. Many of the roads which have not been improved with stone or gravel are well graded and kept in good condition.

PHYSIOGRAPHY AND GEOLOGY.

Pike County in the northwestern part is fairly level or rolling. East from Petersburg, the divide between White and Patoka rivers, is made up of rather broken parts to the south, fairly level to the north and includes the Patoka Lake Plain in the eastern part. After passing the flat areas of the Patoka bottom the land becomes very hilly and continues to increase in roughness to the southern boundary. The area is covered with the loess material, except for some small till areas, terraces and sand hills along the northern edge of the county, residual areas in the southwestern part, along the steep hills and ravines, and the alluvial soils which are in part derived from the loess.

White River forms the northern boundary of the county and its main tributaries from the county are Harbin's, Conger, Beech, Pride's, Mud and Bear Creeks. The Patoka, a muddy and sluggish stream, flows across the center of the county from east to west. The principal tributaries are Flat, Stone, Coal and Sugar Creeks from the north; Rock, Cup and Barren Creeks and South Patoka River, with its tributaries, on the south.

SOILS.

The soils of Pike County consist of seven distinct types, the area of each being shown as follows:

	Square miles.
Miami silt loam (loess)	265
Patoka lake plain	20
Sand dunes	1
Till and terrace	5
Residual	5
Alluvial—	
White River	15
Patoka River	25

PATOKA LAKE PLAIN.

The Patoka Lake Plain occupys an area in eastern Pike County of about twenty square miles and extends over into Dubois County, where a large area is covered in the northwestern part of the county. The soils consist of modified loess containing a large percentage of silt, sand and rarely fine gravel. The soil to a depth of 8 to 12 inches is a loose loamy material, varying in color from light gray to light brown, and becomes lighter in color in the subsoil, but often with a mottled appearance due to a brown stain of iron oxide.

The soils were formerly very wet, but they have been sufficiently drained that practically the entire area is under cultivation. The soil in the western part of the plain is not so good as that part lying in Dubois County, but for the most part is of great agricultural value.

Wheat is extensively grown and yields from ten to thirty bushels per acre; corn yields from thirty to seventy-five bushels; oats, rye, clover and timothy make good growths. Land sells for from \$50 to \$100 per acre. Fruit growing is engaged in in a limited way. Hogs and cattle are the principal stock raised. Dairying is engaged in and a good creamery is established at Otwell, the principal town of the area.

There are no railroads through the area. The public roads are well graded and in good condition most of the year, although but a very small part have been improved with gravel or stone.

MECHANICAL ANALYSIS OF PATOKA LAKE PLAIN SOILS.

Number.	Locality.	Description.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt and Clay.
26	Two miles northwest Ireland..	White soil..	.0	1.0	.0	3.0	15.0	81.0
25	One-half mile " " ..	Brown soil..	.0	1.5	.1	2.5	12.0	83+
41 & 42	W. Otwell	White......	1.5	1.0	.5	2.8	14.0	80+

Chemical Analysis of Brown Soil, Patoka Lake Plain.

Laboratory number	25
Reaction to litmus...........................	Acid
Moisture at 105° C...........................	1.51
Total soil nitrogen...........................	.103

Analysis of Fine Earth Dried at 105° C.

Volatile and organic matter..................	3.451
Insoluble in (1.115 sp. gr.) HCL..............	89.299
Soluble silica	.013
Ferric oxide (FE_2O_3)...........................	2.691
Alumina (Al_2O_3)	3.111
Phosphoric acid anhydride (P_2O_5)............	.178
Calcium oxide (CaO)........................	.358
Magnesium oxide (MgO).....................	.525
Sulphuric acid anhydride (SO_3)...............	.045
Potassium oxide (K_2O)......................	.331
Sodium oxide (Na_2O).......................	.409
Total	100.411

Chemical Analysis of White Soil, Patoka Lake Plain.

Laboratory number	26
Reaction to litmus	Acid
Moisture at 105° C	1.33
Total soil nitrogen	.089

Analysis of Fine Earth Dried at 105 C.

Volatile and organic matter	2.819
Insoluble in (1.115 sp. gr.) HCL	91.961
Soluble silica	.083
Ferric oxide (FE_2O_3)	1.415
Alumina (Al_2O_3)	2.447
Phosphoric acid anhydride (P_2O_5)	.093
Calcium oxide (CaO)	.508
Magnesium oxide (MgO)	.440
Sulphuric acid anhydride (SO_3)	.052
Potassium oxide (K_2O)	.213
Sodium oxide (Na_2O)	.305
Total	100.336

Chemical Analysis of Surface Patoka Lake Plain.

Laboratory number	41
Reaction to litmus	Acid
Moisture at 105° C	1.51
Total soil nitrogen	.119

Analysis of Fine Earth Dried at 105° C.

Volatile and organic matter	2.872
Insoluble in (1.115) HCL	90.931
Soluble silica	.112
Ferric oxide (FE_2O_3)	2.208
Alumina (Al_2O_3)	2.158
Phosphoric acid anhydride (P_2O_5)	.099
Calcium oxide (CaO)	.287
Magnesium oxide (MgO)	.329
Sulphuric acid anhydride (SO_3)	.046
Potassium oxide (K_2O)	.165
Sodium oxide (Na_2O)	.266
Total	99.473

Chemical Analysis of Subsoil Patoka Lake Plain.

Laboratory number	42
Reaction to litmus	Acid
Moisture at 105° C	2.88
Total soil nitrogen	.064

Analysis of Fine Earth Dried at 105° C.

Volatile and organic matter	2.922
Insoluble in (1.115) HCL	86.799
Soluble silica	.072
Ferric oxide (FE_2O_3)	3.687
Alumina (Al_2O_3)	5.136
Phosphoric acid anhydride (P_2O_5)	.076
Calcium oxide (CaO)	.260
Magnesium oxide (MgO)	.522
Sulphuric acid anhydride (SO_3)	.028
Potassium oxide (K_2O)	.182
Sodium oxide (Na_2O)	.289
Total	99.973

TILL AND TERRACE.

Till.—Along the edge of the White River Valley west of Petersburg to the county line are deposits of glacial till, exposed in part and partly covered with the loess soils. The underlying formations seem to have had some part in the formation of the material. The texture of the till varies greatly, depending on the nature of the material from which it was derived. Where the surface is rough enough for the till to be exposed the land is covered with timber growth.

Terraces.—The terrace deposits are of small area, occurring along the edge of the White River bottom west of Petersburg. They are composed of medium sands, have good drainage and are fairly productive; wheat and corn are grown.

SAND DUNES.

Sand.—A limited area of about one square mile, just west of Petersburg is covered with sand. The sand is rather coarse, and is used to some extent for economic purposes. The area is too small to be considered from an agricultural standpoint, although some crops are grown.

RESIDUAL.

Residual.—In the southeastern art of the county some small areas in the rough topography present some residual soil. This is derived from the coal measure formation and is confined chiefly to hillsides too steep for cultivation. The soil is a sandy clay loam, with numerous iron ore concretions. Much of the soil of this part of the county is made up in part from residual material and does not maintain as high a degree of fertility as the uplands entirely of loess origin.

The Alluvial Soils.

(1) *White River Bottoms.*—White River proper and the East Fork form the entire northern boundary of the county, and with their tributaries on the south have a bottom area of about fifteen square miles, varying in width from a few feet to more than a mile. The soil is a sandy loam, containing considerable clay and silt. The color grades from a light yellow to black. The subsoil contains a greater amount of clay and in some places is very tenacious.

The area is not subject to overflow except after excessive rainfall, but when there are heavy spring floods and dry summer the soil often becomes baked and difficult to cultivate, otherwise the soil is in a good state of tilth. In general the natural drainage is good. The principal crops are corn and hay. Corn produces from forty to seventy-five bushels per acre. Clover and timothy yield from one to two tons per acre. Some wheat is grown on the better drained parts and gives good results. Large tracts are wooded, chiefly with second growth timber.

There are but few farm houses in the area, these being located on the uplands. The improvements are poor, but are growing to be of a better class.

(2) The Patoka and its tributaries constitute the drainage system for the southern half of the county. These streams have a large area of bottom land, varying in width from a few rods to one and a half miles. The Patoka is a very sluggish stream. The slight fall and meandering course produces much ponding in the wet seasons. The bottoms along the Patoka are known as the "flats." The soils are whitish in color and are cold, being saturated with water during the winter and spring months and hardened by drouth in summer. Natural drainage is poor and artificial drainage is difficult, but extensive areas have been recently reclaimed. Corn grows fairly well but gives a low yield. Small fields of wheat are grown in the upper parts. Hay makes a rank growth, but is sometimes rather coarse. Although portions of the soil have been under cultivation for many years, large areas still remain forested with elm, red maple, gum, water beech, birch, sugar maple, oaks and tulip poplars. In places of small areas sloughs and bayous are common and are grown over with cat-tails, water-lilies, willows, etc. When partially cleared the bottoms furnish good pasturage. The South Fork of the stream affords a better agricultural region than that along the main stream. The soils along the entire system have been largely leached of their natural plant foods and such cultivation as will restore organic matter to the soil will be of benefit.

WARRICK AND SPENCER COUNTIES.

In the summer of 1904 the United States Bureau of Soils, through A. W. Mangum and N. P. Neill, worked out a soil survey of part of Warrick and Spencer counties, known as the *Boonville Area.* The boundaries of this area are defined as follows:

"The Boonville area is located in the southwestern part of Indiana, bordering on the Ohio River. It is bounded on the east by the meridian of 87° west longitude and the Ohio River; on the north by a line drawn east and west through Tennyson; on the west by a line running ten and three-quarter miles north from the Ohio River to one and three-quarter miles east of the village of Hatfield, thence west for a distance of four and three-quarter miles, and then north to the northern boundary; and on the south by the Ohio River. This territory includes parts of Warrick and Spencer counties, and embraces 169,216 acres, or approximately 264 square miles."

The report on the survey, along with a good lithographic map of the area, has been published and a copy of same may be secured by any person sending his request to the Bureau of Soils, Department of Agriculture, Washington, D. C.

In completing the soil survey of the south and southwestern part of the State, the remaining parts of Warrick and Spencer counties were surveyed by the State and the information obtained is given in the following report, accompanied by that part of the United States report which deals with the physiography of the region, the description of the soil types, and the agricultural condition of the area.

WARRICK COUNTY.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Warrick County was organized in 1813, and was named in honor of Capt. Jacob Warrick, a soldier who fell at the head of his company in the battle of Tippecanoe. The first settlers were known as "Squatters," as the county was not surveyed until 1805, and the lands were not put up for sale by the government until several years after that time. Among the first settlers was John Sprinkle, who crossed the Ohio River from Kentucky and settled at Newburg in 1803; several other families soon followed and settled in the same locality. Four years later the town of Rockport was established by Daniel Grass, and rapid growth followed, since supplies for the settlement could readily be obtained from Owensboro, Kentucky.

The civil townships are: Boone, Ohio, Anderson, Skelton, Pigeon, Owen, Lane, Hart, Greer and Campbell.

The part of the county bordering on the river made the best progress, since the river was the only outlet for products until the building of the railroad through the county in 1873.

Boonville, the county seat, was settled in 1817, and was named after Ratliff Boone, an early citizen of the place. It is located near the center of the county on an elevated tract of land; it is about eleven miles from Newburg, on the Ohio, and about eighteen miles from Evansville. The population in 1850 was 300, and the population at the present time is about 4,800. Fourteen rural routes lead out to all parts of the county. The St. Louis division of the Southern Railroad passes through the town, giving six passenger trains daily; also the S. & N. traction line to Evansville.

The town has good macadamized streets, water-works and a good sewerage system is being constructed. The present industries are tobacco twist factories, flour mills and lumber yards. The Business Men's Club will give a free site and bonus to any industry desiring to locate here. A new court house was erected in 1906.

Newburg is located in the southwestern part of the county on the Ohio River. The town was formerly known as Sprinklesburg. The present population is about 1,750. Five rural routes lead out from here. Two traction lines, the E. S. & N. and Evansville Terminal Traction between Rockport and Mt. Vernon, furnish the principal transportation. Steam freights are run on both lines. The river traffic is also of considerable importance. The industries are tobacco factories, brick and tile works, a canning factory and a glove factory. Later developments of the resources surrounding the town may soon be a means of bringing in new enterprises and building up the town.

Elberfeld is situated in the northwestern part of the county and has a population of about 850. Five rural routes go out from here. It is on the line of the E. & I. Railway and has four passenger trains daily. A flouring mill is the only industry of importance within the town. One of the largest coal mines in the county is located about one half mile south of the town, and coal is available for all industries at low cost. The town is a trading and shipping point for a very large area of surrounding country. There are good opportunities here for canning factories and creameries, and free sites will be given.

Tennyson, located in the east central part of the county has a population of 500. The Southern Railway affords six passenger trains daily. Three rural routes lead out from the town. The town is dependent chiefly on the surrounding country, there being no industries of importance in the town. There are opportunities for creameries and canning factories. The improvements are good for a place of such size.

Lynnville, located in the northern side of the county about ten miles from Boonville, has a population of 470. It is about ten miles distant from the nearest railroad station. It is a good trading center for a large area of the surrounding country.

Yankeetown, in the southeastern part of the county, six miles from Newburg, has a population of 209. It is on the Rockport line of the interurban.

Stevenson (60), Folsomville (160), Canal (130), Chandler (160), DeForest (61), Eby (50), are little country villages affording marketing places for the surrounding population.

General.—The population of the county in 1830 was 2,973; in 1840, 6,321; in 1850, 10,000, and at the present time about 22,400. The county is very irregular in shape and has an area of 397 square miles. The total farm area is 236,357 acres, of which 202,705 acres are improved. The assessed value of farm lands and assessed value of taxable property in the county is $9,060,985. Fifty years ago 100,000 acres within the county still belonged to the government and was considered worthless, but those lands have since become some of the best within the county. The average selling price of farm land is now from $75 to $85 per acre.

The county produces annually about 800,000 bushels of corn, an average of about thirty bushels per acre; almost the entire crop is sold to the distilleries at Owensboro, Kentucky; wheat, 400,000 bushels, with an average yield of about eleven bushels per acre; oats, 25,000 to 80,000 bushels, ranging in yield from seven bushels to fifteen bushels per acre; timothy, about 15,000 tons, or about one and a quarter tons per acre; alfalfa, about fifty acres; clover, 8,000 to 10,000 tons, yielding from one to two tons per acre, and producing about 700 bushels of seed.

From 250 to 450 acres of potatoes are grown and yield from forty to seventy bushels per acre. About 150 acres of tomatoes have been grown the past few years, yielding about 150 bushels per acre. In the growing of tobacco Warrick County stands among the first. In 1907-1908 it ranked third in the acreage of tobacco, having over 2,000 acres each year; in 1907 the county ranked third in the total yield, producing 1,589,500 pounds; in 1908 it took second place in the total production, having 1,751,200 pounds, Spencer County heading the list with 2,090,000 pounds, and Switzerland taking third place with 1,128,200 pounds.

The dark export type, such varieties as the Pryor and One-sucker, is chiefly grown, since a heavy growth is always secured in the heavier soils, while the Burley is grown to some extent on the lighter soils. Most of the tobacco grown here is shipped to foreign markets, where the dark heavy type is preferred.

Stock raising has not received much attention. Very few farmers are engaged in stock raising as a business. Hog raising has received the most attention, about 15,000 being marketed during the year of 1908.

Transportation Facilities.—The railway facilities are only fair. The Evansville branch of the Southern crosses the south part of the county from east to west; the E. & I. crosses the northwest corner of the county. A suburban railway runs from Newburg to Evansville and a branch of the S. & N. interurban runs out from Evansville to Boonville, and another branch across the county to Rockport from Evansville. Small steamers on the Ohio carry the farm products direct to Louisville, Owensboro and other markets.

The northern half of the county has practically no transportation facilities, except that some of the principal public roads are being improved and permit of more economic hauling to and from the distant railway stations. The interurban lines have done much for the smaller towns along their lines, and for the farmers in giving them opportunity to market their produce in much better condition. Some vegetable farming is now engaged in along these lines and dairying is receiving attention.

The county has 750 miles of public roads, with about forty miles improved. The improvement has been principally with crushed stone, at a cost of about $1,800 per mile. Road improvement did not begin until 1899, but the farmers are well satisfied with their investment on improved roads. Most of the stone used has been shipped from the road-metal quarry at Marengo, but there are some exposures of good stone in the county which should receive attention in further road building.

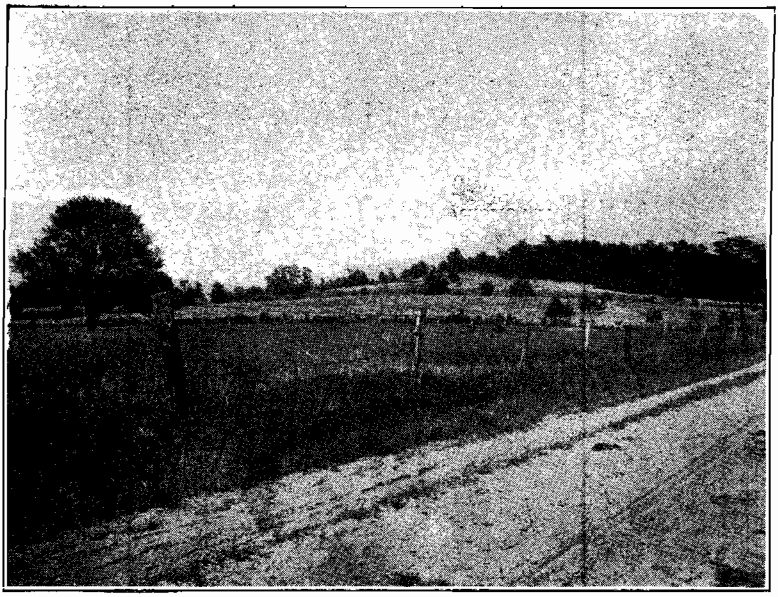
Agricultural Societies.—A county fair is being held each year at Boonville. The farmers' institutes are well attended and local agricultural societies have been organized. The farmers are a thrifty class of people and the greater percentage of the farmers own their farms and the county shows progress in the agricultural condition.

SOILS.

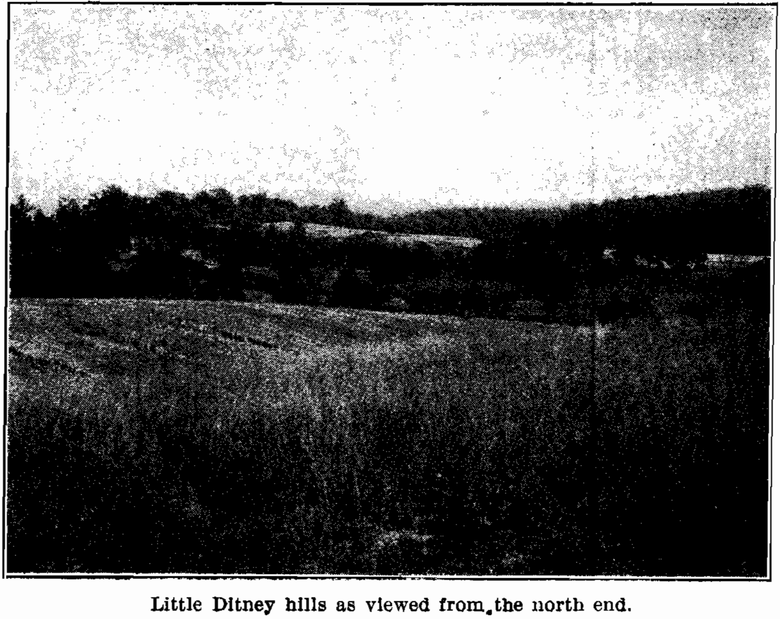
The soils of the county are divided into two general groups, the upland and the bottom land. These groups comprise six distinct types. Of these the upland type (Miami silt loam) derived from the loess of glacial origin is the most extensive. This type is a silt loam, varying in color from light ashy gray to light brown, and in its natural state has a large amount of organic matter. The area of this type has a good drainage condition and its adaptability to the various crops and its natural productiveness make it the most valuable soil in the county for general farming. It comprises an area of about 330 square miles. This type will be discussed in the following pages under the head of Miami silt loess of the Boonville area.

WAVERLY CLAY LOAM.

The second type is a clay loam, derived from the same loess material as the silt loam of the uplands, but because of its low lying position just above the streams, it has been reworked until it is made into a distinct type. The soil is of a light color and contains small iron concretions, which have been formed by the action of stagnant waters. The drainage conditions are bad. Under the best conditions average crops are produced. In general this type is not



Little Ditney hills as viewed from the west.



Little Ditney hills as viewed from the north end.

good for general farming purposes. The hay crop is the principal crop, but is rather coarse. Considerable coarse tobacco is grown; corn, wheat and oats in favorable seasons give fair yields.

WAVERLY SILT LOAM.

This type is found along the smaller streams and is of considerable value for the production of most of the farm crops. Corn has been the principal crop, and large yields are obtained. Tobacco is now grown extensively and produces heavy crops of good quality. Wheat, oats, clover and timothy are all good growing crops.

The origin of the soil is from the bordering uplands, but the material has undergone considerable change and is mixed with a large amount of vegetable matter. Drainage conditions are good and artificial drainage systems are well worked out. The soil has good depth and is easily cultivated.

WAVERLY CLAY.

This is a type of alluvial clay found in rather limited areas in the low bottom lands bordering the Ohio River. This type is separated from the river along most of its course by the sand ridges (Waverly fine, sandy loam), which represent the work done by the river before the channel had been cut down to the present level.

The sand ridges are of sufficient height to stand above the ordinary high water level while the waters are backed up through the smaller streams and flood the basin like depressions between the ridges and the main uplands.

Corn is the principal crop grown on the Waverly clay, and good yields are usually secured. In favorable seasons wheat is a good crop. The grasses grow well and give good pasturage and heavy yields of hay. On the sand ridges the season is sometimes too dry for good yields of the ordinary crops, but corn gives fair production, and wheat and oats are both profitably grown. Cowpeas and navy beans are grown extensively, and alfalfa and clover give heavy yields.

MIAMI FINE SANDY LOAM.

This type is found in small areas along the western side of Little Pigeon Creek near the Ohio. The type covers a large area in southwestern Spencer County. The soil is of a light to dark brown, fine sandy loam from 6 to 8 inches in depth. The sand content decreases with depth and the subsoil grades into a silt or clay loam.

For more complete description of this type see under Spencer County and under description of soil types from "Soil Survey of the Boonville Area" in the following pages of the report.

The following table gives the relative extent of the soil types:

	Square miles.
Miami silt loam	330
Waverly clay loam	23
Waverly silt loam	40
Waverly clay	2
Waverly fine sandy loam	1
Miami fine sandy loam	1
Total	397

SPENCER COUNTY.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Spencer County was organized in 1818 and named in honor of Capt. Spier Spencer of Harrison County, who was killed in the battle of Tippecanoe. In 1807 the town of Rockport was established by Daniel Crass. The settlement could readily secure supplies from Owensboro, Kentucky, and the population rapidly increased, many settlers coming in from Kentucky, Tennessee, Georgia, Virginia and the Carolinas. Corn, tobacco, wheat, barley and oats soon began to be cultivated, and the settlers were no longer dependent on other sources of supplies. The growing of tobacco soon became of importance and has continued to increase until Spencer County still holds first place in the State in tobacco production.

The civil townships are Luce, Ohio, Grass, Jackson, Hammond, Huff, Harrison and Carter.

Rockport, the county seat, is situated on a high bluff on the Ohio River 50 miles above Evansville and 150 miles below Louisville. It derived its name from the hanging rock, known to boatmen of early days as the "Lady Washington Rock." The population in 1850 was 600, at the present time 3,300. The Southern Railroad comes into the town from the north with six passenger trains daily. The E. & E. traction line gives direct route to Evansville and Mt. Vernon. It is one of the chief river ports for steamers between Evansville and Louisville, and motor boats give passenger service to Grandview, Tell City and Cannelton. The water supply comes from deep wells, and good fire protection is afforded. The principal industries are pearl button factories, box board, paper and egg case filler factories, a foundry, a brick plant and flour, lumber and planing mills. Coal can be procured at a very low cost per ton, and inducements will be offered to enterprises seeking a location.

Chrisney, ten miles north of Rockport, has a population of 800. It is on the Southern Railroad and has four passenger trains daily. The town is in a progressive condition and there is opportunity for works in clay and lumber. The Commercial Club will give valuable aid to factories and mills desiring to come into the town.

The present industries are a broom factory, canning factory, creamery and wagon works.

Grandview, about six miles up the river from Rockport, has a population of about 900. There is no railroad, and the transportation is by the Louisville and Evansville steamers and motor boats to Rockport. The present industries are a flouring mill and creamery. Many other works are needed and would receive assistance, and the location would be a valuable one to many concerns.

Dale, in the northwestern part of the county, has a population of 750. It is on the Evansville division of the Southern Railroad, with six passenger trains daily. It has connection with Boonville, Evansville, Rockport, Tell City and Cannelton. The present industries are two planing mills, flour mill, creamery and two tobacco leaf houses. Brick and drain tile industries would find a good location here.

Gentryville, located on the western edge of the county, is on the Evansville division of the Southern Railroad, with six passenger trains daily. It has a population of about 500. A small tobacco factory and flour mill are the chief industries.

St. Meinrad, in the northeastern part of the county, is about ten miles from Dale, the nearest railroad station. The population is about 525. The St. Meinrad Abbey, a parochial school, is located here. The school has an attendance of about 400 students and is well equipped. The present industries of the town are a flour mill, planing mill, brick and tile factory and creamery.

Other towns and villages of small size are: Mariah Hill (125), three miles east of Dale, flour, meal and feed; Lincoln City (140), junction of Evansville and Cannelton branches of Southern Railroad; Rockport Junction, junction of Rockport and Evansville division of Southern Railroad; Bradley, Miller, Ritchie and Rock Hill, country stations along Southern between Rockport and Rockport Junction; Hatfield (110), in the southwestern corner of the county, is on the E. S. & N. traction line; Lake (310), about four miles northeast of Hatfield, has a brick and tile works, and a spur from the traction line has been extended from Hatfield. The town is a good trading center and will now give a good outlet for this part of the county's produce; Eureka (200), about two miles southeast of Hatfield, is also benefited by the traction line, although it does not touch the town; Enterprise (60), is a river port southeast of Eureka; Pueblo (60) and Patronsville (60) are situated in the pocket southwest of Rockport; Grass, 3½ miles northwest of

Chrisney, and Midway (80), about five miles west, are trading points; Pigeon (48) is just west of Gentryville on Little Pigeon Creek; Buffaloville (140), Kennedy (20), Lamar (40) and Evanston (20) are stations on the Cannelton branch of the Southern between Lincoln City and Troy; Huff (70), Schley (25), Huffman (110), Newtonsville (240), five miles northeast of Grandview, Liberal (50), Fulda (148) and Santa Clause are villages of importance as trading centers for the surrounding country.

General.—The total population of the towns and villages of the county is about 8,900. The population of the county in 1830 was 3,187; in 1840, 6,305; in 1850, 9,000, and at the present time 22,500.

The county has river boundary with the exception of the north side and about five miles of the west side to the north. Little Pigeon Creek forms the western boundary, Anderson River the east and the Ohio the southern. The county has an area of 406 square miles. The total farm area is about 246,978 acres, of which 202,799 acres are improved. The total value of the taxable property amounts to $8,029,820 and the farm land and improvements amount to $4,262,360. Until within the past fifty years the rough lands of the northeastern part of the county and the low river flats were considered worthless, but these are rapidly being improved and are of much value to the county. In the poorer parts of the county land sells at $25 to $60 per acre, in the best agricultural parts at prices varying from $75 to $100 per acre.

The county produces annually about 850,000 bushels of corn, an average of 25 to 30 bushels per acre; wheat 450,000 bushels, a yield of about 12 to 15 bushels per acre, ranking seventh in the State in 1907 and ninth in 1908; oats 50,000 to 100,000 bushels, averaging from 10 to 12 bushels per acre; timothy 12,000 to 15,000 tons, about 1¼ tons per acre; clover 7,000 to 10,000 tons, a yield of 1 to 1½ tons per acre and producing about 1,800 bushels of seed; a good acreage of alfalfa is grown, about 120 acres being grown for each year 1907-1908.

From 500 to 600 acres of potatoes are grown annually and yield from 40 to 60 bushels per acre; 60 to 70 acres of tomatoes, yielding from 75 to 110 bushels per acre; peas from 2,000 to 2,500 acres; apple yield in 1907 was about 2,000 bushels, in 1908 5,750 bushels; a few acres of melons are grown and a few vegetables are grown for the market. The canning factory at Chrisney is the only one within the county, but there is excellent opportunity for others to be located in other towns of the county. Spencer County stands at the head of the list in the State in tobacco production, having an acreage of more than 2,000 acres each year and an annual production of about 2,250,500 pounds.

Transportation Facilities.—The transportation facilities are fair. The Southern is the only steam railroad in the county, but there are three divisions of this road, the Evansville division, the Cannelton branch and the Rockport branch, hence no part of the county is far removed from a railroad station. The E. S. & N. traction line extends through the southern part of the county to Rockport and has a spur from Hatfield, near the southwestern corner of the county, to Lake, about four miles farther north. The traction line opens up direct connection with Evansville and Mt. Vernon. Motor boats run between Rockport and Cannelton, and the Louisville and Evansville steamers carry much of the produce of the county. Much of the grain, especially corn, is sold to Owensboro, Kentucky, and the Louisville, Henderson and St. Louis Railroad on the Kentucky side also aids the transportation of products from the county.

Good public roads lead out from all the principal towns. There are 1,008 miles of public road, with 35 miles improved. The improvement is chiefly with limestone, which has been shipped in from Marengo and Milltown. The county is very poor in its supply of good road material. A small quantity of river bar gravel is found and has been used considerably on the streets of Grandview.

Agricultural Societies.—Two agricultural societies, one at Rockport and one at Boonville, were organized about 1836 for the purpose of creating an interest in stock raising and general farming. A county fair is held each year at Rockport. Farmers' institutes are well attended, and the farmers are desirous to learn the best farming methods. Fertilizer tests are being tried on the different soil types, especially as to the needs of wheat and tobacco.

SOILS.

The soils of this county are divided into two general groups, the uplands and the bottom lands. The former comprises an area of about 304 square miles, the bottoms about 102 square miles. These two groups include seven distinct types, the area of each being shown in the following table:

	Square miles.
Loess Soils—	
Miami silt loam	229
Miami fine sandy loam	35
Waverly clay loam	30
Waverly silt loam	20
Waverly clay	12
Waverly fine sandy loam	5
Residual Soils—	
Derived from the coal measure	75
Total	406

LOESS SOILS.

Miami Silt Loam.

This is the principal soil of the uplands, covering every part of the uplands except that designated by the residual soils. This soil is very uniform wherever found over the entire area of this survey, some slight changes, however, being due to the physical features of the area. The surface soil varies in color from a light gray to light brown or reddish yellow; considerable very fine sand is present, but coarse sand and clay constitute a very low percentage. The soil is very easily tilled, being very friable and crumbles into a loamy mass.

The subsoil is red or reddish yellow in color and usually contains a higher percentage of clay than the surface, giving it a more plastic nature, and is termed a "heavy, silty loam." The origin of the loess soils has been fully discussed in the preceding part of the report. Being of glacial origin, it would naturally be a soil of great fertility, having been derived from so wide a source. All the staple crops yield well upon this soil, and special crops, such as garden vegetables and small fruit. Apples and pears are also well adapted to this soil, and a large number of trees have been planted during the past few years.

Miami Fine Sandy Loam.

This type comprises an area of about 40 square miles. The largest area lies in the southwestern part of the county to the east of the Waverly clay loam. Beginning near Midway, it extends in irregular patches about two and one-half miles south and then widens into a compact body from three to four miles in width, and extends in a southwestern direction within one mile of the Ohio River. Other smaller areas and irregular patches lie to the northwest of Rockport and surrounding Grandview, and extending somewhat to the east and in narrow strips and patches along Anderson River.

The soil varies from a light brown to reddish brown sandy loam with a varying clay content. The sand content decreases greatly with depth. The soils of this type are low lying, but slope gradually toward the streams and usually have good natural drainage. The general surface is slightly undulating. In some places there are low hills with slight depressions intervening. The origin of this soil is a combination of alluvial materials with removed loess material of the higher elevations. The soil seems well adapted to all crops. The growing of small fruit and truck farming should find proper soil conditions here, and the fact that the new traction line crosses the southern half of the largest area of this type and the spur of the road reaches lengthwise through the area from Hatfield to Lake gives ample opportunity for undertaking such work.

Waverly Clay Loam.

This is a light ashy color. Its origin is due to the same source as the Miami silt loam. It is somewhat hard and compact, but contains a large amount of silt. The loess material has been reworked and mixed with a large amount of alluvial material. The principal areas are along Little Pigeon Creek, and to some extent along the lower part of Anderson River, and an area of a few square miles lying between Rockport and Grandview. The soil is low lying and wet except where artificial drainage has been carried out. Corn and wheat give low yields; clover and timothy grow well, especially in the parts that have been under cultivation for some time. In very favorable seasons some good yields of wheat are secured.

Waverly Silt Loam.

This type is the soil of the small stream bottoms and of parts of the old lake beds. The soil is black in color, due to the large amount of vegetable matter contained. The origin is from the loess deposits, but the areas have been subjected to stagnant waters with heavy growths of vegetation, which decayed, adding a large amount of humus to the soil. Silt carried in from the uplands by running water caused a continual mixing of soil and vegetation, and accounts for the great depth of the black surface soil. The subsoil at considerable depth is a yellowish color, more plastic than the surface soil.

The most extensive area is the Willow Pond tract five miles west of Rockport. The area contains about three square miles. The Willow Pond tract has just been drained and is not yet in the best state of cultivation but promises to be one of the best soils of the county. The traction line passes through this region and will give a good chance for development here. The area would be an exceptionally good one for truck farming, and the products could find a ready market.

The second largest area of the type is the Lake Mills area, beginning about three miles northwest of Rockport and extending to the north in a strip a half mile wide for about three miles. The area has been well drained and the cultivation is bringing good results.

All the crops grow well. Corn yields from 40 to 60 bushels per acre; wheat 15 to 25 bushels; clover and timothy give from 1½ to 2 tons per acre. Tobacco makes a good growth but is rather coarse; and the entire area seems well adapted to the growing of vegetables.

Waverly Clay.

This type occurs extensively in the great bend of the Ohio River southwest of Rockport. The surface soil is a brownish clay loam containing a high percentage of clay and silt and a small percentage of sand. The subsoil is more compact and somewhat tenacious, and is usually mottled in appearance. This soil is overflowed annually and some low depressions are usually very wet throughout the year. Iron concretions occur in many places in the soil, due to the leaching action of stagnant water.

The soil is distinctly an alluvial type. An additional deposit of sediment is left each year, and the fertility is thus kept up to a good standard. The soil often cakes and cracks after the overflows, but it is not difficult to get in a good state of cultivation. Corn is the principal crop grown, the danger from overflow making the wheat crop too uncertain; timothy and clover grow well.

A large part of the area is difficult to drain, but several ditches have been constructed and the small streams opened up, and tile draining in some places has been done with good results.

Waverly Fine Sandy Loam.

This type consists of a light brown to yellowish sandy loam with a varying percentage of clay. The soil occurs in low ridges, varying in width from a few rods to a half mile, and immediately bordering upon the Ohio River the entire length of its course along the county except where the hills extend entirely to the river. The soils are usually higher than the adjoining types and has good drainage. Practically all of this type is under cultivation, and good crops are grown except where the soil is a loose, incoherent sand and scarcely any vegetation grows upon it. This type is purely of alluvial origin, being laid down during overflows. The slope next the river is steepest, the other sloping off very gradually to the clay loam types. The occurrence of these ridges is accounted for by the fact that during flood time, the sand being the heaviest sediment in the waters, is deposited first and the clays and fine silts are carried farther inland.

RESIDUAL.

Coal Measures.—The residual soils derived from the formations of the coal measures occupy the part of the county lying between the eastern boundary at the Anderson River and Crooked Creek, as far north as Santa Fe, then to the northwest along a line running about one mile west of Mariah Hill and extending from that point across the northern edge of the county. The residual soil proper occupies about 75 square miles. To the west of the line designated the soil gradually becomes intermingled with the loess material and grades into the typical Miami silt loam, although in many places the underlying formations have had much to do with the character of the soil. This eastern part of the county is of very rough topography—high hills and sharp, winding ridges with narrow valleys, intervening. The hills rise from 180 to 250 feet above the level of the principal streams. The highest elevations reach heights of about 650 feet above sea level. The soil is a sandy clay loam, having been derived chiefly from the shale and sandstones of the lower coal measures, and along the eastern border the Mansfield sandstone has entered to a slight extent into the making of the soils. The area is not very inviting from an agricultural point of view. However, there are some well improved farms and good results are obtained from the careful cultivation of the soils. The area is well adopted to fruit growing, and tobacco is successfully grown. Land may be bought at prices ranging from $10 to $60 per acre. There are no transportation facilities for the eastern part, and the roads are too hilly to allow economic hauling.

DESCRIPTION OF THE BOONVILLE AREA.

PHYSIOGRAPHY AND GEOLOGY.

"The physiographic features of the area are quite marked, varying from rolling uplands and small valleys to bottom lands or river flats. The rolling uplands vary considerably in height, but rarely exceed 500 feet above sea level. The coal knobs, located 3½ miles northwest of Rockport, have an elevation of 600 feet and are the highest hills in the area. The hilliest portions are found in the vicinity of Boonville, in the northwestern corner of the sheet, around Chrisney, in the northern and eastern portions of the area, and to the south and west of Rockport.

"The hills in only few instances have very steep slopes, but as a rule are characterized by their smooth, gently rounded forms, with intervening shallow depressions. At Rockport, where the hills extend to the river, they have a steep, precipitous bluff 75 to 100 feet above the level of the river for about two miles to the south of the town. Where the surface is undulating or less hilly the soil does not erode to any extent. It is only on the steep sides of some of the higher hills that erosion is very great.

"The principal valleys of the area occur along the Cypress Creek ditch and Little Pigeon Creek, which still flow in the same channels they occupied prior to the glacial period.

"The valley formed by the Cypress Creek ditch has an average width of one mile and extends across the area from north to south immediately west of Boonville. The Little Pigeon Valley Creek traverses the area in a northeast and southeast direction and occupies the territory between the Boonville hills on the west and Chrisney hills on the east. It has an average width of four miles and is the largest valley in the area. Numerous other small valleys occur, especially in the hills, where small streams have cut their way through, but they are not of sufficient importance to warrant separate discussion. The streams usually overflow after heavy rains or long wet periods, and the soils found in the valleys are of a silty or clayey character.

"The surface of bottom lands or river flats in the southern part of the area along the Ohio River presents a flood-plain cut by numerous small streams, old stream channels and bayous. These lands are flooded annually by overflow of the river, and each year new channels and bayous are formed. A few small ridges occur over these bottoms and have an elevation of 3 to 4 feet above the surrounding surface. The elevation of this flood-plain is from 340 to 360 feet above sea level.

"Following the course of the Ohio River and bordering it is a sand ridge averaging one-half mile in width, which is somewhat higher than the lands immediately back of it and is rarely overflowed. The soils found in the bottoms are of a stiff clayey character, and owing to their low-lying position are exceedingly difficult to drain.

"All the drainage of the Boonville area finds its way into the Ohio River, the streams flowing in a southerly direction and emptying directly into the river. The largest is Little Pigeon Creek, which drains over three-fourths of the area. It enters the area two miles east of Tennyson, flows in a southwesterly direction and passes out about five miles west of Richland City. The Cypress Creek ditch, which flows in a southerly direction through the extreme western portion of the area, drains the territory around Boonville and to the west of it. The remainder of the area is drained by smaller streams which have their sources within the area and flow directly into the Ohio River.

"The rocks forming the basal structure of the area belong to the carboniferous system. The rocks of this system have played an important part in the economic geology of the area, and at present quite extensive coal mines are being developed. The rocks belonging to this period which are more commonly exposed consist of sandstone, shale and shaly sandstone. Exposures may be seen in different parts of the area, especially in deep road cuts.

"Inasmuch as the underlying rocks are everywhere covered by a thick mantle of loess they have played only a minor part in the formation of the soils of the area. During the early Quaternary times great ice sheets extended across Indiana some distance north of the area. As the ice melted and the glaciers began to recede it is believed that a part of the material which later formed the soils of the area was released and carried still farther south and deposited over broad flats by streams then issuing from the glacial front. It was later picked up by the winds and generally redeposited in the form of loess over the surface of the uplands, covering all older geological formations. The soils of the uplands are of recent alluvial origin, being made up of reworked loess material and very fine sand, and are generally underlain by alluvium of the glacial age."

SOILS.

"The soils of the area are divided naturally into two general groups—upland and bottom land. The several soils in their typical occurrence are quite distinct, each possessing its own physical peculiarities. Six types have been recognized in the area, the Miami silt loam and Miami fine sandy loam being found in the upland division, the Waverly fine sandy loam in the bottom land division of the area.

"The following table shows the actual and relative extent of each of the different types found in the area:

AREAS OF DIFFERENT SOILS.

SOIL.	Acres	SOIL.	Acres.	Per Cent.
Miami silt loam	86,656	Waverly clay	8,320	4.9
Waverly clay loam	30,208	Wavery fine sandy loam	3,904	2.3
Miami fine sandy loam	22,848			
Waverly silt loam	17,280	Total	169,216	....

MIAMI SILT LOAM.

"The Miami silt loam is the most extensive type in the area surveyed. Its topographic features, ability to withstand drought, adaptability to a great diversity of crops, and its natural productiveness make it the most valuable soil in the area for general farming purposes.

"The soil is a silt loam averaging from 8 to 10 inches in depth and varying in color from a light ashy gray to light brown, according to the amount of organic matter present. It contains in its typical form a small percentage of fine sand, and when recently put under cultivation or in its virgin state carries a large amount of organic matter.

"The subsoil, from 9 to 36 inches, consists of a silt loam containing a small proportion of very fine sand in the first few inches. It varies in color from dark red to yellow, and becomes heavier as the depth increases. At a depth of 4 or 5 feet the clay content is much larger and a very heavy silt loam occurs, which is usually of lighter color than that immediately underlying the soil. The material is very compact at a depth from 25 to 36 inches, making a subsoil very retentive of moisture, while the fine silty texture of the soil prevents the surface from becoming baked, sun cracked or difficult to cultivate.

"The Miami silt loam, covering 51 per cent. of the entire survey, occurs in the uplands in all parts of the area. The largest unbroken body occurs in the northeastern part of the area and extends from near Rockport to the extreme northern boundary. Small tracts occupy the low ridges in the vicinity of the flat river bottoms. These differ slightly from the typical Miami silt loam in that the soil is slightly heavier and the underlying subsoil has a larger clay content. These small areas have undoubtedly been submerged at times, and the soil has been slightly altered by material deposited by water, as well as by what washed down from the neighboring uplands.

"The topography of the country occupied by this type is rolling. The hills are low and rounded, with gently sloping sides, and the intervening valleys are broad and shallow. This insures good drainage, and with proper attention the land is subject to but little injury from erosion. Artificial drainage is seldom necessary and is practiced in but few localities, the rolling topography being usually sufficient to drain the excess water into the numerous small streams.

"The loess from which the soil is derived is of glacial origin. The material, which is supposed to have been transported by wind and water, was deposited as a mantle over the entire country to the southward. It shows no stratification, and has an average depth of from 8 to 10 feet in the more hilly section, although it often reaches a greater depth in the valleys or more level areas. The loess overlies beds of sandstone and shaly sandstone belonging to the Carboniferous system. These rocks, however, have not entered into the composition of the soil except on an occasional steep slope where a thin layer of sandy shales has been exposed through the process of erosion, in which case they weather rapidly, and, becoming mixed with the silty material, cause a larger percentage of fine sand in the soil of the immediate vicinity.

"Great care is necessary to keep the Miami silt loam in a high state of productiveness, and a rotation of crops is very essential in order to secure the best results. Where the soil is in a loose and thorough state of cultivation, as is necessary when the crop is corn or potatoes, it suffers greatly from the effects of erosion, and large areas of the subsoil are exposed along the steeper slopes.

"The Miami silt loam is well adapted to most of the general farm products of the area. Wheat and oats do especially well, and large fields of clover, timothy and other grasses are always obtained.

Very little tobacco is cultivated on this type, as the other soils of this area are considered better suited to the variety grown in this section. Wheat averages 15 bushels, oats about 30 bushels and corn from 30 to 35 bushels per acre. Where the soil is well tilled and a good system of rotation practiced much larger yields are frequently realized without the aid of commercial fertilizers. Clover and timothy average from 1½ to 2 tons per acre, two or more cuttings often being obtained. Apples, peaches, plums and pears are all successfully grown in the most hilly sections. No attempt has been made to cultivate vegetables and truck crops except on limited scale for home use and for local markets, but excellent yields are generally realized from these crops.

"The following table gives the mechanical analyses of typical samples of the Miami silt loam:

MECHANICAL ANALYSES OF MIAMI SILT LOAM.

No.	LOCALITY.	Description.	Gravel, 2 1 mm.	Coarse Sand, 1 to 0.5 mm.	Medium Sand, 0.5 to 0.25 mm.	Fine Sand, 0.25 to 0.1 mm.	Very Fine Sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
10796	1 mile east of Pedigo Lake Mills.	Gray to brown silty loam, 0 to 12 inches.	0.1	0.3	0.2	0.5	4.0	84.2	10.7
10798	¾ miles south of Chrisney.	Yellow to brown silty loam, 0 to 10 inches..	.2	.8	.5	1.2	6.1	77.1	13.8
10797	Subsoil of 10796........	Heavy silty loam, 12 to 36 inches.	.0	.2	.1	.3	8.7	68.2	22.4
10799	Subsoil of 10798........	Yellow silty loam, 10 to 36 inches.	.2	.3	.4	.7	5.2	70.2	22.7

MIAMI FINE SANDY LOAM.

"Third in extent and second in agricultural importance among the soil types of the Boonville area is the Miami fine sandy loam. The soil consists of a light to dark brown sandy fine loam, averaging about 8 inches in depth. This sandy loam varies from fine to medium in texture, with the coarser material usually occurring in the upper portions of the soil. The sandy content rapidly decreases with depth, and below 8 to 14 inches the subsoil is a heavy, fine sandy loam whose color varies from light red to yellow, generally becoming lighter in the deeper layers. The subsoil found from 20 to 36 inches below the surface is a light silt or clay loam, there being only a small percentage of sand present.

"The type is practically uniform throughout the area with the exception of a few minor variations in local spots. Of some of the higher elevations a sandy phase occurs which consists of a very sandy loam in which the percentage of sand continues to be quite large throughout the entire 3-foot profile. At a lower depth, however, the sand content decreases rapidly, and at 4 or 5 feet below the surface the subsoil is the same as that found underlying the typical soil. The sandy loam of this phase for a depth of from 20 to 30 inches is somewhat coarser than that of the typical soil, but grades rapidly into a sandy loam of finer texture at lower depths.

"In low positions a somewhat heavier phase of the type is encountered which has been slightly modified by the action of the water. The soil in this case is a fine sandy loam to a depth averaging 8 inches, mixed with varying quantities of organic matter. The underlying subsoil is a heavy, fine sandy loam which grades into a clay loam at about 15 to 20 inches below the surface. The color of both soil and subsoil varies from gray to brown, depending upon the amount of organic matter present. These variations occur only in limited areas over the main soil type, and are not of sufficient extent to be shown on a map of the scale used.

"The Miami fine sandy loam occurs in one extensive body, reaching from the central part to the southwestern corner of the area. It embraces all the territory from a short distance south of Midway southwest to within three-fourths of a mile of the Ohio River. The eastern boundary of this is formed by the rolling uplands of the Miami silt loam and the western by the bottoms of Little Pigeon Creek. Two small patches of this type are found a few miles northwest of Rockport, bordering the bottom lands of Lake Drain Creek. In the extreme western part of the area northwest of Hatfield two small areas are also found.

"The topography of this soil is generally level or slightly undulating. Some portions, however, consist of low hills with shallow depressions intervening. The small hills or ridges trend in a northeast-southwest direction, the general slope being to the south and west.

"Many small streams and drains flow across this type in a southwesterly direction, emptying either into Little Pigeon Creek or the Ohio River. In a few instances the streams have cut out wide depressions, and a heavier type of soil is usually found occurring along them. The type possesses good natural drainage. The streams which flow through it afford excellent outlets for all the drainage waters, and only in a few instances has it been necessary to construct artificial ditches. Occasionally, however, it has been found advisable to widen and deepen the streams in order to increase their capacity for carrying off the surplus water during times of heavy rains or long wet periods.

''In addition to the good natural drainage which this soil type possesses, it also has the power to retain moisture, the underlying silt or clay loam subsoil forming an excellent medium for storage of the soil water, so that with the aid of proper cultivation crops suffer but little from the effects of drought.

''Over the more elevated portions of the type, and where the sand content of the soil is above the average, natural drainage is apt to be too thorough for most crops. In this case great care should be exercised in the methods of cultivating, particular attention being paid to the preservation of a surface mulch in order to carry the crops safely through the dry season of July and August. The lower lying portions of this soil type require artificial drainage to secure the best crops. Ditching and tiling greatly improve the productivity of such areas, and a large part of these is being artificially drained at the present time.

''The Miami fine sandy loam is of alluvial and glacial origin. The underlying silt and clay loam is undoubtedly reworked loess material washed down from the uplands, while part of the sand which goes to make up the sandy loam was deposited at an early date during times of exceptionally high water. The sand underlying the Miami silt loam bordering this type on the east has been washed over the surface of this soil and has entered into its composition.

''The type is well adapted to almost all kinds of crops that will grow in this latitude, with the possible exception of timothy, which requires more moisture than this soil can retain during the dry season. Ordinarily wheat averages 20 bushels per acre. The yield of corn on the cob varies from 40 to 80 bushels per acre, depending upon the manner in which it is cultivated, and of oats only from 25 to 30 bushels, owing to the lack of sufficient moisture fully to mature the crop. Early potatoes yield from 75 to 175 bushels, while the late varieties produce from 100 to 125 bushels per acre.

''The Miami fine sandy loam is one of the best soils in the area for the production of tobacco. It produces usually from 700 to

1,000 pounds per acre, although a much higher yield is often obtained. Tobacco is considered a sure crop, and often does well when corn, wheat and other crops are a failure.

"Apples and peaches are grown to some extent, but the apples do not keep as well as those grown on heavier types. Small fruits are cultivated to a limited extent, the quantity produced being scarcely sufficient for home consumption. The soil is well adapted to truck crops, but its distance from good markets render their production unprofitable at the present time.

"The following table gives mechanical analyses of typical samples of this type of soil:

MECHANICAL ANALYSES OF MIAMI FINE SANDY LOAM.

No.	LOCALITY.	Description.	Gravel, 2 to 1 mm.	Coarse Sand, 1 to 0.5 mm.	Medium Sand, 0.5 to 0.25 mm.	Fine Sand, 0.25 to 0.1 mm.	Very Fine Sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P ct.*	*P. ct.*
10790	2 miles east of Hatfield..	Brown fine sandy loam, 0 to 14 inches.	0.0	1.7	10.0	28.6	19.2	32.1	8.3
10788	1 mile east of Richland City.	Brown to gray fine sandy loam, 0 to 12 inches.	.2	1.7	6.4	27.1	18.6	34.9	11.1
10791	Subsoil of 10790........	Heavy fine sandy 14 to 36 inches.	.1	1.2	7.7	26.1	10.7	39.7	14.2
10789	Subsoil of 10788........	Yellow loam, 12 to 36 inches.	.1	.8	3.0	17.3	14.2	40.3	24.4

WAVERLY SILT LOAM.

"The Waverly silt loam covers a very limited part of the area surveyed, but agriculturally it is one of the most valuable soils. The soil has a depth of from 12 to 18 inches. It is a silt loam, slightly plastic when wet, gradually becoming heavier as the depth increases, and varying in color from gray to dark brown, according to the amount of organic matter present.

"The subsoil is a light yellow silt loam containing a larger percentage of clay than the soil and becoming heavier at a depth of 25 or 30 inches. In places the subsoil is a mottled, heavy, drab silt loam of a much stiffer nature than the soil, but still retaining its silty character.

"The Waverly silt loam occurs as narrow strips bordering most of the small streams in all sections of the area, but seldom extends back more than a quarter of a mile from the streams. The largest area, which lies along the Cypress Creek ditch west of Boonville, has an average width of one mile. A second extensive area occurs at the head of the Willow Pond ditch, northwest of Rockport, where the soil contains a very large amount of organic matter and is of a much darker color than the greater proportion of the type. The Willow Pond area has only recently been drained and put under cultivation, and both soil and subsoil are of a slightly heavier nature than the typical Waverly silt loam.

"In topography the type is level, with a gentle slope toward the small streams. It occupies the low depressions near the source of streams and the narrow valleys between the rolling hills. The streams have usually cut their channels down several feet below the lands bordering them, but are generally insufficient to drain thoroughly the larger areas without artificial means. The soil is easily drained by straightening and deepening the small stream courses and cutting lateral ditches at frequent intervals through the wet areas. Tiles are used with excellent results, and at present the greater part of the soil is drained well. When ditched and tiled thoroughly it is very productive, and in several localities its value has been increased from $10 to $50 an acre by the installation of a good drainage system.

"The Waverly silt loam is derived from material washed from the uplands at times of heavy rains and deposited in the depressions and shallow valleys, mixed with decaying vegetable matter. The remains of decomposed logs and other organic matter have been found in the soil at a depth of from 6 to 10 feet below the surface, indicating that the now shallow valleys have been gradually built up to this present level by the steady accumulation of material from uplands.

"Where the soil is well drained corn averages from 50 to 70 bushels; wheat, 20 bushels; oats, 40 bushels; clover and timothy, about 2 tons, and tobacco from 1,000 to 1,200 pounds per acre. Large yields of potatoes and other vegetables are obtained. The soil seems best adapted to corn and tobacco. The corn crop is never a failure, and when well cultivated gives larger yields per acre, and as quantity rather than quality is what the growers strive for, much of this soil is devoted to its production.

"The following table gives the mechanical analyses of typical samples of the Waverly silt loam:

MECHANICAL ANALYSES OF WAVERLY SILT LOAM.

No.	LOCALITY.	Description.	Gravel, 2 to 1 mm.	Coarse Sand, 1 to 0.5 mm.	Medium Sand, 0.5 to 0.25 mm.	Fine Sand, 0.25 to 0.1 mm.	Very Fine Sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
10806	4 miles north of Rockport.	Brown to yellow silty loam, 0 to 10 inches.	0.2	0.5	0.5	3.6	10.4	74.8	10.1
10804	2 miles east of Boonville.	Yellow fine silty loam, 0 to 12 inches.	.2	.2	.1	.5	5.8	82.1	11.1
10805	Subsoil of 10804........	Yellow silty loam, 12 to 36 inches.	.3	.5	.3	.4	5.7	77.8	15.1
10807	Subsoil of 10806.......	Yellow heavy silty loam, 10 to 36 inches.	.2	.5	.5	3.5	10.7	67.5	16.7

WAVERLY CLAY LOAM.

"The soil of the Waverly clay loam consists of about 6 inches of heavy, light brown to gray silt loam, often containing small iron concretions scattered over the surface and through the soil. The soil becomes heavier with depth and grades into a very heavy silt loam containing a large percentage of clay. At a depth of from 12 to 20 inches the subsoil is a sticky, mottled clay, usually containing small iron concretions. It becomes stiffer and more tenacious as the depth increases, making the soil difficult to drain. When plowed and exposed to the air the subsoil often becomes whitish in color and dries into hard crusts or clods very difficult to pulverize. There is apparently little organic matter in the soil except in small swampy areas, and no attempt has been made to drain these areas or to put them under cultivation. In such places the soil is known locally as "glade" or "crawfish" land, and is of little agricultural value.

"The Waverly clay loam occupies small areas adjacent to many of the small streams, but in the north central part of the area there is one body of considerable extent. This occupies the low, flat country which extends along Little Pigeon Creek and other streams from near Tennyson to where Little Pigeon Creek leaves the area. There are a few ridges and shallow depressions in this area, but the greater part of the land is almost level. It is drained with great difficulty on account of the compact nature of the soil, the level topography and the slight elevation above the level of the streams.

"Where this soil is ditched and tiled and a complete system of artificial drainage established the least productive phases have been made to produce average crops. Where no system of drainage is practiced these lands are either covered with a growth of scrub oak or are used exclusively for pasture.

"A small area of the type situated about two and one-half miles north of Rockport deserves special mention. It occupies an old terrace of the Ohio River, and has a more rolling topography than the typical areas. This, together with its elevation and nearness to the river, gives it better drainage and a higher crop value than this soil usually possesses. This area is of too small extent, and the soil occurring between the low ridges is too typical of the Waverly clay loam to classify it as a separate soil type.

"The Waverly clay loam is derived from the same loess material as the Miami silt loam of the uplands, but its position in the low, flat valleys, only a few feet above the present level of the streams, has caused this material to undergo considerable change. The poor drainage, the addition to finer material washed down from the uplands, the effect of water which collects and spreads over the low areas in wet seasons, and the material deposited over these sections by former inundations, all combine to make this soil much heavier than that formed from the loess on the well-drained uplands.

"The yields of the various crops cultivated on this soil depend to a great extent on the thoroughness of the drainage and cultivation. With the methods usually practiced corn will average from 10 to 15 bushels and wheat from 10 to 12 bushels per acre. Wheat often gives larger yields in a favorable season if preceded by clover. Very little oats is grown on this type, and a yield of from 15 to 20 bushels per acre is estimated as an average crop.

"Tobacco is grown quite extensively on this soil, a heavy, coarse textured leaf being produced. This tobacco does not command so high a price as that grown on the more sandy soils, but the plants are larger and larger yields are obtained, the average being 1,000 to 1,200 pounds per acre.

"The soil seems best adapted to clover, timothy and redtop, and a large amount of hay is harvested yearly from it. The hay crop averages from two to three tons per acre for each cutting, and the facilities for shipping this product to southern cities make it a profitable industry.

"The Waverly clay loam varies considerably in agricultural value according to its position, topography and the methods used in its management. The greater part of it is considered a very poor soil for general farming purposes, but where it occupies the low ridges a few feet above the more level areas and is well drained very fair crop yields are usually obtained. Small areas frequently appear only a few rods apart where, on account of the local influences of topography and the natural drainage, fair yields are produced on one field, while on an adjacent one which is too wet and poorly drained nothing except clover and grass can be successfully grown.

"The following table gives the mechanical analyses of this type:

MECHANICAL ANALYSES OF WAVERLY CLAY LOAM.

No.	LOCALITY.	Description.	Gravel, 2 to 1 mm.	Coarse Sand, 1 to 0.5 mm.	Medium Sand, 0.5 to 0.25 mm.	Fine Sand, 0.25 to 0.1 mm.	Very Fine Sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
10786	1½ miles northeast of Richland City.	Heavy silty loam, 0 to 6 inches.	0.3	1.0	1.4	395	8.9	56.3	28.6
10784	3½ miles east of Boonville.	Clay, 0 to 6 inches....	.3	1.0	.7	1.0	1.8	59.0	36.1
10787	Subsoil of 10786........	Gray clay, 6 to 36 inches.	.4	1.3	1.6	3.7	8.6	53.2	31.0
10785	Subsoil of 10784........	Yellow to gray heavy clay, 6 to 36 inches.	.2	.4	.3	.3	1.1	53.9	43.7

WAVERLY CLAY.

"The Waverly clay is an alluvial soil found in the low bottom lands bordering the Ohio River. It extends uniformly over that section of the area which is subject to annual inundation during the spring floods.

"The soil to a depth of from 8 to 10 inches consists of a light brown clay loam, often containing a small amount of sand. The percentage of silt and clay is very large, the soil rapidly becomes stiffer and more tenacious with depth, grading into a heavy, tenacious clay subsoil of a brown or drab color, which is often mottled in the lower depressions. A few small iron concretions are frequently seen in the more swampy areas, both in the soil and the subsoil.

"This type of soil is overflowed annually, and when the water recedes the lands on drying become baked and sun cracked, making its cultivation difficult.

"The Waverly clay occurs in a large area in the extreme southern part of Spencer County and embraces a greater part of the lands lying within the great bend of the Ohio River southwest of

Rockport. It also extends in narrow strips a short distance up the valleys of some of the small streams which flow through this section of the area. These lands are comparatively level, but are traversed by numerous narrow sloughs and shallow, swampy depressions with low ridges intervening.

"The type as a whole occupies a basin-like depression surrounded on three sides by the sand ridge which extends along the banks of the Ohio River, and on the north by the rolling uplands. The small streams which flow through it have cut their channels several feet below the surface of the greater portion of the area, and as soon as the floods subside the water covering the lowlands finds its way back to the river through these outlets. Drainage is difficult over a large proportion of the type, but ditching and tiling greatly increase its agricultural value.

"The material from which this soil is formed is brought down by the Ohio River at times of high water and is deposited over the areas flooded. During the annual spring floods the river water backs up through the openings which the small streams have cut in the sandy ridge and spreads out over the low, flat country of the interior. The fine particles of silt and clay held in suspension are gradually deposited over the bottom lands, while the sand and coarser particles are deposited nearer the main current of the stream. This annual addition of new material to the soil tends to maintain its productiveness, and when the crops are not damaged by overflow large yields are obtained. Along some of the narrow depressions where the current of the stream is strongest during the overflow the surface soil has been eroded and the stiff clay subsoil exposed. Crops planted in such places are either a total failure or give very low yields.

"The Waverly clay is cultivated almost exclusively to corn, which averages about forty bushels per acre. During favorable seasons and where the land is well drained and cultivated as much as sixty bushels per acre is often produced. Wheat yields from eighteen to twenty bushels per acre, although the crop is sometimes destroyed or greatly damaged by the floods. It is estimated that about one wheat crop from three is harvested from this soil. Wheat is often sown in the fall, and if the crop is destroyed by the overflow it is followed by corn planted in the late spring. Oats are grown to a very small extent, as they suffer from the same disadvantages as wheat; but when not damaged by floods forty bushels per acre may be produced. Tobacco is grown to a limited extent, and about the same grade of the dark export type is obtained as that grown on the Waverly clay loam. The yield is about 1,000 pounds per acre. Clover, timothy and other grasses give yields of from two to three tons per acre.

"This type, however, is best adapted to the production of corn. The soil is usually in condition to cultivate by the latter part of April and often at an earlier date, and as the corn is planted in May it is very seldom damaged by overflow, and large and profitable yields are thus almost always assured.

"The following table gives mechanical analyses of typical samples of the Waverly clay:

MECHANICAL ANALYSES OF WAVERLY CLAY.

No.	Locality.	Description.	Gravel, 2 to 1 mm.	Coarse Sand, 1 to 0.5 mm.	Medium Sand, 0.5 to 0.25 mm.	Fine Sand, 0.25 to 0.1 mm.	Very Fine Sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
10808	7½ miles southwest of Rockport.	Heavy Clay loam, 0 to 8 inches.	0.3	1.1	0.7	1.8	3.0	58.2	34.8
10810	7½ miles southwest of Rockport	Brown heavy clay loam, 0 to 10 inches.	.1	.2	.3	1.1	1.5	55.5	41.2
10809	Subsoil of 10808........	Stiff clay, 8 to 36 inches.	.7	2.2	1.2	2.9	4.7	51.6	36.6
10811	Subsoil of 10810........	Brown to gray heavy clay, 10 to 36 inches.	.1	.3	.5	1.5	1.8	46.8	49.0

WAVERLY FINE SANDY LOAM.

"The Waverly fine sandy loam is a type of minor importance in the area on account of its limited extent. It is well adapted to a variety of crops, and, owing to its elevation above the flood-plain, the crops are seldom seriously injured by the overflow of the Ohio River.

"The soil to a depth of 15 inches is a light brown to gray, fine sandy loam, the sand content being usually large and of finer grades. As the depth increases the soil becomes heavier, and at from 15 to 20 inches passes into a brown, fine sandy loam containing a larger percentage of clay. The sand content, depth of soil and size of the sand particles often vary according to location. That portion of the type lying nearest the river is of a coarser texture and is often deeper than that immediately bordering the Waverly clay.

"The Waverly fine sandy loam occupies a narrow ridge extending along the whole course of the Ohio River, where it forms the southern boundary of the area except where the Rockport hills reach to the water's edge. This ridge slopes gently toward the low inland basin occupied by the Waverly clay, but its slope toward the river is more abrupt and ends in the steep banks which extend to the water's edge. Its elevation above the river and the neighboring lowlands, together with the sandy nature of the soil itself, gives to this type excellent drainage. Ditching and tiling are never necessary, as only a very small proportion of the type is subject to overflow.

''This sandy ridge was formed before the river had cut its channel down to its present level. During times of overflow the water, spreading over the more level sections, deposited the coarser material near the banks of the river. The coarser sands are deposited near the main current, while the finer grades were carried farther inland and laid down near the deposits of silt and clay. As the river gradually deepened its channel, and as more material was annually deposited along its banks, a natural levee was soon formed, consisting of a sand ridge several feet above the flood-plain of the river. Small quantities of silt, clay and organic matter, becoming mixed with the sand, formed a soil which is not only productive but easily cultivated.

''During a very dry season the crop yields are very small, but with an average amount of rainfall large yields of oats, corn, wheat, potatoes, melons and navy beans are secured. Corn averages from 40 to 50 bushels, wheat from 15 to 20 bushels, oats from 25 to 30 bushels per acre. Tobacco is also grown on this soil and averages about 700 pounds per acre. The yield is not so large as obtained on the heavier soils, but the leaf grown on this soil usually brings a higher price. All vegetables do well on this soil. A large acreage is devoted to navy beans. It is also excellently adapted to alfalfa, while a large yield of clover is always obtained. The type is best adapted to corn, melons, alfalfa and early vegetables, the latter being grown for local markets.

''The following table gives mechanical analyses of typical samples of the Waverly fine sandy loam:

MECHANICAL ANALYSES OF WAVERLY FINE SANDY LOAM.

No.	LOCALITY.	Description.	Gravel, 2 to 1 mm.	Coarse Sand, 1 to 0.5 mm.	Medium Sand, 0.5 to 0.25 mm.	Fine Sand, 0.25 to 0.1 mm.	Very Fine Sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
10802	3 miles south of Rockport.	Brown fine sandy loam, 0 to 12 inches.	0.1	0.4	0.6	23.1	34.7	31.0	9.9
10800	6 miles south ofRockport.	Gray to brown sandy heavy fine loam, 0 to 5 inches.	.1	.3	.3	9.7	37.6	38.9	13.1
10803	Subsoil of 10802........	Heavy fine sandy loam, 12 to 36 inches.	.1	.1	.4	18.0	32.8	32.4	16.0
10801	Subsoil of 10800........	Brown loam, 15 to 36 inches.	.1	.2	.2	8.0	32.9	41.2	17.5

AGRICULTURAL METHODS.

"To obtain the best results on the soils of the area very careful methods of cultivation are necessary.

"When the Miami silt loam is constantly kept in the loose condition required for the successful cultivation of corn the upper soil soon becomes eroded and its productivity is greatly lessened. The underlying subsoil becomes exposed on the surface and the land often fails to give sufficient yields to make its cultivation profitable. The usual method used to restore these lands to their former state of productiveness is to seed them down to clover. A fair stand of clover is usually obtained except on a few small areas where erosion has been greatest. The lands are heavily fertilized with stable manure or commercial fertilizer, and the fields are pastured to sheep or other live stock. By this means much of the wornout land in the area has been restored and profitably cultivated to all crops adapted to the soil.

"Where a rotation of crops is practiced the upland soils suffer very little from erosion, and profitable yields are continuously obtained without the aid of commercial fertilizers. Some system of crop rotation is in use in all sections of the area and on all soil types with the exception of the Waverly clay, but crop rotation is of the greatest importance on the Miami silt loam and the Miami fine sandy loam. The soils occupying the river flats and low upland valleys are not so easily eroded, and are annually enriched by the addition of new material washed down from the surrounding uplands or deposited by water.

"Drainage is the most important factor in the management of the soils occupying the lower and more level sections of the area.

The agricultural value of a large proportion of the Waverly silt loam and of the Miami fine sandy loam has been greatly increased where a system of artificial drainage has been established. The Waverly clay loam, on account of its level topography and slight elevation above the level of the streams, is the most difficult soil of the area to drain, but where ditching and tiling are practicable good results are always obtained. Where tile drainage is used the tiles are laid at a depth of 2½ to 3 feet and are placed 30 to 35 yards apart. These open into a main drainage ditch which leads to the neighboring stream. This system is adequate to drain the greater part of the upland valleys and low depressions occupied by the Waverly clay loam, but the topography of some of the small swampy areas occupied by the latter makes thorough drainage almost impossible.

"When preparing the soil for the cultivation of wheat the field is plowed about the 1st of August. It is then dragged, harrowed and rolled three or four times. The wheat is usually drilled in during the first week in September and is harvested early in July. The preparation of the land for oats is about the same as for wheat, except that the land is seldom worked more than twice before the crop is drilled in. Oats are sown during March and April, and the crop is harvested during the latter part of July.

"For corn the soil is plowed in the early part of April or as soon as the season permits. It is then dragged or harrowed until it is in a loose and thoroughly cultivated condition. The crop is planted from the 10th to the 20th of May, and should be cultivated once each week until it becomes too large.

"Tobacco seeds are first sown in beds located on the sunny hillsides, which afford them a natural protection. The tobacco beds are covered with a thin canvas or cheese cloth. The plants are set out during the latter part of June and the crop matures in September. It is then cut and hung on low scaffolds in the fields until the leaves begin to turn yellow. Great care is taken to protect it during rainy weather while in the field. After a short interval of time it is removed to open, well ventilated barns, stripped from the stalks and suspended from scaffolds. It is alternately dried and softened as the climatic conditions vary from dry to damp, and when thoroughly cured it is assorted and put on the market. No curing by means of artificial heat in especially constructed barns is practiced at present in the area.

AGRICULTURAL CONDITIONS.

"The agricultural interests of the area are centered in the production of corn, wheat and tobacco. A limited acreage is devoted to the production of oats, hay and vegetables, but the climatic conditions, soils and facilities for marketing all tend to make the area particularly well adapted to the three staples first named. The farmers of the area are intelligent and energetic, and the majority of them are prosperous and free from debt. Large yields of all crops grown, together with the prevailing good prices, have placed the farmers in all sections of the area in excellent financial condition. Great interest is manifested in farmers' institutes, agricultural societies and all kinds of local organizations which tend to advance the interests of the rural population.

"The average farm dwelling consists of a neatly painted two-story frame building, while the barns and other outbuildings are modern and well kept. These are always large enough to store the crops, to shelter the small number of stock which each farmer invariably owns and to protect the farm machinery during the winter months.

"About three-fourths of the farmers own the lands they cultivate, the remainder being tenants on the farms of larger landholders. Lands are usually rented on a share basis, but a few tenants in the upland sections pay cash. When rented on shares the landowner receives from one-fourth to one-third of the crop produced. The tenant furnishes the seed, work animals, farm machinery, fertilizers and labor, receiving from two-thirds to three-fourths of the crop made. From $3 to $4 an acre is the usual cash rent for farms in the Miami silt loam or Miami fine sandy loam, but a higher rate is obtained for well drained lands in the Waverly silt loam. The Waverly clay loam and Waverly clay types of soil are never rented for cash, the uncertainty of a profitable yield on account of the liability of crops on these areas to damage or destruction by floods, droughts or unfavorable seasons causing the share system to be preferred by the tenant.

"The largest farms in the area are situated along the Ohio River on the low, flat areas of Waverly clay. They average from 150 to 300 acres each, and, owing to the annual flooding of this section during the early spring months, they are cultivated almost exclusively to corn. There are comparatively few dwellings or farm buildings in this part of the area, as the farmers cultivating these lands live on the neighboring uplands or on the sandy ridge bordering the river. On the Miami silt loam of the uplands and the Miami fine sandy loam the farms have an average size of from 100 to 125 acres, and a very large proportion of the land is under cultivation. No large tracts are being cultivated on the Waverly clay loam. Although some farmers own from 150 to 200 acres of this type, much of it is either used for pasturage or is covered with a growth of hardwood timber.

"The average tenant in the area farms from forty to seventy-five acres. As a general rule farm labor is plentiful throughout the year, the supply often exceeding the demand, so that many of the farm laborers are compelled at certain seasons to seek employment in the towns or neighboring counties. During harvest there is always a demand for experienced farm hands at good prices, and it is often difficult to obtain them at this season. The labor employed in the area is of a very efficient character. When hired by the month from $14 to $20, including board, is paid for farm hands, but during harvest from 75 cents to $1 a day is the usual rate.

"Corn, wheat and tobacco are the principal products, each being grown on every variety of soil found in the area. A failure of the corn crop on many of the soil types is very rare, and during a favorable season an excellent crop is always obtained. This crop cannot be grown continuously on the rolling uplands without involving damage to the soil from erosion. As the soil becomes loose and friable when frequently cultivated, much of it is washed from the surface of the rolling hills to the neighboring valleys. However, when a rotation of crops is practiced large yields are continuously obtained and the general productiveness of the soil remains unchanged.

"A number of varieties of wheat are grown in the area, the most important being the Pool, the Red Wonder, the Russian Red and the New Columbia. The Pool is the variety most widely grown, but the Red Wonder seems better adapted to the more sandy soils.

"The greater part of the tobacco produced in the area is of the dark export type, but on some of the lighter soils a small amount of Burley is grown. The Pryor and One Sucker are the varieties of dark tobacco most widely cultivated, and a vigorous growth of these is always obtained on the heavier soils. The leaf is heavy and oily, varying in color from a light brown to a dark reddish brown. While a comparatively small quantity of Burley tobacco has been grown in the area, the present good prices are causing the production of this variety to increase rapidly. When the difference in the market prices is not very great the farmers prefer to grow the dark export type, as larger yields per acre are produced and it requires much less attention both while the crop is in the field and when being cured. Only a small part of the tobacco grown in the area is consumed in the United States, the greater proportion being exported to foreign markets where the dark, heavy types of this product are in greater demand.

"In connection with the foregoing discussion of the agricultural products of the area it seems advisable to point out again the relation between these products and the several soils. The Waverly clay and the Waverly fine sandy loam are well adapted to corn. The Waverly silt loam is also excellently adapted to this crop, and when well drained it produces larger yields than any other type in the area. The Miami silt loam is best adapted to wheat. Large yields of wheat are also harvested annually from the Miami fine sandy loam, and while there is no great difference between these types in the yield per acre, that produced on the silt loam of the uplands is of a higher grade, and as a rule commands better prices on the markets. Large yields of wheat are obtained on the Waverly clay when the crop is not destroyed by floods. The Waverly clay loam when properly drained is well adapted to the production of the dark-leaf tobacco, and yields of from 1,000 to 1,200 pounds per acre are realized. This soil, however, is best adapted to clover and timothy, a large part of the hay produced in the area being grown on it.

"The Waverly fine sandy loam and the Miami fine sandy loam are well adapted to melons, and the heavier, poorly drained phases of these types produce large yields of oats. Burley tobacco is also grown on these sandy loams, and with proper care in its cultivation, cutting and curing, a very fair grade is often obtained. Tomatoes, small fruits and early vegetables are well suited to these sandy soils, and limited experiments have demonstrated that alfalfa does well, especially on the Waverly fine sandy loam which borders the Ohio River.

"The transportation facilities of the area are excellent. Two branches of the Southern Railroad traverse the area, one of which terminates at Rockport, an important local shipping point on the Ohio River. The facilities afforded by both the river and the railroad cause Rockport to receive a large amount of produce from the surrounding country on the way to more distant markets.

"A large number of well kept county roads connect Boonville, Rockport, Chrisney and other smaller towns with all sections of the surrounding country. The streams are all well bridged, and the more important county roads are macadamized for some miles out from the leading towns.

"Several landings are situated at short intervals along the Ohio River where products of the neighboring farms are loaded on the small river steamers and transported direct to Louisville, Owensboro or other large markets. An electric car line is now being constructed to connect some of the smaller towns with Evansville, Rockport and other important local markets. This will greatly facilitate traffic and will enable the farmers in certain sections of the area to market their produce with more dispatch and at much less expense than at present.

"Owensboro, Ky., is the market for almost the entire corn crop of the area. The large distilleries located there create a constant demand for this product. The greater part of the wheat and tobacco is shipped to Louisville, Ky. A small proportion of the tobacco crop is marketed at Owensboro, and a still smaller proportion is shipped direct from the area to foreign markets. Very few farmers own more than a few head of stock. No cattle are raised for other than the local markets, but a large number of hogs are raised and marketed at Louisville and Cincinnati. A few farmers in the area have made a specialty of this industry, and as good prices are obtained it has proved very profitable.

"The diversity of crops grown, the natural productiveness of the land, the transportation facilities afforded by the river and railroads, and the nearness to large markets all tend to make the area surveyed one of the most prosperous sections of the State."

SUMMARY.

The counties of Warrick and Spencer are becoming prosperous agricultural communities. The people are progressive. Many good, substantial farm improvements are being made, good houses, well built barns and shelters for stock and machinery.

All the staple crops are grown—corn, wheat, oats, timothy, clover, alfalfa, cow-peas, tobacco and melons. Vegetable farming meets with success. All kinds of fruit grow well, and a large number of apples, pears and peaches have recently been planted.

At the present time there is but one canning factory in each county. It has been well demonstrated that the soils are well adapted to the growing of tomatoes, peas, sweet corn, etc., and excellent advantages are afforded for canning factories.

The increased transportation facilities should give impetus to fruit growing and truck farming, since all such produce could be handled in excellent condition and find a ready market in Evansville and other more distant points.

Large areas of the more rugged parts of the land could be devoted to grazing, and dairying would become a paying occupation. More creameries are needed, and inducements will be offered for their establishment.

Corn and tobacco are the leading products. A tobacco market was established at Rockport in 1855. The high prices from 1860 to 1870 caused a large acreage to be grown, almost to the exclusion of other crops. Spencer County alone is said to have produced 10,000,000 pounds a year. The production has greatly decreased, but Spencer County still takes the lead in the State, and the production is on the increase in both counties.

Road improvement has not progressed very rapidly, but the farmers are well pleased with their investment in road improvement. Good road metal is not very abundant and many of the best exposures of limestone well suited for this purpose are far removed from the railroads, but could be economically utilized by the use of portable crushers.

Considerable fertilizer is used, especially on wheat and tobacco, but in all the best farming localities wheat and oats straw is kept on the farm and the part not used as food for the stock is hauled out in manure spreaders and scattered over the fields. All stable manure is carefully utilized. Clover and cow-peas are also grown for green manure, and some attention is now being given to the growing of alfalfa.

The area is well adapted to agriculture, which, together with the developments of the natural resources, coal and clay, should cause the counties to hold a high rank in the State.

TABLE SHOWING THE RESULTS OF CHEMICAL ANALYSES.

COLLECTOR AND DESCRIPTION OF SOIL SAMPLE.	Shannon. Surface Patoka Lake Plain. 95.	Shannon. Subsoil Patoka Lake Plain. 90.	Shannon. Surface of Loess. 74.	Shannon. Subsoil of Loess. 75.	Shannon. Surface of Loess. 50.	Shannon. Subsoil of Loess. 55.	Shannon. Surface Marl Loess. 60.	Shannon. Subsoil Marl Loess. 61.
Laboratory No.	47.	42.	43.	44.	45.	46.	47.	48.
Reaction to litmus	ac.	ac.	v. f. ac.	v. f. ac.	v. f. ac.	ac.	ac.	v. f ac.
Moisture at 105° C.	1.51	2.88	2.17	3.09	2.41	3.54	1.21	3.66
Total soil nitrogen	.118	.064	.104	.059	.125	.074	.074	.071
Carbon dioxide	....	....	....	.887	....	....	....	2.137

ANALYSES OF FINE EARTH DRIED AT 105° C.

Volatile and organic	2.872	2.922	3.035	3.563	3.655	3.398	1.882	4.718
Insol. in 1.115 HCl_2	90.931	86.799	88.456	84.405	88.395	84.721	92.086	79.856
Soluble silica	.112	.072	.010	.012	.031	.073	.022	.83
Fe_2O_3	2.208	3.687	2.542	4.153	3.211	4.641	2.202	4.012
Al_2O_3	2.158	5.136	4.735	4.706	3.391	5.283	2.314	6.864
P_2O_5	.099	.076	.164	.174	.156	.145	.139	.128
CaO	.287	.260	.247	1.372	.279	.231	.334	1.901
MgO	.329	.522	.493	.949	.398	.477	.333	.683
SO_3	.046	.028	.022	.021	.036	.029	.017	.022
K_2O	.165	.182	.236	.296	.245	.372	.159	.382
Na_2O	.266	.289	.205	.201	.254	.192	.208	.241
Total	99.473	99.973	100.145	99.852	100.051	99.562	99.696	99.491

These soil analyses were made by Dr. R. E. Lyons, of Indiana University, the same methods being used as in former analyses and described in the 32d Annual Report, Dept. of Geology 47–55.

SPECIAL TOPICS.

The area described in this report has a large number of soil types with an exceedingly wide range of adaptability. Some areas are of the most fertile soils, with apparently no cause to ever be replenished; others become depleted and yield inferior crops unless kept up by fertilizers; others already exhausted and abandoned; small tracts with no degree of natural fertility. Thousands of acres have, however, been reclaimed; good drainage systems are being established until acre by acre the most worthless lowland will become of agricultural value.

The farmers' and scientists' investigations are finding crops adapted to all soils, and if the soil naturally be so poor that it can scarcely do more for a plant than give it firm support, plant foods are added in various ways and good returns secured.

The sand hills, a few years ago considered without value, are now yielding enormous crops of watermelons and cantaloupes, and luxuriant growths of cow-peas, and selling for $60 to $100 per acre. The hills and ridges of the eastern part, which were once abandoned as soon as the timber was cut away, are well adapted to special crops and fruit growing.

The following pages devoted to brief reports on various subjects may not only be of value to the farmers of the areas included in southwestern Indiana but to the farmers of the entire State.

The growing of leguminous crops is rapidly growing in importance, and it is a common belief that they improve the soil, but the benefits derived by the soil depend entirely on the manner of disposition of the crops grown. Clover failure is very common, but how few farmers stop to consider the cause.

The annual wheat crop for the State of Indiana is about 2,100,500 acres, yielding 33,500,000 bushels. The five counties of this report grow about 202,500 acres of this crop, yielding about 2,300,000 bushels, a comparatively high acreage and yield for the size of the area, yet the yield per acre for any part of the area is not up to the highest. The production no doubt can be increased from one to five bushels per acre with proper understanding of the soil requirements.

Special crops, such as tobacco, watermelons and cantaloupes, and crops raised for canning purposes have a marked adaptability for this region, and their growth becomes a most important industry.

Parts suited for truck farming are made accessible by the building of traction lines, and the branch of agriculture promises to occupy a high place in the growth of these counties.

A brief discussion of the following subjects may be of priceless value:

1. Plant Foods.—Leguminous Crops and Commercial Fertilizer.
2. Increased Wheat Production.
3. Special Crops.
4. Truck Farming.

(1) LEGUMINOUS CROPS AND COMMERCIAL FERTILIZER.

By leguminous crops are meant such as clover, alfalfa, cow-peas and soy-beans—plants which have the power of extracting nitrogen directly from the free air through the soil. The ordinary grain crops do not have this power of securing nitrogen. To use leguminous crops profitably they must be well supplied with potash and phosphoric acid and the crop either turned under as green manure or used as forage and returned to the soil as farmyard manure. Clover if so used improves the soil, but if the hay crop is removed from the farm it is found that for each ton of hay removed from the soil per acre about 184 pounds of potash, 152 of phosphoric acid and 212 of nitrogen is taken, and the soil is just that much poorer. The second crop and the roots and stubble must, however, be taken into consideration, but the gain is in nitrogen only. The cow-pea is a wonderful grower and will as a rule make better growth than any other plant under unfavorable conditions of soil, and even when other crops have failed; however, no crops thrive better and more amply repay on rich land, but it is a mistake to suppose that the cow-pea itself needs no fertilizer. The cow-pea must get its potash and phosphoric acid the same as any other plant, and if these are deficient they must be supplied. Cow-peas may be planted at any time from early spring up until two or three weeks before fall frosts are expected. The harvesting for hay should not be too early, but is best when the earliest pods have begun to ripen. The cow-pea crop always benefits the soil chemically and mechanically. The methods for using the crop to benefit the soil are:

1. Plowing under the entire crop while green.
2. Allowing the crop to remain and decay on the surface of the ground during the winter and plowing it under in the spring.

3. Pasturing the field and then turning under the stubble, roots and manure from the stock.

4. Mowing the field for hay and plowing under the remainder of the crop.

Alfalfa thrives best on a light, sandy loam with a loose subsoil and good drainage. It is often a difficult crop to make a good stand, but if care is exercised the first year good results will be obtained. The hay crop may be cut from two to four times per year. Alfalfa is a heavy user of potash and should be thoroughly fertilized, and especially must this be done each year if it is expected to hold the crop for a number of years.

Clover, cow-peas and alfalfa all grow and yield good returns on many types of Indiana soils, and their growth should be more extended both for green manuring and for hay.

The following paragraphs will show the growth in the use of commercial fertilizer and the value to the farmer in securing the proper brand and in the right application of the material to his crops:

"The consumption of commercial plant foods in the United States has reached approximately 5,000,000 tons, and the cost to the consumer is nearly equal to the sum which we formerly paid for imported sugar, and which became the slogan in the campaign to establish the beet sugar industry of America—$100,000,000

"The industry is established but by no means stationary. It has increased at least 50 per cent. during the past five years, a very high rate considering the magnitude of the business.

"In the manufacture and control of these products there is employed a large number of chemists, and the Association of Official Agricultural Chemists, now over a quarter of a century old, was originally formed for devising suitable methods of analysis for these products. Thirty-three states have special laws for fertilizer inspection. The American Chemical Society recently organized a division of fertilizer chemists, and most of our agricultural colleges and experiment stations devote a considerable amount of attention to the subject.

"The farmer wants to know the facts about commercial plant foods, and all officialdom from the bureau chiefs of the National Department of Agriculture to the local speaker at the township farmers' institute undertakes to enlighten him.

"In those sections of the country where fertilizers have been longest used—along the Atlantic, the eastern gulf coast and the upper Ohio Valleys—the experiment stations and control officials appreciate the magnitude and importance of the industry and understand its vital relation to crop productions. In marked contrast to this is the state of affairs in the greater part of the great area drained by the Mississippi, where most of our corn, wheat and oats are produced. Here we find also the curious combination of land rapidly increasing in money value and at the same time declining in productiveness, while the cost of farm labor is increasing. These circumstances cause the farmer to inquire how his crops may be increased and whether commercial plant foods may be profitable in this connection.

"Some thirty-five years ago the winter wheat growers of the Ohio Valley began to use fertilizers, most of the material being the side products of the packing houses, mainly bone meal; very profitable results were secured and the trade rapidly increased. In time, acidulated goods were introduced, often being mixtures of equal parts of acid phosphate and bone. Later came the 'complete' fertilizer, being ammonia 2, available phosphoric acid 8, and potash 2 per cent. This is still the so-called basal formula, that is the one used as a starting point in calculating the trade value of goods with different formulas. About two-thirds of the fertilizer used in that section consists of complete fertilizer, the use of bone and ammoniated phosphate is declining and the use of mixtures of acid phosphate and potash is rapidly increasing. Common applications for wheat are from one to two hundred pounds per acre, and it is almost invariably applied with a fertilzer attachment at the same time the seed is sown. The efficiency of the fertilizer in securing a stand of clover, the seed of which is sown before the wheat starts its spring growth, is a point to which the farmers attach considerable importance, and the increase in clover production may in part account for the reduction in the amount of nitrogen in the fertilizers now used as compared with that used at an earlier period.

"The use of fertilizers gradually extended to other crops, but fully two-thirds of the fertilizer sold in the Ohio Valley is used on winter wheat. The general tendency in composition has been to reduce nitrogen and increase potash, while the phosphoric acid has remained practically unchanged. Ready mixed brands are the rule, home mixing the rare exception.

"It is, however, unnecessary to state that much of this plant food has been used in a most haphazard way and that both buyer and local seller knew little about the composition of the goods sold or their fitness for the crop or soil on which they were to be used.

"The one thing which stood out very clearly was that they paid; that by their use good crops of wheat could be secured where unprofitable crops grew before; and that a stand of clover or grass could be secured, a suitable rotation of crops established and maintained, and that the cost of the fertilizer was returned many fold in the increase of wheat grain alone—ten pounds of fertilizer, costing from ten to fifteen cents, producing on the average an increase of a bushel of wheat. This condition exists over much of the winter wheat belt, extending from Kansas east, and comprising an area of probably 200,000 square miles. These facts have existed too long and cover too much territory to be ascribed to local peculiarities of soil or season. The wheat grower knows that fertilizers pay. But as brands multiplied, the question arose which is the more profitable, and many made simple tests of different brands in which the popularity of the local agent received more consideration than the amount and kind of plant food in the goods; they obtained the confusing results that might be expected under these conditions.

"The chemical industries supplying plant foods and the purchaser of these products would both be greatly benefited by the inauguration at our expermient stations in the grain growing section of experiments properly planned to solve the question of the most profitable method of supplementing the plant food resources of the farm. Both farmer and fertilizer manufacturer need the help of the educational institutions in the direction of securing facts relative to the most profitable methods of utilizing plant foods in the production of our great cereal crops—facts that will help and not discourage.*

(2) INCREASED WHEAT PRODUCTIONS.

"The first fertilizer used on wheat in the Central West consisted of bone and of tankage from the packing houses and the rendering plants. In a short time the collection of buffalo bones from the plains became quite an industry, and the buffalo bone was so highly esteemed that the name remained in the trade long after the supply was exhausted. Bone tankage seems to have been sold for wheat fertilizer in the West as early as 1875, but very little is known about the amounts or grades used during the first

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***H. A. Huston.—From material submitted at request concerning Fertilizer Materials and Experiments on Wheat.**

ten years. During the early eighties legislatures began to pass laws regulating the sales of fertilizers, and from that time we have a fair knowledge of the trade.

"One may say that in a certain sense the use of fertilizer in the section under consideration is little more than an experiment, but one whose extent deserves more attention than its quality. While there has been a rapid increase in the quantity of wheat fertilizer used and of the area to which it is applied, there has been little systematic study of the best methods of applying them.

"The high esteem in which bone is held as a wheat fertilizer is doubtless due to the fact that the typical wheat land of the Ohio Valley was a rather heavy clay whose scanty original supply of phosphoric acid had been much reduced by a bad system of cropping. In many places the soil had become acid, and phosphoric acid was the element that limited the crop; under these circumstances the nitrogen was not very heavily drawn upon and the inert potash of the soil became available a little more rapidly than it was used by the limited wheat crops, thus permitting an accumulation of available potash sufficient to last several years.

"Of course these conditions were not understood by those who began the use of bone. The one thing that appealed to them was that by drilling in with the seed 100 to 200 pounds of 'bone dust,' as mostly all fertilizer was then called, they could bring up the yield of wheat from six or eight bushels per acre to twenty or thirty bushels, at a cost of about fifteen cents per bushel.

"It is not strange that under these circumstances the farmer should believe that in the bone dust he had found the secret of successful and profitable wheat culture on land which a few years before appeared to have lost its value for wheat production. Indeed, many farmers thought that 'dust' could be used as a substitute for manure or crop rotation, and there was a tendency to neglect the utilization of the manural resources of the farm.

"Before a generation had passed, the farmers began to complain that bone was not as good as at first and failed to produce such striking results. As a matter of fact, the bone had improved in quality.

"Then came the introduction of the so-called 'half and half,' which consisted of a mixture of equal parts of acid phosphate and bone meal. At this time farmers were learning of the value of legumes as nitrogen gatherers and introducing them into their rotations more freely. Thus the phosphate and nitrogen supplies were reasonably maintained. The gypsum in the acid phosphate released some of the less resistant of the soil potash, and for a time this system of 'half and half' and clover seemed to have won the day.

"But presently the crops failed to respond and clover did not catch well. Attention was then given to the question of potash, and the reign of the so-called 'complete fertilizer' began. In the past fifteen years the use of the ammoniated phosphate mixture has almost disappeared, the sale of ground bone has increased but slowly, while the complete fertilizers and the mixtures containing only phosphate and potash have been in rapidly increasing amounts.

"The complete fertilizer and 'bone and potash' mixtures at first contained only one or two per cent. of potash, but have gradually changed until now from six to eight per cent. is not unusual, and many farmers use high-grade potash salts to increase the potash content to ten or twelve per cent.

"If one looks up the records of tests by the experiment stations he will find that many experiments on wheat are reported unprofitable. An examination of the details of such experiments at once reveals the cause. Such excessive amounts of nitrogen have been used in the mixtures that the cost has been too high and often the amount of phosphoric acid used was not sufficient to permit the nitrogen and potash to be fully utilized.

"One of the oldest of the wheat experiments used plant food equivalent to 500 pounds per acre annually of a fertilizer containing nitrogen 10 per cent., phosphoric acid 5 per cent. and potash 6 per cent.

"As contrasted with this is the fact that wheat growers find that fertilizers of the 2-8-6 or 3-10-6 type used at the rate of 100 to 300 pounds per acre pay, even when we consider only the increase in the yield of grain and neglect the value of the straw increase or the efficiency of the fertilizer in securing a good stand of clover.

"So conspicuous is the effcet of phosphoric acid on the usual wheat soil of the winter wheat belt that many doubt whether the nitrogen or potash are effective or profitable in the mixtures.

"On a typical worn clay wheat land an experiment was undertaken on the basis of 300 pounds per acre of a goods containing nitrogen 3 per cent., available phosphoric acid 10 per cent. and potash 6 per cent., each element being omitted in turn the usual way."

The following results were obtained:

GRANT COUNTY, IND.

FERTILIZER APPLIED EQUAL TO	Yield Bushels.	Reduction from, Omitting				
		Nitrogen.	Phos. Acid.	Potash.	All.	
300 lbs. 3-10-6	33.8					
300 lbs. 0-10-6	29.1	4.7				
300 lbs. 3- 0-6	7.6		26.2			
300 lbs. 3-10-0	25.0			8.8		
None	6.5				27.3	

The nitrogen in the fertilizer cost	$1.80
The phosphoric acid cost	1.50
The potash cost	1.10
The complete fertilizer cost	$4.40

"The nitrogen increased the crop 4.7 bushels at a cost of $1.80, the phosphoric acid increased it 26.2 bushels at a cost of $1.50, while the potash increased it 8.8 bushels at a cost of $1.10. As wheat sold at 90 cents per bushel it will be seen at a glance that all the plant foods were used at a profit although, of course, we are not in a position to show that the combination is the one most profitable, nor do we know that this was the most profitable amount. We do know that it was very profitable, even neglecting the value of the increase in straw and the very striking effect on the clover which followed the wheat.

"The experiment is a typical one, for soils in the winter wheat belt and numerous others could be given, showing results of just the same character and even more striking in profits.

"The figures show how the lack of phosphoric acid limited the crop, and they serve to explain why bone gave such increases on these soils that for nearly a generation it was considered the only profitable thing to use.

"In another set, where the grower was of the opinion that less potash would be just as effective, the experiment was conducted along the same line, but the formula was 3-10-5, used at the ratio of 300 pounds per acre."

The following results were obtained:

SCOTT COUNTY.

FERTILIZER APPLIED EQUAL TO PER ACRE.	Yield Bushels.	Reductions from, Omitting				
		Nitrogen.	Phos. Acid.	One-half Potash.	Whole Potash.	All Foods.
300 lbs. 3-10-5	30.8					
300 to 0-10-5	22.6	8.2				
300 lbs. 3-0-5	9.5		21.3			
300 lbs. 3-10-2.5	24.8			6.0		
300 lbs. 3-10-0	21.3				9.7	
No fertilizer	4.2					26.6

"This experiment shows clearly enough the fact that with only a partial supply of potash the vegetable part of the plant uses it at the expense of the seed; the full ration of potash giving much more than double the increase of the half ration.

"Of course, we are still far from knowing the most profitable amounts or formulas for wheat growing in the Central West, but we have at least progressed far enough to know that the kinds and amounts that are practicable in ordinary use can be profitably used and more progress will be made when we have fuller experiments established which will take into consideration the kind of material to use, the right methods of application, the question of the most profitable amounts, and finally, the rational interpretation of the results secured."

Results of experiment by A. G. Mace, Lexington, Indiana, Scott County, showing stand of wheat on fertilized and unfertilized plots. Crawfish soil. Season 1907. See Photograph No. 1.

FERTILIZER PER ACRE IN POUNDS.

PLOT.	17	1
Blood	0	120
Banner Bone Flour	0	172
Muriate of Potash	0	207

YIELD PER ACRE.

Bushels	2	11.4

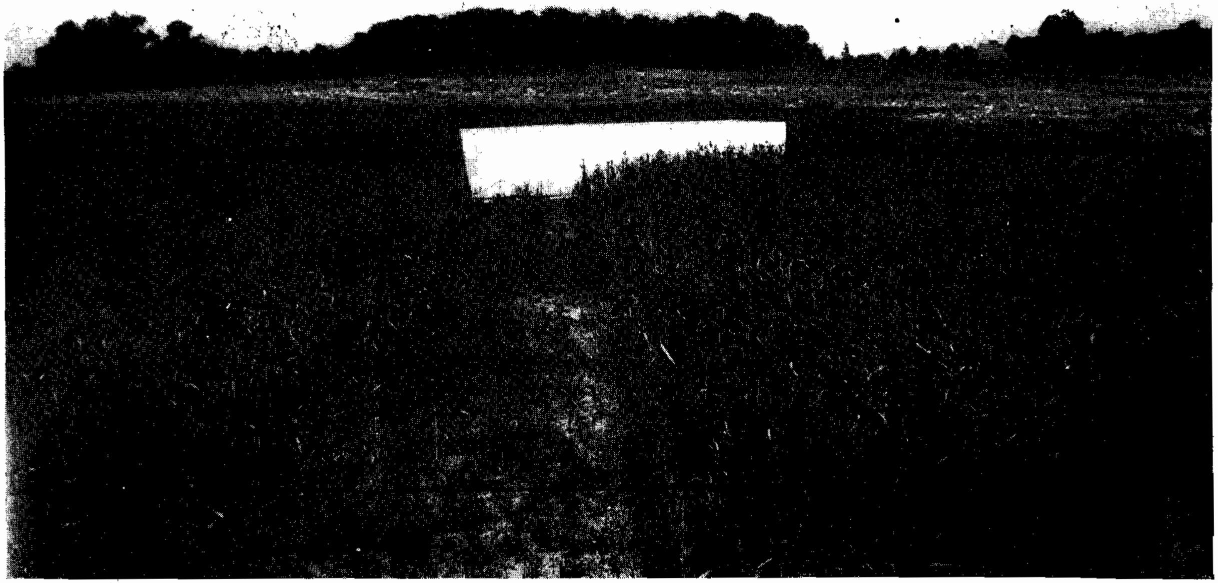
Results of experiment by A. G. Mace, Lexington, Scott, County, Indiana, showing the yield of wheat from 1-10 acre plots. Crawfish soil. Season 1904. Results also shown in Photograph No. 2.

FERTILIZER PER ACRE IN LBS.

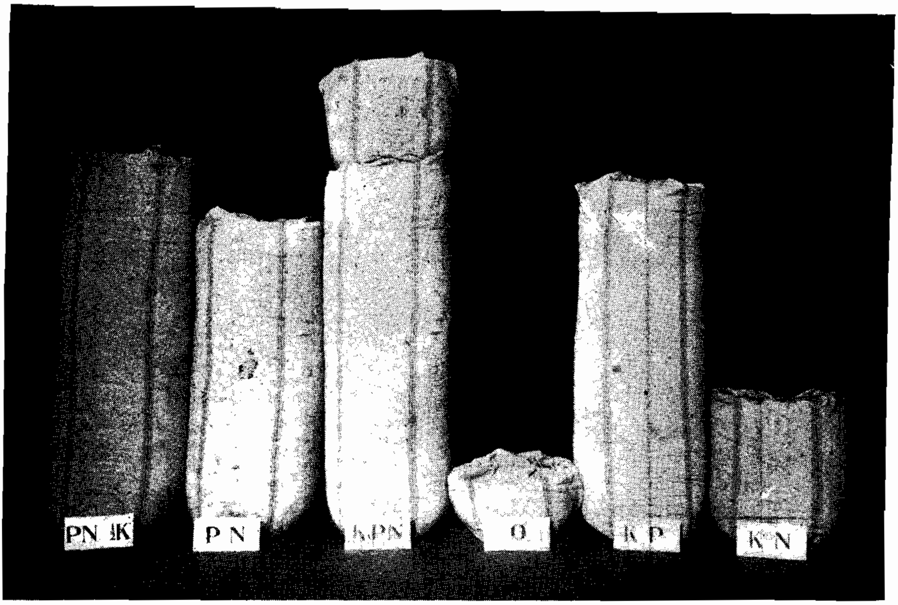
PLOT.	1	2	3	4	5	6
Acid Phosphate	200	200	200	0	200	...
Blood	60	60	60	0	...	60
Muriate of Potash	15	...	30	0	30	30

YIELD PER ACRE.

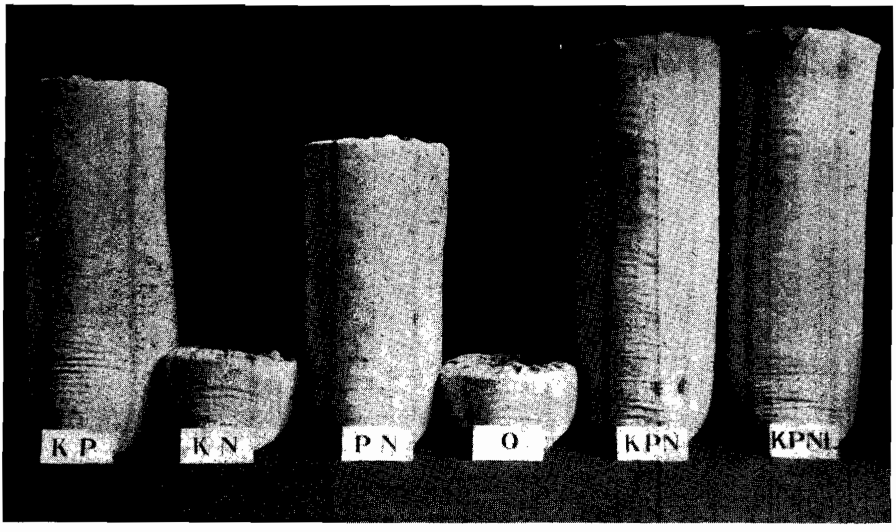
Bushels	24.8	21.3	30.8	4.2	22.6	9.5



No. 1. Showing stand of wheat on fertilized and unfertilized plots. A. G. Mace, Scott County.



No. 2. Shows wheat yield from $\frac{1}{10}$-acre plots. A. G. Mace, Scott County.



No. 3. Shows wheat yield from $\frac{1}{15}$-acre plots. P. R. Edgerton, Grant County.

Results of experiment by P. R. Edgerton, Marion, Grant County, Indiana, showing the yield of wheat from 1-15 acre plots clay loam. Yellow clay subsoil. Season 1907. Results also shown in Photograph No. 3.

FERTILIZER PER ACRE IN LBS.

PLOT.	1	2	3	4	5	6	7
Blood	0	...	70	70	70	70	0
Banner Bone Flour	0	100	...	100	100	100	0
Muriate of Potash	0	35	35	...	35	35	0
Lime	....	....	....	....	....	10 bbls.	....

YIELD PER ACRE.

Bushels	6.5	29.1	7.6	25	33.8	34.1	6.5

Results of experiments by Ernest P. Welborn, Cynthiana, Posey County, Indiana, showing the comparative yield of wheat per acre on clay soil. Experiment in season 1907. Results also shown in Photograph No. 4.

FERTILIZER PER ACRE IN POUNDS.

PLOT.	1	2	3	4	5	6	7	8	9
Banner Bone Flour	0	125	....	125	....	125	125	....	0
Acid Phosphate	0	....	300	....	300	....	....	....	0
Muriate of Potash	0	....	....	60	60	30	120	60	0

YIELD PER ACRE.

Bushels Wheat	19.83	34.37	28.66	33.33	36.08	37.08	34.0	31.58	21.5
Pounds Straw	2740	3367	3570	3810	3855	4245	3880	3535	3430
Pounds per Struck Bus.	55	57	57	59	59	58	59	57	56

(3) SPECIAL CROPS.

At present more than 700,000 acres of land are planted each year in this country with tobacco, and the average annual crop amounts to over 600,000,000 pounds and the value of the manufactured products from tobacco is estimated at $200,000,000, or nearly half the value of our flouring mill products. Of the amount produced Indiana grows an annual yield of about 10,000,000 pounds of tobacco.

Four chief classes are known in the trade: (1) Cigar leaf, (2) Export types, (3) Bright leaf manufacturing, (4) Perique.

No. 4. Showing comparative wheat yield from one acre. Ernest P. Welborn, Posey County.

The export types and the Burley tobacco belonging to the third class are the class chiefly grown in Indiana.

The State grows about 8,000 acres of watermelons, and 2,500 acres of cantaloupes, and the counties of the southwestern part of the State are the big growers, Gibson, Knox and Sullivan taking the lead, with Jackson in the central southern, striving for fourth or fifth place in the production of watermelons, and second in the acreage of cantaloupes. A light, rich, sandy loam is best for these crops, and good yields can never be secured on a wet, heavy soil. Farmyard manure is useful in growing melons. Commercial fertilizer should contain nitrogen 3 per cent., potash 8 per cent., and available phosphoric acid 8 per cent.

There are excellent opportunities in Southern Indiana for canning factories. Tomatoes, peas, sweet corn, pumpkins, etc., can be grown very profitably, and a number of localities are anxious to secure canning factories.

(4) TRUCK FARMING AND FRUIT GROWING.

The successful farmer does nothing but farm. He invests his money as fast as made in a way to improve the farm. He informs himself by books, magazines and farm journals as to the best methods, so he can do his work intelligently. No dilapidated buildings, tumble-down fence, tall weeds, neglected implements, nor unsheltered stock are to be found upon such a farm, but everything is attended to with the purpose of making everything count.

He is a poor farmer, indeed, who does not know how to produce a crop of grain, or fatten a carload of cattle, or care for his dairy herd that his milk may be the most wholesome on the market; he is a poor market gardener who cannot turn off a sound lot of potatoes, or celery, or onions; the fruit grower has missed his calling who cannot make his vines and trees yield liberal quantities of attractive fruits.

The chief object of every truck farmer is to make money. But in truck farming as in every other business, the most successful are usually those who have the most experience. There is, however, some difference between truck farming and general farming. Thus in most cases the truck farmer, who grows a great variety of garden crops, must show more knowledge, care and attention than does the general farmer who raises only the staple crops. A most successful farmer who turns his attention to truck farming may fail because he does not understand the "intensive" farming which he is trying to do on general farming principles.

Markets and Marketing.—No particular discredit must be attached to one engaged in any branch of agriculture who is not fully posted on all the ins and outs of marketing farm products. In these days of sharp competition it is of prime importance that the agriculturist should not only know how to raise a crop, but should know how to dispose of it so as to get the most profit from his money and his labor.

Until recently the large truck farms were generally located near the big cities. But today, with the splendid transportation facilities, low rates and the improved methods of handling fruits and vegetables, it is not necessary to be very near the large cities, where the prices of truck land are sure to be high. Thus the "out of town" gardener, if he has these transportation facilities, can compete on almost equal terms with his rivals near the large cities.

Among the simplest methods of marketing produce is peddling it direct from wagon to the doors of consumers in villages, towns and cities. While this method is one much employed by small farmers, gardeners and fruit growers, it can at the same time be profitably carried on to a considerable extent if the business is thoroughly developed, even though from a small beginning. Innumerable families in all of our towns, who are entirely dependent upon purchases for food supplies, are very glad to secure an important part direct from producers. They demand strictly fresh and sound produce, however, and for such are willing to pay full market prices. In many instances families will be willing to pay a little more for something especially nice, rather than buy something a little less desirable at the store even at a lower rate.

This suggests that the farmer's wagon must be first-class in every respect, attractive in appearance and the produce must be sound and of the best quality. It is a mistake to presume that the average housekeeper will pay a bonus to get fresh country produce; she is willing to pay a full price, but that is all. In securing this, the producer should be satisfied, because he saves all the middlemen's charges, and it is usually a quick trade with immediate and profitable returns. A second method of disposing of farm produce is to sell to a local grocer or marketman. This has some advantages, but like the first named can only be carried on in a limited way. Frequently, however, the local retailer with an established trade can handle the product of the small farmer and gardener to mutual advantage.

In producing on a large scale the farmer can sell his grain, live stock, poultry, eggs, fruit, vegetables, etc., direct to local buyers, who in turn has his established outlet at distant large points of consumption and distribution, and often accumulating a carload or more from various farmers, ships as market conditions warrant. One thing in favor of this plan is the securing of a known price for the produce without fear of loss through dishonest agents and the expense of transportation rates. But a positive drawback is that the local middleman must take out a considerable profit to himself in order to protect against shrinkage, loss and decline in prices. A fourth method is shipping produce direct to consumers at distant points, previously secured by working up a trade from a small beginning. This is often a favorite and successful method, where the farmer has taken pains to establish a reputation for his goods and honest pack and count. The fifth method is selling through the commercial merchant, who handles by far the greater part of the farmer's supplies. This is true of perishable products, such as fruits and vegetables, but less true of poultry, eggs, hay, etc. As for grain, live stock, etc., they are frequently sold by the farmer to the local country buyers who trade through the hands of commission merchants in large cities. Thus to a great extent the commission merchant is the agent of the producers and shippers, standing for their best interests, and for his compensation in a way of common charges endeavors to do for the producer and shipper what he could not do for himself.

Whatever plan of selling the producer selects, the market must be big enough to take care of any usual supply of perishable goods, and, to be absolutely profitable, must be large enough to take care of a supply which for a time is even greater than usual.

REPORT OF THE STATE NATURAL GAS SUPERVISOR FOR THE YEAR 1909.

BY

B. A. KINNEY.

LETTER OF TRANSMITTAL.

Office of State Natural Gas Supervisor.
Marion, Indiana, Feb. 21, 1910.

Hon. W. S. Blatchley, State Geologist of Indiana:

Dear Sir—I have the honor to submit to you herewith the manuscript of my annual report as State Natural Gas Supervisor, the same being for the year 1909, and the eighteenth report issued from this office.

Again acknowledging the cordial support that I have received from you while I have had charge of this office, and thanking you for the same, I remain,

Yours very truly,
B. A. Kinney,
State Natural Gas Supervisor.

Annual Report of State Natural Gas Supervisor.

THE PLUGGING LAW.

The work of this department for the past year was greatly increased and made much more beneficial for the welfare of the State of Indiana by the passage of the new well-plugging law. Up to this time it has been practically impossible for the department to get at the persons who were illegally pulling abandoned wells without properly plugging them. The evils that were attributed to this illegal and improper plugging were: (1) the lowering of fresh water veins twenty feet farther down in limestone since the discovery of gas and oil, due to water being allowed to flow down into Trenton Rock and penetrate oil and gas-bearing sands; (2) the tainting of the drinking water by salt water and oil rising in the above-mentioned wells to the water veins; (3) the drowning out of the gas and the spoiling of good oil wells by the flood of fresh water from above.

As to the second of these evils, I can say that here in Grant County, the drinking water has, during the past year, become entirely free from the unpleasant crude-oil taste that it formerly had. Occasional visitors have noticed this fact and have commented upon it. As to the third of the above-mentioned evil results of bad plugging, there has been, where legal plugging has been most extensive, a slight increase in gas pressure. Though this increase is slight at present, many oil and gas producers are looking for a big improvement in this way. The great decrease of gas in the old Gas Belt was the immediate result of two great evils, namely, pumping and the drowning out of the gas by fresh water.

The law reads as follows:

Natural Gas Supervisor—Plugging Wells.

Section 1. Be it enacted by the General Assembly of the State of Indiana, That before the casing shall be drawn from any well drilled into gas or oil-bearing rock for the purpose of abandoning the same, it shall be the duty of any person, firm or corporation having the custody of such well, or having charge of removing the casing therefrom for the purpose of abandoning the same, at the time of such abandonment, to properly and securely stop and plug each of said wells so abandoned in the following manner: Such hole shall first be solidly filled from the bottom thereof to a point at least twenty-five (25) feet above such gas or oil-bearing rock with sand, gravel or pulverized rock, on the top of which filling shall be seated a dry pine-wood plug not less than two (2) feet long, and having a diameter of one-fourth of an inch less than the inside diameter of the casing of such well; above such wooden plug such well shall be solidly filled for at least twenty-five (25) feet with the above mentioned filling material; immediately above this shall be seated another wooden plug of the same kind and size as above provided, and such well shall again be solidly filled for at least twenty-five (25) feet above said second plug with such filling material. After the casing has been drawn from such well there shall immediately be seated at the point in said well where such casing was seated a cast-iron ball, the diameter of which ball shall be greater than that of the hole below the point where such casing was seated, and above such ball such well shall again be solidly filled with the above-mentioned filling material for a distance of fifty (50) feet. Any person, firm or corporation owning or having charge or supervision of any well which has been drilled into gas or oil-bearing rock, or having charge or control of removing the drive pipe or casing from any such well, and from which the drive pipe and casing or the drive pipe alone has been or shall be pulled, leaving therein the tubing, casing, or both, shall give notice to the state natural gas supervisor, and under the supervision and direction of said supervisor, or one of his assistants, shall plug such tubing where such tubing only remains in such well, and shall fill from the bottom up not less than three hundred (300) feet with cement and clean sand, one part Portland cement to four parts of sand, and where the casing and tubing remain in any such well, such well shall be filled on the packer with not less than fifty (50) feet of Portland cement and sand, and if there be no such packer, with not less than one hundred (100) feet of Portland cement and sand in the proportion hereinbefore indicated, and in all cases where the drive pipe and casing or either the drive pipe or casing are removed from any such well and the tubing is left therein said tubing shall be plugged as herein provided, and if any part of the tubing, drilling stem or other substance prevent the plugging of any such well or wells as hereinbefore provided, such well or wells shall be filled to a point within twenty-five (25) feet of the top part of said tubing, drill stem or substance with sand, gravel or crushed stone, and shall thereupon be filled to a point twenty-five (25) feet above such part of tubing, drill stem or substance with Portland cement and sand, all proportioned as above provided.

Notice to Supervisor—Fee.

Sec. 2. Any person, firm or corporation, before proceeding to plug any such well so drilled into any gas or oil-bearing rock, or to pull the casing or drive pipe therefrom, shall notify the state natural gas supervisor, or one of his authorized assistants, of such intention, and the time and place where such plugging is to be done, and it shall be the duty of said natural gas supervisor or his duly authorized assistants, to be present in person all the time while such plugging is being done, and the same shall be done under his instructions and supervision, and such person, firm or corporation so plugging such well shall file, or cause to be filed, in the office of the recorder of the county in which any such well is located, within fifteen days after the same has been plugged, as provided in section one (1) hereof, a written statement of such state natural gas supervisor, or his duly appointed assistant, showing that such well was duly plugged under his personal supervision and instruction and in the manner herein prescribed and required, which statement shall be recorded in the miscellaneous records in the office of such recorder. And for supervising and superintending the plugging of any such well said person, firm or corporation plugging such well or having the same done, shall pay in advance of doing any such work or plugging a fee of five dollars ($5.00) to the state natural gas inspector or his assistants, to be by them turned into the state treasury.

Assistants—Compensation.

Sec. 3. For the purpose of enforcing the provisions of this act and supervising the plugging of said wells the state natural gas inspector shall appoint such assistants as he may deem necesary, who shall receive for their services for such supervision in the plugging of each well the sum of five dollars ($5.00), to be paid by the treasurer of state each month, upon a warrant drawn by the auditor of state, upon a verified statement made by said assistants showing the wells plugged by him during such month, their location, the date when plugged and by whom the fee has been paid, and file the same with the auditor of state. Such verified statement shall, before any warrant is drawn thereon or therefor, be approved by the state natural gas supervisor, and in no event shall any such assistant be paid any such fee until the same shall have been (paid) into the treasury of state as herein provided.

Salt Water or Oil.

Sec. 4. It shall be the duty of every person, firm or corporation who sinks or maintains a well to the depth of the oil or salt-bearing strata to prevent the salt water or oil of any such well from flowing into fresh water strata of that or any other well.

Fresh Water—Casing Off.

Sec. 5. It shall be the duty of any person, firm or corporation sinking a well into any gas or oil-bearing rock, or maintaining the same after it has been sunk, to case off and keep cased off all fresh water from such well until such well has been plugged as herein provided.

Powers of Supervisor.

Sec. 6. For the purpose of enforcing the provisions of this act the state natural gas supervisor is hereby authorized and empowered to enter upon any land at any time for the purpose of examining or testing any such well or wells for the purpose of plugging the same, and said supervisor and his assistants are hereby given police powers to arrest persons found violating any of the provisions of this act.

Penalty.

Sec. 7. Any person, firm or corporation violating any of the provisions of this act shall, on conviction, be fined in any sum not less than one hundred dollars nor more than one thousand dollars, to which may be added imprisonment in the county jail not to exceed six months.

Repeal.

Sec. 8. All laws and parts of laws in conflict herewith are hereby repealed.

Emergency.

Sec. 9. Whereas an emergency exists for the immediate taking effect of this act, the same shall be in full force from and after its passage.

Heretofore it has been impossible for this department to hire a sufficient number of deputies to enforce proper plugging. However, the new law remedies this by the clause providing that before a well can be plugged the department must be notified, and by the fee clause by which inspectors are paid. In compliance with the law the department has had thirty-nine deputy inspectors at work plugging 3,029 wells in thirty-one counties of the State of Indiana. These wells were plugged between April 1, 1909, and January 1, 1910. It can easily be seen what a vast amount of damage could have been done if these wells had not been properly plugged. There has not been a single instance reported where pullers have failed to notify the office when there was plugging to be done. It can easily be seen that the law is working splendidly.

The following table will show the distribution of the above mentioned wells as plugged in counties and by months:

COUNTIES.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Total.
Adams	2	15	2	....	15	10	1	26	11	82
Allen	....	1	....	....	....	....	....	....	....	1
Blackford	27	33	28	16	72	53	69	39	23	300
Cass	....	....	....	....	1	....	....	....	1	2
Delaware	10	12	7	4	43	42	9	19	5	151
Gibson	....	8	2	....	1	....	....	5	2	18
Grant	64	143	130	88	61	83	102	65	52	788
Greene	....	1	....	....	....	....	....	....	....	1
Hamilton	....	3	....	1	4	....	5	3	3	19
Hancock	1	1	....	3	4	5	8	3	....	25
Harrison	....	....	....	....	....	....	....	....	1	1
Henry	1	1	1	....	5	4	....	....	....	12
Howard	13	12	26	5	11	16	10	14	6	113
Huntington	39	65	29	36	28	55	46	16	....	314
Jay	5	10	1	8	10	18	10	17	8	87
Knox	....	....	....	....	....	....	1	....	....	1
Lawrence	....	....	....	....	....	....	....	....	1	1
Madison	4	14	20	14	10	5	8	12	5	92
Marion	....	....	....	....	1	....	....	....	....	1
Miami	1	....	1	....	....	1	....	....	....	3
Pike	1	2	3	1	2	....	....	6	2	17
Pulaski	....	....	....	....	....	....	2	....	....	2
Randolph	2	....	2	10	18	7	3	25	2	69
Rush	1	2	2	....	2	2	....	....	....	9
Spencer	....	....	....	....	1	1	....	3	....	9
Sullivan	2	....	....	....	....	....	....	....	....	2
Tipton	....	....	4	....	2	1	....	1	1	9
Wabash	....	2	....	....	....	2	....	....	1	5
Warrick	1	....	....	....	....	....	....	....	....	1
Wayne	....	1	....	....	....	....	....	....	....	1
Wells	86	82	95	140	127	68	85	100	54	837
Total	....	....	....	....	....	....	....	....	....	3,029

THE OLD FIELD.

To sum up in a few words the conditions of the old North Field, it can be said that owing to the results of the new plugging law the pressure for the whole field is improving. Drilling is still going on and many producers have hopes that there will be a rejuvenation of this field.

The Condition of the Central-Eastern Indiana Field.

There is an idea prevalent among many people of the State of Indiana that the day for the use of natural gas as a fuel is at an end. This idea is most assuredly a mistaken one. One has but to visit Greensburg, Rushville, Knightstown, Connersville, Shelbyville, or other cities and towns of central-eastern Indiana to find this out. In Rushville there are four gas companies doing business, three of which are using gas from a total of eighty-six wells, which have a rock pressure varying from 100 pounds to 360 pounds. The records for these three companies are as follows:

People's Gas Company.

Number of wells operated	17
Average depth	825 ft.
Rock pressure varies from 100 to 300 pounds.	
New wells sunk in the past year	5
Wells abandoned	3

During the fall this company drilled a well that turned out to be a freak from the fact that at a depth of 550 feet they struck an abundant supply of gas, whereas the gas was never struck before at less than 825 feet. The record of the first test of this well is as follows:

3 seconds	75 lbs.
9 seconds	100 lbs.
15 seconds	125 lbs.
21 seconds	150 lbs.
27 seconds	175 lbs.
38 seconds	200 lbs.
51 seconds	225 lbs.
1:32 seconds	305 lbs.

After using this well for three months another test was made, giving the following results:

6 seconds	25 lbs.
28 seconds	50 lbs.
53 seconds	75 lbs.
1:10 seconds	100 lbs.

The Rushville Natural Gas Company.

Number of wells operated	32
Average depth	850 ft.
Average rock pressure	150 lbs.
Number wells drilled in past year	6
Number wells abandoned in past year	2

Central Fuel Company.

Number of wells operated	37
Average depth	900 ft.
Average rock pressure	100 to 300 lbs.
Number wells drilled in past year	6
Number wells abandoned in past year	0

At Arlington, Rush County, there are two companies operating ten wells with an average rock pressure of seventy-five pounds. Besides this there are in Rush County more than 100 wells owned and operated by farmers for their own use. There are also numerous small incorporated companies scattered over the county. At Carthage a company is operating twenty-two wells with an average pressure of seventy pounds. At Gwynneville, Morristown and Fountaintown there are small companies furnishing the citizens with gas for household use.

In Decatur County the gas has been holding out very well. In Greensburg, where six companies are doing business, gas is being furnished in plentiful supply to the citizens at fifteen cents per 1,000 cubic feet. In addition to the companies operating here, there are companies in Clarksburg, Newpoint, Adams, St. Paul, Sandusky and Westport. There are also in this county 100 or more private wells sunk and owned by farmers for their individual use.

The companies at Greensburg are:

The Greensburg Natural Gas Co.

Operating	25 wells.
Average depth	900 ft.
Average rock pressure	75 to 240 lbs.
New wells drilled during past year	2

Greensburg Gas and Electric Light Co.

Number of wells operated during past year	30
Average depth	900 ft.
Average rock pressure	200 lbs.
New wells drilled during past year	5
Number of wells abandoned during past year	2

Muddy Fork Gas Co.

Number wells operated during past year	35
Average depth	850 to 875 ft.
Average rock pressure	200 lbs.
New wells drilled during past year	2

Dashiel Gas Co.

Number of wells operated during past year.......	8
Average depth..................................	910 ft.
Average rock pressure.........................	150 lbs.
New wells drilled during past year..............	1
Number of wells abandoned during past year.....	2

Mr. Chas. R. Porter, of the Greensburg Natural Gas Company, in a letter telling of the condition of this field, says: "The gas is developed in the Niagara shale and is found at a depth of 860 to 900 feet. It is in limited quantity, probably due to the density of the stone. In the drillings of all the work in this county there has never been found, to my knowledge, a piece of porous rock. We undoubtedly get the gas through crevices by shooting with large amounts of nitro-glycerin—usually sixty quart shots."

At Connersville the Connersville Natural Gas Company is furnishing gas at fifty cents per 1,000 cubic feet. The record of this company is:

Number of wells operated........................	30
Average depth..................................	900 ft.
Average rock pressure..........................	125 lbs.
Number of new wells drilled in past year.........	5
Number of wells abandoned in past year..........	5

In Henry County there are companies operating at Knightstown, Newcastle, Spiceland, Shirley and Kennard. At Knightstown the Knightstown Gas Company is using gas from thirty to thirty-five wells giving a pressure of from 40 to 100 pounds. During the past year they have drilled three successful wells. The Soldiers' and Sailors' Orphans' Home is using gas from five wells. Besides, there are probably twenty-five individual wells within a radius of ten miles of Knightstown. At Newcastle the Citizens' Natural Gas Company is using gas from ten wells, and the Light, Heat and Power Company is still using some natural gas.

At Cambridge City the Cambridge Natural Gas Company is operating with thirty-five to forty wells in Henry, Rush and Fayette counties. The pressure in the eastern part of this field, which is practically new territory, runs from 175 to 280 pounds. The depth at which gas is found here varies from 850 to 930 feet. This company has drilled five good wells and is still drilling.

At Winchester, Randolph County, the Rock Oil Company is furnishing gas to the citizens from fifteen wells having a rock pressure of 150 pounds. During the year they drilled four new wells and pulled none.

It can be seen from these statistics that though the pressure is failing in some localities it is gaining in others, that more wells are being drilled than are abandoned, and that natural gas is still a factor in this old field of central-eastern Indiana.

The New Field.

The past year in the Southern Field has been one of great activity. This field now covers parts of Pike, Gibson, Spencer and Martin counties. Operations have begun in Warrick County and several bores are being put down.

Big operators are planning to drill a chain of five test wells covering a territory running from Vincennes, Knox County, to the Kentucky line at Rockport, Spencer County. This is an attempt to find the link between the Kentucky and the Illinois fields. Up to the present time but one of these wells has been completed, this one being at Gentryville, Spencer County. This location is twenty-five miles southeast of the Oakland City field. This well produced 1,000,000 cubic feet of gas the first twenty-four hours with a rock pressure of 425 pounds. It is practically a proven fact that this is a continuation of the Pike County field, as the formations passed through were almost identical as in the Pike County wells. The record for the Gentryville well is as follows:

Drilled by The Southern Oil and Gas Company on the Fred Fakes farm, Sec. 3, Range 6 W., Jackson Township, Spencer County:

	Feet.
10-inch drive pipe	80
8-inch drive pipe	400
Showing of oil	720
6¼-inch casing	900
Gas sand	990
Finished	1,025

Rock pressure, 425 pounds.

Capacity of first twenty-four hours, 1,000,000 cubic feet.

The first gas well drilled in the Oakland City field, in Pike County, was the one on the M. Burnett farm, drilled by the M. Murphy Oil Company in April, 1908. This well had a capacity of 5,000,000 cubic feet. From time to time it has been gauged by the department and gave a minute pressure of 325 pounds, that is to say it took the well one minute to gather the above pressure. The well has at various times had two pumping powers and seven drilling wells attached to it and at the same time gave a test of

120 pounds pressure at the well. This goes to show that there must be a great reservoir of gas to draw from. The rock pressure for the well at the present time is 475 pounds.

Records for various wells drilled in the Oakland City field during the past year are as follows:

A well on the Butler farm, Sec. 23, Range 14 E., Monroe Township, Pike County, drilled February 20, 1909, by the M. Murphy Oil Company; rock pressure 475 pounds; daily capacity 2,000,000 cubic feet.

A well on the Simpson Burnett farm, Sec. 23, Range 8 W., Monroe Township, Pike County, drilled by the Monroe Oil Company, August, 1909; rock pressure 500 pounds; daily capacity 6,500,000 cubic feet. This is the best gas well in the State of Indiana.

A well on the M. Skinner farm, Sec. 23, Range 8 W., Monroe Township, Pike County; rock pressure 485 pounds; daily capacity 1,200,000 cubic feet.

Well No. 1 on the Case farm, Monroe Township, Pike County, drilled by the Rogers Oil and Gas Company, April, 1909; rock pressure 500 pounds; capacity 2,000,000 cubic feet.

A well on the Peter English farm, Sec. 26, Range 8 W., Pike County, drilled by John McCray, May, 1909; rock pressure 475 pounds; capacity 2,000,000 cubic feet.

The Petersburg field has been reopened by a well drilled on the Wm. Lamb farm, about one mile southwest of Petersburg. This field was at one time one of the most promising gas-producing pools in the State of Indiana. About a mile from the above mentioned well was located the famous "Jumbo" well, at one time the largest producing well in the State. It furnished gas for the city of Petersburg for several years, and would undoubtedly be producing at the present time had it had the proper attention, but owing to leaky casing fresh water was allowed to drown out the gas. This was ascertained too late to remedy the evil and save the well.

The record for the well on the Wm. Lamb farm is (location Sec. 28, Washington Township, Pike County):

	Feet.
13-inch drive pipe	57
10-inch drive pipe	124
8¼-inch casing	791
6¼-inch casing	1.075
Top of gas sand	1,162

Drilled in 3 feet.
Tested 3,162,000 cubic feet capacity.
Completed March 24, 1909, by Queen Bros. and Fenton.

Two more wells are being drilled in this township and an attempt is being made to connect this field with the Oakland City field.

In conclusion, I will say that it is reported on good authority that companies are being organized and franchises sought to furnish gas to numerous cities in these southern Indiana counties. But, owing to the small acreage of gas-producing land yet developed in this district, there is but one city in this field that is now being furnished with gas, that being Oakland City. A line is being laid to furnish Petersburg, and it is but a question of a short time until that city is again using natural gas as a fuel.

During the past year eighty oil and gas bearing wells have been completed, fifty of which produce more or less gas. At present there are at least fifty strings of drilling tools at work in this field, and it is impossible to procure leases in or around either the Oakland City or the Petersburg branch of the field. The coming year will undoubtedly be the banner year for southern Indiana, as oil and gas men are flocking there from all parts of the country.

REPORT OF THE STATE INSPECTOR OF MINES FOR THE YEAR 1909.

BY

JAMES EPPERSON.

LETTER OF TRANSMITTAL.

Office of Inspector of Mines,
Indianapolis, February 23, 1910.

Prof. W. S. Blatchley, State Geologist:

Dear Sir—I have the honor to submit to you herewith my eleventh annual report as Inspector of Mines, covering the calendar year of 1909, and being the Thirty-first Annual Report of this department and Nineteenth made to the Department of Geology and Natural Resources.

I trust it will receive your approval and be found worthy of consideration by the public.

James Epperson,
Inspector of Mines.

CONTENTS.

Thirty-First Annual Report of the Inspector of Mines for the State of Indiana.

GENERAL INFORMATION RELATING TO THE MINING INDUSTRY FOR THE YEAR ENDING DECEMBER 31, 1909.

In preparing this report we present no topic that is not required of us by statute. The same general subjects are included as in our former reports, viz., Coal Production, Condition of Coal Trade, Mining Statistics, Mine Accidents and Recommended Legislation.

In arranging and treating each of these subjects we have endeavored to meet the requirements of the general public and those directly interested in the business of mines and mining.

The past year has brought the usual numerous inquiries for specific information concerning each of the subjects embraced in the report, and, prompted by such inquiries, we have changed the arrangement of some of the statistical tables, making the information more complete.

In arranging the table of mine employes for the present report the total number of each class and the aggregate number of employes for the State are given, subdivisions are made, and those employed in the block and bituminous mines, the machine and hand mines are each exhibited separately. The number of accidents to mine employes and the different causes of accidents are reported more accurately than heretofore, and under recommended legislation we recommend amendments to a number of the present mining laws and the enactment of new laws for the prevention of such accidents.

A reference to each of the various subjects included in the report may be found in the following summary, which contains all the important totals and averages for the year:

SUMMARY OF TOTALS AND AVERAGES FOR THE YEAR 1909.

Number of coal-producing counties	18
Number of counties having shipping mines	13
Number of coal seams operated	6
Number of new coal companies organized	6
Total number of coal companies operating in the State	104
Number of new block coal mines opened	2
Number of new bituminous mines opened	10
Total number of new mines opened	12
Number of block coal mines abandoned	1
Number of bituminous mines abandoned	11
Number of block coal machine mines in operation	4
Number of block coal hand mines in operation	22
Number of block coal hand mines idle during entire year	4
Number of block machine mines idle during entire year	0
Number of bituminous hand mines in operation	72
Number of bituminous machine mines in operation	62
Number of bituminous hand mines idle during entire year	23
Number of bituminous machine mines idle during entire year	3
Total number of machine mines in the State	69
Total number of hand mines in the State	121
Total number of mines employing more than ten men	190
Number of hand miners, block mines	1,132
Number of machine runners and helpers, block mines	40
Number of loaders, block mines	137
Number of inside day and monthly employes, block mines	386
Number of outside day and monthly employes, block mines	158
Total employes, block mines	1,853
Number of hand miners, bituminous mines	6,638
Number of machine runners and helpers, bituminous mines	1,008
Number of loaders, bituminous mines	4,572
Number of inside day and monthly employes, bituminous mines	3,478
Number of outside day and monthly employes, bituminous mines	1,359
Total number of employes, bituminous mines	17,055
Total number of mine employes	18,908
Number of mules used, block mines	152
Number of mules used, bituminous mines	1,340
Total number of mules used in all mines	1,492
Number of kegs powder used in block mines	44,831
Number of kegs powder used in bituminous mines	376,715
Total number of kegs of powder used in the State	421,546
Aggregate number of days block coal mines were operated	4,295
Average number of days, per mine, block machine mines were operated	195
Average number of days, per mine, block hand mines were operated	155.4
Aggregate number of days bituminous mines were operated	22,749

Average number of days, per mine, bituminous hand mines were operated	151.3
Average number of days, per mine, bituminous machine mines were operated	191.2
Tons hand-mined block coal	594,038
Tons machine-mined block coal	124,175
Total tons of block coal produced	718,213
Tons hand-mined bituminous coal	5,975,680
Tons machine-mined bituminous coal	6,998,196
Total tons bituminous coal produced	12,973,876
Total production for the State	13,692,089
Tons block coal shipped outside the State	470,432
Tons block coal consumed in the State	247,781
Tons bituminous coal shipped outside the State	5,376,037
Tons bituminous coal consumed in the State	7,597,839
Total tons coal shipped outside the State	5,846,469
Total tons coal consumed in the State	7,845,620
Wages paid to block coal miners	$632,553.29
Wages paid to inside day and monthly employes, block mines	$239,381.87
Wages paid to outside day and monthly employes, block mines	$115,427.19
Total wages paid to block coal employes	$987,362.35
Wages paid to bituminous miners	$7,191,064.45
Wages paid to inside day and monthly employes, bituminous mines	$2,321,162.26
Wages paid to outside day and monthly employes, bituminous mines	$880,461.98
Total wages paid to bituminous mine employes	$10,392,688.69
Grand total wages paid to mine employes	$11,380,051.04
Average earning per mine employ for the year	$601.86
Total average cost per ton for mining block coal	$1.37
Total average cost per ton for mining bituminous coal	.80.1
Total average cost per ton for entire production of the State	.83.1
Total money expended on improvement	$68,743.32
Number of fatal accidents	50
Number of permanent accidents	8
Number of serious accidents	525
Number of minor accidents	546
Total number of accidents to mine employes	1,129
Number of accidents to mine property	8

TABLE

Showing by Months and by Counties the Number of Tons Mined and Wages Paid to Employes for the Year 1909 at Mines Employing More Than Ten Men.

MONTH.	CLAY COUNTY.		DAVIESS COUNTY.	
	Tonnage.	Wages.	Tonnage.	Wages.
January	97,786	$85,370 66	3,300	$4,391 00
February	80,734	83,526 68	2,927	3,856 35
March	75,942	82,834 78	2,800	799 45
April	76,331	75,109 31	2,650	665 91
May	57,428	63,625 97	2,579	3,509 08
June	73,510	60,064 74	2,317	3,134 00
July	53,510	78,268 57	1,850	1,270 00
August	68,126	80,281 25	3,718	3,081 44
September	69,792	91,580 06	5,313	4,483 96
October	83,257	96,961 18	6,448	5,602 20
November	88,442	95,974 09	6,489	5,423 09
December	83,709	95,635 83	7,381	6,633 90
Total	912,567	$989,233 12	47,772	$42,850 38

MONTH.	FOUNTAIN COUNTY.		GIBSON COUNTY.	
	Tonnage.	Wages.	Tonnage.	Wages.
January	No mines operating.		21,578	$20,665 46
February			21,819	19,568 15
March			17,603	15,730 14
April			10,134	10,171 17
May			9,865	8,660 85
June			9,629	8,525 79
July			11,584	11,247 46
August			16,888	15,976 69
September			18,534	19,619 29
October			23,665	21,690 16
November			22,484	20,614 45
December			24,871	21,895 25
Total			208,654	$194,364 86

MONTH.	GREENE COUNTY.		KNOX COUNTY.	
	Tonnage.	Wages.	Tonnage.	Wager.
January	281,571	$146,986 97	35,438	$27,321 55
February	225,119	163,531 76	34,253	28,926 06
March	244,596	178,843 37	43,345	32,493 52
April	180,181	134,583 80	42,168	31,235 04
May	174,213	131,480 99	38,625	28,712 36
June	181,183	139,768 10	40,444	29,177 38
July	175,606	141,790 76	38,411	27,537 94
August	190,086	146,407 96	42,498	30,508 16
September	215,272	166,209 82	40,058	29,326 68
October	246,044	188,619 52	54,660	38,516 53
November	239,045	182,233 68	71,117	49,367 80
December	249,960	188,937 20	73,926	49,545 67
Total	2,602,876	$1,909,393 93	559,943	$402,668 69

MONTH.	PARKE COUNTY.		PERRY COUNTY.	
	Tonnage.	Wages.	Tonnage.	Wages.
January	58,826	$56,899 62		
February	57,206	56,851 34		
March	52,991	52,700 15		
April	49,967	49,282 08	706	$663 30
May	48,359	48,751 90	602	579 15
June	49,720	49,118 72		
July	58,889	52,446 92		
August	55,200	64,288 95		
September	66,816	68,649 61		
October	71,664	70,852 01		
November	67,961	68,156 37		
December	65,415	63,883 04		
Total	703,014	$701,880 71	1,308	$1,242 45

MONTH.	PIKE COUNTY.		SULLIVAN COUNTY.	
	Tonnage.	Wages.	Tonnage.	Wages.
January	40,097	$33,793 80	253,916	$194,360 17
February	37,104	30,783 28	220,675	178,252 31
March	28,337	24,770 22	200,821	183,413 60
April	24,150	19,118 24	204,523	171,891 44
May	21,303	17,267 57	164,217	155,506 75
June	14,011	11,380 20	152,663	135,006 60
July	16,351	13,176 29	177,823	154,417 48
August	20,297	22,203 08	194,635	170,356 25
September	35,064	22,032 19	257,305	207,561 70
October	38,217	29,130 20	300,006	241,435 82
November	36,687	28,320 62	318,743	251,030 26
December	50,564	38,359 43	335,243	271,207 83
Total	372,182	$290,535 12	2,800,570	$2,314,440 21

MONTH.	VANDERBURGH COUNTY.		VERMILLION COUNTY.	
	Tonnage.	Wages.	Tonnage.	Wages.
January	22,843	$26,594 72	117,901	$94,079 17
February	28,470	23,817 15	95,820	83,754 82
March	23,266	22,400 26	103,564	85,594 47
April	15,259	14,899 43	123,803	96,956 38
May	8,245	9,437 42	100,057	88,565 97
June	11,124	12,205 67	108,441	97,762 40
July	12,312	13,386 13	111,354	96,081 23
August	15,756	14,654 73	86,315	79,867 09
September	18,142	17,720 06	92,451	83,556 99
October	29,020	26,060 40	127,242	100,843 78
November	24,532	22,181 01	137,902	118,159 66
December	38,257	32,590 43	145,203	126,182 00
Total	250,218	$235,949 41	1,350,053	$1,151,403 96

MONTH.	VIGO COUNTY.		WARRICK COUNTY.	
	Tonnage.	Wages.	Tonnage.	Wages.
January	347,319	$224,140 18	31,883	$22,798 30
February	315,311	315,178 66	27,207	20,682 97
March	263,126	217,817 01	35,876	23,820 78
April	257,312	212,055 32	23,069	16,589 87
May	188,564	210,200 36	27,234	19,017 75
June	257,757	216,416 29	23,846	17,326 21
July	240,466	213,388 25	25,585	17,632 76
August	286,097	220,613 05	27,552	18,309 06
September	267,894	233,180 64	34,914	24,077 19
October	311,637	269,000 93	40,599	27,846 28
November	366,790	256,585 95	45,576	32,235 78
December	388,076	281,842 27	49,242	35,332 34
Total	3,490,349	$2,870,418 91	392,583	$275,669 29

REVIEW OF COAL TRADE AND MINING CONDITIONS.

The mining situation in Indiana during the year 1909 was peculiar in some respects. From January 1 to the latter part of March market demands were fairly good and the mines generally were operated better than three-fourths time. Selling prices for that period ranged from 90 cents to $1 per ton for mine run bituminous coal f. o. b. cars at the mine. During the period beginning the latter part of March and extending over into the early part of August the coal business was in an exceedingly depressed condition; market demands were poorer than for years, competition strong, selling prices phenomenally low, ranging from 75 to 90 cents; practically all the mines in the State were operated considerably less than one-half time and hundreds of employes were idle. During the month of August, however, conditions began to improve; the market grew much stronger, and with an increasing demand for coal and for labor, by September 1 a majority of the larger producing mines were operated to their full capacity, furnishing employment to all the idle labor. Selling prices also advanced during the last four months in the year, ranging from 90 cents per ton in September to $1.40 in December.

Practically the same conditions prevailed in the block coal field as in the bituminous, with the exception of the difference in the selling price per ton.

Notwithstanding the above mentioned period of business depression, the total production for the year was 13,692,089 tons, an increase of 441,374 tons, or a fraction over 3 per cent. greater than any preceding year in the history of the State. Of this tonnage 12,973,876 tons were bituminous and 718,213 tons block coal. This shows an increase of 1,829,532 tons, or a fraction over 16 per cent. in bituminous production for 1909 over 1908, and 134,747 tons, or a fraction over 18½ per cent. less produced of block coal in 1909 than in 1908. This large increase in tonnage comes mainly from Greene, Sullivan, Vermillion and Vigo counties, and the greater portion was produced from machine mines. Vigo, with an increase of 872,434 tons, shows a larger increase than any other county, and of this increase 645,285 tons were bituminous machine mined coal.

The aggregate of wages reported for the year was $11,380,051.04, or an increase of $1,075,181.60 over 1908. Of the aggregate wages reported, $10,392,688.69 was paid to bituminous employes, making a cost of 80.1+ per ton for production. The average selling price for bituminous mine run coal for the year would be approximately $1 per ton f. o. b. car at the mine. The total wages reported for the block coal mines was $987,362.35, a cost of $1.23+ per ton for production. The selling prices for block coal ranged from $1.75 to $2.45 per ton for screened coal f. o. b. car at the mine. The lower prices prevailed during the dull season and the higher prices when the market demands were good. This would probably give an average selling price for the year at $2.45 per ton.

Of the total production, 7,845,620 tons, or 57 per cent., was consumed in Indiana. This shows an increase of about 1 per cent. gain in home consumption of the yearly production over any previous year.

The total number of mine employes reported was 18,908, a decrease of 184 in number under 1908, and the aggregate wages being $11,380,051.04, shows an average earning of $601.86 per mine employe, an increased earning of $62.12 per employe over 1908.

It has always been the policy of this department to make every reasonable effort to secure a conformance to the mining laws on the part of persons amenable to such laws without resorting to the courts, and each assistant to the department has instructions to that effect. Notwithstanding such efforts, we were compelled to make prosecutions in 1909 for violations of practically every mining statute relating to sanitary and safety conditions in mines. In many instances these prosecutions have caused an extremely bitter feeling toward the department on the part of the persons prosecuted. This is especially true of the miners and some of the mine bosses and mine owners in the Clinton field. The threats made in this field against the lives of some of our assistants have become so numerous that it is not deemed safe to permit an assistant to inspect some of the mines alone, and as a result two are required to make such inspections.

The manner in which we have enforced the mining laws, however, has resulted in a betterment of mining conditions generally, and so far as safety and sanitary conditions are concerned, Indiana mines will compare favorably with those of any other State in the Union.

Our report shows a total of fifty fatal accidents occurring to employes in and around the mines during the year, or a rate of one death for each 273,841 tons of coal produced, as against one death for each 266,606 tons in 1908. We deplore this great loss of life, yet our report shows several thousand tons greater production per death than any of the reports of other states we have examined. We also report a total of 8 permanent, 525 serious and 546 minor accidents occurring in 1909, the greatest number of accidents our report has ever shown in any one year. This, though, does not indicate that accidents in our mines are on the increase.

The table given in this report showing the different occupations of persons injured exhibits a list of twenty-two different occupations or classes of workmen, and the table of causes shows twenty different causes of accidents exclusive of miscellaneous, under which head a large number of serious and minor accidents are classed.

In a mine employing from 100 to 350 persons at the many different kinds of labor, and the numerous sources whereby accidents occur, there is seldom a day that some one is not injured more or less seriously.

We require a report of each and every accident, no matter how trivial, and have made numerous prosecutions for failure to report. As a result our record of accidents for 1909 is more complete than for any previous year.

LABOR TROUBLES.

There were but four strikes of consequence during the year. Those occurring affected only individual mines and were of short duration.

PIKE COUNTY.

May 10 the employes of the Pike County Coal Company, operating the Winslow Nos. 4 and 5 mines, came on strike on account of the company failing to meet its pay roll. The mine has been idle since that date, and we have not learned whether the company settled with its employes or not.

GREENE COUNTY,

July 16 the employes of the Summit Coal and Mining Company came on strike over the company refusing to pay for handling the dirt band or binder which divides the coal seam, and for the reinstatement of the mine committee who were discharged during the controversy. Pay for the time lost by the committee was also demanded. The mine remained idle until the 28th, when work was resumed pending a settlement of the difficulty by National President T. L. Lewis. Mr. Lewis rendered his decision September 16, by which decision-persons working in that part of the mine affected by the slate band were transferred to other places, and the mine committee were to be reinstated without pay for the time lost.

The question of pay for handling the slate band was referred back to the officials of the mine local and the company officials, for settlement, and was finally adjusted by the company agreeing to pay to the loader three cents per lineal yard in rooms having 6 inches and over of slate, and three cents per lineal yard in entries having 3 inches or over of slate.

VIGO COUNTY.

During the first of July the employes at the Grant No. 3 mine refused to go into the mine one morning on account of the condition of the approach to the escape shaft, which they contended was wet and muddy. The company claimed the stopping of the mine was in violation of the contract, and assessed a fine of $1 on each employe for the day's work lost, upon which the miners came on strike, and after an idleness of twelve days the matter was referred to President Lewis, who rendered an opinion in favor of the miners.

CLAY COUNTY.

During the month of July a difference came up between the O. S. Richardson Coal Company and its employes as to the price to be paid the miners for mine-run coal. Failing to agree on a price the miners came on strike and were idle twelve days, when the matter was settled in their favor and the mine resumed operations.

The average wages of all classes of employes are exhibited in the following table:

TABLE

Exhibiting the Number of Miners, the Number of Inside Day and Monthly Employes, the Number of Outside Day and Monthly Employes, the Total Wages Earned by Each Class of Labor, and the Average Earnings per Employe in the Block and Bituminous Mines, Each Shown Separately.

BLOCK COAL HAND MINES.

COUNTY.	Number of Miners.	Total Wages.	Average. Wages.	Inside Employes.	Total Wages.	Average Wages.	Outside Employes.	Total Wages. Wages.	Average Wages.
Clay	737	$379,056 39	$517 83	198	$139,409 89	$704 09	83	$65,790 89	$792 66
Parke	333	127,784 70	383 73	101	43,181 44	427 53	34	25,403 80	744 20
General average	1,070	$506,841 09	$473 68	299	$182,591 33	$610 67	117	$91,194 69	$779 44

BLOCK COAL MACHINE MINES.

COUNTY.	Number of Miners.	Total Wages.	Average. Wages.	Inside Employes.	Total Wages.	Average Wages.	Outside Employes.	Total Wages. Wages.	Average Wages.
Parke	43	$37,197 07	$865 05	27	$19,705 32	$729 82	10	$7,157 52	$715 75
Vigo	196	88,515 13	451 61	60	37,085 22	618 08	31	17,074 98	550 80
General average	239	$125,712 20	$525 99	87	$56,790 54	$652 76	41	$24,232 50	$591 03
General average for all block mines	1,309	$632,553 29	$483 23	386	$239,381 87	$620 16	158	$115,427 19	$730 55

BITUMINOUS HAND MINES.

COUNTY.	Miners.	Total Wages.	Average Wages.	Inside Employes.	Total Wages.	Average Wages.	Outside Employes.	Total Wages.	Average Wages.
Clay	250	$68,763 59	$275 05	74	$25,291 82	$341 78	20	$9,889 86	$494 49
Daviess	104	28,394 45	273 02	19	8,054 72	423 93	16	6,401 21	400 07
Fountain	Mines idle	during the year.	......	......	......	......	......	......	......
Greene	308	144,237 40	468 30	85	37,624 07	442 63	41	17,111 10	417 34
Gibson	172	132,372 89	769 34	56	45,836 47	818 50	21	16,155 50	769 30
Knox	24	8,928 99	372 04	7	7,590 32	1,084 31	5	3,453 42	690 68
Parke	233	119,713 46	513 79	68	36,125 26	531 25	30	14,935 07	497 83
Perry	12	721 05	60 08	2	298 55	148 27	2	222 85	111 42
Pike	364	134,430 80	369 31	101	40,660 75	402 58	50	19,657 03	393 14
Sullivan	323	94,921 43	293 87	103	32,549 62	316 01	52	22,820 02	438 84
Vanderburgh	298	156,892 90	526 48	79	48,174 25	609 80	47	30,882 26	657 06
Vermillion	1,154	801,811 52	694 81	254	175,681 08	353 48	75	42,276 29	563 68
Vigo	1,986	1,248,795 05	628 79	497	389,654 55	784 01	167	128,316 14	768 36
Warrick	151	29,525 36	195 53	26	10,095 42	388 28	25	5,064 05	202 56
General average	5,379	$2,969,508 89	$552 05	1,371	$857,636 88	$625 55	551	$317,184 80	$575 65

BITUMINOUS MACHINE MINES.

Clay	294	$196,490 91	$668 33	73	$74,143 80	$1,015 67	31	$30,395 97	$980 51
Greene	1,807	1,185,122 12	655 84	592	388,663 03	656 52	192	136,636 21	711 65
Knox	414	266,821 50	644 49	104	71,286 23	685 44	52	44,588 23	857 46
Parke	219	174,291 02	795 84	79	71,895 19	910 06	27	24,490 86	907 07
Pike	168	60,929 63	368 62	29	20,067 74	691 99	23	14,789 17	643 00
Sullivan	2,458	1,392,444 58	525 81	858	573,959 05	668 95	324	197,745 51	610 32
Vermillion	146	111,707 84	765 12	30	17,506 14	583 53	12	2,421 09	201 75
Vigo	995	670,530 50	673 90	270	207,548 68	768 60	94	82,898 66	881 90
Warrick	338	163,217 46	482 89	72	38,455 52	534 10	53	29,311 48	553 04
General average	6,839	$4,221,555 56	$617 27	2,107	$1,463,525 38	$694 60	808	$563,277 18	$697 12
Total general average bituminout mines	12,218	$7,191,064 45	$588 56	3,478	$2,321,162 26	$667 38	1,359	$880,461 98	$647 87
General average for all mines	13,527	$7,823,617 74	$578 37	3,864	$2,560,544 13	$662 66	1,517	$995,889 17	$656 48

Total employes in State 18,908. Total wages, $11,380,051.04. Average wages, $601.86.
NOTE.—Machine runners, helpers and loaders are classed as miners.

TABLE

Showing Number of Miners, Machine Runners and Helpers, Loaders, Inside Day and Monthly Men, Persons Employed Outside; Total Number of Employes at Each Mine, Number of Days Worked and Number of Mules Used; Totals by Counties, the Block and Bituminous Mines Shown Separately.

BLOCK HAND MINES.

CLAY COUNTY.

NAME OF MINE.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Brazil Block Coal Co. No. 1	31	11	4	46	248	6	1,578
Brazil Block Coal Co. No. 4	100	30	11	141	218	13	4,694
Superior No. 4	61	17	6	84	157	7	1,933
Crawford No. 2	32	18	6	56	194	4	874
Crawford No. 6	51	17	5	73	175	8	1,595
Crawford No. 8	21	5	4	30	182	2	799
Crawford No. 9	39	9	5	53	21	4	2,264
Crawford No. 10	51	12	6	69	164	3	2,769
Indiana Block No. 1	37	8	5	50	189	3	1,158
Plymouth No. 2	72	16	6	94	187	7	3,933
Monarch	24	7	2	33	299	5	1,132
Eureka No. 5	93	22	8	123	176	9	4,251
Treager	8	2	1	11	252	1	443
Harrison No. 5	13	1	2	16	104	1	1,868
Wizard	60	14	5	79	169	4	1,276
Progressive	27	7	5	39	87	4	299
German	17	2	2	21	117	1	175
Shefferman	....	....	....	....	....	....	....
Pyrah	....	....	....	....	....	....	....
Total	737	198	83	1,018	2,939	82	31,041

PARKE COUNTY.

NAME OF MINE.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Brazil Blk. No. 9	43	12	6	61	80	8	858
Brazil Block No. 12	21	6	4	31	69	2	181
Superior No. 2	78	27	8	113	131	11	2,200
Superior No. 3	71	19	7	97	69	8	736
Superior No. 5	120	37	9	166	191	14	5,603
Moore	Less than	ten men.					
Total	333	101	34	468	540	43	9,578
Totals for block hand mines	1,070	299	117	1,486	3,479	125	40,619

BLOCK COAL MACHINE MINES.

PARKE COUNTY.

NAME OF MINE.	Miners.	Machine Runners and Helpers.	Loaders.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Number Mules Used.	Powder.
Mary No. 1	6	10	27	27	10	80	246	9	352
Total	6	10	27	27	10	80	246	9	352

VIGO COUNTY.

NAME OF MINE.	Miners.	Machine Runners and Helpers.	Loaders.	Inside Employes.	Outside Employes.	Total. Employes.	Days Worked.	Number Mules Used.	Powder.
Mary No. 2	17	8	18	9	8	60	205	2	716
Plymouth No. 1	37	10	39	21	9	116	195	7	2,726
Domestic Block No. 1	2	12	53	30	14	111	134	9	418
Total	56	30	110	60	31	287	534	18	3,860
Total for machine block mines	62	40	137	87	41	367	780	27	4,212
Total for all block mines	1,132	40	137	386	158	1,853	4,259	152	44,831

BITUMINOUS HAND MINES.

CLAY COUNTY.

NAME OF MINE.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Vivian No. 1	Idle.						
Klondyke No. 3	37	14	7	58	51	2	244
Gifford No. 2	38	8	7	53	213	4	2,407
Vandalia No. 65	175	52	6	233	88	18	2,221
Total	250	74	20	343	352	24	4,872

DAVIESS COUNTY.

Winterbottom	12	2	3	17	176	1	405
Mutual	62	12	7	81	132	7	1,695
Mandabach	Idle.						
Winklepeck	Idle.						
Pine Island	Idle.						
Montgomery No. 4	30	5	6	41	170	2	1,088
Total	104	19	16	139	478	10	3,188

FOUNTAIN COUNTY.

All Mines Idle in 1909.

GREENE COUNTY.

Dickason	Idle.						
Sponsler	80	15	7	102	227	12	5,138
Antioch	Idle.						
N. Linton	Idle.						
Vandalia No. 3	46	20	8	74	68	8	745
Vandalia No. 4	60	26	10	96	4	5	65
Vandalia No. 6	Idle.						
Queen	87	18	7	112	219	7	4,490
Cherry Hill	20	3	6	29	41	3	358
Letsinger	Idle.						
P. & I.	Idle.						
Enterprise	15	3	3	21	158	2	721
Total	308	85	41	434	717	37	11,526

GIBSON COUNTY.

NAME OF MINE.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder
Oswald	137	44	12	193	225	23	7,368
Ft. Branch	27	10	6	43	189	2	1,408
Francisco	8	2	3	13	116	2	182
Total	172	56	21	249	530	27	8,958

KNOX COUNTY.

Bicknell	Idle.						
Wheatland	24	7	5	36	142	3	630
Total	24	7	5	36	142	3	630

PARKE COUNTY.

Fairview	84	15	9	108	181	8	3,119
Mecca No. 3	26	4	4	34	72	3	504
Vandalia No. 316	111	46	15	172	166	20	3,501
Harrison	12	3	2	17	100	2	1,000
Total	233	68	30	331	519	33	8,124

PERRY COUNTY.

Lincoln	12	2	2	16	100	2	600
Total	12	2	2	16	100	2	600

PIKE COUNTY.

Ayrshire No. 3	46	12	9	67	84	5	861
Ayrshire No. 4	113	31	19	163	118	10	3,294
Muren	40	12	8	60	140	5	993
Blackburn No. 1	21	5	4	30	108	3	746
Littles	144	41	10	195	154	14	4,928
Petersburg	Idle.						
Winslow No. 4 and 5	Idle.						
Muren	40	12	8	60	140	5	993
Hartwell No. 1	Idle.						
Hartwell No. 2	Idle.						
Hartwell No. 3	Idle.						
Total	364	101	50	515	604	37	10,822

SULLIVAN COUNTY.

Citizens	21	6	6	33	139	5	476
Keystone	61	15	9	85	175	7	2,218
Viola	51	20	13	84	185	7	2,702
Freeman	51	20	10	81	24	7	333
Hudson	129	37	9	175	40	13	1,300
Bellevue	10	5	5	20	141	1	287
Larsh	Idle.						
Total	323	103	52	478	704	40	7,316

VANDERBURGH COUNTY.

Name of Mine.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Diamond	42	10	10	62	140	6	1,624
Ingleside	62	18	10	90	175	9	1,552
Sunnyside	38	9	6	53	133	5	1,440
Unity	111	34	12	157	206	11	5,254
First Avenue	45	8	9	62	246	6	1,773
Total	298	79	47	424	900	37	11,643

VERMILLION COUNTY.

Name of Mine.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Dering No. 5	Idle.	....	....	....	....	....	....
Dering No. 7	109	33	10	152	99	12	3,008
Dering No. 8	165	45	11	221	228	19	9,967
Eureka No. 1	11	3	2	16	19	3	70
Crown Hill No. 1	251	40	13	304	255	20	16,496
Crown Hill No. 2	225	40	13	278	269	20	18,056
Oak Hill	24	8	6	38	127	2	1,132
Maple Valley	Idle.	....	....	....	....	....	....
Buck Eye No. 2	240	63	10	313	193	29	16,073
Klondyke 19	129	22	10	161	184	8	7,952
Total	1,154	254	75	1,483	1,374	113	72,754

VIGO COUNTY.

Name of Mine.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Riverside	15	4	2	21	49	1	353
Vandalia No. 66	117	44	12	173	213	20	5,164
Vandalia No. 67	184	54	16	254	215	29	6,822
Vandalia No. 81	73	27	12	112	252	11	4,484
Lawton	119	27	13	159	202	22	3,716
Victor No. 1	45	8	5	58	25	4	435
Lower Vein	200	45	10	255	200	19	9,586
Miami No. 1	66	20	7	93	271	6	3,103
Miami No. 2	99	27	8	134	294	13	5,085
Miami No. 3	63	25	9	97	209	11	4,087
Miami No. 4	133	20	7	160	275	8	8,159
Mami No. 5	New Mine.	no report.	....	....	....	....	....
Fauvre No. 1	36	14	7	57	31	5	377
Fauvre No. 2	51	10	8	69	211	4	3,565
Deep Vein No. 5	80	17	9	106	125	9	1,223
Ray No. 2	240	48	11	299	192	21	6,982
Sugar Valley	41	5	3	49	298	3	2,263
Dering No. 6	223	65	9	297	238	33	13,933
National	38	6	3	47	223	4	1,804
Pittsburg No. 1	101	17	9	127	276	5	No report.
Atherton	62	14	7	83	229	10	5,345
Total	1,986	497	167	2,650	4,028	238	86,536

WARRICK COUNTY.

Name of Mine.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Chandler	22	4	3	29	88	2	542
Red Shaft	Idle.	....	....	....	....	....	....
Castle Garden	25	5	4	34	51	2	256
Brizius	37	6	4	47	129	4	789
Elberfeld	24	5	5	34	92	3	350
Korff	21	3	4	28	43	1	180
Sargent	22	3	5	30	45	2	128
Total	151	26	25	202	448	14	2,245
Total for bituminous hand mines	5,379	1,371	551	7,301	10,896	615	229,204

BITUMINOUS MACHINE MINES.

CLAY COUNTY.

NAME OF MINE.	Miners.	Machine Runners and Helpers.	Loader.	Inside Employes.	Outside Employes.	Total.	Days Worked.	Mules Used.	Powder.
Lewis	15	16	45	11	7	94	105	5	478
Vivian No. 2	10	14	54	25	11	114	215	11	1,383
Island Valley No. 4	30	16	94	37	13	190	277	22	5,042
Total	55	46	193	73	31	398	597	38	6,903

GREENE COUNTY.

Black Creek	53	6	30	33	10	132	238	9	4,786
Vandalia No. 2	14	26	63	34	12	149	156	9	1,444
Vandalia No. 5	36	18	88	55	23	220	252	16	2,562
Vandalia No. 8	4	24	150	66	18	262	231	17	2,292
Vandalia No. 9	2	18	175	60	17	272	245	14	3,241
Vandalia No. 20	....	6	25	5	5	41	284	2	490
Vandalia No. 21	....	24	99	30	15	168	247	11	1,901
Gillmore	22	18	121	59	18	238	170	16	6,015
Summit No. 2	3	18	98	52	9	180	194	25	1,468
Green Valley	....	22	131	38	12	203	176	11	2,574
Lattas Creek	47	32	146	84	25	334	177	17	9,896
Northwest	20	14	85	30	12	161	235	10	1,839
Twin No. 4	14	8	34	19	7	82	176	6	889
Twin No. 5	23	12	78	27	9	149	194	10	1,936
Total	238	246	1,323	592	192	2,591	2,975	173	41,329

KNOX COUNTY.

Knox	7	14	62	22	13	118	142	7	1,273
Lynn	10	8	40	18	8	84	188	9	1,170
Freeman	19	16	95	38	18	186	138	14	3,189
Tecumseh	....	42	101	26	13	182	175	11	2,237
Total	36	80	298	104	52	570	643	41	7,869

PARKE COUNTY.

Parke No. 11	47	26	45	43	12	173	263	13	3,934
Lyford No. 1	....	34	67	36	15	152	274	16	2,370
Total	47	60	112	79	27	325	537	29	6,304

PIKE COUNTY.

Ayrshire No. 5	5	8	33	12	8	66	198	6	954
Blackburn No. 2	58	6	12	11	8	95	112	4	1,484
Peacock No. 2	8	6	32	6	7	59	162	3	683
Total	71	20	77	29	23	220	472	13	3,121

SULLIVAN COUNTY.

NAME OF MINE.	Miners.	Machine Runners and Helpers.	Loader.	Inside Employes.	Outside Employes.	Total.	Days Worked.	Mules Used.	Powder.
Rainbow	2	18	112	34	23	189	98	18	2,693
Phoenix No.	....	20	104	50	17	191	92	14	3,167
Hocking	....	16	85	41	17	159	46	10	1,060
Sunflower	....	12	85	26	13	136	167	11	1,178
Consolidated No. 25	....	24	91	48	16	179	261	15	2,422
Consolidated No. 26	Idle.	....	....	....	....	....	....	....	....
Consolidated No. 28	Idle.	....	....	....	....	....	....	....	....
Consolidated No. 30	....	12	73	34	18	137	188	12	1,412
Consolidated No. 32	....	2	16	5	6	29	43	2	91
Consolidated No. 33	27	28	166	89	19	329	264	22	3,415
Vandalia 10	1	20	118	75	20	234	159	13	2,195
Jackson Hill No. 2	....	20	115	37	16	188	172	22	1,434
Jackson Hill No. 4	....	20	117	38	15	190	178	22	1,619
Dering No. 13	....	14	77	37	14	142	202	17	1,488
Dering No. 14	3	18	101	53	18	193	230	15	1 725
Mammoth Vein	2	14	83	44	18	161	52	12	1,458
Shirley Hill No. 1	35	10	42	26	13	126	217	9	2,773
Shirley Hill No. 3	6	10	64	19	12	111	218	5	1,215
Little Giant	172	14	93	74	21	374	256	16	9,794
Clover Leaf	94	8	50	53	15	220	237	17	5,306
Pearl	4	10	56	27	12	109	162	12	688
Reliance	2	12	77	35	12	138	193	10	1,039
Hamilton	Idle.	....	....	....	....	....	....	....	....
Black Hawk	60	8	15	13	9	105	174	5	2,745
Total	408	310	1,740	858	324	3,640	3,609	279	48,917

VERMILLION COUNTY.

Crown Hill, No. 3	32	42	72	30	12	188	262	9	2,635
Total	32	42	72	30	12	188	262	9	2,635

VIGO COUNTY.

Vandalia No. 60	22	16	67	48	13	166	266	16	2,212
Forrest	180	12	34	52	20	298	180	19	5,752
Wabash	20	16	129	42	10	217	268	13	3,108
Minshall	81	16	55	25	8	185	269	12	6,111
Grant No. 3	12	44	98	49	19	222	280	13	2,788
Glenn Ayr No. 1	9	18	91	35	12	165	212	11	2,413
Glenn Ayr No. 2	2	4	13	5	5	29	43	2	480
Deep Vein No. 4	17	6	33	14	7	77	231	7	1,821
Plymouth No. 1	Idle.	....	....	....	....	....	....	....	....
Total	343	132	520	270	94	1,359	1,749	93	24,685

WARRICK COUNTY.

Big Four	......	18	54	10	16	98	188	7	1,330
De Forrest	11	4	12	4	2	33	107	3	201
Electric	18	8	33	22	9	90	105	11	913
Dawson	....	16	35	11	6	68	293	7	876
Erie Canal	....	8	44	14	8	74	125	7	752
Polk No. 5	....	18	59	11	12	100	191	5	1,676
Total	29	72	237	72	53	463	1,009	40	5,748
Total for bituminous machine mines	1,259	1,008	4,572	2,107	808	9,754	11,853	725	147,511
Total for all bituminous mines	6,638	1,008	4,572	3,478	1,359	17,055	22,749	1,340	376,715
Grand total for all all mines in the State	7,770	1,048	4,709	3,864	1,517	18,908	17,008	1,492	421,546

LOCAL OR WAGON MINES.

During the year 1909 the location of 327 mines, employing from one to nine men, and operated for wagon or local trade only, was ascertained by our department. An effort was made to secure from the operators of such mines a report showing the number of tons of coal produced, number of kegs of powder used, and the number of men employed during the year. These mines are located in nineteen different counties, five of which, viz., Dubois, Martin, Owen, Spencer and Warren, have no shipping mines and have not been previously mentioned in our annual reports. The remaining fourteen counties have shipping mines, the statistical reports of which are included each year in our annual report.

Of the aggregate number of small mines, 202 are bituminous and 125 block. The block mines are located in Clay, southeast part of Fountain, east part of Green, Owen, Parke, Perry, Spencer and Warren counties.

Reports were obtained from thirty-six of the block mines, showing a production of 26,251 tons of coal, and 188 employes. Reports were also received from fifty-two bituminous mines, giving a production of 113,120 tons of coal and 209 employes, or a total production of 139,371 tons of both kinds of coal, and a total of 397 employes.

Basing our opinion on mines that have reported and other information concerning those that have not reported, we estimate the total production of block coal produced by all the local or wagon mines in the State to be 50,000 tons, and a total of 360 employes, and the total production of bituminous coal at 300,000 tons, with a total working force of 475 employes, or a total production of 350,000 tons of both kinds of coal and a total working force of 835 employes.

TABLE.

Showing by Counties the Name of Mine, Number of Tons of Screened, Slack, Nut and Mine Run Coal, Total Tons of all Grades of Coal Produced and the Distribution Thereof, the Production of Block and Bituminous Coal, Each Being shown Separately, as is the Machine and Pick or Hand-Mined Coal.

BLOCK COAL MACHINE MINES.

PARKE COUNTY.

NAME OF MINE.	MACHINE MINED.				PICK MINED.				DISTRIBUTION.		WAGES PAID.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Mary No. 1	39,007	6,573	....	45,580	4,383	937	....	5,320	4,421	46,479	$37,197 07	$19,705 32	$7,157 52	$64,059 91
Total	39,007	6,573	....	45,580	4,383	937	....	5,320	4,421	46,479	$37,197 07	$19,705 32	$7,157 52	$64,059 91

VIGO COUNTY.

NAME OF MINE.	MACHINE MINED.				PICK MINED.				DISTRIBUTION.		WAGES PAID.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Mary No. 2	9,366	1,911	....	11,277	5,314	1,318	....	6,632	2,010	15,899	$16,340 57	$7,450 48	$5,581 19	$29,372 24
Plymouth No. 1	29,883	6,886	....	36,769	21,179	6,048	....	27,227	22,057	41,939	48,366 25	15,932 00	6,403 30	70,751 55
Domestic Block No. 1	25,152	5,397	....	30,549	98	97	....	195	10,108	20,636	23,808 31	13,652 74	5,090 49	42,551 54
Total	64,401	14,194	....	78,595	26,591	7,463	....	34,054	34,175	78,474	$88,515 13	$37,085 22	$17,074 98	$142,675 33
Total machine mined block coal	103,408	20,767	....	124,175	30,974	8,400	....	39,374	38,596	124,953	$125,712 20	$56,790 54	$24,232 50	$206,735 24

BLOCK HAND OR PICK MINES.

CLAY COUNTY.

NAME OF MINE.	Pick Mines.				Distribution.		Wages Paid.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Brazil Block No. 1	17,222	3,450	....	20,672	4,178	16,494	$18,900 27	$7,899 65	$7,454 93	$34,254 85
Brazil Block No. 4	57,501	5,766	....	63,267	11,107	52,160	61,436 13	19,520 33	9,039 17	89,995 63
Superior No. 4	23,371	5,640	97	29,108	13,262	15,846	27,600 24	11,250 34	5,633 86	44,484 44
Crawford No. 2	16,745	3,440	....	20,185	6,511	13,674	18,657 35	12,692 80	4,612 72	35,962 87
Crawford No. 6	19,786	4,375	....	24,161	6,000	18,161	20,453 28	10,927 80	4,106 59	35,487 67
Crawford No. 8	10,415	2,155	....	12,570	3,182	9,388	10,892 77	3,888 82	2,620 89	17,402 48
Crawford No. 9	23,414	5,150	....	28,564	19,675	8,889	25,065 71	8,851 36	5,240 56	39,157 63
Crawford No. 10	23,909	5,225	....	29,134	9,787	19,347	28,243 71	9,531 57	4,395 35	42,170 63
Indiana No. 1	9,810	1,150	6,989	17,949	3,244	14,705	16,221 08	5,194 79	3,442 50	24,858 37
Plymouth No. 2	33,568	9,070	830	43,468	5,227	38,241	37,746 60	10,821 35	4,851 05	53,419 00
Monarch	....	....	10,661	10,661	10,661	....	12,000 00	10,306 85	1,374 38	23,681 23
Eureka No. 5	43,131	9,650	108	52,889	15,856	37,033	47,587 23	12,769 01	5,593 36	65,949 60
Treager	5,396	1,548	....	6,944	6,944	....	5,436 90	1,370 27	659 00	7,466 17
Harrison No. 5	1,868	350	....	2,218	2,218	....	2,203 30	332 10	500 45	3,035 85
Schefferman	Idle.	....	....	....	....	....	....	....	....	....
Wizard	31,898	5,921	30	37,849	29,201	8,648	38,348 93	11,053 00	3,879 00	53,280 93
Pyrah	Working less	than ten men	....	....	....	....	....	....	....	....
Progressive	2,591	....	1,895	4,486	4,486	....	5,262 89	1,999 85	1,476 08	8,738 82
German	....	....	2,493	2,493	2,493	....	3,000 00	1,000 00	911 00	4,911 00
Total	320,625	62,890	23,103	406,618	154,032	252,586	$379,056 39	$139,409 89	$65,790 89	$584,257 17

PARKE COUNTY.

Brazil No. 9	12,428	2,400	....	14,828	7,931	6,897	$12,744 90	$5,018 17	$5,147 63	$22,910 70
Brazil No. 12	2,241	465	....	2,706	370	2,336	2,357 11	1,234 94	1,742 39	5,334 44
Superior No. 2	26,689	6,520	1,222	34,431	34,431	....	30,715 22	12,239 55	6,169 69	49,124 46
Superior No. 3	9,971	2,450	....	12,421	12,421	....	10,722 53	4,402 66	2,201 22	17,326 41
Superior No. 5	67,460	16,200	....	83,660	....	83,660	71,244 94	20,286 12	10,142 87	101,673 93
Moore	Working less	than ten men	....	....	....	....	....	....	....	....
Total	118,789	28,035	1,222	148,046	55,153	92,893	$127,784 70	$43,181 44	$25,403 80	$196,369 94
Total pick mined block coal	439,414	90,925	24,325	554,664	209,185	345,479	$506,841 09	$182,591 33	$91,194 69	$780,627 11
Total machine mined block	134,382	29,167	....	163,549	38,596	124,953	$125,712 20	$56,790 54	$24,232 50	$206,735 24
Total block	573,796	120,092	24,325	718,213	247,781	470,432	$632,553 29	$239,381 87	$115,427 19	$987,362 35

BITUMINOUS HAND OR PICK MINES.

CLAY COUNTY.

NAME OF MINE.	Pick Mines.				Distribution.		Wages Paid.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Klondyke No. 3	2,262	1,480	3,383	7,125	6,918	207	$3,766 54	$4,091 24	$1,047 05	$8,904 83
Gifford No. 2	31,321	10,340	180	41,841	23,631	18,210	29,608 81	8,793 82	4,882 13	43,284 79
Vivian No. 1	Idle.									
Vandalia No. 65	3,014	1,519	55,235	59,768	55,679	4,089	35,388 24	12,406 76	3,960 68	51,755 68
Total	36,597	13,339	58,798	108,734	86,228	22,506	$68,763 59	$25,291 82	$9,889 86	$103,945 27

DAVIESS COUNTY.

NAME OF MINE.	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Winterbottom No. 3			8,010	8,010	8,010		$4,393 45	$1,019 72	$1,958 21	$7,371 38
Mutual	8,550	3,600	15,000	27,150	17,300	9,850	22,451 00	5,910 00	3,443 00	31,804 00
Mandabach	Idle.									
Winklepeck	Idle.									
Pine Island No. 1	Idle.									
Montgomery No. 4	7,162	3,290	2,160	12,612	11,012	1,600	1,550 00	1,125 00	1,000 00	3,675 00
Total	15,712	6,890	25,170	47,772	36,322	11,450	$28,394 45	$8,054 72	$6,401 21	$42,850 38

GREENE COUNTY.

Dickason	Idle.	...	...	...	...	...	...	...	...	...
Sponsler	30,697	11,152	77,116	118,965	73,235	45,730	$76,402 45	$20,177 51	$6,581 19	$103,161 15
Antioch	Idle.	...	...	...	...	...	...	...	...	...
North Linton	Idle.	...	...	...	...	...	...	...	...	...
Vandalia No. 3	13,498	6,688	2,561	22,747	22,617	130	13,629 41	3,504 43	1,693 70	18,827 54
Vandalia No. 4	...	...	1,200	1,200	1,200	...	720 00	250 00	200 00	1,170 00
Vandalia No. 6	Idle.	...	...	...	...	...	...	...	...	...
Queen	15,604	15,204	51,740	82,548	80,148	2,400	39,764 00	11,175 00	5,650 00	56,589 00
Cherry Hill	4,336	2,442	1,892	8,670	8,670	...	5,470 52	351 37	917 77	6,739 66
Letsinger	Idle.	...	...	...	...	...	...	...	...	...
P. & I	Idle.	...	...	...	...	...	...	...	...	...
Enterprise	...	...	19,334	19,334	19,334	...	8,251 02	2,165 76	2,068 44	12,485 22
Total	64,135	35,486	153,843	253,464	205,204	48,260	$144,237 40	$37,624 07	$17,111 10	$198,972 57

GIBSON COUNTY.

Oswald	64,385	81,750	30,268	176,403	176,403	...	$111,433 57	$38,166 34	$11,557 66	$161,157 57
Ft. Branch	11,445	11,100	6,381	28,926	28,926	...	18,630 58	7,268 13	4,185 15	30,083 86
Francisco	917	543	1,865	3,325	3,325	...	2,308 74	402 00	412 69	3,123 43
Total	76,747	93,393	38,514	208,654	208,654	...	$132,372 89	$45,836 47	$16,155 50	$194,364 86

FOUNTAIN COUNTY.

Indio	Idle.	...	...	...	...	...	...	...	...	...

KNOX COUNTY.

Bicknell	Idle.	...	...	...	...	...	...	...	...	...
Wheatland	...	...	14,383	14,383	14,383	...	$8,928 99	$7,590 32	$3,453 42	$19,972 73
Total	...	...	14,383	14,383	14,383	...	$8,928 99	$7,590 32	$3,453 42	$19,972 73

PARKE COUNTY.

NAME OF MINE.	PICK MINES.				DISTRIBUTION.		WAGES PAID.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Fairview	29,251	20,319	10,807	60,377	36,512	23,865	$43,717 86	$9,909 85	$5,710 33	$59,338 04
Mecca No. 3	6,153	1,672	592	8,417	4,687	3,730	6,986 41	2,443 32	1,078 39	10,508 12
Vandalia No. 316	48,493	31,014	5,422	84,929	78,413	6,516	61,972 93	21,753 59	7,188 35	90,914 87
Harrison	....	....	12,129	12,129	12,129	....	7,036 26	2,018 50	958 00	10,012 76
Total	83,897	53,005	28,950	165,852	131,741	34,111	$119,713 46	$36,125 26	$14,935 07	$170,773 79

PERRY COUNTY.

NAME OF MINE.	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Lincoln	200	103	1,005	1,308	1,268	40	$721 05	$298 55	$222 85	$1,242 45
Total	200	103	1,005	1,308	1,268	40	$721 05	$298 55	$222 85	$1,242 45

PIKE COUNTY.

NAME OF MINE.	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Ayrshire No. 3	17,538	6,479	10,030	34,047	25,028	9,019	$13,199 62	$3,605 49	$1,899 35	$18,704 46
Ayrshire No. 4	26,613	26,887	14,536	68,036	39,675	28,361	40,135 23	12,244 57	7,608 66	59,988 46
Muren	....	....	23,300	23,300	12,000	11,300	13,591 00	5,259 00	2,225 00	21,075 00
Blackburn No. 1	....	....	14,603	14,603	14,603	....	8,053 52	1,783 79	1,616 15	11,453 46
Littles	28,967	38,734	38,639	106,340	74,773	31,567	59,451 43	17,767 90	6,307 87	83,527 20
Petersburg	Idle.	....	....	....	....	....	....	....	....	....
Winslow Nos. 4 and 5	Idle.	....	....	....	....	....	....	....	....	....
Hartwell Nos. 1, 2 and 3	Idle.	....	....	....	....	....	....	....	....	....
Total	73,118	72,100	101,108	246,326	166,079	80,247	$134,430 80	$40,660 75	$19,657 03	$194,748 58

SULLIVAN COUNTY.

Citizens			10,210	10,210	10,210		$6,710 00	$1,810 00	$2,020 00	$10,540 00
Keystone	24,430	22,542	4,058	51,030	40,000	11,030	33,261 72	10,245 25	6,640 32	50,147 29
Viola	7,691	12,353	20,695	40,739	29,444	11,295	29,555 44	10,140 27	7,736 97	47,432 68
Freeman	4,536	2,259	445	7,240	5,424	1,816	4,676 64	1,507 77	1,097 28	7,281 69
Hudson	16,260	13,493	29,753	59,506	29,753	29,753	17,968 85	6,997 63	2,418 66	27,385 14
Bellevue	2,643		1,919	4,562	4,562		2,748 78	1,848 70	2,906 79	7,504 27
Larsh	Idle.									
Total	55,560	50,647	67,080	173,287	119,393	53,894	$94,921 43	$32,549 62	$22,820 02	$150,291 07

VANDERBURGH COUNTY.

Diamond	21,335	13,255	5,778	40,368	40,368		$26,418 20	$5,754 19	$4,697 12	$36,869 51
Ingleside	4,744	5,354	29,630	39,728	39,728		21,918 80	8,819 05	4,374 26	35,112 11
Sunnyside	18,989	10,290	3,211	32,490	28,382	4,108	19,372 00	7,312 00	7,601 00	34,285 00
Unity	25,100	22,912	50,130	98,142	98,142		63,974 68	18,900 10	8,940 11	91,814 89
First Avenue	22,944	13,182	3,364	39,490	39,490		25,209 22	7,388 91	5,269 77	37,867 90
Total	93,112	64,993	92,113	250,218	246,110	4,108	$156,892 90	$48,174 25	$30,882 26	$235,949 41

VERMILLION COUNTY.

Dering No. 5	Idle.									
Dering No. 7	32,098	20,872	9,111	62,081		62,081	$34,161 77	$9,736 80	$3,262 41	$47,160 98
Dering No. 8	94,753	106,234	56,345	257,332		257,332	141,520 24	50,608 77	7,389 25	199,518 26
Eureka			2,363	2,363	2,363		901 67	1,134 81	868 82	2,905 30
Crown Hill No. 1	96,204	39,879	114,884	250,967	54,931	196,036	191,552 58	30,865 10	3,627 12	226,044 80
Crown Hill No. 2	71,172	23,689	153,797	248,658	46,117	202,541	193,826 89	28,809 40	3,826 59	226,462 88
Oak Hill	2,277	1,637	8,609	12,523		12,523	8,961 44	4,239 90	2,417 05	15,618 39
Maple Valley	Idle.									
Buckeye No. 2	65,641	37,537	159,128	262,306	32,661	229,645	149,088 30	37,258 30	11,654 45	198,001 05
Klondyke No. 10	25,840	16,024	87,221	129,085	120,761	8,324	81,798 63	13,028 00	9,230 60	104,057 23
Total	387,985	245,872	591,458	1,225,315	256,833	968,482	$801,811 52	$175,681 08	$42,276 29	$1,019,768 89

VIGO COUNTY.

NAME OF MINE.	PICK MINES.				DISTRIBUTION.		WAGES PAID.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Riverside	2,479	1,637	894	5,010	4,751	259	$4,310 65	$521 30	$866 85	$5,698 80
Vandalia No. 66	65,573	51,842	6,731	124,146	124,146		67,463 63	23,390 09	7,169 90	98,023 62
Vandalia No. 67	14,442	6,999	168,070	189,511	172,321	17,190	112,181 94	28,636 26	9,988 66	150,806 86
Vandalia No. 81	43,641	35,056	5,893	84,590	53,503	31,087	49,200 19	17,071 61	7,212 75	73,484 55
Atherton	40,223	20,090	66,596	126,909		126,909	55,319 88	25,979 85	10,834 25	92,133 98
Lawton	61,042	38,400	692	100,134	100,134		56,591 70	21,059 90	8,283 55	85,935 15
Victor	8,099	4,488	784	13,371	13,371		7,592 35	1,629 10	1,033 90	10,255 35
Lower Vein No. 1	81,939	52,539	33,896	168,374	168,374		96,276 96	28,111 18	9,510 08	133,898 22
Miami No. 1	42,745	29,546	26,173	98,464		98,464	55,883 50	20,230 28	6,818 41	82,932 19
Miami No. 2	50,732	47,460	39,486	137,678		137,678	82,071 54	27,780 64	12,889 94	122,742 12
Miami No. 3	49,757	40,426	36,564	126,747		126,747	75,561 78	23,603 64	7,002 59	106,168 01
Miami No. 4	50,946	37,007	92,196	180,149		180,149	114,636 51	29,227 46	9,593 75	153,457 72
Miami No. 5	New mine;	no report.								
Fauvre No. 1	2,257	1,982	1,601	5,840	5,840		3,504 89	1,566 23	488 00	5,559 12
Fauvre No. 2	33,549	26,997	4,108	64,654	59,827	4,827	34,183 52	9,297 77	3,575 32	47,056 61
Deep Vein No. 5	5,565	3,712	5,929	15,206	15,206		9,721 93	3,002 24	1,841 13	14,565 30
Ray No. 2	51,276	24,343	108,739	184,358	152,016	32,342	118,598 50	26,054 10	8,024 24	152,676 84
Sugar Valley	12,400	18,428	9,160	39,988	39,988		25,506 82	4,679 84	4,318 60	34,505 26
Dering No. 6	182,577	79,403	35,167	297,147		297,147	184,408 33	54,048 51	7,136 00	245,592 84
National	6,691	5,584	19,609	31,884	29,522	2,362	19,925 51	4,791 51	4,684 26	29,401 28
Pittsburg No. 1	57,211	45,547	55,618	158,376	68,808	89,568	75,854 92	38,973 04	7,043 96	121,871 92
Total	863,144	571,486	717,906	2,152,536	1,007,807	1,144,729	$1,248,795 05	$389,654 55	$128,316 14	$1.766,765 74

WARRICK COUNTY.

Chandler			10,542	10,542	10,542		$6,256 69	$1,573 66	$884 50	$8,714 85
Red Shaft	Idle.									
Castle Garden			5,101	5,101	5,101		3,052 15	537,90	504 05	4,094 10
Brizius	7,649	3,222	6,526	17,397	17,397		10,646 30	3,048 62	2,255 91	15,950 83
Elberfeld	916	914	7,904	9,734	9,734		4,780 97	2,145 99	1,072 34	7,999 30
Epworth	No report.									
Korff	2,780	1,853		4,633	4,633		3,000 00	2,000 00	190 00	5,190 52
Sargent			2,590	2,590	2,590		1,789 25	789 25	157 25	2,735 75
Total	11,345	5,989	32,663	49,997	49,997		$29,525 36	$10,095 42	$5,064 05	$44,684 83
Total hand mined bituminous coal	1,761,552	1,213,303	1,922,991	4,897,846	2,530,019	2,367,827	$2,969,508 89	$857,636 88	$317,184 80	$4,144,330 57

BITUMINOUS MACHINE MINES.

CLAY COUTNY.

NAME OF MINE.	MACHINE MINED.				PICK MINED.				DISTRIBUTION.		WAGES PAID.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Tons of Screened. Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Lewis	10,385	18,389	8,637	37,411	....	....	....	....	23,722	13,689	$13,334 43	$8,098 36	$7,607 50	$29,040 29
Vivian No. 2	29,729	11,659	38,675	80,063	4,804	1,930	6,645	13,379	50,877	42,565	46,046 98	26,057 32	9,102 02	81,206 32
Island Valley No. 4	80,399	35,253	97,660	213,312	17,863	9,135	26,052	53,050	74,945	191,417	137,109 50	39,988 12	13,686 45	190,784 07
Total	120,513	65,301	144,972	330,786	22,667	11,065	32,697	66,429	149,544	247,671	$196,490 91	$74,143 80	$30,395 97	$301,030 68

GREENE COUNTY.

NAME OF MINE.	MACHINE MINED.				PICK MINED.				DISTRIBUTION.		WAGES PAID.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Tons of Screened. Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Black Creek	30,233	11,911	5,322	47,466	53,759	22,034	15,643	91,436	80,491	58,411	$86,858 08	$28,680 96	$9,759 70	$125,298 74
Vandalia No. 2	....	....	92,400	92,400	....	....	5,318	5,318	97,718	....	47,265 13	15,126 96	6,245 27	68,637 36
Vandalia No. 5	95,051	52,638	2[illegible],2[illegible]8	170,937	16,088	8,008	1,7[illegible]4	25,830	162,345	34,422	102,672 89	34,459 75	15,298 01	152,430 65
Vandalia No. 8	107,458	59,902	64,663	232,023	2,430	1,190	1,300	4,920	214,114	22,829	121,490 90	42,673 45	14,463 53	178,627 88
Vandalia No. 9	107,040	46,980	137,834	291,854	829	408	1,635	2,872	274,813	19,913	147,916 63	42,285 00	14,018 60	204,220 23
Vandalia No. 20	22,571	11,681	3,771	38,023	....	....	....	....	38,023	....	20,582 64	3,835 60	4,347 76	28,766 00
Vandalia No. 21	....	....	163,771	163,771	....	....	....	....	163,771	....	75,603 99	17,698 40	10,905 40	104,207 00
Gilmour	....	.....	124,484	124,484	....	....	....	....	38,740	85,744	79,589 00	30,878 00	8,948 00	119,415 00
Summit No. 2	40,745	51,943	86,957	179,645	....	....	....	....	179,645	....	88,580 37	42,115 39	9,392 93	140,088 69
Green Valley	55,710	30,165	144,003	229,878	....	....	....	....	134,966	94,912	110,224 32	32,758 18	10,550 09	153,532 59
Lattas Creek	....	....	211,473	211,473	....	....	....	....	64,953	146,520	129,385 00	48,390 00	143,15 00	192,090 00
North West	59,595	31,112	46,232	136,939	4,338	2,526	3,411	10,275	135,733	11,481	73,853 37	20,950 34	6,759 89	101,563 60
Twin No. 4	23,890	8,029	22,698	54,617	6,334	1,370	3,471	11,175	31,373	34,419	29,171 60	11,147 55	2,931 70	43,250 85
Twin No. 5	99,705	14,405	85,300	199,410	6,848	2,427	15,391	24,666	102,104	121,972	71,928 20	17,663 45	8,700 15	98,291 80
Total	641,998	318,766	1,212,156	2,172,920	90,626	37,963	47,903	176,492	1,718,789	630,623	$1,185,122 12	$388,663 03	$136,636 21	$1,710,421 36

KNOX COUNTY.

NAME OF MINE.	MACHINE MINED.				PICK MINED.				DISTRIBUTION.		WAGES PAID.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Tons of Screened. Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Knox	13,087	6,997	71,086	91,170	776	312	5,151	6,239	62,170	35,239	$45,933 06	$15,063 62	$10,630 49	$71,627 17
Lynn	16,420	7,786	42,926	67,132	1,066	562	4,594	6,222	72,174	1,180	32,266 84	14,223 30	7,435 29	53,925 43
Freeman	33,041	13,725	125,518	172,284	2,860	....	5,114	7,974	130,429	49,829	91,164 08	24,143 26	14,629 07	129,936 41
Tecumseh	32,652	16,682	145,205	194,539	....	....	....	....	136,130	58,409	97,457 52	17,856 05	11,893 38	127,206 95
Total	95,200	45,190	384,735	525,125	4,702	874	14,859	20,435	400,903	144,657	$266,821 50	$71,286 23	$44,588 23	$382,695 96

PARKE COUNTY.

Parke No. 11	....	....	101,550	101,550	....	....	67,324	67,324	146,820	22,054	$91,248 29	$40,630 30	$12,392 83	$144,271 42
Lyford No. 1	19,908	12,666	136,768	169,342	....	....	....	....	34,153	135,189	83,042 73	31,264 89	12,098 03	126,405 65
Total	19,908	12,666	238,318	270,892	....	....	67,324	67,324	180,973	157,243	$174,291 02	$71,895 19	$24,490 86	$270,677 07

PIKE COUTNY.

Ayrshire No. 5	22,246	15,986	20,120	58,352	....	....	....	....	39,618	18,734	$28,777 17	$8,146 21	$5,754 12	$42,677 50
Blackburn No. 2	....	....	1,859	1,859	522	611	23,593	24,726	23,691	2,894	14,416 72	4,303 80	2,946 63	21,667 15
Peacock No. 2	24,397	15,522	....	40,919	....	....	....	....	35,905	5,014	17,735 74	7,617 73	6,088 42	31,441 89
Total	47,643	31,508	21,979	101,130	522	611	23,593	24,726	99,214	26,642	$60,929 63	$20,067 74	$14,789 17	$95,786 54

SULLIVAN COUNTY.

Rainbow	...	...	59,850	59,850	...	...	...	...	29,690	30,160	$39,692 00	$10,420 00	$7,568 00	$57,680 00
Phoenix No. 4	...	...	63,341	63,341	...	...	...	...	31,221	32,120	42,074 00	16,297 00	5,877 00	64,248 00
Hocking	...	...	21,310	21,310	...	...	...	...	10,410	10,900	12,930 00	5,355 00	2,485 00	20,770 00
Sunflower	75,691	30,493	18,204	124,388	...	...	...	...	38,255	86,133	32,244 98	10,771 17	17,671 91	60,688 06
Consolidated No. 25	66,105	34,656	37,204	137,965	758	206	90	1,054	46,005	93,014	81,046 76	42,537 95	12,636 41	136,221 12
Consolidated No. 26	Idle.	...	...	...	...	...	...	...	...	...	...	...	...	...
Consolidated No. 28	Idle.	...	...	...	...	...	...	...	...	...	...	...	...	...
Consolidated No. 30	72,724	29,277	2,134	104,135	...	...	...	...	45,989	58,146	54,396 40	25,116 56	10,909 99	90,422 95
Consolidated No. 32	1,974	452	5,512	7,938	...	...	...	...	7,938	...	3,355 84	1,995 35	2,111 21	7,462 40
Consolidated No. 33	189,150	83,855	49,310	322,315	3,281	778	1,279	5,338	46,760	280,893	174,394 30	81,257 83	19,474 14	275,126 27
Vandalia No. 10	44,890	17,374	117,253	179,517	184	90	975	1,249	137,619	43,147	91,971 35	39,599 12	11,149 17	142,719 64
Jackson Hill No. 2	104,478	41,251	63,256	208,985	...	...	...	...	145,912	63,073	103,432 11	42,736 01	10,843 95	157,012 07
Jackson Hill No. 4	108,656	61,973	19,930	190,559	...	...	...	...	57,776	132,783	96,171 74	34,908 29	10,427 41	141,507 44
Dering No. 13	80,771	40,119	12,995	133,885	...	...	...	...	...	133,885	61,084 66	32,958 86	7,184 64	101,228 16
Dering No. 14	89,290	83,867	...	173,157	...	...	...	...	...	173,157	86,373 26	50,219 93	14,334 79	150,927 98
Mammoth Vein	...	...	34,994	34,994	...	...	...	...	15,974	19,020	21,218 00	8,835 00	3,528 00	33,581 00
Shirley Hill No. 1	7,558	7,114	16,710	31,382	10,154	4,449	21,203	37,806	69,188	...	55,845 71	11,610 14	5,474 70	72,930 55
Shirley Hill No. 3	42,079	17,337	36,303	95,719	1,496	401	529	2,426	98,145	...	41,597 43	14,949 80	7,955 50	64,502 73
Little Giant	19,358	8,772	99,644	127,774	33,998	12,589	112,999	159,586	287,360	...	158,434 64	43,431 06	12,620 05	214,485 75
Clover Leaf	16,927	8,487	15,017	40,431	63,543	42,897	40,622	147,062	187,493	...	121,191 37	48,593 34	12,973 91	182,758 62
Pearl	32,327	14,726	13,323	60,376	745	271	141	1,157	43,349	18,184	31,425 37	13,301 05	6,979 94	51,706 36
Relianee	46,955	18,512	12,551	78,018	1,972	759	231	2,962	80,980	...	42,315 57	30,433 77	10,201 36	82,950 70
Hamilton	Idle.	...	...	...	...	...	...	...	...	...	...	...	...	...
Black Hawk	9,833	6,190	3,580	19,603	27,160	18,148	7,693	53,001	24,249	48,355	41,249 09	8,631 82	5,338 43	55,219 34
Total	1,008,766	504,455	702,421	2,215,642	143,291	80,588	187,762	411,641	1,404,313	1,222,970	$1,392,444 58	$573,959 05	$197,745 51	$2,164,149 14

VERMILLION COUNTY.

Crown Hill No. 3	57,185	19,619	47,934	124,738	...	...	...	...	40,851	83,923	$111,707 84	$17,506 14	$2,421 09	$131,635 07
Total	57,185	19,619	47,934	124,738	...	...	...	...	40,815	83,923	$111,707 84	$17,506 14	$2,421 09	$131,635 07

VIGO COUNTY.

NAME OF MINE.	MACHINE MINED.				PICK MINED.				DISTRIBUTION.		WAGES PAID.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Vandalia No. 69	49,362	30,103	31,124	110,589	12,578	6,220	5,330	24,128	129,610	5,107	$65,046 38	$28,372 82	$9,754 11	$103,173 31
Forrest	....	....	38,825	38,825	....	....	75,955	75,955	67,800	46,989	79,234 00	25,040 00	9,395 00	113,669 00
Plymouth No. 1	29,883	6,886	....	36,769	21,179	6,048	....	27,227	22,057	41,939	48,366 25	15,982 00	6,403 30	70,751 55
Wabash	84,644	32,001	115,835	232,480	11,021	340	20,451	31,812	219,039	45,253	131,922 30	31,423 05	9,614 15	172,959 50
Minshall	4,924	6,745	41,294	52,963	8,216	3,972	90,235	102,423	151,283	4,103	100,276 10	19,920 20	8,847 95	129,044 25
Grant No. 3	41,029	35,344	110,958	187,331	....	....	....	....	21,454	165,877	95,843 92	40,664 77	17,129 44	153,638 13
Glenn Ayr No. 1	48,434	32,658	76,508	157,600	5,548	2,724	5,599	13,871	149,334	22,137	83,069 51	22,831 17	12,643 91	118,544 59
Glenn Ayr No. 2	15,452	9,649	20,935	46,036	....	....	....	....	33,980	12,056	19,250 15	4,962 91	2,309 38	26,522 44
Deep Vein No. 4	24,733	16,486	21,781	63,000	8,918	5,842	9,395	24,155	20,302	66,853	47,521 89	18,351 76	6,801 42	72,675 07
Total	298,461	169,872	457,260	925,593	67,460	25,146	206,965	299,571	814,859	410,305	$670,530 50	$207,548 68	$82,898 66	$960,977 84

WARRICK COUNTY.

NAME OF MINE.	MACHINE MINED.				PICK MINED.				DISTRIBUTION.		WAGES PAID.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Big Four	8,171	5,450	72,767	86,388	....	....	....	....	86,39	....	$40,370 98	$7,387 83	$9,334 3	$57,093 17
De Forrest	1,600	892	200	2,692	1,440	930	1,111	3,481	6,1	....	3,485 73	1,108 33	848 79	5,442 85
Electric	....	....	33,702	33,702	....	....	7,735	7,735	4,92	26,515	18,514 01	7,337 02	3,870 2	29,721 32
Dawson	15,013	5,382	37,566	57,961	....	....	....	....	7,61	50,344	30,248 82	8,753 44	3,919 46	42,921 72
Erie Canal	....	....	47,318	47,318	....	....	....	....	40,00	7,317	19,884 72	6,404 50	3,828 4	30,117 70
Polk No. 5	....	....	103,309	103,309	....	....	....	....	103,30	....	50,713 20	7,464 40	7,510 10	65,687 70
Total	24,784	11,724	294,862	331,370	1,440	930	8,846	11,216	258,410	84,176	$163,217 46	$38,455 52	$29,311 48	$230,984 46
Total bituminous machine mined coal	2,314,458	1,179,101	3,504,637	6,998,196	330,708	157,177	589,949	1,077,834	5,067,820	3,008,210	$4,221,555 56	$1,463,525 38	$563,277 18	$6,248,358 12

RECAPITULATION.

Showing Total Production and Wages of Indiana Mines for 1909.

TOTAL PRODUCTION OF BLOCK COAL.

	Machine Mined.				Pick Mined.				Distribution.		Wages Paid.			
	Tons of Screened Coal.	Tons of Slack and Nut Coal.	Tons of Mine Run Coal.	Total Tons of all Kinds of Coal Produced.	Tons of Screened Coal.	Tons of Slack and Nut Coal.	Tons of Mine Run Coal.	Total Tons of all Kinds of Coal Produced.	Tons of Indiana.	Tons of Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages Paid.
Total mach. mined block coal......	103,408	20,767	....	124,175	30,974	8,400	....	39,374	38,596	124,953	$125,712 20	$56,790 54	$24,232 50	$206,735 24
Total pick mined block coal......	....	....	....	....	439,414	90,925	24,325	554,664	209,185	345,479	506,841 09	182,591 33	91,194 69	780,627 11
Total block coal.	103,408	20,767	....	124,175	470,388	99,325	24,325	594,038	247,781	470,432	$632,553 29	$239,381 87	$115,427 19	$987,362 35

TOTAL PRODUCTION OF BITUMINOUS COAL.

	Machine Mined.				Pick Mined.				Distribution.		Wages Paid.			
	Tons of Screened Coal.	Tons of Slack and Nut Coal.	Tons of Mine Run Coal.	Total Tons of all Kinds of Coal Produced.	Tons of Screened Coal.	Tons of Slack and Nut Coal.	Tons of Mine Run Coal.	Total Tons of all Kinds of Coal Produced.	Tons of Indiana.	Tons of Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages Paid.
Total bituminous machine mined coal............	2,314,458	1,179,101	3,504,637	6,998,196	330,708	157,177	589,949	1,077,834	5,067,820	3,008,210	$4,221,555 56	$1,463,525 38	$563,277 18	$6,248,358 12
Total bituminous pick mined coal.	....	....	....	....	1,761,552	1,213,303	1,922,991	4,897,846	2,530,019	2,367,827	2,969,508 89	857,636 88	317,184 80	4,144,330 57
Total bituminous coal..........	2,314,458	1,179,101	3,504,637	6,998,196	2,092,260	1,370,480	2,512,940	5,975,680	7,597,839	5,376,037	$7,191,064 45	$2,321,162 26	$880,461 98	$10,392,688 69
Total machine mined coal......	2,417,866	1,199,868	3,504,637	7,122,371	361,682	165,577	589,949	1,117,208	5,106,416	3,133,163	$4,347,267 76	$1,520,315 92	$587,509 68	$6,455,093 36
Total pick mined coal............	....	....	....	....	2,200,966	1,304,228	1,947,316	5,452,510	2,739,204	2,713,306	3,476,349 98	1,040,228 21	408,379 49	4,924,957 68
Grand total.....	4,980,514	2,669,673	6,041,902	13,692,089	....	....	....	....	7,845,620	5,846,469	$7,823,617 74	$2,560,544 13	$995,889 17	$11,380.051 04

Total estimated tonnage local mines... 350,000 tons.
Grand total for all mines in the State... 14,042,089 tons.

NEW COAL COMPANIES AND NEW MINES.

Six new coal companies were organized, and began operating mines in Indiana during the year, with headquarters located as follows:

The Alliance Coal Company, main offices Chicago, Ill., with suboffices in Terre Haute; German Coal Company, Brazil; Pittsburg Coal Company, Terre Haute; Henry Korff Coal Company, Boonville; Sargent Coal Company, Evansville, and the Gibson & Moore Coal Company, Evansville.

Eleven shipping mines and one wagon or local mine, employing more than ten men, were opened, developed and became competitors in the general market.

The annexed table exhibits the names of the companies owning these mines, and the names by which each mine is known; the location by section, township, county, railroad, and proximity to town or city of each mine; whether bituminous or block; thickness of seam in feet and inches; depth of shaft, and the month in which the first shipment of coal was made.

TABLE OF NEW MINES.

CLAY COUNTY.

NAME OF COMPANY.	Name of Mine.	Location of Mine.	Railroad.	Pick or Machine.	Geological No. of Seam.	Block Bituminous.	Thickness of Seam.	Depth of Shaft.	Size of Shaft.	Month First Shipment Was Made.
German Coal Co.	German	2 mi. se. Brazil, nw ¼ Sec. 5, T. 12 n., R. 6 w, Jackson Tp.	Wagon mine	Pick	IV	Block	4′	61	8x16	July.
C. Ehrlich Coal Co.	Klondike No. 3	2½ mi. w. Brazil, nw. ¼ Sec. 11, T. 12 n., R. 7 w., Posey Tp.	Vandalia	Pick	III	Bitum.	7′6″	100	9x20	September.

DAVIESS COUNTY.

NAME OF COMPANY.	Name of Mine.	Location of Mine.	Railroad.	Pick or Machine.	Geological No. of Seam.	Block Bituminous.	Thickness of Seam.	Depth of Shaft.	Size of Shaft.	Month First Shipment Was Made.
Daviess County Coal Co.	Montgomery No. 4	1¾ mi. w. Montgomery, Sec. 28, T. 3 n., R. 6 w., Barr Tp.	B. & O. S. W.	Pick	V	Bitum.	3′8″	96	7x18	March.

KNOX COUNTY.

NAME OF COMPANY.	Name of Mine.	Location of Mine.	Railroad.	Pick or Machine.	Geological No. of Seam.	Block Bituminous.	Thickness of Seam.	Depth of Shaft.	Size of Shaft.	Month First Shipment Was Made.
Washington-Wheatland	Wheatland	¼ mi. w. Wheatland Donation, 106, T. 3 n., R. 8 w., Steen Tp.	B. & O. S. W.	Pick	V	Bitum.	5′6″	238	......	March.

VIGO COUNTY.

NAME OF COMPANY.	Name of Mine.	Location of Mine.	Railroad.	Pick or Machine.	Geological No. of Seam.	Block Bituminous.	Thickness of Seam.	Depth of Shaft.	Size of Shaft.	Month First Shipment Was Made.
Otter Creek Coal Co.	Mary No. 2	2 mi. n. Fontanet, sw. ¼ nw. ¼, Sec. 1, T. 13 n., R. 8 w., Nevins Tp.	C. & E. I.	Machine.	III	Block	3′9″	245	8x21	February.
Pittsburg Mining Co.	Pittsburg No. 1	7 mi. w. Terre Haute, Sec. 34, T. 12 n., R. 10 w.; Fayette Tp.	Big Four	Pick	VII	Bitum.	5′8″	260	8x15	Dec., 1908.
Glenn Ayre Coal Co.	Glenn Ayre No. 2	5 mi. e. Terre Haute, ne. ¼ Sec. 21, T. 12 n., R. 8 w., Lost Creek Tp.	Vandalia	Electric Mach.	IV	Bitum.	5′1″	74	8x14	June.
Coal Bluff Mining Co.	Riverside	2½ mi. nw. W. Terre Haute, Sec. 8, T. 12 n., R. 9 w., Sugar Creek Tp.	Big Four	Pick	V	Bitum.	4′5″	165	9x18	November.
Miami Coal Co.	Miami No. 5	Sw. ¼ ne. ¼ Sec. 36, T. 13 n., R. 7 w., Nevins Tp.	C. & E. I.	Pick	III	Bitum.	5′6″	40	8x17	December.

WARRICK COUNTY.

NAME OF COMPANY.	Name of Mine.	Location of Mine.	Railroad.	Pick or Machine.	Geological No. of Seam.	Block Bituminous.	Thickness of Seam.	Depth of Shaft.	Size of Shaft.	Month First Shipment Was Made.
Big Four Coal Co.	Big Four No. 3	1 mi. se. Boonville, Sec. 6, T. 6 s., R. 7 w., Boon Tp.	Southern	Pick	IV	Bitum.	5′	Slope.	......	December.
Henry Korff	Korff	2½ mi. w. Boonville, s. ½ ne. ¼ Sec. 32, T. 5 s., R. 8 w., Boone Tp.	E. S. & N.	Pick	V	Bitum.	6′	50	7x14	June.
Sargent Coal Co.	Sargent	¼ mi. n. Newburg, Sec. 34, T. 6 s., R. 9 w., Ohio Tp.	E. & E.	Pick	V	Bitum.	4′	95	6x14	January.

IMPROVEMENTS.

The improvements of various kinds made in and around Indiana mines during the year 1909 represents an expenditure aggregating $68,743.32. We give herewith a statement of the more important of the improvements made and the money expended, where such information could be obtained.

The Coal Bluff Mining Company made extensive repairs on the haulage roads in their Plymouth No. 1 mine at a cost of $800.

The Vivian Colliers Company expended $655 on general repairs in the Vivian No. 2 mine.

The Queen Coal Company expended $800 in constructing a motor haulage road; also installed motor haulage, the cost of which we were unable to obtain.

The Wyoming Coal Company remodeled the tipple at their Francisco mine and bought new cages, screens, etc., at a cost of $2,000.

The Robertson Bros. expended $575 improving the tipple at their Cherry Hill mine.

The Peacock Coal Company installed a compressed air punching machine plant at their Peacock No. 2 mine at a cost of $3,200.

The Ayrshire Coal Company made extensive improvements in their Ayrshire No. 4 mine in laying about one mile of 35-pound steel rail for motor haulage, equipping the haulage road with electric lights, installing an electric fan and in the purchase of two 7½-ton Goodman mine motors, representing a total expenditure of $15,000.

The Shirley Hill Coal Company expended $8,467 on Shirley Hill No. 1 mine in constructing a motor haulage road laid with 30-pound steel rails and equipping the mine with motor haulage, the 10-ton Jeffrey type of motor being used. This same company equipped their Little Giant and Clover Leaf mines with high-speed Sullivan ventilating fans at a cost of $3,500 each.

The Vandalia Coal Company erected a new tipple at their No. 10 mine at a cost of $5,000, the construction of which necessitated laying the mine idle during the months of July and August and a part of June.

The Gibson & Moore Coal Company made general repairs in their Ingleside mine amounting to $1,400.

The Sunnyside Coal Company expended $1,838 in building a brick blacksmith shop and making general underground improvements in their Sunnyside mine.

The Crown Hill Nos. 1 and 3 mines were equipped with Sullivan high-speed ventilating fans at a cost of $3,500 each.

The Otter Creek Coal Company equipped their Mary No. 2 mine with electric mining machines, using the Morgan-Gardner chain type. The cost of this plant we were unable to obtain.

The Vandalia Coal Company installed motor haulage in their No. 69 mine, using 7½-ton Goodman motors; also installed three new type Sullivan long wall electric mining machines and constructed a motor haulage road, altogether expending about $12,000. The same company also installed at their No. 67 mine a 26x30 Norfolk air compressor to be used in driving the mine pumps, also a 15-foot Crawford-McCrimmon ventilating fan.

The National Fuel Company expended $1,269 repairing the tipple at their National mine and improved the mine switches, etc.

The Coal Bluff Mining Company equipped their Wabash mine with a high-speed Sullivan ventilating fan having sufficient capacity to ventilate both the Wabash and their Riverside mines, the two mines being but a few hundred feet apart but operating separate veins. We did not learn the cost of this fan.

The Grant Coal and Mining Company expended $15,924 in equipping their Grant No. 3 mine with electric haulage and in the purchase of new mining machines.

The Sugar Valley Coal Company built a new boiler house and installed a new boiler at their Sugar Valley mine, expending $2,425.

The Glenn Ayr Coal Company equipped their Glenn Ayr No. 1 mine with motor haulage, the cost of which we have not learned.

The T. D. Scales Coal Company expended $1,200 on new cages and general repairs in their Electric mine.

CHANGES IN OWNERSHIP AND MANAGEMENT OF MINING PROPERTIES.

Transfers in the ownership and the management of mining properties were made during the year as follows:

The Rush Coal Company's Indio mine, located in Fountain County, was taken charge of in May by the circuit court of that county, to be sold in the settlement of labor claims, some three or four months in arrears, due miners and other employes.

The management of the mines owned and operated by the Dering and the Consolidated Indiana Coal Companies changed hands in April, being leased by the Brazil Block Coal Company.

The Cedar Creek Coal Company's mines Nos. 4 and 5, located in Pike County, changed hands during the year and are now operated by the Pike County Coal Company.

The mines owned and operated by the Southern Indiana and the Indiana Southern Coal Companies, located in Greene, Sullivan and Vigo counties, were sold at receiver's sale during the month of July and were taken over by the Alliance Coal Company, the management of the properties remaining in the hands of the former officials.

The Cayuga Pressed Brick Coal Company's Eureka mine, located in Vermillion County, was leased in August by the Silverwood Coal Company, who formerly operated in Fountain County.

The management of the mine and disposition of the product of the Kettle Creek Coal Company's Pearl mine, located in Sullivan County, was assumed by Clem Richards & Sons, of Terre Haute, during the month of May, since which time the mine has been operated very successfully.

The Home Coal Company, operating the Bicknell mine, located at Bicknell, Knox County, suspended operation in December and the mine was leased to a company of eight coal miners.

The Atherton Splint Coal Company's Atherton mine, located in Vigo County, was placed in the hands of a receiver December 6th, Mr. Paul N. Bogatt, of Terre Haute, being appointed receiver.

The Gibson & Moore Coal Company assumed control of the Ingleside mine at Evansville early in the year, expending some $1,400 in general repairs, and now have the mine in first-class condition.

The Crown Hill Nos. 1 and 3 mines were equipped with Sullivan high-speed ventilating fans at a cost of $3,500 each.

The Otter Creek Coal Company equipped their Mary No. 2 mine with electric mining machines, using the Morgan-Gardner chain type. The cost of this plant we were unable to obtain.

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The National Fuel Company expended $1,269 repairing the tipple at their National mine and improved the mine switches, etc.

The Coal Bluff Mining Company equipped their Wabash mine with a high-speed Sullivan ventilating fan having sufficient capacity to ventilate both the Wabash and their Riverside mines, the two mines being but a few hundred feet apart but operating separate veins. We did not learn the cost of this fan.

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ABANDONED MINES.

Twelve mines were abandoned during the year, situated in the different counties as follows: Clay County, one block and one bituminous, both hand mines; Greene County, one bituminous, hand; Parke County, one bituminous, hand; Pike County, one bituminous, hand; Vermillion County, one bituminous, hand, and Vigo County, four bituminous, hand mines. The following table exhibits the names of the companies owning these mines, the date on which each mine was abandoned, the railroad on and the county in which each mine is located:

TABLE.

CLAY COUNTY.

Name of Company.	Name of Mine.	Date.	Railroad.
Vandalia Coal Co.	Vandalia No. 65	July 10	Vandalia.
Crawford Coal Co.	Crawford No. 8	November 10	E. & 1.

GREENE COUNTY.

Vandalia Coal Co.	Vandalia No. 3	June 3	I. & V.

PARKE COUNTY.

Mecca Coal and Mining Co.	Mecca No. 3	April 3	C. & E. I.

PIKE COUNTY.

Ayrshire Coal Co.	Ayrshire No. 3	June 30	Southern.

VERMILLION COUNTY.

Brazil Block Coal Co.	Dering No. 7	July 2	C. & E. I.

VIGO COUNTY.

M. D. West Coal Co.	Chicago No. 6	1908	C. & E. I.
Fauvre Coal Co.	Fauvre No. 1	February 27	Vandalia.
Coal Bluff Mining Co.	Victor	Apri 3.	Big Four.
Miami Coal Co.	Miami No. 3	October	C. & E. I.
Miami Coal Co.	Miami No. 1	December	C. & E. I.
Coal Bluff Mining Co.	Lawton	October 29	Big Four.

TABLE.

Showing by Counties the Total Number of Miners and Total Number of Kegs of Powder Used in 1909, the Number of Kegs per Miner, the Total Tons of Coal Produced and the Number of Tons Produced per Keg of Powder—The Block and Bituminous Mines Each Shown Separately, as are the Machine and Hand Mines—Also a General Average of Tons Produced per Keg in All the Mines in the State Combined.

BLOCK COAL MACHINE MINES.

COUNTY.	Tons Produced.	Kegs Powder.	Number Miners.	Kegs per Miner.	Tons per Keg.
Parke	50,900	352	43	8.18+	14.6+
Vigo	112,649	3,860	196	19.7—	29.2—
General average	163,549	4,212	239	17.6—	38.8+

BLOCK COAL HAND MINES.

Clay	406,618	31,041	737	42.1+	13.0+
Parke	148,046	9,578	333	28.7+	15.4+
General average	554,664	40,619	1,070	37.9+	13.6+
Total general average for block mines	718,213	44,831	1,309	34.2+	16.0+

BITUMINOUS HAND MINES.

Clay	108,734	4,872	250	19.5—	22.3+
Daviess	47,772	3,178	104	30.5+	15.0+
Fountain	No mines operating during the year.				
Green	253,464	11,526	308	37.4+	21.1+
Gibson	208,654	8,958	172	52.0+	23.3—
Knox	14,383	630	24	26 2+	22.8+
Park	165,852	8,124	233	34.9—	20.4+
Perry (see note)	1,308	600	12	(See foot note.)	
Pike	246,326	10,822	364	29.7+	22.7+
Sullivan	173,287	7,316	323	22.6+	23.6+
Vanderburgh	250,218	11,643	298	39 0+	21.4+
Vermillion	1,225,315	72,754	1,154	63.0+	16.8+
Vigo	2,152,536	86,536	1,986	43.5+	24.9+
Warrick	49,997	2,245	151	14.8+	22.3+
General average	4,897,846	229,204	5,379	42.6+	21.3+

NOTE.—All the powder for Perry County was not reported, hence no average could be made.

BITUMINOUS MACHINE MINES.

Clay	397,215	6,903	294	23.8+	57.5+
Green	2,349,412	41,329	1,807	22.8+	56.8+
Knox	545,560	7,869	414	19.0+	69.3+
Park	338,216	6,304	219	28.7+	53.6+
Pike	125,856	3,121	168	18.5	40.3+
Sullivan	2,627,283	48,917	2,458	19.9+	53.7+
Vermillion	124,738	2,635	146	18.0+	47.3+
Vigo	1,225,164	24,685	995	24.8+	49.6+
Warrick	342,586	5,748	338	17.0+	59.6+
General average	8,076,030	147,511	6,839	21.5+	54.7+
Total general average for bituminous mines	12,973,876	376,715	12,218	30.8+	34.4+
Total general average for the state	13,692,089	421,546	13,527	31.1+	22.5—

NOTE.—Machine Runners, Helpers and Loaders are classed as Miners.

EXAMINATIONS.

Examinations for applicants for certificates of competency to serve as mine bosses, fire bosses and hoisting engineers were held at three different times during the year in the city of Terre Haute. The annexed table shows the date on which each examination was held, the number of applicants examined each time, the number passing a successful examination and the number who failed:

DATE.	TOTAL APPLICANTS.			PASSED.			FAILED.		
	M. B.	F. B.	H. E.	M. B.	F. B.	H. E.	M. B.	F. B.	H. E.
April 7 and 8.........	22	20	22	11	9	13	11	11	9
August 25 and 26.....	31	21	17	15	11	7	18	10	11
December 29 and 30...	23	5	16	12	2	9	11	2	7
Total...........	76	46	55	38	22	29	38	24	26

We give herewith the name and address of each person receiving a certificate, the number of each certificate and the per cent. grade made by the holder thereof:

MINE BOSS.

Examination Held April 7 and 8, 1909. Total Number of Candidates 22. Total Number Passed 11.

Certificate No.	*Name and Address.*	*Per Cent.*
1.	D. N. Curry, Farmersburg	87
2.	Thomas Shouse, Linton	79
3.	Wm. Gardner, Jasonville	82
4.	John Thompson, Bicknell	81
5.	David Lewis, Jasonville	80
6.	J. S. Townsley, Clinton	82
7.	Emile Dubruelle, Linton	83
8.	Frank B. Posey, Evansville	89
9.	C. T. Connaughton, Montgomery	81
10.	Wm. Moody, Evansville	90
11.	Bismarck Schrepferman, Brazil	77

Examination held August 25 and 26, 1909. Total Number of Candidates 31. Total Number Passed 15.

Certificate No.	*Name and Address.*	*Per Cent.*
12.	W. C. Ehlrich, Staunton	81
13.	Charles H. Coleman, Oakland City	84
14.	Wm. F. McDonald, Linton	82
15.	W. A. Wildon, Shelburn	76

Certificate No.	*Name and Address.*	*Per Cent.*
16.	John Stiles, Coalmont	76
17.	Reed Aleshire, Burnett	78
18.	Dora Benjamin, Terre Haute	80
19.	James D. Lewis, Burnett	77
20.	E. G. Sargent, Newburg	80
21.	David McPhail, Linton	83
22.	James S. Deeble, West Terre Haute	82
23.	W. H. Johnson, Brazil	88
24.	John Clark, Terre Haute	77
25.	C. I. Duckworth, Hymera	78
26.	Lemuel C. Fulkerson, Boonville	79

Examination Held December 29 and 30, 1909. Total Number of Candidates 23. Total Number Passed 12.

Certificate No.	*Name and Address.*	*Per Cent.*
20.	Joseph Overend, West Terre Haute	76
21.	Hugh Walker, Jasonville	83
22.	H. L. Rector, Gilmour	79
23.	Charles H. Menden, Evansville	86
24.	John O. Laughlin, Boonville	82
25.	Wm. Straker, Evansville	81
26.	Samuel Dickie, Linton	80
27.	Boyd Walters, Sullivan	82
28.	William Gose, Terre Haute	77
29.	Zollie Duckworth, Shelburn	81
30.	William McDaniel, Shelburn	78
31.	Frank D. Chadwick, Spring Valley	90

FIRE BOSS.

Examination Held April 7 and 8, 1909. Total Number of Candidates 20. Total Number Passed 9.

Certificate No.	*Name and Address.*	*Per Cent.*
1.	John Clark, Terre Haute	79
2.	Joseph Herron, Evansville	83
3.	Clarence Filbert, Linton	78
4.	Wm. Strachan, West Terre Haute	94
5.	Silas Johnson, Jasonville	78
6.	Pete Hardesty, Paxton	77
7.	Leopold Escaffee, Hymera	83
8.	Wm. F. Brown, Clinton	85
9.	Louis Rouslan, Terre Haute	80

Examination Held August 25 and 26, 1909. Total Number of Candidates 21.
Total Number Passed 11.

Certificate No.	Name and Address.	Per Cent.
9.	George A. Sage, Bicknell	79
10.	B. L. Smith, Burnett	76
11.	Genoa C. Potter, Augusta	82
12.	Jas. C. Anderson, Princeton	76
13.	Hugh Rice, Linton	83
14.	William Wilson, Linton	88
15.	James Challenger, Bicknell	77
16.	Calvin Wilson, West Terre Haute	80
17.	Louis Wautelet, Linton	91
18.	William Jardine, Clinton	78
19.	H. M. Stewart, Shelburn	78

Examination Held December 29 and 30, 1909.

Certificate No.	Name and Address.	Per Cent.
20.	Robert Weston, Edwards	82
21.	Thomas Hall, Chandler	79

HOISTING ENGINEER.

Examination Held April 7 and 8, 1909. Total Number of Candidates 22.
Total Number Passed 13.

Certificate No.	Name and Address.	Per Cent.
1.	Cornelius Schrepferman, Brazil	79
2.	George Rudock, Diamond	79
3.	Charles H. Coleman, Oakland City	80
4.	Edward L. Cox, Sullivan	80
5.	Carl Alumbaugh, Sullivan	80
6.	Samuel Gambill, Hawesville	76
7.	William Forbs, Linton	84
9.	Willey Almer Poole, Linton	82
10.	Thomas Huntley, West Terre Haute	80
11.	Neal Watts, Brazil	80
12.	Charles Lawtor, Clinton	79
13.	N. E. Day, Burnett	78
14.	Cecil M. Stewart, Fontanet	80

Examination Held August 25 and 26, 1909. Total Number of Candidates 17.
Total Number Passed 7.

Certificate No.	Name and Address.	Per Cent.
15.	H. E. Stevenson, Brazil	83
16.	Walter W. Robertson, Linton	81
18.	Charles H. Hagg, Bicknell	79
19.	Arthur McFarland, Oakland City	79
20.	George W. Rudolph, Boonville	81
21.	J. L. Austren, Newburg	79
22.	George Grabe, Clay City	80

Examination Held December 29 and 30, 1909. Total Number of Candidates 16. Total Number Passed 9.

Certificate No.	*Name and Address.*	*Per Cent.*
23.	Joe N. Vansickle, Clinton	78
24.	Carl F. Hughes, Shelburn	84
25.	Elza Hutchison, Dugger	82
26.	Jasper Boyd, Coalmont	77
27.	Frank Letterman, Linton	80
28.	Wm. Armstrong, Sullivan	75
29.	Harvey Marlowe, Bridgeton	78
30.	Bert Norris, Hymera	80
31.	Homer West, Dugger	77

FATALITIES AND INJURIES TO MINE EMPLOYES.

A compilation of the monthly reports of mine bosses, coal companies, and the reports of inspections made to this office during the year 1909 shows a total of 1,129 accidents to persons employed in and around Indiana mines. These accidents are divided into four different classes, each class being treated separately.

The annexed table of causes exhibits the different heads under which the accidents are treated, the total number of each class of accidents occurring and the different causes thereof:

TABLE OF ACCIDENTS.

Cause.	Fatal.	Permanent.	Serious.	Minor.	Total.
Falling coal	1	....	46	46	93
Falling slate	24	6	141	92	263
Mine cars	4	1	174	206	385
Mining machine	1	1	32	24	58
Mine motors	0	0	4	2	6
Smoke and dust explosion	6	0	0	0	6
Smoke explosion	1	0	4	0	5
Exploding powder	1	0	11	2	14
Explosion of fire damp	0	0	13	19	32
Explosion of gasoline	1	0	1	0	2
Premature blasts	2	0	2	1	5
Delayed blasts	0	0	1	3	4
Windy shots	0	0	4	1	5
Shots through pillar	1	0	3	2	6
Mine cages	3	0	16	2	21
Falling down shaft	2	0	0	0	2
Coal falling down shaft	1	0	2	11	14
Kicked by mules	....	0	21	34	55
Railroad cars	1	0	1	2	4
Electric shock	1	....	9	5	15
Miscellaneous	....	....	40	94	134
Total	50	8	525	546	1,129

DESCRIPTION OF FATAL ACCIDENTS.

Each of the above fatal accidents has been investigated, either by myself or one of my assistants, acting in conjunction with the coroners of the different counties in which the accidents occurred. We give herewith a brief statement of facts, circumstances and conditions attending each fatality, as brought forth at such investigation:

VIGO COUNTY.

January 5—Vandalia No. 67 Mine: Zigmund Falevich, miner, twenty-one years of age, Polander, single, was fatally injured by a fall of dirt band located near the top of the coal seam.

The coal seam here is divided into three benches, as follows: Beginning at the bottom of the seam there are 32 inches of coal called the lower bench, on top of this a smooth parting, then 29 inches of coal called the upper bench; following this a binder, or band, 9 inches in thickness, composed of a mixture of slate, fire clay and bone coal, called the dirty band, and above this 20 inches of coal which is usually kept up for roof.

The lower and upper benches are each mined separately, the upper bench being advanced first, and the dirty band, although separated from the coal by a smooth parting, is broken with each shot and should be taken down with the coal. Miners frequently become careless, however, and permit it to hang back several feet from the face, making an exceedingly dangerous roof to work under.

An examination of decedent's working place after his accident evidenced the fact that he had permitted the dirty band to remain up and hang back a distance of 7½ feet from the face without props or other support under it.

About 8 o'clock the morning of the accident he was at work under this ledge, mining off a loose shot in the upper bench, when suddenly, without warning, the ledge gave away, falling on him and inflicting injuries from which he died one and one-half hours later.

SULLIVAN COUNTY.

January 30—Larsh Mine: Alpha Thomas, mine boss, thirty-eight years of age, American, wife and five children, met his death at the bottom of the north side of the hoisting shaft.

There were no eye-witnesses to this accident.

When found deceased was lying in the water in the north sump of the shaft, dead. It is presumed that while working around the shaft bottom he was struck and knocked into the sump by the descending north cage and that the cage following on down crushed him to death against the timbers in the bottom of the sump.

PARKE COUNTY.

February 1—Mary No. 1 Mine: Patrick Daugherty, jerryman, fifty-six years of age, American, who leaves a dependent wife, was fatally injured by falling slate. At the time he met his accident decedent and a fellow-workman by the name of John Swain were at work closing a break-through between rooms 1 and 2 in the second east entry with dirt and slate, which they were shoveling from the gob in room No. 2. About 12:30 o'clock, while so engaged, a large piece of slate measuring 6 feet in length, 4 feet in width and 4 inches thick, suddenly gave away, falling on them and crushing Daugherty through the ribs and abdomen, inflicting injuries from which he died at 9:45 o'clock a. m. the 4th inst. Swain was also seriously injured by the fall. Both men had examined and tested the slate before commencing to work under it and pronounced it in their judgment safe.

GREENE COUNTY.

February 12—Twin No. 5 Mine: Walter Masterson, machine helper, twenty-eight years of age, Scotch, who leaves a wife and one child, was killed by falling slate.

On the morning of the accident Masterson and his machine runner, Edd Pigg, were at work with an electric chain mining machine undercutting room No. 22 on the third south entry, which they had partially undercut the day previous. Before commencing work they were advised by James Gill, "loader for room No. 22," that he had noticed a slip in the roof which had been uncovered by the previous fall, and that they had better examine the roof before starting the machine.

Both Masterson and Pigg examined the roof and sounded it with a pick. Pigg, remarking that it would stand all right, proceeded with his work. They had completed one run or undercut, and about 3 feet of the second one, when suddenly a piece of slate measuring 21 feet in length, 7 feet in width, ranging from 1 to 5 inches in thickness, gave away and fell on them, killing Masterson instantly. Pigg, who was struck by the outer edge of the fall, was injured slightly.

PIKE COUNTY.

February 13—Muren Mine: John Merwin, motorman, forty-seven years of age, American, who leaves a wife, was fatally burned by an explosion of gasoline.

The motor which Merwin was driving was one of the gasoline type, and at the time he met his accident it was standing idle on one of the entries, the engine having run out of gasoline. Decedent was filling the tanks from a can, and at the time had his lighted lamp on his head within a few inches from the mouth or the top of the tank into which he was pouring gasoline. In some way his lamp was knocked off his head and fell in the tank, exploding the gasoline, burning him about the face, hands and body, and so injuring him that he died at 5 o'clock p. m. the following day.

CLAY COUNTY.

February 16—Pyrah Mine: Thomas Race, mine boss, thirty-four years of age, American, wife and five children, was fatally injured by falling slate.

This mine is operated for local trade only and employs but seven miners, the mine boss being required to serve in the capacity of timber man, track man, bottom shooter, or any other work necessary to keep the mine going.

About 1:30 o'clock p. m. the day of the accident decedent had gone into the working place of James Flockheart for the purpose of drilling a bottom shot. Flockheart was loading a car at the time, which was standing where the shot was to be drilled in the bottom, and in order to hurry matters along Race started to mine off a block of coal under some bad roof. He had mined but a few minutes when some small pieces of slate fell on him, warning him of his danger. Before he could reach a place of safety, however, a large piece of slate 10 feet in length, 2 feet in width and 1 foot thick, fell on him, crushing him through the stomach and bowels, inflicting injuries from which he died at 5 o'clock of the same evening.

VERMILLION COUNTY.

March 2—Prince Mine: John Dardana, shot firer, twenty-six years of age, Italian, who leaves a dependent mother, was killed in an explosion of gases generated from powder used in excessively overcharged blasts, combined with the gases distilled from coal dust which had been used in tamping shots, coming in contact with the large volume of flame produced by the overcharges of powder.

From evidence brought forth at the investigation of this accident it was learned that decedent and a fellow-miner by the name of Adam Meskewich were employed as regular shot firers in this mine; also that an explosion occurred in the mine the evening of the 21st before they had completed the firing of all the shots.

Fortunately they were in a place of safety when this explosion occurred and both escaped without injury. The mine, however, was damaged to such extent that they could not complete their work until repairs had been made.

About 5 o'clock the evening of the accident, the necessary repairs having been made and the ventilating current restored, they again went into the mine for the purpose of firing the remaining shots left over from the previous evening.

On this occasion they commenced the shot fire on the first and second northeast cross-entries, decedent going up through the rooms on the second, facing the return air, and his buddy through the rooms on the first, traveling with the air, each splitting the ends of the fuse in the shots but not lighting the fuse.

It should be stated that the purpose of splitting the fuse was to expose the powder, which would render them more quickly lighted. It is customary for each shot firer to take an entry and light all the shots thereon, lighting them one after another in rapid succession without waiting for any of those lighted first to explode.

When they met at the head of the first and second northeast entries, decedent had split the ends of the fuse in 19 shots and his buddy those in 22.

Turning at the head of the entry, each retraced his way through the same workings, lighting the shots one after another as quickly as possible.

In this manner decedent had lighted 18 shots and his buddy 20, or a total of 38 shots lighted in about nine minutes, when the explosion occurred.

This was probably the most destructive explosion that has occurred in the Clinton field. A number of buntings were torn out in the main hoisting shaft, mine cars and mine doors were demolished, heavy iron rails torn up from the mine tracks and twisted or bent double; in fact, the mine was almost completely wrecked.

As soon as possible a rescue party entered the mine in search of the shot firers. Dardana was found lying near the north rib between rooms 7 and 8, on the second east entry, dead, his clothing being almost completely burned off him.

Mesewich escaped with his life, but was seriously burned and bruised and suffered intensely from the effect of the after-damp he inhaled.

An examination of the mine was made the 4th inst. by Assistant Inspectors O'Connor and Irving for the purpose of ascertaining, if possible, the exact cause of the explosion. They reported conditions found as follows:

(1) Room No. 8 is the first room working on both the first and second northeast cross-entries.

(2) All the shots on each entry had been fired except those in room No. 8 on each entry.

(3) A total of 38 shots, i. e., 20 on the first entry and 18 on the second entry, had been fired.

(4) That the charges contained in these shots represented not less than 225 pounds of powder.

(5) That each and every shot was excessively overcharged.

(6) Evidence was found that the drill dust had been used extensively in stemming the shots.

(7) Drill holes were found that measured 3½ inches in diameter.

(8) That the 38 shots were fired in a fraction less than nine minutes, or one shot for less than each 15 seconds.

(9) Three powder kegs were found burst from the inside, indicating them to have been burst by powder exploding in them.

From the foregoing it is evident that a large volume of carbon monoxide was produced from the excessive amount of powder burned; add to this a perhaps larger quantity of the same gas distilled from the drill dust produced by the blasts in grinding and breaking down the coal, each coming in contact with the flame from the overcharged shots, and considering the fact that the lower explosive limit of CO is 1 volume of gas to 13 of air, and that the mixture continues to be explosive until the proportions of 1 of gas to 75 of air is reached, also that in the firing of 38 shots at intervals of perhaps 15 seconds the mixture is brought up to the proper temperature to ignite readily, we have conditions just ripe for an explosion, and all that is required to produce one is the flame of a blown-out shot projected into the mixture.

It is the opinion of those who made the investigation that the explosion had its origin at the face of room No. 8 on the first northeast and was brought on by the flame from the last shot fired on that entry. The drill hole in this shot measured 3½ inches in diameter, and the shot was excessively overcharged and evidently produced a large sheet of flame, which was projected into the mixture as above described. The debris found along the roadway and the damage done at this point indicate the opinion to have been the correct one.

CLAY COUNTY.

March 6—Vandalia No. 65 Mine: Walter Neice, miner, thirty-five years of age, American, single, was fatally injured by falling slate.

About 11:40 o'clock a. m. decedent was engaged mining off a standing shot, when suddenly, without warning, a large piece of draw slate 10 feet in length, 5 feet wide and 7 inches in thickness, under which he was working, gave away, falling on him, breaking his spinal column in two places, also crushing him through the chest, inflicting injuries from which he died May 18 following.

VERMILLION COUNTY.

March 9—Dering No. 7 Mine: Patrick Fair, day laborer, forty-four years of age, Irish, who leaves as dependents two children, was fatally injured by falling slate.

A few moments previous to the accident decedent had assisted in pushing an empty car to the working face of one of the rooms, and was leaning on the outside end of the car apparently resting a few moments before leaving the room, when a piece of slate 6 feet in length, 3 feet in width and 3 inches thick fell on him, crushing his breast down against the end of the car and so injuring him that he died at 10:30 o'clock p. m. of the 13th, following, in St. Anthony Hospital at Terre Haute.

VIGO COUNTY.

March 19—Wabash Mine: Frank Hogue, loader, thirty years of age, American, who leaves a wife, was fatally burned by an explosion of powder.

About 3 o'clock p. m. decedent and his buddy, Joe Morris, having completed their day's work, were sitting in a break-through a short distance back from the face of their working place, where they kept their powder, oil, tools, etc., waiting for the shot firing to commence.

Hogue at the time was sitting on an almost full keg of powder from which the slide opening had been removed, leaving the opening in the top of the keg uncovered. While in this position he picked up some loose grains of powder lying on the mine floor and began exploding them on his lamp blaze within a few inches of the uncovered opening in the powder keg, thus not only endangering the lives of his buddy and himself, but polluting the mine air with powder smoke as well. His buddy warned him of the danger and requested him to quit burning the powder. He continued placing the grains one at a time on his lamp blaze, however, until the result to be expected followed, i. e., one of the grains of powder flashed into the open keg, exploding the powder, burning him about the face, hands and body and so injuring him that he died at 9 p. m. of the same day. Morris was also severely burned.

GREENE COUNTY.

March 20—Lattas Creek: Joseph Reed, top laborer, forty-four years of age, American, wife and three children, was killed by being run over by a railroad car.

About 11 o'clock a. m. decedent was dropping an empty railroad car down to the tipple when in some way he slipped and fell directly under the moving car, which crushed him through the breast and bowels, killing him instantly.

VANDERBURGH COUNTY.

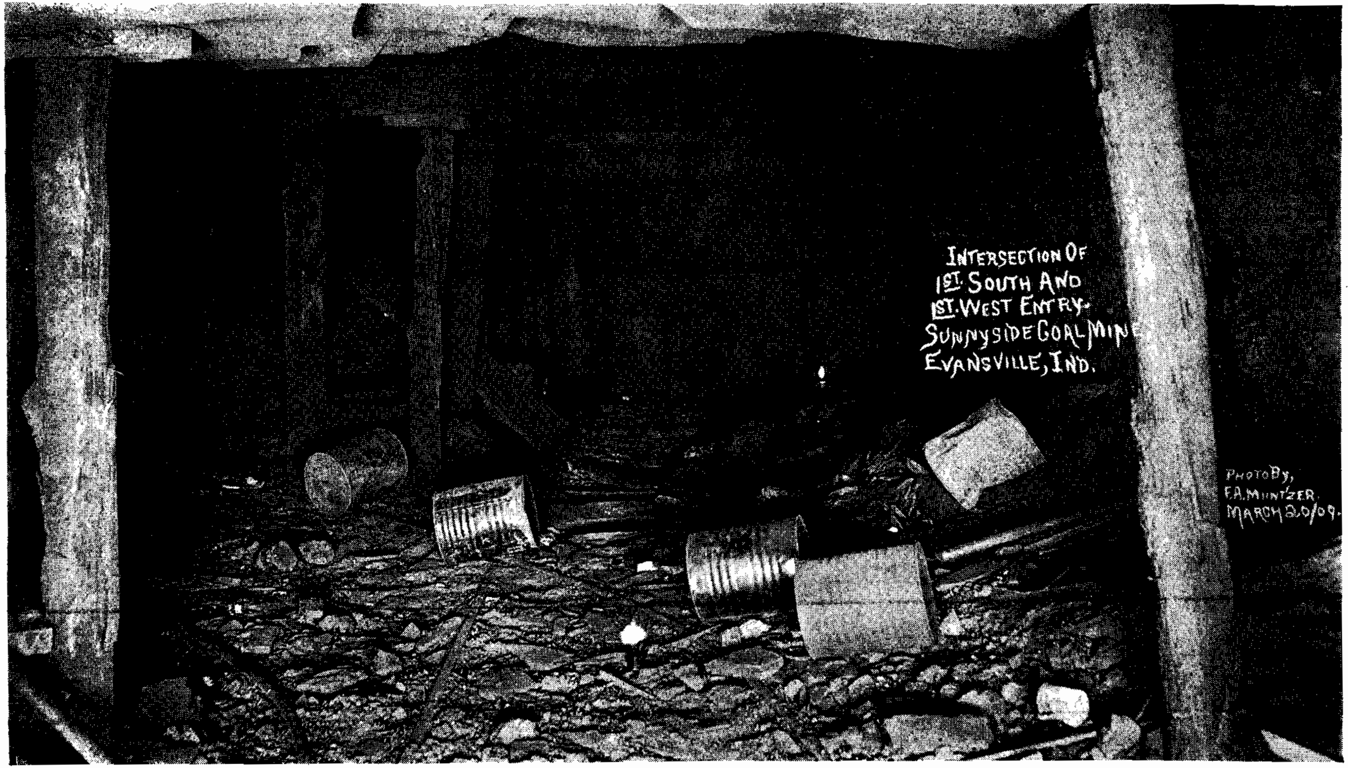
March 20 dates the most disastrous mine accident for the year concerning the loss of life.

About 12 o'clock midnight of this date an explosion occurred in the Sunnyside mine at Evansville, resulting in the death of six persons, five of whom were taken out of the mine dead and one so badly injured that he died some twelve hours later.

The causes responsible for this disaster were identical with those causing the explosion March 2 in the Prince mine, Vermillion County.

An examination of the mine was made the day following the explosion by myself, my assistants, the coroner of Vanderburgh County, the mine superintendent, mine boss and a number of miners who were working in the mine when the explosion occurred. The following are the facts and conditions that were developed through this examination:

(1) The explosion had its origin at the face of room No. 6, the last room on the first southwest cross-entry, in what is known as



Photograph No. 1.

the new workings of the mine. (See photograph No. 1, showing intersection of first west and first south entries, at which point five bodies were found.)

(2) In room No. 1 we found one shot tamped on fuse with drill dust, but not exploded.

(3) In room No. 2 two shots not exploded, both tamped with drill dust, one of which was tamped so loosely that the fuse, with its knotted end, was easily drawn out of the charge through three or four feet of drill dust tamping.

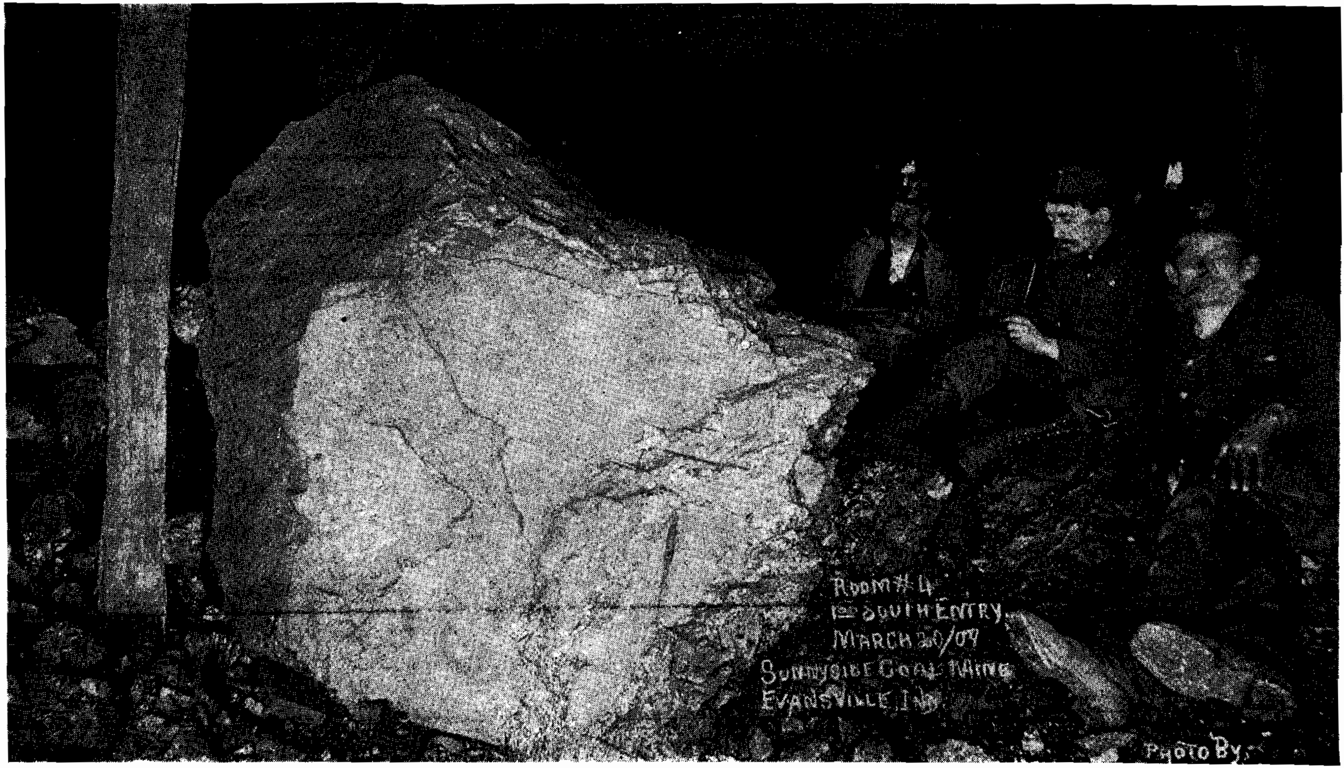
(4) In room No. 4 we found a shot that had evidently been fired the evening the explosion occurred. This shot was eight feet wide at the point, measured at right angles to the drill hole, drilled eighteen inches past the cutting or loose end and was excessively overcharged, the coal being thrown back down the room a distance of forty-four feet. Approximately 40 per cent. of the powder contained in this charge was in excess of that required to break down the coal, and was expended in the mine air in the form of carbon monoxide. (See photograph 2.)

(5) In room No. 5 two shots had been fired, both excessively overcharged, the coal being thrown back down the roadway thirty feet or more.

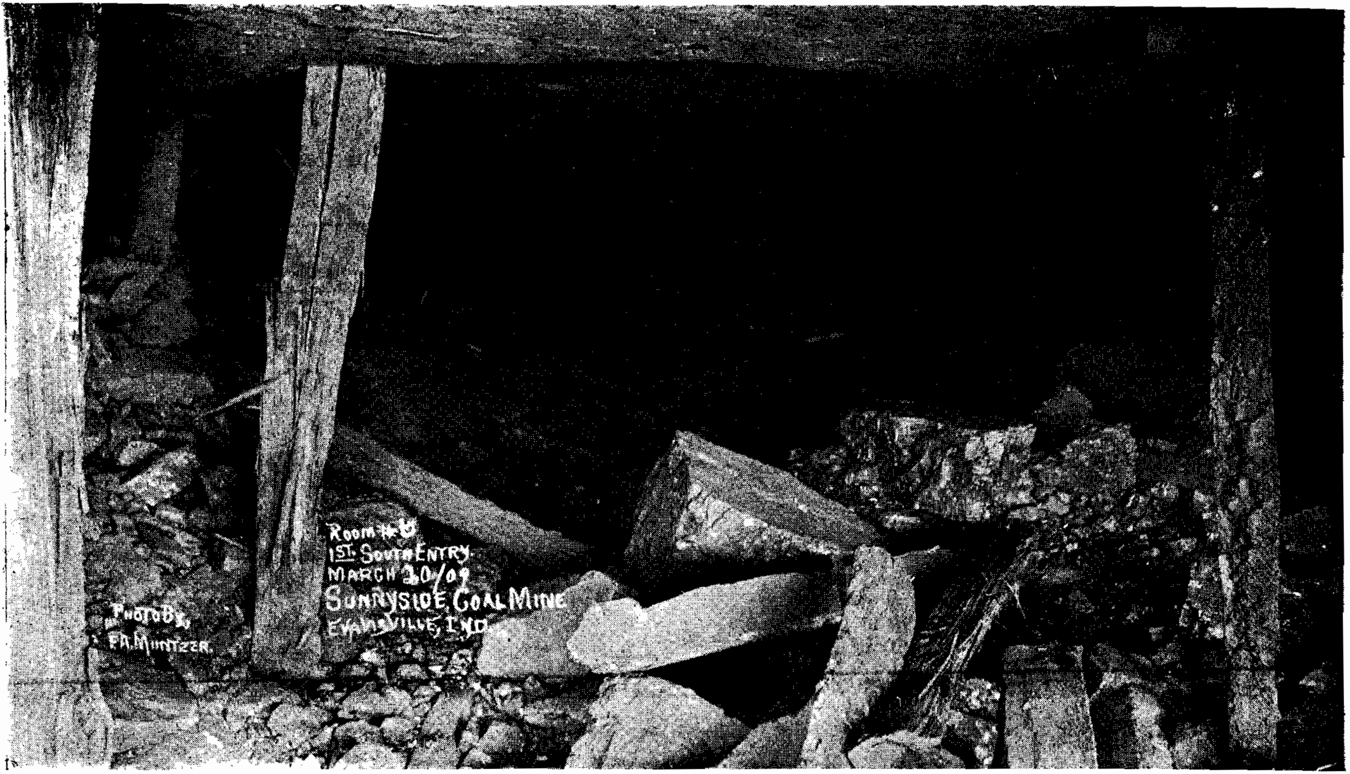
At least 25 per cent. of the energy in each of these charges was expended in the mine air.

(6) In room No. 6, where the explosion had its origin, two shots had been fired. These shots had been laid facing each other, one of which was drilled pointing toward the north rib and the other one toward the south rib of the room, the mouths of the two holes being but a few feet apart. Both shots were very heavily overcharged, and the coal brought down by them was broken very fine, much of it ground into a dust and a portion of the coal thrown the full length of the room and across the entry a distance of about sixty feet. All the props on the north side of the roadway were swept out a distance of thirty feet back from the face, indicating that an unusually large amount of powder had been exploded in this room. (See photograph No. 3, showing interior of room, and No. 4, showing mouth of room.)

(7) At the face of the first south entry much the same conditions were found as in room No. 6. A cutting shot had been placed in the southwest corner of the entry which measured 4 feet in length, 22 inches in width at the point, and a few inches thicker at the heel. This shot was literally pulverized, and no doubt created



Photograph No. 2. Showing conditions in Room No. 4.



Photograph No 3. Showing interior of Room No. 6.

a large quantity of very fine coal dust. Less than twenty-five per cent. of the powder used in this charge would have been ample to perform the work intended, leaving at least seventy-five per cent. of the energy to be expended in the mine air, to which must be added the large quantity of carbon monoxide distilled from the coal dust burned in the flame from the shot. (See photograph No. 5, showing conditions at the face of the entry.)

NOTE.—Quoting an eminent authority on properties of coal dust: One pound of inflammable coal dust exposed to the flame of a blown-out shot or other explosion will produce a volume of carbon monoxide equal to 31.5 cubic feet, measured at sixty degrees Farenheit, and 14.7 pounds pressure per square inch.

CO has a lower explosive limit at the proportions of 1 volume of gas to 13 of air and a higher explosive limit at 1 part of gas to 75 parts of air, which, being true, 1 pound of coal dust will produce sufficient gas to render explosive a maximum volume of mixture equal to 31.5×75 equals 2,362.5 cubic feet. Thus it can be readily understood that a small amount of coal dust under favorable conditions can be made to produce sufficient gas to render explosive a large volume of air, and that the use of drill dust, or even coal slack, in tamping shots is an extremely dangerous practice.

After completing our inspection of the mine we then assisted the coroner in examining witnesses, sixteen of whom were examined. This part of the investigation occupied two days' time and no questions were unasked that would tend to throw light on the cause of the explosion. Invitations were also extended the miners' committee, miners or other persons present to ask any questions touching on the matter.

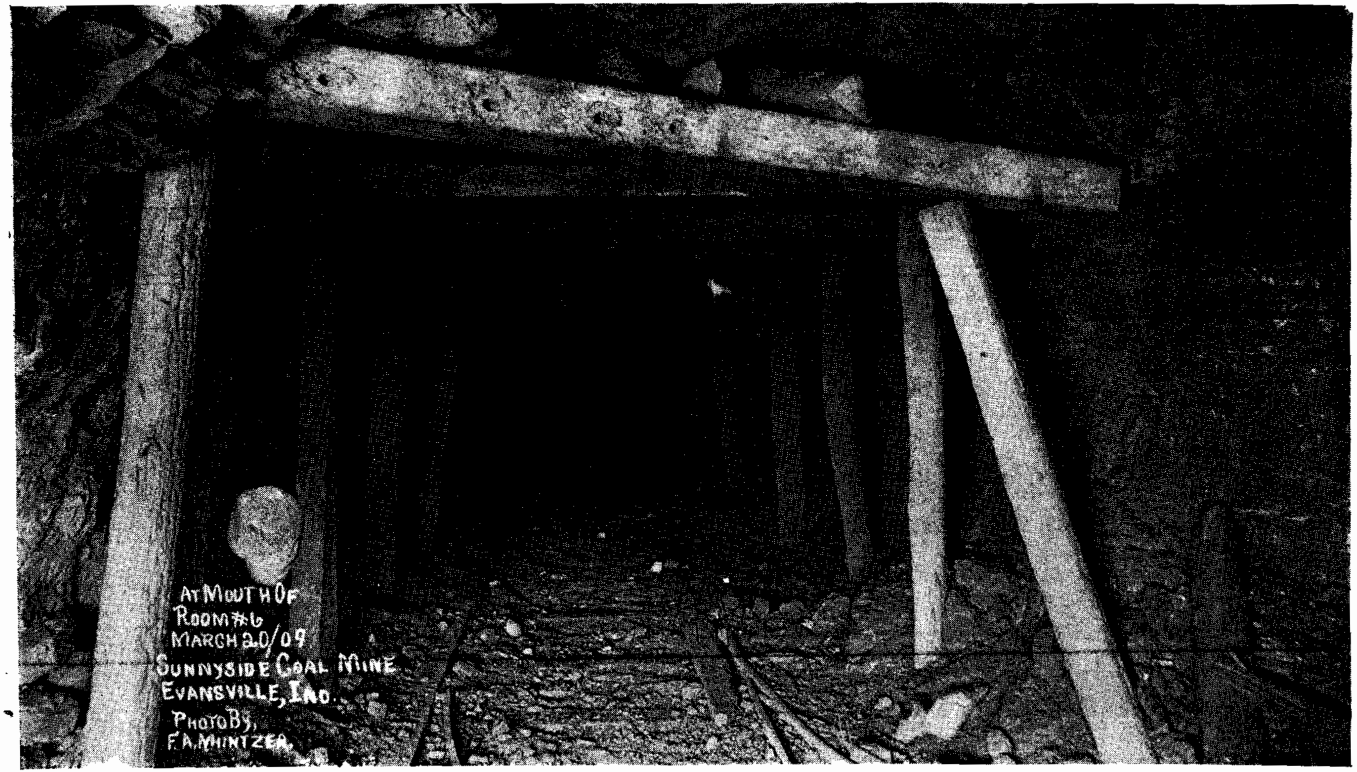
From our examination of the premises, together with evidence brought forth in the examination of witnesses, we established the following facts:

(1) That it was a common practice throughout the mine for miners to tamp their shots with drill dust or dry coal slack.

(2) That in numerous instances the tamping was shoved back against the powder loosely, with the button on the end of the scraper, instead of being tamped solid with tamping bar, which is necessary to confine the charge.

(3) That the greater number of shots in the mine were fired with fuse.

(4) That where a miner had more than one shot to fire, it was customary for him to light each one before leaving his place.



Photograph No. 4. Showing conditions at mouth of Room No. 6.

(5) That at firing time it was customary for the person first on turn to fire, to light his shot or shots, run past the working place of the next in turn and call "All right;" he in turn would light his shots and run past the next in turn, calling "all right."

In this manner the shots were lighted one after another in quick succession without waiting for any of those first lighted to explode. The fuse in perhaps a dozen or more shots are burning at the same time, and as the fuse is cut at different lengths to suit the length of the drill holes, a number of the shots would explode simultaneously.

(6) That the statute relating to the thickness of shots and drilling past the cutting or loose end was violated in numerous instances.

(7) That the ventilation in that section of the mine where the explosion occurred was exceptionally good.

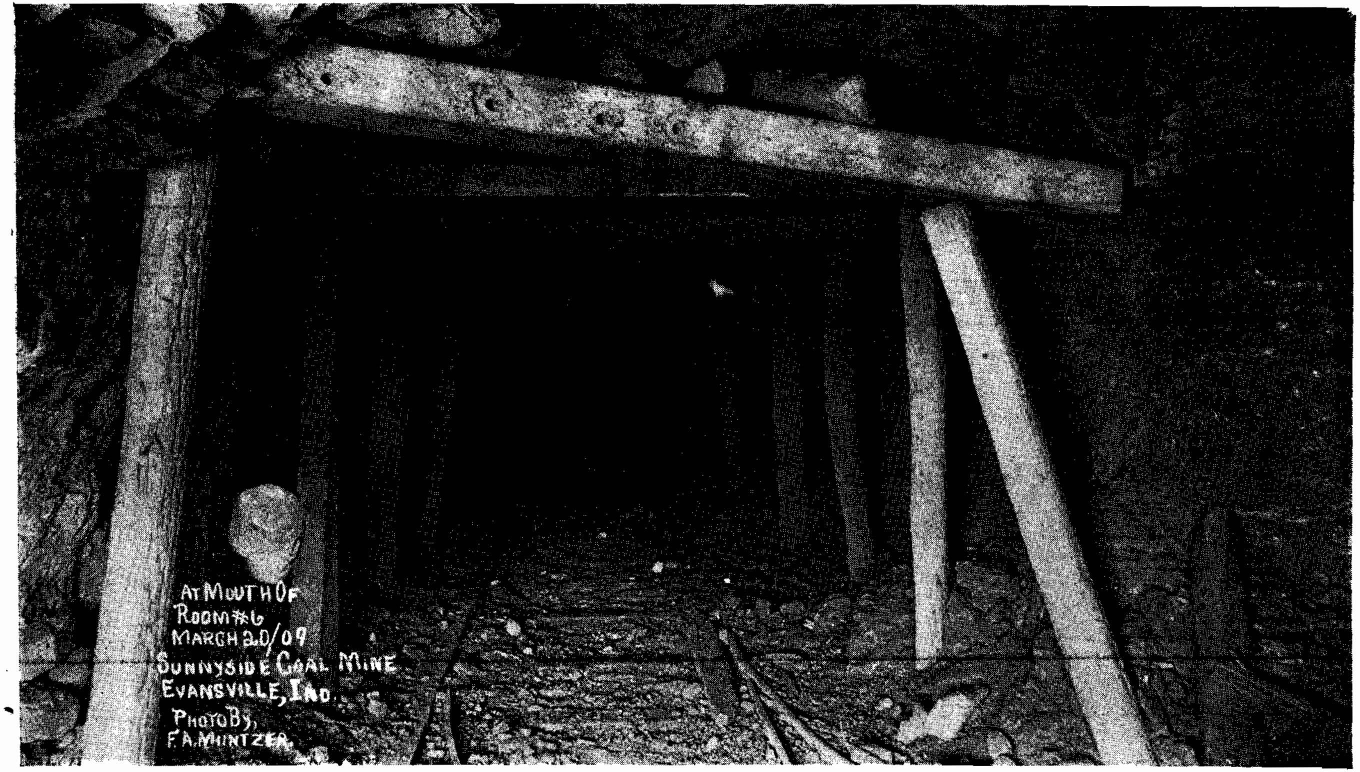
(8) That there was a total absence of fire damp.

Summing up all the foregoing facts, it is my opinion, which opinion is concurred in by the coroner and those who assisted in the investigation, that this was purely an explosion of gases produced from the explosion of powder and the gases distilled from the coal dust used in tamping shots and that produced in blasting down the coal, each coming in contact with the volume of flame from such blasts.

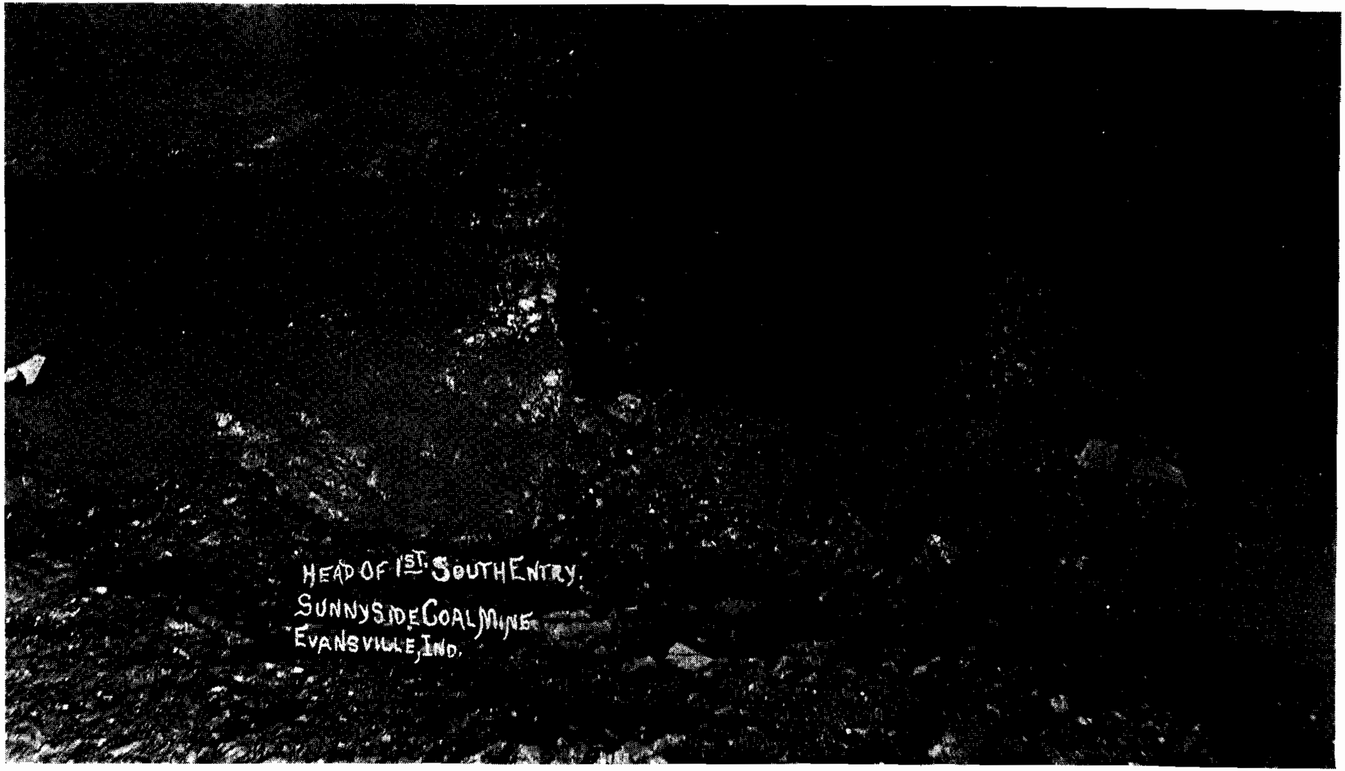
Also that the two shots placed facing each other in room No. 6 were directly responsible for the explosion. These two shots were evidently tamped on fuse and both lighted at the same time, one exploding a few seconds after the other, the flames from the second shot igniting the gases generated by the first one, these in turn communicating to the gases generated in the first south entry.

The following are the names, ages, nationality and occupation of the persons killed and the number of dependents left by each:

Joseph Shanks, miner, 54, American, wife, four children,
Samuel Coomer, miner, 51, American, wife, three children.
N. Willenham, miner, 48, colored, one child.
Frank James, miner, 18, colored.
John Pettitt, miner, 52, American, wife, one child.
Wm. Schnute, miner, 49, American, wife, one child.



Photograph No. 4. Showing conditions at mouth of Room No. 6.



Photograph No. 5. Showing conditions at face of first south entry.

About 10 o'clock a. m. a loaded trip was pulled out of the fifth west, and decedent then should have set the switch so that the motor could pass that point when going in after the following trip. This he forgot to do, however, and when he heard the motor returning with a train of empty cars a few minutes later he opened the trap door between the two entries and stepped into the mouth of the fifth west, thinking to let the train pass him. The switch not having been changed, the trip ran into the entry, the front car pinning him against the entry side, crushing and injuring him so badly that he died within a few minutes.

VERMILLION COUNTY.

April 20—Prince Mine: Oliver Bowen, cager, thirty-three years of age, colored, wife and four children, was struck and fatally injured by a piece of coal falling down the hoisting shaft. About 8 o'clock a. m., while caging a car of coal on the west cage, decedent for some reason (presumably for the purpose of raising the keepers which hold the car in position on the cage) leaned out over the edge of the car into the shaft, and while in that position a piece of coal weighing nearly two and one-half pounds fell from the top landing, a distance of something over 300 feet, striking him on the head and fracturing his skull and inflicting injuries from which he died at 9 o'clock p. m. of the same date.

GREENE COUNTY.

April 30—Vandalia No. 9 Mine: Desire Simon, loader, thirty-three years of age, French, wife and one child, was killed by falling slate.

About 8 o'clock a. m. decedent and his buddy were engaged drilling the face of their working place preparatory to shooting down the undercut which had been recently made. Simon had finished his work on one side of the room and was crossing over to commence drilling on the opposite rib, when, just opposite the head of his roadway, a large piece of slate 9 feet in length, ranging from 3 to 5 feet in width and from 8 to 12 inches in thickness, suddenly gave way, falling on him and killing him instantly.

KNOX COUNTY.

May 18—Lynn Mine: Egbert Cleghorn, loader, thirty-five years of age, American, who leaves a wife and one child, was killed by falling slate.

At the time he met with his accident deceased was working under a piece of roof which he knew to be loose and dangerous and which the mine boss had ordered him to timber a few hours previous to his death.

Regardless of the orders given him by the mine boss and his knowledge that the slate was loose and dangerous, he continued loading coal and performing other work, neglecting to set the props necessary to protect his life.

About 11:30 a. m., while engaged mining down some loose top coal, a piece of slate 7 feet in length, 5 feet wide, ranging from 3 to 12 inches in thickness, gave way, falling on him and killing him instantly.

From the foregoing it is evident that decedent contributed to his own accident and death. Notwithstanding this fact, the mine boss was also negligent of his duty in not forbidding empty cars to be given decedent to load coal in, or permitting him to perform work of any kind in his working place until he had properly secured it with props or other timbers.

Vermillion County.

May 24—Crown Hill No. 3 Mine: Joe Shertoe, machine helper, thirty-five years of age, Austrian, who leaves a wife and five children, was killed by falling slate.

About 6:50 o'clock a. m. deceased and John Vargo, machine runner, were going into the mine preparatory to commencing their day's work, when opposite room No. 7, in the third east off first north entry, a large piece of slate 16 feet in length, 6 feet wide, ranging from 1 to 14 inches in thickness, suddenly gave way, falling on Shertoe and killing him instantly. Vargo was also struck by the slate and seriously injured.

Greene County.

June 5—Vandalia No. 5 Mine: Lewis Hogue, machine helper, thirty-four years of age, American, wife and four children, was fatally injured by the bitt chain of an electric mining machine.

About 9 o'clock a. m. deceased and his buddy, M. K. Lackey, machine runner, had set up and started their machine on an undercut. The helper usually occupies a kneeling position facing the coal seam near the left side of the bed frame of the machine, from which point he shovels back the cuttings as they are delivered on that side of the machine by the bitt chain.

On this occasion Hogue for some reason took his position with his back toward the coal face, and just when the machine had gotten fairly started his shovel in some way caught in the chain and he was dragged over against the side of the machine. The machine bitts, which protrude outside the bed frame and travel at the rate of about 275 feet per minute, catching his left leg, almost severed it from his body.

The loss of blood and the shock incident to his injury resulted in his death about 4 o'clock p. m. following.

Vigo County.

June 9—Dering No. 6 Mine: James Picco, miner, thirty-six years of age, wife and three children, was killed by falling down the hoisting shaft.

From evidence adduced at the investigation of this accident it was learned that on the morning of above date an accumulation of white damp (CO) produced by the shots fired the previous evening was found to have collected in the working places on the ninth and tenth west cross-entries to such an extent that the miners and other workmen were compelled to leave that section of the mine, some of whom did not begin their day's work; others, making an effort to work, remained in their places a short time. Among the latter was deceased, who remained at work until ordered out by the driver.

On coming to the shaft bottom, although affected by the white damp, he was able to walk and apparently was able to take care of himself and got on the cage with eight other persons to be hoisted to the surface.

When within about 30 feet of the top of the shaft he fell over against one of the shaft buntings and was dragged through an 8-inch space between the bottom of the cage and the buntings, falling to the bottom of the shaft, a distance of 90 feet, killing him instantly.

It is presumed that the effect of the white damp caused him to become dizzy on reaching the fresh air, which, with the motion of the cage, caused him to fall.

Vermillion County.

June 17—Dering No. 8 (Brazil Block No. 8): Frank Moliskie, driver, twenty-three years of age, Polander, wife and three children, was fatally injured by falling slate.

About 12:30 o'clock p. m. decedent brought a loaded trip of cars to the shaft bottom and passed with his mule through the cross-cut into what is known as the west lead, or empty siding, for a trip of empty cars.

At this time there was but one empty car standing in the lead, to which he hitched his mule, and while standing waiting for cars sufficient to make up his trip a piece of slate 18 by 24 inches, 5 inches thick, suddenly gave way, falling on his head, crushing him down on the mine floor and inflicting injuries from which he died thirty minutes later.

VERMILLION COUNTY.

June 23--Crown Hill No. 1 Mine: Hubert Eller, trip rider, twenty-two years of age, American, single, was crushed to death by loaded mine cars.

About 9:30 a. m. Eller and Frank Jeffreys, motorman, were coming out of the mine with an electric motor coupled to a trip of eighteen loaded cars.

When some 400 or 500 feet from the bottom of the shaft they were signalled to stop, and a few minutes later were signalled to advance. When starting the trip in response to the latter signal the front drawbar in the twelfth car from the motor gave way, leaving seven cars of the trip standing.

When they had delivered the eleven cars on the siding at the shaft bottom they ran the motor back after the remainder of the trip, and using a ten-foot chain, one end of which was hooked in the drawbar of the motor and the other end passed through under the first car and hooked in the drawbar of the second one, the trip was started for the shaft bottom.

Eller was riding on the front end of the first car, standing with one foot on the car bumper and the other on the chain ready to take up the chain when it was cut loose from the motor at the shaft bottom.

When near the empty siding at the bottom of the shaft the motorman cast off the chain, and Eller, stooping to pick it up, in some way lost his footing and fell under the front car of the rapidly moving trip, in which position he was dragged and rolled along the roadway about twenty feet, killing him instantly.

SULLIVAN COUNTY.

June 26—Phoenix No. 4 Mine: William Phillips, room boss, twenty-four years of age, American, who leaves a wife, was killed by falling slate.

At the time he met with the accident Phillips and a driver by the name of James Snapp were cleaning up some slate in room No. 16, on the fifth northeast cross-entry, preparatory to making a double parting. While so engaged the roof under which they were working was discovered to be loose and dangerous and Phillips ordered Snapp out from under the loose slate until he (Phillips) could secure it with props. This he proceeded to do, and had set one prop and was in the act of setting the second one, when a large piece of the slate, 12 feet in length, 6 feet wide and 12 inches in thickness, gave way, falling on him and killing him instantly.

VIGO COUNTY.

July 19—Atherton Mine: Adolph Mosk, miner, twenty-eight years of age, Polander, single, was fatally injured by falling slate.

At the time he met with the accident deceased was at work shoveling loose coal out from the north side of the face of his room. He had been so engaged for some little time and had shoveled a considerable pile of the coal back about six feet from the face, when a large piece of slate, 7 feet in length, 2 feet wide and 10 inches in thickness, suddenly gave way. The outer edge, falling first on the pile of coal, toppled over on him, breaking his back and injuring him otherwise, from which injuries he died the following day in St. Anthony Hospital at Terre Haute.

VERMILLION COUNTY.

August 4—Klondyke Mine: Andrew Verbic, miner, thirty-three years of age, Austrian, single, was fatally injured by a blast.

The morning he met with the accident was decedent's first work in the mine, and on examining the working place assigned him he discovered a shot that had not been fired.

The place had been standing idle for several days, and thinking the powder contained in the charge, having lain so long, had become damp, he proceeded to drill out the tamping for the purpose of recharging the shot.

In removing the tamping he was using a punch drill having a steel bitt, and had struck but four or five blows on the tamping when the charge exploded, burning and so injuring him that he died at 9:30 o'clock a. m. on the 13th, following, in St. Anthony Hospital at Terre Haute, where he had been taken for treatment.

It is not known what caused the charge to explode. It is presumed, though, that it was covered with only a few inches of tamping and that he uncovered the powder sooner than expected, and the steel bitt probably coming in contact with a piece of sulphur about that time, emitted a spark which ignited the powder.

SULLIVAN COUNTY.

August 13—Consolidated Indiana No. 30 Mine: Bert Riggles, driver and jerryman, twenty-one years of age, American, who leaves a wife, was fatally injured by falling slate.

On the afternoon of the accident Riggles, in company with some other workman, were engaged in constructing an overcast on one of the cross-entries. In order to make space for the overcast it was necessary to shoot down some slate, which after being shot down was loaded in mine cars. Riggles and a fellow-workman were hauling and unloading the slate in old workings. They had hauled a car into the mouth of an abandoned room and unloaded it at 3:28 o'clock p. m. Decedent, who was serving as driver, was in the act of bringing his mule around to the outside end of the car, when a piece of draw slate, about 5 feet wide, 9 feet in length, ranging from 3½ to 3¾ inches in thickness, suddenly gave way, falling on him and injuring him so that he died about three hours later.

GREENE COUNTY.

August 17—Vandalia No. 8 Mine: Henry Wessel, miner, forty-one years of age, wife and one child, killed by falling slate.

About 11:30 o'clock a. m. decedent was engaged loading a car of coal when a piece of slate measuring 6 feet in length, 4 feet wide and 14 inches in thickness suddenly gave way, falling on him and killing him instantly.

GREENE COUNTY.

September 3—Vandalia No. 9 Mine: Thomas Smith, loader, forty-one years of age, wife and five children, was killed by falling coal.

About 10:30 o'clock a. m. deceased was at work snubbing one of his working places which had been recently undercut.

The snubbing, i. e., breaking down the bottom of the coal seam at the edge of the undercut being necessary to permit the coal to fall over when blasted.

While engaged at this work a piece of coal weighing probably 350 pounds gave way, striking his head, crushing it against the mine floor, and killing him almost instantly.

VIGO COUNTY.

September 12—Deep Vein Mine No. 1: Charles Benson, cager, forty-one years of age, American, wife and six children, was killed by falling down the hoisting shaft.

There are two seams of coal operated at this mine, the coal from each being hoisted through the same opening.

The two seams are respectively known as numbers IV and V, and lie about 105 feet apart, No. V being the lower seam. There are two gates placed at the No. V seam (as required by statute), one for the north and one for the south stage landing. The purpose of these gates is to prevent persons or mules from walking into the shaft or mine cars from being pushed or otherwise falling into the shaft when the cages are not at the landings, and these gates are required to be kept closed at all times except when opened to afford access to the cages.

There were about thirty miners employed at night, mining and loading coal in No. V, and decedent was employed as cager for this night shift. About 1:30 a. m. he caged a loaded car on the north cage which was hoisted to the tipple. At this time, notwithstanding the fact that the south cage was at the lower, or No. IV, level, he opened the south gate and left it standing open.

A few minutes later, presumably forgetting the location of the south cage and thinking it at the proper landing, he pushed a loaded car over into the empty compartment. Involuntarily clutching the car as it started to fall he was jerked over and fell with the car to the bottom of the shaft, killing him instantly.

VERMILLION COUNTY.

September 14—Dering Mine No. 8: Frank Costa, miner, thirty-seven years of age, Italian, single, was fatally injured by falling slate.

On the morning of the accident, decedent, having his working place full of loose coal and no other work to perform while waiting for empty cars, was spending his time visiting other workmen in the near locality. He had visited a number of rooms, among which was room No. 9, located on the same entry he was driving. About 8:30 a. m., while coming out of this room, when within 18 feet of the entry, a piece of slate 5 feet in length, 3½ feet wide and 5 inches in thickness, under which he was passing, gave way and fell on him, crushing him about the face, head and back. He was taken to St. Anthony Hospital in Terre Haute the evening of the same date, where he died of the injuries received, at 6 p. m. of the 16th following.

SULLIVAN COUNTY.

September 15—Shirley Hill No. 1 Mine: Alex L. Rogers, fire boss, forty-one years of age, American, wife and one child, was fatally injured by falling slate.

Rogers and a number of other persons were employed on night shift cleaning up the mine and making repairs.

About 1.30 o'clock the morning of the accident, having completed their shift, they were sitting in a break-through near the mouth of the fourth southeast cross-entry taking a short rest before going home. At the time Rogers and James Peckaliske were sitting between a prop and one of the break-through ribs, the prop being set about 3½ feet out from the coal. They had been seated but a few minutes when a piece of slate 5 feet in length and 3 feet wide gave way, falling on both men, crushing them about the back and also injuring them internally.

Peckaliske was permanently disabled and Rogers died from his injuries October 8th following.

CLAY COUNTY.

September 20—Vivian Mine No. 2: Charles Bennet, miner, thirty-five years of age, American, who leaves a wife and one child, was killed by an electric shock.

The coal seam in the mine is undercut with electric coal cutting machines, and the electric current of 250 volts by which the machines are driven is conducted to the machines at the working faces by an exposed copper wire, strung on insulators alongside of the main entry, which also serves as a main haulage and traveling road for employes and mules. Decedent was not an employe of the company, and on the afternoon of the accident had gone down in the mine with his brother, John Bennet, who was an employe, for the purpose of examining a working place in the main south entry which he had asked the mine boss for. After examining the working place in question they started to leave the mine, and while passing through a small body of water some 6 or 8 inches deep lying on the roadway, decedent's foot slipped, causing him to fall on the electric wire mentioned above, striking it with the back of his neck. In his struggle to free himself he also grasped the wire with both hands, thus completing the circuit through his body. His brother, who at the time was a few feet behind him, on hearing his outcry when he fell, ran forward and took hold of him and, though receiving a severe shock while so doing, succeeded in pulling him off the wire, not in sufficient time however to save his life. The contact probably lasted less than one minute, but life was practically extinct when decedent was extricated from the wire.

Three hundred volts of electricity are considered by expert electricians as the minimum voltage dangerous to human life, yet in this instance the engineer in charge of the electric machinery testified under oath that the load on his dynamo at the time the accident occurred did not exceed 250 volts, proving conclusively that under proper conditions, 250 volts, and in accidents of previous record even a less voltage, will cause death. There is no good reason, except a small amount of added expense, why such wires should not be insulated or strung in places other than on a main traveling road for employes, and there should be a statute enacted compelling this precaution against accidents such as above.

SULLIVAN COUNTY.

September 24—Rainbow Mine: Romain Saude, miner, sixty-five years of age, of French nationality, who leaves a wife and seven children, was killed by an ascending cage.

This accident was investigated by assistant inspector, Mr. Frank Pearce, and from evidence adduced at the investigation, together with his examination of the hoisting shaft and the mine cage on which the accident occured, it was learned, that about 3:35 p. m. (quitting time) decedent and eight other persons got on the east cage for the purpose of being hoisted out of the mine.

Decedent at the time had with him a coal pick, a powder keg, and his dinner pail, and was standing near the northeast corner of the cage without holding to the rings or devices suspended from the cross-head of the cage to be used as supports by persons ascending or descending the shaft; in fact, having the above named articles in his hands it would have been practically impossible for him to have held on to these supports.

The proper signals were exchanged between the cager at the shaft bottom and the hoisting engineer, and the engineer commenced to hoist the cage at the regular rate of speed, when, about 15 or 20 feet up the shaft, decedent in some way lost his balance and fell over the north edge of the cage bottom and was caught and dragged between the cage and the shaft curbing up to within about 20 feet of the surface, a distance of probably 50 to 60 feet, from where he was precipitated to the shaft bottom, 75 feet below. He was immediately removed to the surface, but was unconscious at the time and died a few minutes later.

KNOX COUNTY.

September 27—Tecumseh Mine No. 1: Earl Vale, driver, twenty-six years of age, American, who leaves a wife, was fatally injured in a collision of mine cars.

On investigating this accident it was learned that decedent, who was employed as a regular driver in this mine, had for his run, or places from which he had hauled coal, the north and east entries.

The switch leading to the east entries is turned off the main north, and the roadway leads through a cutoff or break-through in the pillar between the main entry and air course.

A swinging trap door is placed across the roadway in the cutoff for the purpose of conducting the air current past that point to the main workings. There was no flagman or trapper stationed at this point, and when more than one driver was making a trip in the north and east entries, in order to avoid collisions it was customary for each when approaching the east parting to make his presence known by whistling.

On the morning of the accident decedent and another driver by the name of Obey Holt were both hauling coal from the two above-named entries. About 9:25 a. m. decedent went into the east air course for a trip and Holt into the north. A few minutes later, with a loaded car each, they both approached the parting at about the same time. The door in the cutoff prevented their seeing and to some extent from hearing, each other, and each thinking the other had gone out, neither knew the other was approaching until Vale came through the door, by which time the cars were so close to the junction it was impossible to prevent a collision.

When decedent saw the cars were going to collide, in order to prevent being crushed between the cars, he tried to save himself by jumping across the north roadway, and in so doing fell under the rapidly moving car from the north, being crushed through the chest and head, death resulting twenty minutes later.

VIGO COUNTY.

October 1—Vandalia No. 69 Mine: Warren Berry, cager, thirty years of age, American, single, was fatally injured by a falling cage.

About 11 o'clock a. m. a trip of loaded cars which were being brought down to the shaft bottom had gained such headway that it was impossible to stop them before the first car in the trip ran into the shaft sump.

The coupling between this car and the second one in the trip was so bent and twisted that it was impossible to uncouple the cars without first cutting the coupling loose.

There being no tools in the shaft bottom it was necessary to send some one to the surface for a cold chisel, and the signal was given the engineer that men were coming up. While waiting for the return signal from the engineer giving notice to get on the cage, decedent for some unknown reason attempted to cross the cage. Just at this time the engineer, who testified that he heard but one bell, thinking he had been signaled to hoist coal, gave his engine a full head of steam and hoisted the cage up, catching decedent against the brow timber at the shaft bottom, crushing and injuring him so that he died ten minutes later.

There was a passage or traveling way at the east end of the shaft, and absolutely no cause for decedent to risk his life in the manner described.

VIGO COUNTY.

October 5—Lawton Mine: Anthony Marsh, miner, seventy-two years of age, English, single, was fatally injured by falling coal.

About 3:15 o'clock a. m. decedent was engaged mining off a loose shot when suddenly without warning a large mass of coal and draw slate, whose combined weight would probably be 2,500 pounds, gave way, falling on him and so injuring him that he died the day following in St. Anthony Hospital, Terre Haute.

CLAY COUNTY.

November 3—Plymouth No. 2 Mine: Victor Lafaver, miner, fifty-two years of age, French, single, was killed by a blast.

At 3:30 o'clock p. m. (firing time) decedent was trying to light a shot in his working place, when the charge exploded prematurely, killing him instantly.

The exact cause of this accident was not learned. It is presumed, though, that he had ignited the powder in the fuse and was not aware of the fact and was vainly trying to light it again.

GREENE COUNTY.

November 10—Vandalia No. 9 Mine: John James, night mine boss, fifty-two years of age, Welsh, wife and two children, was killed by falling slate.

At the time he met his death James and a fellow-miner by the name of John Goodwin were engaged in cleaning up a fall of slate in a room neck on one of the cross-entries. Goodwin thought the roof under which they were working was loose and dangerous, and so informed James, who sounded and examined the roof and pronounced it safe and proceeded with the work of cleaning up the fall. He at the time was breaking up the slate in small pieces and Goodwin loading it into an empty car. About 11 o'clock p. m. decedent again examined the roof and pronounced it safe, and while yet making the statement a piece of the slate 11 feet in length, 3 feet wide and 1 foot thick suddenly·gave way, falling on him and killing him instantly.

SULLIVAN COUNTY.

November 17—Little Giant Mine: Edward Price, miner, fifty-three years of age, American, who leaves a wife, was killed by falling slate.

There were no eye-witnesses to this accident. Decedent was last seen alive some time during the forenoon. Shortly before 12 o'clock noon the driver, Raymond Hale, pulled a loaded car which had been off the track at the mouth of his room and called to Price to come and get the empty car he was leaving for him. Returning about 1 o'clock the driver was surprised to find the car standing where he had left it.

He called to Price, and not receiving an answer, went up to the face of his room and found him lying dead under a piece of slate which measured 17 feet in length, 5 feet wide and 1 foot thick.

CLAY COUNTY.

November 18—Vivian No. 2 Mine: William Butts, miner, twenty-two years of age, American, single, was killed by falling rock.

About 10:30 o'clock a. m. decedent was engaged at work near the face of his room when a large mass of sandstone (which forms the roof over the seam) weighing probably twenty tons suddenly gave way the inner edge of the fall striking and killing him instantly.

VIGO COUNTY.

November 22—Ray No. 2 Mine: William File, shot firer, twenty-two years of age, American, wife and one child, was killed by a shot blowing through a pillar.

File and a fellow-miner by the name of James Hyde were employed as regular shot firers in the mine, and on the evening of above date were at their usual work, firing the shots that had been prepared during the day by the miners.

About 5:30 o'clock p. m. they had completed their work up to rooms Nos. 7 and 8 on what is known as the cutoff between the fifth and sixth northwest cross-entries. There were seven shots to fire in these two rooms, i. e., four in room 7 and three in room 8. One of the shots in No. 7 was located in the pillar between the two rooms, and, as later developments proved, was drilled within about 1 foot of being through the pillar.

Lighting the fuse in four shots in room No. 7, they proceeded into room No. 8, and were tamping the third hole in this room, at the time working just opposite to the shot located in the pillar in room No. 7; in fact, were not over 3 feet distant from the charge in the shot, which when it exploded, broke through the pillar, pieces of the flying coal striking File and killing him instantly. Hyde was also seriously injured.

SULLIVAN COUNTY.

November 23—Reliance Mine: Thomas Rogers, loader, thirty-six years of age, American, single, was killed by falling slate.

About 2:45 o'clock p. m. decedent was engaged loading a car of coal, having the car about one-third full, when a large piece of slate measuring 11 feet in length, 9 feet wide and 9 inches in thickness, fell on him, killing him instantly.

VERMILLION COUNTY.

December 1—Dering No. 8 Mine: William Burrows, fire boss, fifty-eight years of age, English, who leaves a wife, was killed by falling slate.

There were no eye-witnesses to this accident. Decedent was last seen alive on the evening of Novembr 30, when he entered the mine to begin his duties as fire boss.

At 6:20 the following morning, he not having reported at the surface, the mine boss sent a searching party into the mine to look for him, when he was found lying under a fall of slate, dead, about 140 feet from the face of the fourth southwest cross-entry.

SULLIVAN COUNTY.

December 10—Mammoth Mine: John F. Eldridge, loader, thirty-two years of age, American, wife and two children, was killed by falling slate.

About 10 o'clock a. m. deceased and his brother, Sam Eldridge, were at work loading a car of coal. They had the car about level full and deceased was bending over the edge of the car leveling down the coal when a large piece of draw slate 16 feet in length, 6 feet wide, and ranging from 3 to 4 inches in thickness, suddenly fell, catching him on the edge of the car, breaking his back and his neck, also crushing him through the chest, causing instant death.

GREENE COUNTY.

December 27—Gilmore Mine: George Waldoroff, loader, thirty-eight years of age, German-American, wife and one child, was killed by falling slate.

About 8:10 o'clock a. m. deceased was engaged loading a car which he had just bedded level full of coal. A piece of slate 9 feet in length, 4 feet wide, and ranging from 1 to 4 inches in thickness, suddenly gave way, falling on and killing him instantly.

The following summary of fatal accidents shows the date on which each fatality occurred, the name, age and occupation of each person killed, dependents left at each death, the cause of the accident, the name of the mine in which the accident occurred, and the county in which the mine is located:

TABLE.

Summary of Fatal Accidents

Date.	NAME.	Occupation.	Age.	Cause of Accident.	Mine.	County.	DEPENDENTS.		Nationality.
							Wife.	Children.	
Jan. 5	Zigmond Falevich	Miner	21	Falling slate	Vandalia No. 67	Vigo	......	......	Polander.
Jan. 30	Alpha Thomas	Mine boss	33	Descending cage	Larsh	Sullivan	1	5	
Feb. 1	Patrick Daugherty	Jerry	56	Falling slate	Mary No. 1	Parke	1	......	American.
Feb. 12	Walter Masterson	Machine helper	28	Falling slate	Twin No. 5	Greene	1	1	Scotch.
Feb. 13	John Merwin	Motorman	47	Explosion, gasoline	Muren	Pike	1	......	American.
Feb. 16	Thomas Race	Mine boss	31	Falling slate	Pyrah	Clay	1	5	American.
Mar. 2	John Dardana	Shot firer	26	Explosion, powder gases	Prince	Vermillion	......	......	Italian.
Mar. 6	Walter Niece	Miner	35	Falling slate	Vandalia No. 65	Clay	......	......	American.
Mar. 9	Patrick Fair	Jerry	44	Falling slate	Dering No. 7	Vermillion	......	2	Irish.
Mar. 19	Frank Hogue	Loader	30	Explosion, powder	Wabash	Vigo	1	......	American.
Mar. 20	Joseph Reed	Topman	44	Railroad cars	Lattas Creek	Greene	1	3	American.
Mar. 20	Samuel Coomes	Miner	51	Smoke and dust explosion	Sunnyside	Vanderburgh	1	3	American.
Mar. 20	William Schnut	Miner	49	Smoke and dust explosion	Sunnyside	Vanderburgh	1	1	Ameircan.
Mar. 20	Joseph Shanks	Miner	54	Smoke and dust explosion	Sunnyside	Vanderburgh	1	4	American.
Mar. 20	N. Willenham	Miner	48	Smoke and dust explosion	Sunnyside	Vanderburgh	1	......	Colored.
Mar. 20	Frank James	Miner	18	Smoke and dust explosion	Sunnyside	Vanderburgh	......	......	Colored.
Mar. 20	John Petitt	Miner	52	Smoke and dust explosion	Sunnyside	Vanderburgh	1	1	American.
Mar. 31	Clarence Britton	Driver	19	Crushed between mine cars	Jackson Hill No. 2	Sullivan	......	......	American.
April 16	Henry Bohnert	Switchman	52	Run down by mine cars	Gilmour	Greene	1	2	American.
April 20	Oliver Bowen	Cager	39	Coal falling down shaft	Prince	Vermillion	1	4	Colored.
April 30	Desire Simon	Loader	33	Falling slate	Vandalia No. 9	Greene	1	1	French.
May 18	Egbert Cleghorn	Loader	35	Falling slate	Lynn	Knox	1	1	American.
May 24	Joseph Shertoe	Machine helper	37	Falling slate	Crown Hill No. 3	Vermillion	1	5	Austrian.
June 5	Lewis Hogue	Machine helper	34	Caught in bitt chain	Vandalia No. 5	Greene	1	4	American.
June 9	James Picco	Miner	36	Fell down hoisting shaft	Dering No. 6	Vigo	1	3	Italian.
June 17	Frank Moleskie	Driver	23	Falling slate	Dering No. 8	Vermillion	1	3	Polinder.
June 23	Hubert Ellis	Trip rider	22	Crushed by mine cars	Crown Hill No. 1	Vermillion	......	......	American.
June 26	William Phillips	Room boss	24	Falling slate	Phoenix No. 4	Sullivan	1	......	American.
July 19	Adolph Mark	Miner	28	Falling slate	Atherton	Vigo	......	......	Polish.
Aug. 4	Andrew Verbie	Miner	33	Premature blast	Klondyke	Vermillion	......	......	Austrian.
Aug. 13	Bert Riggles	Jerry	21	Falling slate	Ind. Consolidated No. 30	Sullivan	1	......	American.
Aug. 17	Henry Werrel	Miner	41	Falling slate	Vandalia No. 8	Greene	1	1	American.

SUMMARY OF FATAL ACCIDENTS—Continued.

Date.	NAME.	Occupation.	Age.	Cause of Accident.	Mine.	County.	DEPENDENTS.		Nationality.
							Wife.	Child-ren.	
Sept. 3	Thomas Smith	Loader	41	Falling coal and slate	Vandalia No. 9	Greene	1	5	American.
Sept. 12	Charles Benson	Cager	42	Falling down shaft	Deep Vein	Vigo	1	6	American.
Sept. 14	Frank Costa	Miner	37	Falling slate	Dering No. 8	Vermillion	......	......	Italian.
Sept. 15	A. L. Rogers	Fire boss	41	Falling slate	Shirley Hill No. 1	Sullivan	1	1	American.
Sept. 20	Charles Bennett	Miner	35	Electrocuted	Vivian No. 2	Clay	1	1	American.
Sept. 24	Romain Pande	Miner	64	Ascending cage	Rainbow	Sullivan	1	7	French.
Sept. 27	Earl Vale	Driver	26	Collision mine cars	Tecumseh	Knox	1	......	American.
Oct. 1	Warren Berry	Cager	30	Ascending cage	Vandalia No. 69	Vigo	......	......	American.
Oct. 5	Anthony Marsh	Miner	72	Falling coal	Lawton	Vigo	......	......	English.
Nov. 3	Victor Lafaver	Miner	52	Premature blast	Plymouth No. 2	Clay	......	......	French.
Nov. 10	John James	Night mine boss	52	Falling slate	Vandalia No. 9	Greene	1	6	Welsh.
Nov. 17	Ed. Price	Miner	53	Falling slate	Little Giant	Sullivan	1	......	American.
Nov. 18	William Butts	Miner	22	Falling rock	Vivian No. 2	Clay	......	......	American.
Nov. 22	William File	Shot firer	32	Shot through pillar	Ray No. 2	Vigo	1	1	American.
Nov. 23	Thomas Roggers	Miner	32	Falling slate	Reliance	Sullivan	1	......	American.
Dec. 1	William Burrows	Fire boss	58	Falling slate	Dering No. 8	Vermillion	1	......	English.
Dec. 10	John F. Eldridge	Miner	32	Falling slate	Mammoth	Sullivan	1	2	American.
Dec. 27	George Waldorff	Loader	38	Falling slate	Gilmour	Greene	1	1	American.

TABLE.

Showing the Number of Tons of Coal Mined, the Number of Persons Employed, the Number of Fatalities and the Number of Tons of Coal Produced per Each Fatality Each Year from January 1, 1898, to January 1, 1910.

YEAR.	Tons Produced.	Employes.	Fatalities.	Tons per Fatality.
1898	5,146,920	No report.	22	233,950
1899	5,864,975	7,366	15	390,997
1900	6,283,063	8,858	18	349,059
1901	7,019,203	10,296	24	292,466
1902	8,763,197	13,139	24	365,133
1903	9,992,563	15,128	15	181,683
1904	9,872,404	17,838	34	290,304
1905	10,995,972	17,856	47	233,956
1906	11,422,027	19,562	31	368,450
1907	13,250,715	19,009	53	250,013
1908	11,997,304	19,092	45	266,606
1909	13,692,089	18,908	50	273,841

TABLE OF OCCUPATIONS.

Showing the Total Number of Fatal, Permanent and Serious Accidents Occuring in 1909, and the Different Occupations of Persons Fatally or Otherwise Injured

OCCUPATION.	Fatal.	Permanent.	Serious.	Total.
Miners	21	2	116	139
Machine runners	......	......	30	30
Machine helpers	3	1	20	24
Loaders	5	2	68	75
Motor men	1	......	5	6
Drivers	3	2	184	189
Road men	......	......	5	5
Timber men	......	......	13	13
Jerries	3	1	23	27
Trappers	......	......	9	9
Cagers	3	......	7	10
Pumpers	......	......	3	3
Electricians	1	......	2	2
Trip riders	......	......	7	8
Car couplers	......	......	1	1
Boss drivers	......	......	1	1
Mine bosses	4	......	2	6
Superintendents	......	......	2	2
Fire bosses	2	......	4	6
Shot firers	2	......	9	11
Flag men	1	......	2	3
Top men	1	......	12	13
Total	50	8	525	583

PERMANENT, SERIOUS AND MINOR ACCIDENTS.

Under the head of perminent accidents we include injuries to persons resulting in a broken or dislocated spine, the amputation of a limb, or other injuries unfitting them to follow their usual occupation.

Under serious accidents we include those resulting in broken or dislocated limbs, cuts, bruises, internal or other injuries such as we think should receive special mention.

Minor accidents include those resulting in slight cuts, bruises, etc., which cause the injured party little loss of time, hence no mention of this class will be made except in the tables of causes, showing the aggregate number that occurred during the year.

The following summary tables of permanent and serious accidents exhibit the dates on which each accident occurred, the name, age and occupation of each person injured, number of dependents, the nature and extent of injury, time lost where same could be learned, name of mine in which the accident occurred, and the county in which the mine is located.

TABLE OF PERMANENT ACCIDENTS.

Date.	NAME.	Age.	Occupation.	DEPENDENTS. Wife.	DEPENDENTS. Children.	DEPENDENTS. Other Dependents.	Injury.	Cause of Accident.	Mine.	County.
Feb. 6	James Holden	35	Miner	1	3	....	Back dislocated	Falling slate	Monarch	Clay.
May 5	John Watt	21	Driver	....	....	....	Left leg mashed; right leg amputated.	Falling slate	Vandalia No. 10	Sullivan.
July 12	Joe Bartlett	32	Loader	....	....	....	Back broken	Falling slate	Union	Sullivan.
Sept. 15	James Peckalaski	25	Jerry	1	....	....	Back broken	Falling slate	Shirley Hill No. 1	Sullivan.
Sept. 21	John Mannick	32	Loader	....	....	....	Back dislocated	Falling slate	Vandalia No. 9	Greene.
Oct. 7	Richard Railsback	26	Miner	1	....	....	Leg crushed; amputation necessary	Falling boulder	Ind. Con. No. 33	Sullivan.
Dec. 15	Press Dent	....	Driver	1	....	....	Foot amputated	Run over by mine car	Atherton	Vigo.
Dec. 24	Gilbert Peurcel	20	Machine helper	....	....	....	Right leg mangled; amputation necessary	Mining machine chain	Vandalia No. 8	Greene.

TABLE.

Exhibiting the Number of Serious Accidents Occurring in 1909, the Name, Age and Occupation of Persons Injured, the Number of Persons Dependent on them for Support, the Length of Time They Were Idle by Reason of Injuries (Where Same Could be Learned), the Name of County and the Mine Wherein the Accident Occurred.

Date.	NAME.	Age.	Occupation.	DEPENDENTS.			Days Lost.	Injury.	Cause of Accident.	Mine.	County.
				Wife.	Children.	Other Dependents.					
Jan. 4	Curt Sullivan	....	Loader	....	....	2	16	Face and head	Flying coal from blast	Vandalia No. 21	Greene.
Jan. 5	Wm. Timmins	34	Electrician	1	....	....	12	Wrist	Mine cars	Phoenix	Sullivan.
Jan. 5	G. H. Palmer	35	Machine runner	1	....	....	14	Foot crushed	Falling coal	Phoenix	Sullivan.
Jan. 5	Pearl Timmerman	16	Miner	....	....	....	....	Hands, face burned	Explosion of powder	Lyford	Parke.
Jan. 6	James F. Harrison	30	Miner	1	1	....	....	Nose broken	Falling slate	Citizens	Sullivan.
Jan. 6	George Smith	26	Driver	....	....	....	6	Hands mashed	Falling coal	Deep Vein	Vigo.
Jan. 7	Robert Williams	45	Machine runner	1	6	....	....	Finger broken	Machine jack	Grant No. 3	Vigo.
Jan. 11	Robert Holden	28	Driver	....	....	....	....	Back sprained	Mine car	Vandalia No. 65	Clay.
Jan. 11	W. A. Bedwell	....	Loader	1	3	....	16	Leg crushed	Falling slate	Lattas creek	Greene.
Jan. 12	Frank Sills	30	Cager	1	2	....	....	Hips crushed	Mine car	Forrest	Vigo.
Jan. 16	Charles Walker	27	Driver	1	1	....	....	Back sprained	Mine car and mule	Crown Hill No. 3	Vermillion.
Jan. 16	John Mulax	....	Driver	....	....	....	....	Back sprained	Crushed by mine car	Lattas Creek	Greene.
Jan. 18	Clarence Davidson	25	Loader	....	....	....	75	Wrist crushed	Mine car and prop	Vandalia No. 9	Greene.
Jan. 18	J. C. Lewis	31	Machine runner	1	1	....	....	Foot broken	Mining machine	Consolidated No. 30	Sullivan.
Jan. 19	R. F. Bonham	35	Driver	....	....	....	56	Arm broken	Fell on iron rail	Vandalia No. 9	Greene.
Jan. 19	Bige Waldon	38	Miner	....	....	....	14	Leg crushed	Falling slate	Miami No. 1	Vigo.
Jan. 19	Andrew Stanley	45	Loader	1	6	....	136	Back and leg	Falling slate	Phoenix No. 4	Sullivan.
Jan. 22	Robert Johnson	27	Loader	1	1	....	....	Back	Falling slate	Gilmour	Greene.
Jan. 23	Olie Moreland	25	Motorman	1	1	....	....	Hips crushed	Mine cars	Wabash	Vigo.
Jan. 25	John Koone	25	Miner	1	1	....	....	Face burned	Explosion fire damp	Citizens	Sullivan.
Jan. 25	F. M. Cotton	32	Driver	1	....	....	....	Back and hips	Fell off cage	Dering No. 6	Vigo.
Jan. 26	Thomas Hall	21	Driver	....	....	....	....	Foot mashed	Mine car	Vandalia No. 3	Greene.
Jan. 26	Perry Brady	27	Cager	1	3	....	....	Leg crushed	Mine car	Glen Ayre	Vigo.
Jan. 27	George Dockery	40	Miner	1	4	....	17	Fingers crushed	Struck by sledge	Vandalia No. 5	Greene
Jan. 27	Irvin Rowe	22	Loader	....	....	....	57	Foot broken	Falling slate	Vandalia No. 9	Greene.
Jan. 27	Samuel James	23	Driver	1	1	....	....	Side and shoulder	Car and boulder	Lower Vein	Vigo.
Jan. 29	George Seldomridge	40	Machine runner	1	2	....	61	Leg broken	Falling slate	Vandalia No. 10	Sulliva
Jan. 30	Mike Myers	24	Miner	1	1	....	....	Back bruised	Falling slate	Superior No. 4	Clay.
Feb. 1	John Swain	39	Jerry	1	4	....	14	Hips and breast	Falling slate	Mary No. 1	Parke.
Feb. 1	Pat Daugherty	56	Bottom shoveler	1	....	....	....	Three ribs broken	Falling slate	Mary No. 2	Parke.
Feb. 2	G. N. Bilboo	40	Miner	1	....	....	6	Back bruised	Mine car	Sponsler	Greene.

Feb. 2	Robert McCoy	25	Driver					Arm fractured	Mine car	Lyford	Parke.
Feb. 2	Frank Dowell	17	Miner					Leg fractured	Falling slate	Lawton	Vigo.
Feb. 3	Robert Beiler	50	Mine boss	1	2		41	Ankle fractured	Falling slate	National	Vigo.
Feb. 3	John Lohner	45	Miner	1	1			Breast and back	Falling coal	Buckeye	Vermillion.
Feb. 4	Wm. Dudley	37	Motorman	1	2			Fingers off	Mine car	Jackson Hill No. 2	Sullivan.
Feb. 5	Eliza West	21	Driver					Hips crushed	Mine car	Vandalia No. 316	Parke.
Feb. 8	Michael McMahon	59	Driver					Leg fractured	Falling slate	Plymouth No. 1	Vigo.
Feb. 8	Carl Dixon	30	Jerry	1	1			Ribs broken	Falling slate	Vandalia No. 9	Greene.
Feb. 10	Jack Jones	38	Driver	1	2			Leg crushed	Mine car	Miami No. 2	Vigo.
Feb. 11	John Hudak	17	Loader					Hips and head	Falling slate	Latta's Creek	Greene.
Feb. 13	W. B. Graham	41	Motorman	1	3		21	Face, hands burned	Gasoline explosion	Muren	Pike
Feb. 16	Sephias Gilbert	34	Driver	1				Finger off	Mine car	Vandalia No. 65	Clay.
Feb. 16	Levi Gambil	40	Machine helper	1				Foot and ankle	Propeller chain	Gilmour	Greene.
Feb. 16	Sol Wyman	47	Loader	1	3			Hand mashed	Mine car	Jackson Hill No. 2	Sullivan.
Feb. 18	Jule Fancher		Loader					Leg broken	Falling coal	Summit No. 2	Greene.
Feb. 19	James Johnson	35	Driver					Hips crushed	Mine car	Freeman	Knox.
Feb. 23	Bert Pelzer	25	Driver					Hips and abdomen	Mine car	Lyford	Parke.
Feb. 26	Emil Dessent	16	Trapper					Foot mashed	Mine car	Vandalia No. 10	Sullivan.
Feb. 27	Henry Buck	39	Driver	1	1			Foot broken	Mine car	Consolidated No. 30	Sullivan.
Feb. 27	George Froshaure	37	Driver	1	3			Leg mashed	Mine cars	Lower Vein	Vigo.
Mar. 1	J. B. Wilson	35	Cager	1	3			Shoulder dislocated	Mine cars	Vandaila No. 3	Greene.
Mar. 1	Arch Curry	34	Machine helper	1				Ankle dislocated	Mine car	Parke No. 11	Parke.
Mar. 2	Herb Compton		Loader				11	Back injured	Falling slate	Forrest	Vigo.
Mar. 2	Hugh Graham	27	Driver					Hips injured	Mine cars	Green Valley	Greene.
Mar. 2	John Roderick	33	Machine runner	1				Ribs fractured	Mining machine	Green Valley	Greene.
Mar. 2	John Wessel	41	Loader	1	2		14	Head cut	Falling slate	Vandalia No. 8	Greene.
Mar. 2	Clifford Bennit	22	Loader				13	Leg injured	Drill	Vandalia No. 20	Greene.
Mar. 5	Frank McDaniel	55	Miner		1			Leg broken	Falling slate	Fort Branch	Gibson.
Mar. 5	John Johnson	17	Bitt boy				23	Fingers mashed	Mine car	Forrest	Vigo.
Mar. 6	Mark Payne	32	Loader				225	Leg broken	Falling coal	Vandalia No. 5	Greene.
Mar. 8	Rufus Hatcher	33	Driver	1				Back injured	Mine car	Gilmour	Greene.
Mar. 8	Roy Cline	25	Driver				28	Finger off	Mule	Shirley Hill	Sullivan.
Mar. 8	Pete Myers	21	Driver	1				Finger broken	Mine car	Minshall	Vigo.
Mar. 9	John Vanmeter	33	Driver					Thigh, knee	Mule	Blackburn No. 2	Pike.
Mar. 10	Wm. Lovelace	26	Driver	1	1			Leg bruised	Car and mine door	Ind. Con. No. 30	Sullivan.
Mar. 10	Andy Hess	40	Miner	1	3			Leg broken	Falling slate	Miami No. 2	Vigo.
Mar. 11	Ira Latta	19	Miner					Ribs broken	Falling slate	Vandalia No. 65	Clay.
Mar. 11	Charles Hand	28	Driver	1	4			Hips injured	Mine cars	Shirley Hill No. 1	Sullivan.
Mar. 13	Archie McTavish		Loader					Leg broken	Falling slate	Little's	Sullivan.
Mar. 15	Dick Bledsoe	23	Driver					Crushed chest	Mine car	Island Valley No. 9	Clay.
Mar. 15	John Wilson	30	Driver	1	1			Ribs fractured	Mine cars and roof	Lower vein	Vigo.
Mar. 16	Ray Fox	16	Trapper				60	Foot crushed	Mine cars	Freeman	Knox.
Mar. 16	Wm. Kerns	25	Miner	1			31	Ankle injured	Falling slate	Dering No. 8	Sullivan.
Mar. 16	Remy Rank	40	Miner	1				Face and hands burned	Explosion fire damp	Little Giant	Sullivan.
Mar. 16	Bert Sherwood	40	Engineer	1	3		14	Face burned	Bursting steam pipe	Shirley Hill No. 1	Sullivan.
Mar. 17	Henry Savigus	35	Driver					Hand smashed	Mine car	Vandalia No. 66	Vigo.
Mar. 19	Ike Morris	38	Loader	1	3			Face and hands burned	Explosion powder	Wabash	Vigo.
Mar. 19	Charles Morrison	16	Driver					Finger broken	Mine car and door	Glen Ayr	Vigo.

TABLE OF SERIOUS ACCIDENTS—Continued.

Date.	NAME.	Age.	Occupation.	DEPENDENTS.			Days Lost.	Injury.	Cause of Accident.	Mine.	County.
				Wife.	Children.	Other Dependents.					
Mar. 22	Thomas Riggs	26	Bottom shooter	1	....	....	....	Hand crushed	Falling slate	Plymouth No. 2	Clay.
Mar. 25	Joe Lang	46	Driver	1	5	....	25	Ribs fractured	Mine cars	Latta's Creek	Greene.
Mar. 26	Lee Johnson	29	Loader	1	....	....	30	Back injured	Falling slate	Reliance	Sullivan.
Mar. 26	Wm. Baughman	24	Driver	1	2	....	....	Ribs broken	Mine cars	Vandalia No. 66	Vigo.
Mar. 26	Wm. Drake	39	Jerryman	1	....	....	....	Ribs fractured	Mine car and entry rib	Glen Ayr	Vigo.
Mar. 27	Joe Gaddon	14	Flag man	1	....	....	....	Leg broken	Mine car	Ind. Con. No. 33	Sullivan.
Mar. 29	J. J. Miller	32	Driver	1	....	....	....	Hips injured	Mine cars	Glen Ayr	Vigo.
Mar. 29	Wm. McCurdy	48	Machine helper	....	....	....	....	Rib broken	Mining machine	Vandalia No. 69	Vigo.
Mar. 30	George Vosiey	30	Miner	....	....	....	....	Legs bruised	Falling coal	Mary No. 2	Vigo.
Mar. 31	Homer Erlinger	28	Timberman	1	....	....	42	Leg broken	Falling slate	Union	Sullivan.
Mar. 31	Ralph Haynes	....	Machine helper	1	....	....	6	Back injured	Mining machine	Grant No. 3	Vigo.
Mar. 31	Charles Morris	19	Driver	....	....	....	....	Ankle injured	Mine cars	Glen Ayr	Vigo.
April 1	Parker Davis	18	Driver	....	....	....	....	Foot and ankle	Mine cars	Vandalia No. 10	Sullivan.
April 5	Hud Watson	27	Driver	1	1	....	....	Internal	Mine car and door	Green Valley	Greene.
April 6	L. Lap	21	Driver	....	....	....	....	Foot cut	Mining machine	Ins. Cons. No. 30	Sullivan.
April 6	Otto Seldomridge	21	Loader	....	....	....	30	Finger off	Car wheel and sprag	Vandalia No. 10	Sullivan.
April 7	Herman Hunt	18	Car coupler	....	....	....	33	Ankle injured	Mine cars	Latta's Creek	Greene.
April 7	Milton Cox	50	Loader	1	4	....	36	Ankle crushed	Falling slate	Vnadalia No. 10	Sullivan.
April 8	Scot Ehrnhart	53	Miner	1	1	....	35	Back and shoulder	Falling slate	Crawford No. 9	Clay.
April 8	Wm. Jones	37	Miner	1	1	....	....	Legs broken	Falling slate	Fort Branch	Gibson.
April 8	Wm. Bridgewater	20	Driver	....	....	....	7	Back	Falling slate	Lawton	Vigo.
April 10	Wade Turner	25	Driver	1	....	....	18	Back and hips	Car and rib	Vandalia No. 5	Greene.
April 10	George Vatral	34	Miner	1	2	....	41	Face and shoulder	Went back on fuse	Latta's Creek	Greene.
April 10	Harry Johnson	30	Driver	1	2	....	18	Hips crushed	Mine car and mule	Miami No. 4	Vigo.
April 13	Alphonso Bernard	29	Loader	1	2	....	30	Toe broken	Falling coal	Vandalia No. 10	Sullivan.
April 14	Walter Gilchrist	28	Machine helper	1	....	....	....	Leg broken	Falling coal	Glen Ayr	Vigo.
April 17	James Chaney	33	Driver	1	....	....	19	3 ribs broken	Mine cars	Mary No. 1	Parke.
April 17	Ras Smith	40	Machine helper	1	....	....	10	Shoulder injured	Falling coal	Union	Sullivan.
April 17	Fred Funk	23	Machine helper	....	....	....	35	Foot cut	Machine bitt	Domestic block	Vigo.
April 19	Pearl Adams	23	Driver	....	....	....	....	Teeth knocked out	Kicked by mule	Phoenix No. 4	Sullivan.
April 19	Ed. M. Inglert	59	Miner	....	....	....	....	Collar bone	Falling coal	Lower Vein	Vigo.
April 20	Will Parrish	54	Miner	1	....	....	14	Head cut	Falling slate	Parke No. 11	Parke.
April 20	Mahlon Ellingsworth	33	Timberman	1	3	....	....	Back injured	Falling slate	Calora	Greene.
April 20	Pete Myers	20	Driver	....	....	1	....	Foot and ankle	Mine car and rib	Minshall	Vigo.
April 23	Lee Johnson	32	Driver	1	....	....	....	Rib broken	Falling coal	Knox	Knox.
April 26	George Harvey	24	Loader	1	2	....	....	Shoulders	Falling slate	Calora	Greene

April 26	James Scott	18	Driver	....	....	....	21	Foot broken	Mine car	Freeman	Knox.
April 26	John Mellon	27	Machine runner	1	1	....	25	Foot crushed	Falling slate	Grant No. 3	Vigo.
April 26	John Waugh	40	Miner	1	3	....	21	Ribs and shoulder blade broken	Falling coal	Miami No. 2	Vigo.
April 27	John Peters	41	Pumper	....	....	....	....	Legs injured	Motor and mine car	Vandalia No. 10	Sullivan.
April 27	James Lyman	21	Driver	....	....	....	....	Stomach	Kicked by mule	Keystone	Sullivan.
April 29	Alonzo Grant	43	Shot firer	1	3	....	....	Face burned	Powder gases	Sunnyside	Vanderburgh.
April 29	James McNutt	47	Shot firer	1	3	....	....	Face and hands burned	Powder gases	Sunnyside	Vanderburgh.
April 30	Adolph Delaise	36	Loader	1	....	....	7	Back injured	Falling slate	Vandalia No. 9	Greene.
May 1	Grover Day	25	Fireman	....	....	....	....	Shoulder dislocated	Valve blown off steam pipe	Vandalia No. 316	Parke.
May 1	Marve City	36	Driver	....	....	....	....	Ribs fractured	Kicked by mule	Vivian No. 2	Clay.
May 1	Angelo Baincei	43	Loader	1	3	....	....	Ankle dislocated	Falling slate	Crown Hill No. 3	Vermillion.
May 3	Thomas D. Jones	56	Loader	1	....	....	....	Hand mashed	Falling coal	Grant No. 3	Vigo.
May 7	Joe Maslauski	23	Driver	....	....	....	....	Shoulder injured	Mine car and mule	Vandalia No. 6	Greene.
May 7	Emmet Gentry	32	Cager	1	2	....	11	2 fingers broken	Coal falling down shaft	Vandalia No. 8	Greene.
May 7	Elmer Fiscus	33	Loader	1	3	....	7	Back injured	Falling slate	Grant No. 3	Vigo.
May 7	Michel Higgins	32	Miner	1	....	....	35	Eye injured	Struck with coal pick	Lawton	Vigo.
May 10	Charles Mullins	....	Load dropper	1	3	....	8	Knee mashed	Mine cars	Island Valley No 4	Clay.
May 11	Len Smith	27	Driver	1	3	....	30	Back and thigh	Mine cars	Island Valley No. 4	Clay.
May 11	Shelby Evans	....	Trapper	....	....	....	....	Lost an eye	Electric shock	Island Valley No. 4	Clay.
May 11	John Rodman	43	Car trimer	1	2	....	86	Foot fractured	Car	Ind. Con. No. 25	Sullivan.
May 12	Roll. Terrill	30	Miner	1	3	....	....	Foot broken	Falling slate	Little Giant	Sullivan.
May 13	Wm. C. Ratcliff	29	Driver	1	2	....	....	Leg broken	Falling slate	Little Giant	Sullivan.
May 13	John Morrison	41	Miner	1	....	....	21	Hand broken	Falling coal	Glen Ayr	Vigo.
May 14	W. B. Ward	40	Miner	....	....	....	17	Foot injured	Stepped on nail	De Forest	Vigo.
May 15	Samuel Miller	23	Loader	1	....	....	....	Collar bone broken	Falling slate	Gilmour	Greene.
May 17	John Cunningham	27	Machine helper	....	....	....	....	Hand mashed	Mining machine	Glen Ayr	Vigo.
May 18	Everet Chambers	41	Fireman	1	....	....	....	Rib fractured	Miscellaneous	Reliance	Sullivan.
May 18	William Crawford	25	Driver	1	1	....	21	Ankle injured	Mine car and mule	Indiana Con. No. 25	Sullivan.
May 18	Gay Ellison	16	Miner	....	....	....	....	Face, hands burned	Explosion of powder	Little Giant	Sullivan.
May 18	Henry Givister	26	Miner	....	....	....	....	Face, hands burned	Explosion of powder	Little Giant	Sullivan.
May 18	Dan Ellison	50	Miner	1	2	....	....	Head burned	Explosion of powder	Little Giant	Sullivan.
May 19	Wm. A. Parrish	54	Miner	1	....	....	....	Head injured	Miscellaneous	Parke No. 11	Parke.
May 20	John Cerres	30	Miner	....	....	....	....	Hand injured	Coal pick	Little Giant	Sullivan.
May 20	Robert Pen	15	Miner	....	....	....	14	Finger mashed	Mining machine	Grant No. 2	Vigo.
May 21	Pat Brannon	25	Boss Driver	....	....	....	....	Foot crushed	Mine cars	De Forest	Vigo.
May 22	Dave Dowdell	37	Flat trimmer	1	3	....	9	Leg injured	Miscellaneous	Phoenix No. 4	Sullivan.
May 24	James H. Eddy	....	Driver	1	1	....	....	Breast injured	Mine cars	Citizens	Sullivan.
May 24	John Vargo	37	Machine runner	1	6	....	....	Hips and leg	Falling slate	Crown Hill No. 3	Vermillion.
May 25	Joel Gamer	29	Driver	1	1	....	....	Foot broken	Mine cars	Ind. Con. No. 33	Sullivan.
May 25	John Kisner	28	Miner	1	2	....	....	Back and foot	Falling top coal	Vandalia No. 69	Vigo.
May 26	James Thompson	22	Driver	1	1	....	....	Back injured	Mine cars	Green Valley	Greene.
May 26	James Green	40	Miner	1	3	....	23	Hips injured	Falling slate	De Forrest	Vigo.
May 28	Charles Heileges	23	Miner	....	....	....	14	Body bruised	Falling slate	Wizard	Clay.
May 28	W. H. Jackson	37	Top boss	1	3	....	81	Bone crushed	Railroad cars	Vandalia No. 9	Greene.
May 28	Ray Tribble	17	Loader	....	....	....	60	Leg broken	Falling slate	Grant No. 3	Vigo.
May 29	Elias Helton	17	Miner	1	2	....	....	Two ribs broken	Falling coal	Brazil Block No. 4	Clay.
June 1	William Barrows	28	Driver	....	....	....	6	Arm broken	Falling slate	Miami No. 3	Vigo.

TABLE OF SERIOUS ACCIDENTS—Continued.

Date.	NAME.	Age.	Occupation.	DEPENDENTS.			Days Lost.	Injury.	Cause of Accident.	Mine.	County.
				Wife.	Children.	Other Dependents.					
June 2	Wm. Hathaway	35	Driver	1	1		10	Hand mashed	Tail chain and prop	Jackson Hill No. 2	Sullivan.
June 2	James Smith	50	Miner	1	5		28	Back injured	Falling slate	Wizard	Clay.
June 2	Wm. Brown	26	Jerryman					Arm cut	Falling timbers	Crown Hill No. 1	Vermillion.
June 2	James Brumno	35	Jerryman				6	Hand cut	Drill bitt	Grant No. 3	Vigo.
June 3	Elijah Lucas	30	Miner	1	2			Neck and shoulders	Falling coal	Crawford No. 10	Clay.
June 3	Wm. Huffman	47	Loader	1	1			Leg broken	Falling slate	Grant No. 3	Vigo.
June 5	Taylor Hill	21	Miner					Foot and ankle mashed	Falling coal	Ray No. 2	Vigo.
June 5	Job Wallon	32	Loader	1				Head and face cut	Miscellaneous	Green Valley	Greene.
June 5	Oye Butler	20	Driver					Back injured	Mine car	Gilmour	Greene.
June 8	Charles Shadley	23	Rope rider					Arm mashed	Mine cars	Parke No. 11	Parke.
June 7	Wm. Beek	36	Miner	1	1			Ribs fractured	Falling slate	Miami No. 3	Vigo.
June 10	Thomas Cregg	21	Driver					Back injured	Mine car	Pittsburg No. 1	Vigo.
June 10	John Thomas	29	Cager	1	3			Finger mashed off	Mine car and timbers	De Forrest	Vigo.
June 11	Ralph Johnson	19	Driver					Side injured	Falling slate	Indiana Con. No. 33	Sullivan.
June 11	Earl Godfrey	26	Miner	1			38	Foot mashed	Falling coal	Keystone	Sullivan.
June 12	Fred M. Woods	28	Miner	1	1			Head and leg	Draw slate	Lawton	Vigo.
June 14	McColough	23	Loader					Hips, stomach and bowels	Falling slate	Island Valley No. 4	Clay.
June 14	Cecil Craig	24	Driver	1	1		9	Hips injured	Mine car and prop	Vandalia No. 8	Greene.
June 14	Marmon Boger	16	Loader					Arm fractured	Mine car and prop	Phoenix No. 4	Sullivan.
June 14	Nels Pecosta	35	Track layer					Hips and legs	Mine car and rib	Crown Hill No. 2	Vermillion.
June 20	Wm. Cunningham	29	Timberman	1				Jaw bone broken	Falling timbers	Summit No. 2	Greene.
June 21	Robert Wilson	33	Miner	1	6		7	Foot mashed	Falling slate	Latta's Creek	Greene.
June 21	Grover Creager	22	Top man				23	Foot injured	Stepped on nail	Vandalia No. 10	Sullivan.
June 21	Bert Price	24	Driver	1	2			Rib broken	Falling boulder	Buckeye	Vermillion.
June 21	George Scott	22	Machine helper					Head and foot	Falling coal	Glen Ayr	Vigo.
June 22	Roy Edwards	21	Driver	1	1		20	Chest and shoulders	Mine car and roof	Vandalia No. 8	Greene.
June 22	Harry Merrigold	24	Driver					Three ribs broken	Kicked by mule	Ind. Con. No. 33	Sullivan.
June 23	Wm. Vaughn	32	Machine runner	1	2			Body bruises	Falling slate	Wabash	Vigo.
June 23	Ira Dickerson	50	Loader	1	3			Head and back	Falling slate	Vandalia No. 9	Greene.
June 23	H. P. Shields	30	Machine helper	1	1			Back injured	Falling slate	Polk No. 5	Warrick.
June 23	Ora Sparks	27	Driver	1			21	Hand injured	Hand injured	Ind. Con. No. 25	Sullivan.
June 23	Alva W. Shields	23	Machine runner	1	1			Back injured	Falling slate	Polk No. 5	Warrick.
June 24	Louis Costa	30	Miner	1	2	2		Left leg	Engineer lost control of cage	Klondyke	Vermillion.
June 24	Emil Yonson		Miner					Both legs fractured	Engineer lost control of cage	Klondyke	Vermillion.
June 24	Charles Predis	49	Miner	1	1			Ankle, knee and neck	Control of cage	Klondyke	Vermillion.
June 24	Frank Casorota	29	Miner	1		1		Back injured	Engineer lost conrol of cage	Klondyke	Vermillion.

June 24	George Kapolo	29	Miner	1	2	1		Fractured ankle	Engineer lost control of cage	Klondyke	Vermillion.
June 24	John Barron		Miner					Concussion of brain	Engineer lost control of cage	Klondyke	Vermillion.
June 24	Frank Neimeien	27	Miner	1	3	1		Right ankle dislocated	Engineer lost control of cage	Klondyke	Vermillion
June 24	Joe Suboleski		Miner					Right leg fractured	Engineer lost control of cage	Klondyke	Vermillion.
June 24	Frank Norda	34	Miner	1	5	1		Left leg compound fracture	Engineer lost control of cage	Klondyke	Vermillion.
June 24	Victor Bonucci	21	Miner					Left leg fractured	Engineer lost control of cage	Klondyke	Vermillion.
June 24	John Stella	25	Miner	1	1			Ribs fractured	Engineer lost control of cage	Klondyke	Vermillion.
June 25	Wm. Brannon	19	Driver					Crushed in chest	Mine car and rib	Forrest	Vigo.
June 25	Robert Stalcup	27	Miner	1	1			Collar bone and ribs broken	Falling slate	Miami No. 1	Vigo.
June 25	Louis Baker	22	Driver	1				Side and back	Falling slate	Miami No. 1	Vigo.
June 27	Saml Ashby	28	Driver	1				Left arm broken	Falling slate	Caledonia	Warrick.
June 28	Benson Jewel	41	Machine helper	1				Foot injured	Machine pick	Plymouth No. 1	Vigo.
June 29	George Phillips	40	Machine runner		2			Hand mashed	Mining machine	Parke No. 11	Parke.
June 30	Allen Brown	26	Track layer					Foot injured	Slipped on nail	Wabash	Vigo.
July 1	Louis Georges	42	Miner					Head injured	Mine door	Elberfeld	Warrick.
July 2	Saml Roebuck	32	Fire bsos	1	3			Rib fractured	Mine car	Vandalia No. 10	Sullivan.
July 2	Frank Wisner	38	Miner	1				Legs crushed	Falling coal	Freeman	Knox.
July 2	W. B. Winterbottom	55	Fire boss	1	4			Foot and leg		Fauvre No. 2	Vigo.
July 3	Frank Martin	53	Loader					Back	Falling slate	Reliance	Sullivan.
July 6	Harley Shepard	17	Driver					Hip dislocted	Mine cars	Knox	Knox.
July 6	Paul Cotton	38	Loader	1	1			Back injured	Mine cars, prop	Vandalia No. 9	Greene.
July 7	Thomas Baughman	23	Miner	1	1			Ankle broken	Falling slate	Consolidated No. 25	Sullivan.
July 7	Thomas Skinner	19	Driver					Back injured	Mine cars	Gilmour	Greene.
July 8	Clarence Ladron	23	Topman					Finger broken	Engine gear	Rainbow	Sullivan.
July 9	William Sheridan	38	Machine helper	1	3			Foot mashed	Machine bar	Consolidnted No. 30	Sullivan.
July 10	John Atkinson	31	Miner	1	2			Back injured	Falling coal	Miami No. 1	Vigo.
July 10	Wesley Webster	56	Miner	1	2			Arm broken	Falling slate	Miami No. 1	Vigo.
July 12	Henry Haines	49	Trackman	1	1			Ribs broken	Falling slate	Lawton	Vigo.
July 13	Charles Secrest	20	Driver	1				Leg broken	Falling slate	Gilmour	Greene.
July 13	David Brassman	33	Driver	1	3			Head cut	Falling slate	Ray No. 2	Vigo.
July 14	Andy Vanhook	50	Jerry	1				Ankle dislocated	Falling slate	Superior No. 5	Parke.
July 15	George Bare	38	Machine runner	1	3			Foot mashed	Machine truck	Island Valley No. 4	Clay.
July 16	Homer Inman	28	Loader	1	1			Leg fractured	Mine cars	Latta's Creek	Greene.
July 16	James Deihl	52	Topman	1				Finger off		Plymouth No. 1	Vigo.
July 17	George Miller		Timberman	1	2			Leg broken	Crossbar	Ind. Blk. No. 1	Clay.
July 19	Andrew Castie	38	Jerry	1	5			Arms, face burned	Powder explosion	Superior No. 5	Parke.
July 19	Charles Bernady	41	Miner	1	7			Arms, face burned	Powder explosion	Superior No. 5	Parke
July 19	Roe Brown	48	Loader	1	5			Back injured	Mine cars	Dering No. 13	Sullivan.
July 20	Claud Lawger	33	Machine runner	1	3			Finger off	Machine jack	Latta's Creek	Greene.
July 21	James Lundy	42	Loader					Nose broken	Falling slate	Latta's Creek	Greene.
July 21	Saml Chancy	53	Loader	1	1			Leg broken	Falling slate	Mary No. 1	Parke.
July 23	Wm. Cox	24	Driver					Crushed chest	Mine cars	Oswald	Gibson.
July 27	Saml Ringo	25	Driver					Foot broken	Mine car	Consolidated No. 25	Sullivan.
July 28	W. H. Arnold	32	Mine superintend't					Face, hands, arms burned	Fire damp	Bellevue	Sullivan.
July 28	Thomas St. Clair	55	Timberman		2			Face, arms, hands burned	Fire damp	Bellevue	Sullivan.
July 29	James Jones	18	Water bailer					Arm burned	Fire damp	Knox	Knox.
July 30	Thomas Stanley	33	Miner					Back and face burned	Fire damp	Keystone	Sullivan.
July 30	John Boyd	23	Driver		2			Foot broken	Mine cars	Miami No. 3	Vigo.

TABLE OF SERIOUS ACCIDENTS—Continued.

Date.	NAME.	Age.	Occupation.	Dependents.			Days Lost.	Injury.	Cause of Accident.	Mine.	County.
				Wife.	Children.	Other Dependents.					
Aug. 2	James Beatty	27	Machine helper	1	2			Hand mashed	Mining machine	Black hawk	Sullivan.
Aug. 2	Charles Cole	24	Trip rider					Arm broken	Falling slate	Latta's Creek	Greene.
Aug. 3	Wm. Stineberger	42	Jerry	1				Hip dislocated	Car and ribs	Vandalia No. 67	Vigo.
Aug. 4	Cliff Jackson	30	Driver	1				Arm and side	Mine cars	Vandalia No. 69	Vigo.
Aug. 4	Phillip Kruing	15	Miner					Arms and abdomen burned	Flames from shot	Klondyke	Vermillion.
Aug. 4	Robert Robeson	25	Driver					Hips injured	Fell off tail chain	Vandalia No. 316	Parke.
Aug. 4	Herbert Jukes	30	Fireman					Foot scalded	Hot water	Parke No. 11	Parke.
Aug. 5	Bert Christie	30	Dumper	1	1			Hips crushed	Conveyor	Vandalia No. 5	Greene.
Aug. 5	Elmer Slerwald	25	Driver	1	1			Hand mashed	Mine cars	Crawford No. 6	Clay.
Aug. 6	Clifford Allen	20	Miner					Thumb broken	Falling slate	Lawton	Vigo.
Aug. 6	William Steward	21	Driver					Hand mashed	Mine cars	Domestic Block No. 1	Vigo.
Aug. 7	Orey Rooksberry	17	Miner					Back	Falling slate	Little Giant	Sullivan.
Aug. 8	John Pelton	27	Timberman	1	2			Foot mashed	Axe	Lyford No. 1	Parke.
Aug. 9	James J. Johnson	33	Machinist					Back	Falling slate	Minshall	Vigo.
Aug. 10	Herbert Jackson	36	Machine runner	1	2			Arm and foot	Falling slate	Little Giant	Sullivan.
Aug. 11	Mark Price	19	Driver					Leg injured	Mine car	Glen Ayre	Vigo.
Aug. 12	Clarence Joyce	23	Driver	1	1			Hand mashed	Mine car	Island Valley No. 4	Clay.
Aug. 12	John Stearley	20	Driver					Hand mashed	Car and rib	Domestic Block No. 1	Vigo.
Aug. 13	Stanko Maslauski	20	Driver					Jaw bone and leg broken	Mine car	Vandalia No. 8	Greene.
Aug. 13	C. E. Perry	47	Loader	1	1			Hips injured	Falling slate	Crown Hill No. 3	Vermillion.
Aug. 14	D. M. Roberts	50	Cager	1				Leg injured	Car and prop	Knox	Knox.
Aug. 14	Frank Jones	40	Timberman					Head cut	Falling slate	Clover Leaf	Vigo.
Aug. 16	Scot Ehrnhart	53	Miner	1				Hips injured	Falling slate	Crawford No. 9	Clay.
Aug. 16	S. T. Ogden	48	Machine helper	1	6			Hand mashed	Mining machine	Fauvre No. 2	Vigo.
Aug. 16	Lon Burden	29	Jerry	1	1			Hips	Mine car	Jackson Hill No. g	Sullivan.
Aug. 17	John Bishop	40	Weighboss	1	2			Back	Fell down chute	Twin No. 4	Greene.
Aug. 17	John Webster	20	Miner	1				Finger broken	Falling slate	Superior No. 5	Clay.
Aug. 17	Pete Duffy	58	Miner	1	5			Two ribs broken	Falling slate	Vandalia No. 8	Greene.
Aug. 18	George Keschela	22	Driver					Ribs broken	Roof and mine car	Vandalia No. 9	Greene.
Aug. 18	Roy Coulter	19	Driver					Leg broken	Mine cars	Black Creek	Knox.
Aug. 19	John Bateman	40	Loader	1	1			Foot mashed	Falling coal	Freeman	Knox.
Aug. 20	Ben Remington	38	Shiftboss	1	4			Rib broken	Falling slate	Latta's Creek	Greene.
Aug. —	F. Cunningham	55	Miner	1	2			Foot and side	Falling coal	Enterprise	Greene.
Aug. 20	Robert Hinkle	39	Electrician					One rib broken	Mining machine	Consolidated No. 33	Sullivan.
Aug. 21	William McWhiney	50	Miner	1				Side injured	Falling slate	Vandalia No. 69	Vigo.
Aug. 21	John Alexander	29	Miner	1	2			Knee,	Falling slate	Wabash	Vigo.

Aug. 23	Dan Feldwick	33	Machine helper	1				Foot mashed	Falling coal	Big Four	Warrick.
Aug. 24	Fred Crawford	33	Machine helper	1	2			Hip and back	Falling slate	Consolidated No. 25	Sullivan.
Aug. 24	Herb Compton	31	Miner	1	1			Head injured	Falling slate	Forrest	Vigo.
Aug. 26	Albert Parrish	39	Loader	1	3			Arm and breast	Falling slate	Domestic Block No. 1	Vigo.
Aug. 29	Al Webster	38	Miner	1	1			Hips injured	Shot through pillar	Vandalia No. 9	Greene.
Aug. 27	George Sargent	48	Fire boss	1				Face and hands burned	Fire damp	Phoenix No. 4	Sullivan.
Aug. 27	Harry Longstaff	32	Machine Runner	1	2			Back and legs	Shot through pillar	Vandalia No. 9	Greene.
Aug. 28	Grover Meredith	24	Driver	1	2			Hips and thigh	Mine cars	Island Valley No. 4	Clay.
Aug. 29	Ernest Johnson	32	Roadman	1	1			Back and ankle	Falling slate	Crown Hill No. 2	Vermillion.
Aug. 31	William Priest	23	Driver	1				Bruised chest	Car and roof	Green Valley	Greene.
Aug. 31	Frank Littleton	31	Miner	1				Jaw fractured	Falling slate	Vandalia No. 9	Greene.
Sept. 3	Orville Watson	32	Loader	1				Hand mashed	Mine car	Phoenix No. 4	Sullivan.
Sept. 4	Lewis Roberts	21	Loader					Ankle crushed	Falling slate	Vandalia No. 21	Greene.
Sept. 4	Robert Fowler	15	Trapper					Thumb broken	Mine cars	Vandalia No. 5	Greene.
Sept. 4	William Purcell	26	Driver	1				Knee	Mule	Summit No. 2	Greene.
Sept. 4	Albert Fenny	32	Driver					Finger off	Mine car	Jackson Hill No. 2	Sullivan.
Sept. 4	George Goldman	45	Miner	1				Leg crushed	Drilling machine	Deep Vein	Vigo.
Sept. 6	Edward Dureffer	23	Miner					Foot mashed	Mine car	Superior No. 4	Clay.
Sept. 7	Frank Richardson	39	Loader					Elbow broken	Falling slate	Kettle Creek	Sullivan.
Sept. 7	S. C. Risher	58	Superintendent	1	7			Back and leg	Falling slate	Forrest	Vigo.
Sept. 8	Joseph Bradley	16	Driver					Face injured	Falling slate	Twin No. 4	Greene.
Sept. 9	Archie Maxwell	25	Bottom shooter					Arm and shoulder	Falling slate	Brazil No. 4	Clay.
Sept. 9	Richard Brane	33	Machine runner	1				Foot mashed	Mining machine	Little Giant	Sullivan.
Sept. 9	J. R. Jones	32	Driver	1	2			Ankle crushed	Mine car	Miami No. 2	Vigo.
Sept. 9	Andrew Cutter	53	Loader	1	5			Hand mashed	Mine car	Grant No. 3	Vigo.
Sept. 9	Ellis Hesler	22	Driver	1				Hip and thigh	Mine car	Elberfeld	Warrick.
Sept. 11	John Arnnamine	53	Miner	1	5			Chest and leg	Mine car	Atherton	Vigo.
Sept. 11	William Strachan	33	Shot firer					Face, hands burned	Explosion fire damp	Wabash	Vigo.
Sept. 12	John Moss	35	Timberman					Toe broken	Falling slate	Deep Vein	Vigo.
Sept. 13	J. J. Cliff	70	Miner					Head, eyes injured	Falling slate	Superior No. 5	Clay.
Sept. 13	John Clark	51	Loader	1	2			Leg fractured	Falling slate	Reliance	Sullivan.
Sept. 13	Alfred Walker	32	Driver	1	2			Hips injured	Mine cars	Atherton	Vigo.
Sept. 13	Walter Green	32	Pumper				11	Side and hip	Falling slate	Forrest	Vigo.
Sept. 13	Ernest V. Falls	17	Machine helper					Foot mashed	Mining machine	Grant No. 3	Vigo.
Sept. 14	Roy Cunningham	17	Driver					Ankle broken	Mine car	Sponsler	Greene.
Sept. 14	Park Busher	68	Car trimmer	1				Foot mashed	Falling coal	Rainbow	Sullivan.
Sept. 14	Floyd Jewel	19	Miner					Leg broken	Falling coal	Vandalia No. 81	Vigo.
Sept. 15	Victor Lefever	50	Miner	1	4		14	Finger cut off	Falling coal	Sponsler	Greene.
Sept. 15	Ezra Roberts	28	Loader	1	1		30	Hand mashed	Falling coal	Green Valley	Greene.
Sept. 15	David Bosk	35	Loader					Wrist broken	Falling coal	Ind. Con. No. 33	Sullivan.
Sept. 15	John Camp	45	Miner	1	2		35	Ribs broken	Falling coal	Oswald	Gibson.
Sept. 16	Charles Frasure	43	Miner	1	9			Foot injured	Falling slate	Brazil No. 1	Clay.
Sept. 16	Frank Lenn	39	Machine runner	1				Ankle mashed	Falling slate	Peacock	Pike.
Sept. 16	William Wilt	24	Driver	1	1			Leg injured	Nail in track	Jackson Hill No. 2	Sullivan.
Sept. 17	Steve Butler	54	Loader	1	1		7	Foot mashed	Falling coal	Vandalia No. 5	Greene.
Sept. 17	Richard Basley	26	Driver					Leg injured	Kicked by mule	Vandalia No. 317	Parke.
Sept. 17	Pete Hardesty	30	Fire boss					Face and hands burned	Explosion fire damp	Shirley Hill No. 1	Sullivan.
Sept. 17	Maurie Beon	25	Driver	1	1			Face and hands burned	Explosion fire damp	Shirley Hill No. 1	Sullivan.

TABLE OF SERIOUS ACCIDENTS—Continued.

Date.	NAME.	Age.	Occupation.	DEPENDENTS.			Days Lost.	Injury.	Cause of Accident.	Mine.	County.
				Wife.	Children.	Other Dependents.					
Sept. 18	Wm. Keltner	19	Driver	....	....	....	....	Leg mashed	Mine cars	Vandalia No. 317	Parke.
Sept. 18	Earl Pollen	21	Driver	....	....	....	....	Foot mashed	Mine car and rib	Klondyke	Vermillion.
Sept. 18	George M. Perry	49	Miner	1	4	....	7	Hips injured	Falling slate	Crown Hill No. 1	Vermillion.
Sept. 20	Thomas Nolan	23	Driver	....	....	....	....	Chest injured	Kicked by mule	Freeman	Knox.
Sept. 20	Bert Hocker	24	Machine helper	1	....	....	....	Ribs broken	Mining machine	Grant No. 3	Vigo.
Sept. 21	Robert Davidson	27	Timberman	....	....	....	....	Back, leg, ribs	Falling slate	Union	Sullivan.
Sept. 23	Joe Howell	27	Jerry	1	1	....	....	Back injured	Falling slate	Dering No. 8	Vermillion.
Sept. 25	Thomas Wirt	34	Driver	1	2	....	35	Back, leg, hand	Falling slate	Plymouth No. 1	Vigo.
Sept. 25	Dow Cleghorn	18	Loader	....	....	....	....	Head and neck burned	Explosion of powder	Parke No. 11	Parke.
Sept. 25	E. Baldwin	....	Trip rider	1	3	....	....	Fingers broken	Falling slate	Wabash	Vigo.
Sept. 27	Daniel Vote	24	Driver	1	....	....	....	Foot mashed	Mine cars	Crown Hill No. 1	Vermillion.
Sept. 27	I. E. Newcome	44	Machine runner	1	6	....	....	Leg injured	Mining machine	Lyford No. 1	Parke.
Sept. 27	William Bolin	24	Driver	....	....	....	....	Nose broken	Kicked by mule	Ayrshire No. 5	Pike.
Sept. 27	Andrew Sisco	22	Driver	....	....	....	....	Hand mashed	Mine car	Buckeye	Vermillion.
Sept. 28	Leslie Reynolds	22	Driver	....	....	....	....	Thumb broken	Kicked by mule	Wizard	Clay.
Sept. 28	W. E. Radius	41	Electrician	1	5	....	....	Rib broken	Mine motor	Dering No. 14	Sullivan.
Sept. 28	Wm. S. Mahan	44	Machine runner	1	5	....	....	Foot mashed	Mining macihne	Consolidated No. 30	Sullivan.
Sept. 28	Walter Jeffrey	21	Driver	....	....	....	....	Hand mashed	Mine car	Consolidated No 33	Sullivan.
Sept. 28	James E. Bader	25	Machine runner	1	2	....	....	Hand mashed	Mining machine	Grant No. 3	Vigo.
Sept. 29	James Johnson	35	Driver	1	....	....	....	Arm and breast	Mine car	Freeman	Knox.
Sept. 29	W. A. Carpenter	53	Loader	1	6	....	....	Back injured	Falling slate	Reliance	Sullivan.
Sept. 29	John Pastria	34	Machine runner	1	1	....	....	Hand mashed	Mining machine	Crown Hill No. 3	Vermillion.
Sept. 29	Frank Edington	49	Track man	1	....	....	....	Back injured	Falling slate	Crown Hill No. 3	Vermillion.
Sept. 30	W. R. Boles	65	Jerryman	1	3	....	....	Arm broken	Falling coal	Rainbow	Sullivan.
Sept. 30	Oscar Phillips	29	Driver	1	....	....	....	Fingers mashed	Mine car	Jackson Hill No. 4	Sullivan.
Sept. 30	Charles Chesterfield	23	Driver	....	....	....	....	Hip injured	Mine cars	Crown Hill No. 3	Vermillion.
Sept. 30	Roy Haines	20	Machine helper	1	....	....	....	Eye injured	Pit lamp	Grant No. 3	Vigo.
Oct. 1	James Darnell	24	Miner	....	....	....	....	Back and arm	Falling slate	Lawton	Vigo.
Oct. 1	Millard McNealy	33	Driver	1	....	....	....	Foot mashed	Mine car	Vandalia No. 69	Vigo.
Oct. 1	Lem Hogger	27	Machine runner	....	....	....	....	Foot broken	Mining machine	Jackson Hill No. 4	Sullivan.
Oct. 1	Charles Stergan	19	Miner	....	....	....	....	Foot mashed	Falling slate	Vandalia No. 316	Parke.
Oct. 2	Fred Klinger	60	Miner	....	....	....	....	Leg broken	Windy shot	Ingleside	Vanderburgh.
Oct. 2	Lawrence Swillorsiok	33	Loader	1	4	....	....	Foot mashed	Mining macihne	Latta's Creek	Greene.
Oct. 2	Joseph Will	22	Loader	....	....	....	....	Leg broken	Falling slate	Latta's Creek	Greene.
Oct. 3	W. D. Van Horn	45	Miner	....	....	....	....	Foot mashed	Falling coal	Pittsburg No. 1	Vigo.
Oct. 3	Pete S. Hull	21	Driver	....	....	....	....	Arm mashed	Mine car and mule	Pittsburg No. 1	Vigo.

Oct.	3	Thomas Cregg	21	Driver					Back injured	Mine car	Pittsburg No. 1	Vigo.
Oct.	3	Pat Crane	38	Timberman					Leg injured	Falling crossbar	Crown Hill No. 3	Vermillion.
Oct.	4	John Wilson	26	Driver					Leg injured	Mine car	Phoenix No. 4	Sullivan.
Oct.	4	Walter Shade	22	Driver					Teeth out	Kicked by mule	Oswald	Gibson.
Oct.	4	Mike Urbain	26	Machine runner	1				Knee cap split	Mining machine	Mary No. 2	Vigo.
Oct.	5	Walter Jones	20	Loader					Collar bone	Falling slate	Vandalia No. 10	Sullivan.
Oct.	5	Frank Blake	24	Machine runner	1	1			Leg crushed	Mining machine	Vandalia No. 21	Greene.
Oct.	6	Pete Mereta	29	Loader					Leg and hip	Falling slate	Grant No. 3	Vigo.
Oct.	6	C. M. House	33	Top-man					Breast and neck	Mining car	Knox	Knox.
Oct.	7	Clyde Lacer	26	Driver					Legs crushed	Kicked by mule	Caledonia	Warrick.
Oct.	7	John Cryrees	30	Driver	1	3			Leg fractured	Mine car	Dering No. 13	Sullivan.
Oct.	8	Ed. A. Kelton	31	Loader		2			Leg fractured	Falling slate	Reliance	Sullivan.
Oct.	8	Arthur Barnhart	22	Driver					Toe broken	Mine car	Consolidated	Sullivan.
Oct.	8	Raymond Olnie	25	Trackman					Leg injured	Mine car	Mary No. 1	Parke.
Oct.	8	Ervin Singer	21	Loader					Abdomen	Falling slate	Calora	Greene.
Oct.	9	Burt Coonrad	27	Machine runner					Side injured	Falling slate	Freeman	Knox.
Oct.	9	Ollie Huff	22	Driver					Foot broken	Miscellaneous	Calora	Greene.
Oct.	9	James Allsip	59	Miner	1	2			Toe broken	Falling coal	Crawford No. 6	Clay.
Oct.	11	John Miller	30	Driver					Foot crushed	Mine car	Bicknell	Knox.
Oct.	13	Frank Mulis	22	Driver					Finger mashed	Mine car and rib	Twin No. 4	Greene.
Oct.	13	Henry Buck	45	Loader	1	2			Ribs fractured	Miscellaneous	Phoenix No. 4	Sullivan.
Oct.	13	Cecil Brock	16	Trapper					Hips bruised	Mine cars	Black Creek	Greene.
Oct.	15	J. T. Maxwell	16	Pumper					Arm fractured	Mine car	Vivian No. 2	Clay.
Oct.	15	James Everett	42	Machine runner	1	4			Ribs fractured	Mining machine	Glen Ayre No. 1	Vigo.
Oct.	15	William Keller	35	Miner	1	3			Shoulder and side	Falling slate	Clover Leaf	Sullivan.
Oct.	15	John Ford	32	Load dropper					Hand mashed	Miscellaneous	Freeman	Knox.
Oct.	15	Charles Morgan	28	Loader	1				Ankle crushed	Falling slate	Vandalia No. 8	Greene.
Oct.	16	C. C. Jeffreys	22	Driver					Two rips broken	Miscellaneous	Jackson Hill No. 4	Sullivan.
Oct.	16	Henry Squires	53	Loader	1	7			Head and face	Falling slate	Vandalia No. 9	Greene.
Oct.	16	Alva Johnson	18	Trapper					Leg broken	Mine cage	Gilmour	Greene.
Oct.	18	Sant Carico	34	Miner					Hips and head cut	Falling coal	Vandalia No. 67	Vigo.
Oct.	18	Lora Childers	16	Trapper					Head and arms bruised	Explosion of powder	Twin No. 4	Greene.
Oct.	18	James Hodson	23	Miner					Face, neck, arms burned	Explosion powder	Twin No. 4	Greene.
Oct.	19	Lee Hammond	50	Timberman	1	5			Leg broken	Falling slate	Green Valley	Greene.
Oct.	19	E. E. Oherlin	46	Miner					Leg broken	Falling slate	Queen	Greene.
Oct.	19	John Thompson	46	Jerry					Ankle dislocated	Falling slate	Knox	Knox.
Oct.	19	James Suttie	15	Trapper					Foot bruised	Falling coal	Wizard	Clay.
Oct.	19	William Lumdsom	62	Shot firer	1				Face and hands burned	Explosion fire damp	Reliance	Sullivan.
Oct.	20	Jason Wilson	27	Shot firer					Rib broken	Windy shot	Knox	Knox.
Oct.	20	William Thompson	22	Driver	1	1			Knee sprained	Mine car	Dering No. 13	Sullivan.
Oct.	21	James Turner	28	Miner	1	1			Hand mashed	Falling coal	Wizard	Clay.
Oct.	21	E. G. Lewis	36	Miner	1	4			Rib broken	Mine cage	Grant No. 3	Vigo.
Oct.	22	Oden Puckett	23	Driver					Foot mashed	Mine car	Island Valley No. 4	Clay.
Oct.	23	J. W. Moss	35	Timberman					Leg broken	Falling slate	Deep Vein No. 4	Vigo.
Oct.	25	Bert Pelers	24	Driver	1				Wrist sprained	Kicked by mule	Union No. 25	Sullivan.
Oct.	27	Owen Evans	27	Machine runner	1	3			Leg injured	Miscellaneous	Reliance	Sullivan.
Oct.	27	Arthur Banfield	20	Spragger					Knee crushed	Mine car	Phoenix No. 4	Sullivan.
Oct.	27	Arthur Keithley	26	Driver	1				Hip and foot bruised	Mine car	Sugar Valley	Vigo.

TABLE OF SERIOUS ACCIDENTS—Continued.

Date.	NAME.	Age.	Occupation.	DEPENDENTS. Wife.	Children.	Other Dependents.	Days Lost.	Injury.	Cause of Accident.	Mine.	County.
Oct. 29	Robert Jacobs	22	Driver					Back injured	Mine cars	Deep Vein No. 4	Vigo.
Oct. 29	John Barnard	21	Driver					Finger broken	Kicked by mule	Little Giant	Sullivan.
Oct. 29	Lou Hatcher	19	Driver					Hand mashed	Miscellaneous	Latta's Creek	Greene.
Oct. 30	J. P. Boughard	55	Jerry	1	6			Foot broken	Falling slate	Dering No. 13	Sullivan.
Nov. 1	Charles Young	40	Machine runner					Foot mashed	Mining machine	Glen Ayre No. 1	Vigo.
Nov. 1	Samuel Ashley	37	Driver					Hips bruised	Mine car and rib	Freeman	Knox.
Nov. 1	David Anman	20	Driver					Hand mashed	Mine car	Superior No. 5	Clay.
Nov. 2	Vachiel Young	36	Driver	1				Finger off	Mine car	Lower Vein	Vigo.
Nov. 2	Thomas Cemmerson	35	Jerry	1	2			Wrist	Mine car	Miami No. 5	Vigo.
Nov. 3	Steve Butler	54	Miner	1	1			Hip dislocated	Falling slate	Vandalia No. 5	Vigo.
Nov. 3	Mike Shelby	19	Driver					Hand cut	Mine car	Superior No. 5	Clay.
Nov. 4	Mac Luck	32	Shot firer					Hips and legs bruised	Smoke explosion	Klondyke	Vermillion.
Nov. 4	Fred Bunch	23	Driver					Hips injured	Mine cars	Hocking	Sullivan.
Nov. 4	Charles Scheffler	36	Driver					Ankle sprained	Mine car	Consolidated No. 25	Sullivan.
Nov. 4	Joseph Lisrey	36	Miner	1	1			Ankle sprained	Falling slate	Sponsler	Greene.
Nov. 5	Peter Bernard	64	Miner					Leg bruised	Falling coal	Vandalia No. 67	Vigo.
Nov. 5	Curtis McAltie	23	Driver					Rib fractured	Mine cars and rib	Summit No. 2	Greene.
Nov. 6	P. C. Lawler	40	Miner	1				Head cut	Coal from shot	Glen Ayre No. 1	Vigo.
Nov. 8	Edward Bowen	27	Driver					Hips and chest	Mine car and mule	Vandalia No. 8	Greene.
Nov. 9	John Busher	40	Miner	1	3			Leg broken	Falling coal	Atherton	Vigo.
Nov. 9	William Hollingsworth	41	Loader					Foot fractured	Falling slate	Freeman	Knox.
Nov. 9	John Emmons	32	Loader					Ribs fractured	Miscellaneous	Freeman	Knox.
Nov. 9	John Gardner	24	Loader					Hand mashed	Miscellaneous	Calora	Greene.
Nov. 11	Ezra Roberts	38	Miner	1	2			Hand mashed	Falling coal	Vandalia No. 67	Vigo.
Nov. 11	Lawrence Evans	31	Driver					Leg injured	Mine car	Blackburn No. 2	Pike.
Nov. 15	Jessie Thomas	33	Miner	1	2			Hip injured	Falling slate	Citizens	Sullivan.
Nov. 15	Perry Roe	22	Driver			1		Leg and ankle sprained	Mine cars	Parke No. 11	Parke.
Nov. 15	George Reichart	17	Miner					Ankle sprained	Falling slate	Crawford No. 10	Clay.
Nov. 16	Walter Butt	38	Driver	1	3			Ankle dislocated	Mine car	Ray No. 2	Vigo.
Nov. 16	Anton Beltrock	35	Miner	1	4			Leg injured	Falling coal	Vandalia No. 67	Vigo.
Nov. 16	Hosea Crosby	18	Loader					Arm dislocated	Falling slate	Mammoth	Sullivan.
Nov. 16	Elmer Pegg	32	Driver	1	2			Head and ear cut	Mine car	Clover Leaf	Sullivan.
Nov. 16	Elmer Hamilton	30	Spragger					Leg cut	Mine car	Mammoth	Sullivan.
Nov. 16	L. J. Tennis	50	Cager	1	3			Fingers broken	Miscellaneous	Dering No. 13	Sullivan.
Nov. 16	Mike Crushack	25	Driver					Back and shoulders	Falling slate	Queen	Greene.
Nov. 18	John W. Robinson	27	Miner	1	2			Back and shoulders	Falling rock	Vivian No. 2	Clay.

Nov. 19	Clarence Harpool	28	Miner	1	1			Back injured	Falling coal	Wabash	Vigo.
Nov. 19	Domemick Dana	28	Shot firer					Face and hands	Blown out shot	Crown Hill No. 1	Vermillion.
Nov. 19	Earl Robinson	19	Machine helper					Arm broken	Falling slate	Clover Leaf	Sullivan.
Nov. 19	Charles Clinger	26	Driver					Collar bone broken	Mine car and rib	Jackson Hill No. 2	Sullivan.
Nov. 19	Henry Chapman	24	Driver					Back	Mine car	Tecumseh No. 1.	Knox.
Nov. 20	William Denene	38	Driver	1	1			Back	Mine car	Electric	Warriek.
Nov. 20	Theodore Parish		Miner					Hand mashed	Mine car	Atherton	Vigo.
Nov. 20	Thomas Cody	34	Motorman	1				Hand broken	Mine motor	Shirley Hill No. 1	Sullivan.
Nov. 22	James Hyde	39	Shot firer	1	3			Head and shoulders cut	Shot through pillar	Ray No. 2	Vigo.
Nov. 24	Butler Smiser	26	Driver					Two ribs broken	Kicked by mule	Knox	Knox.
Nov. 24	John Harris	21	Jerry					Foot mashed	Mine car	Crawford No. 10	Clay.
Nov. 27	Arthur Peek	20	Driver	1	1			Injured internally	Kicked by mule	Crown Hill No. 2	Vermillion.
Nov. 27	Gus Letto	18	Driver					Ribs broken	Kicked by mule	Consolidated No. 33	Sullivan.
Nov. 29	William Morgan	32	Driver	1	2			Hips and leg	Mine cars	Pittsburgh No. 1	Vigo.
Nov. 29	Jessie Walford	19	Driver			1		Back and hips	Falling slate	Gilmour	Greene.
Nov. 30	John Broady	22	Driver					Leg	Mine car	Jackson Hill No. 4	Sullivan.
Nov. 30	James Denwiddie	28	Miner					Face and hands	Explosion fire damp	Wabash	Vigo.
Nov. 30	Thomas Ganger	20	Driver					Finger off	Mine car	Consolidated No. 30	Sullivan.
Dec. 1	Emil Koman	23	Shot firer	1				Face and hands burned	Smoke explosion	Crown Hill No. 3	Vermillion.
Dec. 1	Cecil Johnson	20	Miner					Hand mashed	Mine car	Vandalia No. 316	Parke.
Dec. 2	Mart Conder	40	Machine runner	1	7			Leg broken	Miscellaneous	Ayrshire No. 5	Pike.
Dec. 3	Robert Moore	20	Miner					Foot broken	Mine cage	Sargent	Warrick.
Dec. 3	Oscar Bledsoe	19	Driver					Hips injured	Kicked by mule	Clover leaf	Sullivan.
Dec. 3	Ray Watson	19	Driver					Collar bone broken	Mine cars	Black Hakk	Sullivan.
Dec. 3	Thomas Green	22	Driver	1				Collar bone broken	Mine cars	Tecumseh	Knox.
Dec. 4	John McKillop	28	Driver	1	1			Collar bone broken	Mine cars	Minshall	Vigo.
Dec. 4	John Rithford	25	Driver					Mashed hand	Mine car and prop	Vandalia No. 10	Sullivan.
Dec. 6	Arthur Waugh	27	Driver	1	2			Leg mashed	Mine cars	Grant No. 3	Vigo.
Dec. 6	Jessie Hutton	22	Driver	1	2			Leg injured	Caught between cars	Vandalia No. 66	Vigo.
Dec. 6	Homer Inman	33	Jerry	1	1			Foot injured	Miscellaneous	Latta's Creek	Greene.
Dec. 7	Glen Lackey	18	Driver					Shoulder disloctaed	Mine cars	Vandalia No. 10	Sullivan.
Dec. 7	Robert Watson	25	Driver	1				Intrenal injuries	Kicked by mule	Consoldated No. 33	Sullivan.
Dec. 7	A. A. Pesler	42	Timberman	1	5			Leg broken	Falling slate	Jackson Hill No. 4	Sullivan.
Dec. 7	Lee Johnson	30	Driver	1				Arm fractured	Mine car	Freeman	Knox.
Dec. 8	Claud Vanmeter	23	Driver	1				Leg crushed	Mine car	Tecumseh	Knox.
Dec. 8	Charles Gill	21	Loader					Hips crushed	Falling coal	Twin No. 4	Greene.
Dec. 9	Benjamin Wake	20	Driver					Head cut	Miscellaneous	Crown Hill No. 1	Vermillion.
Dec. 10	William St. Clair	25	Driver					Jaw bone	Mine cars	Pittsburg No. 1	Vigo.
Dec. 10	Otis Peaks	24	Driver	1				Head and breast	Mine car and mule	Jackson Hill No. 4	Sullivan.
Dec. 11	Alex Harmon	19	Driver					Hip and leg	Kicked by mule	Vandalia No. 9	Greene.
Dec. 13	Jack Scott	35	Miner					Face and hands burned	Explosion of fire damp	Viola	Sullivan.
Dec. 13	Charles Taylor	27	Driver	1	3			Chest	Falling slate	Union No. 25	Sullivan.
Dec. 13	Ethelbert Engle	27	Machine runner	1	3			Toe mashed off	Machine	Dering No. 13	Sullivan.
Dec. 13	John Bledsoe	41	Miner	1				Leg broken	Falling slate	Gilmour	Greene.
Dec. 14	Walter Conrad	34	Machine runner	1				Foot crushed	Mining machine	Freeman	Knox.
Dec. 14	William Dill	52	Loader		2			Legs and arm broken	Falling slate	Peacock No. 1	Pike.
Dec. 14	Note Fry	28	Miner	1	2			Leg broken	Falling slate	Gilmour	Greene.
Dec. 14	Shelby Potter	23	Driver					Leg injured	Mine car	Green Valley	Greene.

TABLE OF SERIOUS ACCIDENTS—Continued.

Date.	NAME.	Age.	Occupation.	Dependents. Wife.	Dependents. Children.	Dependents. Other Dependents.	Days Lost.	Injury.	Cause of Accident.	Mine.	County.
Dec. 14	Thomas Nichols	27	Miner	1	1			Hand mashed	Falling coal	Wizard	Clay.
Dec. 15	Chester Neuby	24	Driver					Hips injured	Mine car	Electric	Warrick.
Dec. 15	William Edwards	45	Jerry	1				Fingers broken	Miscellaneous	Grant No. 3	Vigo.
Dec. 15	Press Dent		Miner					Body	Miscellaneous	Atherton	Vigo.
Dec. 16	Jessie Bennings	16	Trapper					Foot mashed	Mine car	Vandalia No. 69	Vigo.
Dec. 16	E. Nicholson	20	Driver	1	1			Hips injured	Mine car	Crown Hill No. 3	Vermillion.
Dec. 16	George Gregg	32	Loader	1	2			Head injured	Miscellaneous	Jackson Hill No. 4	Sullivan.
Dec. 17	Albert Carmichael	15	Miner					Hand mashed	Car wheel	Vandalia No. 69	Vigo.
Dec. 17	William Thompson	29	Driver	1	2			Side injured	Kicked by mule	Clover Leaf	Sullivan.
Dec. 17	John Gaskins	32	Miner	1	2			Shoulder and ankle	Falling slate	Crawford No. 10	Clay.
Dec. 20	Evert Stultz	28	Driver	1	2			Toes broken	Mine car	Forrest	Vigo.
Dec. 20	Melvin Mackey	24	Driver					Foot cut	Mine car	Freeman	Knox.
Dec. 21	James R. Shaw	27	Jerry					Finger off	Mine cage	Consolidated No. 33	Sullivan.
Dec. 22	Grover Hague	25	Driver	1	2			Broken collar bone	Mule and car	Rainbow	Sullivan.
Dec. 22	Samuel Newton	22	Driver					Ankle dislocated	Falling slate	Ayrshire No. 4	Pike.
Dec. 22	Roy Goodwine	25	Loader					Broken leg	Falling coal	Freeman	Knox.
Dec. 22	Paul Cotton	36	Loader	1	1			Back injured	Falling slate	Vandalia No. 9	Greene.
Dec. 23	Charles Starkie	28	Driver	1	4			Leg fractured	Mine car	Shirley Hill No. 3	Sullivan.
Dec. 28	William Smith	25	Driver					Shoulder injured	Mule and mine car	Consolidated No. 33	Sullivan.
Dec. 28	Ray Bemis	27	Driver	1	3			Three ribs fractured	Mine cars	Black Hawk	Sullivan.
Dec. 29	E. Stanfield	28	Motorman	1	3			Hand crushed	Motor	Twin No. 5	Greene.
Dec. 31	Abe Bidwel	19	Driver					Arm fractured	Mine car	Vandalia No. 8	Greene.

TABLE OF ACCIDENTS.

Exhibiting by Months, the Number of Fatal, Permanent, Serious and Minor Accidents, Occuring in Indiana Mines During the Year 1909 and the Different Causes of Each Accident.

JANUARY.

NATURE OF ACCIDENT.	Falling Coal.	Falling Slate.	Injured by Mine Cars.	Injured by Mining Machine.	Injured by Mine Motors.	Smoke and Dust Explosion.	Smoke Explosion.	Explosion of Powder.	Explosion of Fire Damp.	Explosion of Gasoline.	Premautre Blasts.	Delayed Blasts.	Windy and Blown-out Shots.	Shots Blowing Through Pillar.	Mine Cages.	Falling Down Shaft.	Coal Falling Down Shaft.	Kicked by Mule.	Railroad Cars.	Electrocuted.	Miscellaneous.	Total.
Fatal		1													1							2
Permanent																						
Serious	1	8	10	2				1	1		1				1		1				2	28
Minor	5	3	11	2											1			2			2	26
Total	6	12	21	4				1	1		1				3		1	2			4	56

FEBRUARY.

NATURE OF ACCIDENT.	Falling Coal.	Falling Slate.	Injured by Mine Cars.	Injured by Mining Machine.	Injured by Mine Motors.	Smoke and Dust Explosion.	Smoke Explosion.	Explosion of Powder.	Explosion of Fire Damp.	Explosion of Gasoline.	Premautre Blasts.	Delayed Blasts.	Windy and Blown-out Shots.	Shots Blowing Through Pillar.	Mine Cages.	Falling Down Shaft.	Coal Falling Down Shaft.	Kicked by Mule.	Railroad Cars.	Electrocuted.	Miscellaneous.	Total.
Fatal		3								1												4
Permanent		1																				1
Serious	3	7	12	1						1												24
Minor	1	3	14						1			1						1			2	23
Total	4	14	26	1					1	2		1						1			2	52

MARCH.

NATURE OF ACCIDENT.	Falling Coal.	Falling Slate.	Injured by Mine Cars.	Injured by Mining Machine.	Injured by Mine Motors.	Smoke and Dust Explosion.	Smoke Explosion.	Explosion of Powder.	Explosion of Fire Damp.	Explosion of Gasoline.	Premautre Blasts.	Delayed Blasts.	Windy and Blown-out Shots.	Shots Blowing Through Pillar.	Mine Cages.	Falling Down Shaft.	Coal Falling Down Shaft.	Kicked by Mule.	Railroad Cars.	Electrocuted.	Miscellaneous.	Total.
Fatal		2	1			6	1	1											1			12
Permanent		0																				0
Serious	2	11	18	3				1	1									3			2	41
Minor		8	16	4					1								2	4			5	40
Total	2	21	35	7		6	1	2	2								2	7	1		7	93

TABLE OF ACCIDENTS—Continued.

APRIL.

Nature of Accident.	Falling Coal.	Falling Slate.	Injured by Mine Cars.	Injured by Mining Machine.	Injured by Mine Motors.	Smoke and Dust Explosion.	Smoke Explosion.	Explosion of Powder.	Explosion of Fire Damp.	Explosion of Gasoline.	Premature Blasts.	Delayed Blasts.	Windy and Blown-out Shots.	Shots Blowing Through Pillar.	Mine Cages.	Falling Down Shaft.	Coal Falling Down Shaft.	Kicked by Mule.	Railroad Cars.	Electrocuted.	Miscellaneous.	Total.
Fatal		1	1														1					3
Permanent																						
Serious	6	10	8	2	1		2					1						2				32
Minor	3	1	4	4					13		1							2			4	32
Total	9	12	13	6	1		2		13		1	1					1	4			4	67

MAY.

Nature of Accident.	Falling Coal.	Falling Slate.	Injured by Mine Cars.	Injured by Mining Machine.	Injured by Mine Motors.	Smoke and Dust Explosion.	Smoke Explosion.	Explosion of Powder.	Explosion of Fire Damp.	Explosion of Gasoline.	Premature Blasts.	Delayed Blasts.	Windy and Blown-out Shots.	Shots Blowing Through Pillar.	Mine Cages.	Falling Down Shaft.	Coal Falling Down Shaft.	Kicked by Mule.	Railroad Cars.	Electrocuted.	Miscellaneous.	Total.
Fatal		2																				2
Permanent		1																				1
Serious	4	9	6	3				3									1	1	1	9	1	38
Minor	3	3	12	1				1									2	7			4	33
Total	7	15	18	4				4									3	8	1	9	5	74

JUNE.

Nature of Accident.	Falling Coal.	Falling Slate.	Injured by Mine Cars.	Injured by Mining Machine.	Injured by Mine Motors.	Smoke and Dust Explosion.	Smoke Explosion.	Explosion of Powder.	Explosion of Fire Damp.	Explosion of Gasoline.	Premature Blasts.	Delayed Blasts.	Windy and Blown-out Shots.	Shots Blowing Through Pillar.	Mine Cages.	Falling Down Shaft.	Coal Falling Down Shaft.	Kicked by Mule.	Railroad Cars.	Electrocuted.	Miscellaneous.	Total.
Fatal		2	1	1												1						5
Permanent																						
Serious	5	15	11	2											11			1			6	51
Minor	1	7	14	2													1	2		1	11	39
Total	6	24	26	5											11	1	1	3		1	17	95

JULY.

Fatal		1																				1
Permanent		1																				1
Serious	2	11	9					3	4												5	34
Minor	4	8	16	2									1						1		8	40
Total	6	21	25	2				3	4				1						1		13	76

AUGUST.

Fatal		2									1											3
Permanent																						
Serious	3	18	15	3					1				1	2							4	47
Minor	6	14	21	1	1				1			2		1	1		1	3	1	1	10	64
Total	9	34	36	4	1				2		1	2	1	3	1		1	3	1	1	14	114

SEPTEMBER.

Fatal		3	1												1	1				1		7
Permanent		2																				2
Serious	7	18	18	7	1			1	3									4			5	64
Minor	4	11	20	1													1	1			8	46
Total	11	34	39	8	1			1	3						1	1	1	5		1	13	119

OCTOBER.

Fatal	1														1							2
Permanent		1																				1
Serious	5	16	17	5				2	1				2		2			4			7	61
Minor	10	10	24					1										5		1	12	63
Total	16	27	41	5				3	1				2		3			9		1	19	127

TABLE OF ACCIDENTS—Continued.

NOVEMBER.

Nature of Accident.	Falling Coal.	Falling Slate.	Injured by Mine Cars.	Injured by Mining Machine.	Injured by Mine Motors.	Smoke and Dust Explosion.	Smoke Explosion.	Explosion of Powder.	Explosion of Fire Damp.	Explosion of Gasoline.	Premature Blasts.	Delayed Blasts.	Windy and Blown-out Shots.	Shots Blowing Through Pillar.	Mine Cages.	Falling Down Shaft.	Coal Falling Down Shaft.	Kicked by Mule.	Railroad Cars.	Electrocuted.	Miscellaneous.	Total.
Fatal		4									1			1								6
Permanent																						
Serious	5	10	23	1	1		1		1		1		1	1				3			3	51
Minor	6	9	26						3								3	2		1	15	65
Total	11	23	49	1	1		1		4		2		1	2			3	5		1	18	122

DECEMBER.

Nature of Accident.	Falling Coal.	Falling Slate.	Injured by Mine Cars.	Injured by Mining Machine.	Injured by Mine Motors.	Smoke and Dust Explosion.	Smoke Explosion.	Explosion of Powder.	Explosion of Fire Damp.	Explosion of Gasoline.	Premature Blasts.	Delayed Blasts.	Windy and Blown-out Shots.	Shots Blowing Through Pillar.	Mine Cages.	Falling Down Shaft.	Coal Falling Down Shaft.	Kicked by Mule.	Railroad Cars.	Electrocuted.	Miscellaneous.	Total.
Fatal		3															3					3
Permanent			1	1																		2
Serious	3	8	27	3	1		1		1						2			3			5	54
Minor	3	15	28	7	1								1				1	5		1	13	75
Total	6	26	56	11	2		1		1				1		2		1	8		1	18	134
Grand total	93	263	385	58	6	6	5	14	32	2	5	4	5	6	21	2	14	55	4	15	134	1,129

SUMMARY.

Total number of fatal accidents	50
Total number of permanent accidents	8
Total number of serious accidents	525
Total number of minor accidents	546
Grand total	1,129

LAW ENFORCEMENT.

During the year 1909, notwithstanding the fact that we put forth every effort to secure a conformance to statute on the part of miners, mine bosses, mine superintendents, and mine owners, without resorting to the courts, we were compelled to file prosecutions under almost every law on the statute books relating to mines or mining. Nor was the lack of observance of statute peculiar to any particular class of individuals, the employer and employe being alike guilty of many gross violations.

The following list exhibits, by counties, the number of prosecutions made, the statutes violated, the occupations of the persons committing the violations, the different courts before whom the causes were brought, the names of the different county prosecutors prosecuting the charges, and the number of convictions secured:

CLAY COUNTY.

Court—J. P. Couch, Brazil.
Prosecutor—Walter E. Lee, Brazil.

Mine boss, failure to report accident	1
Mine boss, failure to cause break-through to be made in conformance to statute	1
Mine boss, failure to provide sufficient ventilation	1
Mine superintendent, failure to provide and keep on hand at mine medical supplies for first care of persons injured	1
Mine owner, failure to equip winding drum with an adequate safety brake	1
Total affidavits filed	5
Cause against mine boss for failure to report accident dismissed	1
Total found guilty and assessed fines	4

DAVIESS COUNTY.

Filed with City Court in Washington.

Miner, drilling past cutting or loose end	1
Found guilty and assessed a fine	1

Greene County.

Court—Mayor Riley, Linton; J. P. Breadawig, Jasonville.
Prosecutor—Jeffrey, Linton.

Miners, opening kegs of powder with coal picks	2
Miners, drilling past cutting or loose end	2
Mine boss, failure to provide two-foot space alongside of haulage roads	1
Mine boss, failure to close break-throughs	1
Mine boss, failure to cause break-through to be made in conformance to statute	1
Total affidavits filed	7
Total found guilty and assessed fines	7

Gibson County.

Court—Esquire J. A. Sprowl, Princeton.

Miner, preparing shots more than the maximum thickness prescribed by law	1
Miners, drilling past cutting or loose end	6
Mine boss, failure to sprinkle roadways	1
Mine superintendent, failure to equip escape shaft with code of signals and signal equipment	1
Total affidavits filed	9
Total found guilty and assessed fines	9

Knox County.

Court—Esquire Pickle, Bicknell.

Fire boss, failure to mark places containing fire-damp	1
Mine boss, failure to cause break-through to be made in conformance to statute	1
Mine superintendent, failure to conform to inspector's orders for necessary repairs	1
Total affidavits filed	3
Total found guilty and assessed fines	3

Parke County.

Courts—Affidavits filed with Prosecutor Powell, Rockville.

Mine owners, failure to make monthly reports of tonnage, etc., to inspector of the mines	2
Mine owner, failure to employ a certified mine boss	1
Mine superintendent, failure to equip escape shaft with stairway	1
Total affidavits filed	4
Total found guilty and assessed fines	4

PIKE COUNTY.

Court—Deputy Prosecutor Scott W. Whitting, Winslow; Deputy Prosecutor at Petersburg; Esquire Cicero Fittinger, Winslow.

Miners, opening kegs of powder with coal picks	6
Miner, drilling past cutting or loose end	1
Miner, preparing shot more than the maximum thickness prescribed by law	1
Mine bosses, failure to close break-through	3
Mine boss, failure to provide miners with tamping material	1
Mine superintendent, failure to provide and keep on hand at mine medical supplies for first care of injured	1
Total affidavits filed	13
Case still pending	1
Total found guilty and assessed fines	12

SULLIVAN COUNTY.

Court—Esquire Kirkham, Sullivan, and Prosecutor Woods, Sullivan; Esquire Goodwin, Sullivan; Esquire Taylor, Shelburn.

Miners, drilling past the cutting or loose end	12
Miners, tamping with drill dust	3
Miner, opening keg of powder with coal pick	1
Mine boss, failure to cause break-through to be made in conformance to statute	1
Mine boss, failure to measure air current	1
Mine bosses, failure to provide places of refuge on haulage roads	2
Mine boss, failure to provide sufficient ventilation	1
Mine boss, working more than fifty persons on one air split	1
Mine bosses, failure to report accidents	2
Mine boss, failure to provide persons with tamping material	1
Mine boss, failure to provide two feet of space along haulage roads	1
Mine superintendent, failure to conform to inspector's orders for necessary repairs	1
Mine superintendent, working more than fifty persons in one air split	1
Mine superintendents, failure to provide two feet of space along haulage roads	2
Mine superintendent, failure to provide and keep on hand medical supplies for first care of injured	1
Total number of affidavits filed	31
Total number found guilty and assessed fines	31

VANDERBURGH COUNTY.

Court—Prosecutions made in City Court, Evansville.

Miners, preparing shots more than the maximum thickness permitted by law	2
Mine boss, failure to cause break-through to be made in conformance to statute	1
Total affidavits	3
Total found guilty and assessed fines	3

VERMILLION COUNTY.

Court—Esquires Guinn and Ruby, both of Clinton; Esquire Brown, Newport, and Prosecutor Lowell; Prosecutor Pike, Clinton.

Miners, drilling past cutting or loose end	42
Miners, opening keg of powder with coal pick	5
Miners, tamping with drill dust	5
Mine bosses, failure to cause break-throughs to be made in conformance of statute	3
Mine bosses, working more than fifty persons one one air split	5
Mine boss, failure to provide sufficient ventilation	1
Mine superintendent, failure to provide two feet of space along haulage roads	1
Mine bosses, failure to conform to inspector's orders for necessary repairs	3
Total number of affidavits filed	65
The affidavits against five miners for tamping with drill dust and one miner for opening keg of powder with coal pick were filed May 27th; also one against miner for opening a keg of powder with a coal pick, filed on May 12th, are in the hands of Constable Whetsel, and for some reason have not been served	6
One miner, charged with drilling past the cutting or loose end, tried and convicted in squire's court, case appealed to circuit court	1
Fourteen cases against miners for drilling past the cutting or loose end are held pending the decision of circuit court testing the constitutionality of the law	14
Total number found guilty and assessed fines	42

Vanderburgh County.

Court—Prosecutions made in City Court, Evansville.

Miners, preparing shots more than the maximum thickness permitted by law	2
Mine boss, failure to cause break-through to be made in conformance to statute	1
Total affidavits	3
Total found guilty and assessed fines	3

Vermillion County.

Court—Esquires Guinn and Ruby, both of Clinton; Esquire Brown, Newport, and Prosecutor Lowell; Prosecutor Pike, Clinton.

Miners, drilling past cutting or loose end	42
Miners, opening keg of powder with coal pick	5
Miners, tamping with drill dust	5
Mine bosses, failure to cause break-throughs to be made in conformance of statute	3
Mine bosses, working more than fifty persons one one air split	5
Mine boss, failure to provide sufficient ventilation	1
Mine superintendent, failure to provide two feet of space along haulage roads	1
Mine bosses, failure to conform to inspector's orders for necessary repairs	3
Total number of affidavits filed	65
The affidavits against five miners for tamping with drill dust and one miner for opening keg of powder with coal pick were filed May 27th; also one against miner for opening a keg of powder with a coal pick, filed on May 12th, are in the hands of Constable Whetsel, and for some reason have not been served	6
One miner, charged with drilling past the cutting or loose end, tried and convicted in squire's court, case appealed to circuit court	1
Fourteen cases against miners for drilling past the cutting or loose end are held pending the decision of circuit court testing the constitutionality of the law	14
Total number found guilty and assessed fines	42

Vanderburgh County.

Court—Prosecutions made in City Court, Evansville.

Miners, preparing shots more than the maximum thickness permitted by law	2
Mine boss, failure to cause break-through to be made in conformance to statute	1
Total affidavits	3
Total found guilty and assessed fines	3

Vermillion County.

Court—Esquires Guinn and Ruby, both of Clinton; Esquire Brown, Newport, and Prosecutor Lowell; Prosecutor Pike, Clinton.

Miners, drilling past cutting or loose end	42
Miners, opening keg of powder with coal pick	5
Miners, tamping with drill dust	5
Mine bosses, failure to cause break-throughs to be made in conformance of statute	3
Mine bosses, working more than fifty persons one one air split	5
Mine boss, failure to provide sufficient ventilation	1
Mine superintendent, failure to provide two feet of space along haulage roads	1
Mine bosses, failure to conform to inspector's orders for necessary repairs	3
Total number of affidavits filed	65
The affidavits against five miners for tamping with drill dust and one miner for opening keg of powder with coal pick were filed May 27th; also one against miner for opening a keg of powder with a coal pick, filed on May 12th, are in the hands of Constable Whetsel, and for some reason have not been served	6
One miner, charged with drilling past the cutting or loose end, tried and convicted in squire's court, case appealed to circuit court	1
Fourteen cases against miners for drilling past the cutting or loose end are held pending the decision of circuit court testing the constitutionality of the law	14
Total number found guilty and assessed fines	42

VIGO COUNTY.

Court—Esquires Brown, Hirsch and Newburger, of Terre Haute.

Prosecutor—Owens, Terre Haute; Deputy Prosecutor Reitzman.

Miners, drilling past cutting or loose end	24
Miner, preparing shots more than the maximum thickness permitted by law	1
Mine boss, failure to conform to inspector's order for necessary repairs.	1
Mine bosses, failure to close break-throughs	2
Mine boss, failure to maintain haulage roads in safe condition	1
Mine bosses, failure to provide sufficient ventilation	3
Mine bosses, failure to cause break-throughs to be made in conformance to statute	3
Mine boss, failure to report accidents	1
Mine superintendent, failure to equip winding drum with indicator	1
Mine superintendent, failure to equip winding drum with an adequate brake	1
Mine superintendents, failure to provide two feet of space along haulage roads	3
Mine superintendent, failure to provide places of refuge on haulage roads	1
Mine owner, failure to keep manway in safe condition	1
Mine owner, failure to provide and keep on hand at mine medical supplies for first care of injured	1
Mine owner, failure to employ a certified mine boss	1
Total affidavits filed	45
Charge against mine owner for failure to keep manway in safe condition thrown out by Prosecutor Reitzman	1
Charge against mine boss for failure to report accidents dismissed	1
One miner charged with preparing a shot more than the maximum thickness permitted by law, tried before a jury and acquitted	1
Charges against two miners for drilling past cutting or loose end dismissed	2
Charges against the superintendent for failure to provide the two-foot space along haulage road still pending in circuit court	1
Total number found guilty and assessed fines	37

Warrick County.

Court—Cases were prosecuted by the chief Prosecutor, Savage, and Deputy Prosecutor Davis.

Mine boss, serving as fire boss without having qualified as required by law	1
Mine boss, for compelling miners to enter mine before it had been examined by a competent fire boss	1

Both the above complaints were filed against the same boss, who entered a plea of guilty to both charges, but on advice of Prosecutor Savage the justice of the peace assessed a fine in but one count.

Recapitulation.

Total number of affidavits filed for the year	188
Total number of counts still pending for the year	17
Total number of cases acquitted and dismissed	6
Total number of convictions and fines assessed for the year	155

The finding of a lower court in the cause against the Vandalia Coal Company, prosecuted in 1908, for the failure to provide two feet of space along haulage roads, in which the law was declared unconstitutional, was reversed by the Supreme Court, and the case has been refiled in the Sullivan County Circuit Court, where it is still pending.

RECOMMENDED LEGISLATION.

On the matter of future mine legislation, we recommend the enactment of the following laws and amendments:

PROTECTION TO DRIVERS.

(1) Provision for the better protection of drivers. Providing that each driver shall be furnished with a portable seat which can be attached to either end of the mine car, and prohibiting drivers, miners or other persons from riding on mine cars in any other manner than that which shall be provided by law.

CARE OF EXPLOSIVES.

(2) Amending the present statute relating to explosives. Providing that all powder kegs, cans or packages containing powder or other explosives shall be stored in boxes, which shall be kept securely closed at all times except when miners are preparing their cartridges or charging blasts. Such boxes to be approved by the inspector of mines, and shall be kept not closer than 100 feet from any working face.

DEBRIS IN BREAK-THROUGHS.

(3) A law making it the duty of the mine boss to see that at all times the last break-through between rooms or entries shall be kept clear of powder boxes, kegs, timbers, slate or other debris.

EXAMINATION FOR FIRE DAMP.

Amending the present statute relating to the examinations of mines for fire damp.

Providing that the time elapsing between the examination of a working place and the regular hour for the mine to commence work, shall not be more than three hours; also providing that when a place is found to contain gas, evidence of the fact, together with the exact time the examination was made, shall be posted conspicuously at each entrance to the place. If there be a dangerous quantity of gas found, the words "Gas; Keep Out," shall be posted, and the time elapsing between the examination and the time the miners or other workmen are permitted to enter the place to commence work shall not exceed one-half hour.

Making it a misdemeanor, punishable by imprisonment, for any mine boss, superintendent or other person in charge of a mine requiring the services of a fire boss, to order or permit miners or other workmen to enter such mine or to enter working places that may be reasonably expected to contain fire damp, previous to an examination and report from the fire boss.

Also fixing the same punishment for miners or other employes who shall knowingly enter a mine previous to its having been examined and reported on by the fire boss, or who shall enter a working place, passing a notice, "Gas; Keep Out," posted by the fire boss.

Provided, further, that each and every fire boss shall be required to make a daily record of his examination in a book kept for that purpose. Such record shall show the date of examination, the hour he commenced the examination and the hour the examination was completed; the number of each entry and the number of working places on each entry examined; the places found to contain gas, giving the exact location of each working place and the quantity of gas found, such record to be signed by the fire boss and kept in charge of the weigh boss, and to be open at all times for the inspection of the mine superintendent, mine boss, miners and inspectors of mines.

Any fire boss who shall sign a false report as to the true condition of a mine shall, upon proof thereof, immediately forfeit his certificate authorizing him to perform the duties of a fire boss.

RECHARGING DRILL HOLES.

(5) A statute making it unlawful for a miner or other person to recharge a drill hole that has once been charged and fired.

OILS FOR ILLUMINATING PURPOSES.

(6) Amending the present statute relating to oils used for illuminating purposes in the coal mines. Fixing the punishment at imprisonment to sell or offer for sale oil to be used for illuminating purposes in coal mines that is of a quality inferior in grade to that prescribed by law; also fixing the same punishment for mine bosses, miners or mine employes who burn coal oil, black jack or machine oil in coal mines, and making it *prima facie* evidence of guilt when their working lamps have been found to contain such oil.

Also providing a smoke test and equipping the office of supervisors of oils for making such tests.

FIRE PROTECTION.

(7) A statute requiring all coal tipples, engine and boiler rooms, or other mine buildings in close proximity to a shaft opening, to be equipped with water lines, taps and fire hose. A water line shall also extend down each hoisting shaft to each coal seam being mined, and along the main entries not less than 400 feet on each side of the bottom of the hoisting shaft, and shall have water taps or valves and fire hose located at proper distances along each water line, and that the water line or lines shall be attached to a pump of adequate size and the line kept under a constant water pressure during working hours.

APPROACH TO ESCAPE SHAFTS.

(8) Amending the present statute relating to the approaches to escape shafts.

Providing that in all coal mines, where the approach or approaches to the escape shaft crosses an air course, entry or other passageway used as an air course, either as an intake or return, the air current shall be conducted by an overcast or undercast, over or under the point where such approach crosses the air course, and that all approaches to escape shafts shall be kept free from falling slate, mine tracks, mine cars and other debris, and shall be used only as means of egress to or from the escape shaft.

CARE OF WORKING PLACES.

(9) Amending the present statute relating to the duties of a mine boss and the care of working faces.

Providing that any mine boss or other person in charge of the underground workings of a mine, who, knowing a working place to be in a dangerous condition at or near the working face by reason of loose slate or rock, accumulations of fire damp or other dangerous conditions, shall order or permit a miner or other employe to enter such place except for the purpose of making it safe, or shall knowingly permit a miner or other employe to continue working in an unsafe place except for the purpose of making it safe, shall be deemed guilty of a misdemeanor punishable by a fine.

Provided, further, that any miner or other employe whose duties are to timber and care for his working place, who when having had a sufficient number of props, cap pieces and other timbers of proper length furnished him, and shall wilfully neglect or fail to set such props or other timbers as are necessary to properly secure his working place, or shall continue working in an unsafe place having sufficient suitable timbers on hand to make it safe, and shall neglect to do so, he or they shall be guilty of a misdemeanor punishable by fine.

TRANSPORTATION OF EXPLOSIVES.

(10) Making it unlawful for any person to place for transportation into or out of any coal mine, a keg or kegs, cans or packages containing powder or other explosives, in or on any mine car or other vehicle that is being hauled or is to be hauled by electric power.

ELECTRIC WIRES.

(11) A statute providing that all wires conducting electric currents in coal mines, except trolley wires used in driving mine motors, shall be insulated or placed in passageways other than the traveling roads used by employes.

Providing that where electric motors requiring a trolley wire are used, the trolley wire shall be so protected as to prevent persons from accidentally coming in contact with the wire.

SHIELDS ON CUTTING MACHINES.

(12) A statute requiring all coal-cutting machines of the bitt chain type to be equipped along each side of the bed frame of the machine with an adjustable shield or cover protecting persons from coming in contact with the coal-cutting bitts when the chain is in

motion, and making it a misdemeanor punishable by fine for any mine owner, operator, mine boss, superintendent or other person in charge of the underground workings of a coal mine, to place in any coal mine for the purpose of undercutting coal, a machine of the bitt chain type that has not been equipped as above described.

Also making it a misdemeanor punishable by fine for any machine runner, helper or other person to undercut coal or attempt to undercut coal with a machine of this type without the shield or cover being in position to protect persons from the coal-cutting belts when the chain is in motion.

ACCIDENTS TO MINE PROPERTY.

Serious accidents to mine property during the year 1909, though comparatively few in number, represent a very considerable financial loss, both in the destruction of property and in the loss of business.

Following is a brief description of each of the most notable accidents occurring, and an estimated statement of the financial loss resulting therefrom:

Miami No. 4 Mine, Vigo County.—Engine-room at this mine burned down during the month of January, the mine was idle ten days during the construction of a new building. The financial loss was not reported.

Brazil Block No. 12 Mine, Clay County.—Early in the month of February, fire broke out in the Byder vein, and before it could be checked had extended down to the upper vein, i. e., IV, and reached such proportions as to necessitate sealing off the hoisting and fan shafts to exclude air from the mine. The mine was sealed February 10, and remained idle until October 1. Financial loss not learned.

Deep Vein Mine, Vigo County.—About 5 o'clock p. m. February 28, fire broke out in the boiler-room, and before it could be brought under control the entire surface plant, comprising the engine, dynamo and boiler rooms and mine tipple were destroyed. The property loss through the destruction of buildings and damage to machinery was estimated at $7,500. The mine was idle as a result of the fire until September 1, thus entailing several thousand dollars' loss of business. The property was insured at $1,600.

Keystone Mine, Sullivan County.—On the night of May 11 a fire occurred at the face of the third northwestern cross-entry, the coal igniting from a shot. The fire was not discovered until 4:30 o'clock the following morning, by which time it had extended along the entry pillar back to the first break-through, a distance of 30 feet from the face, and through the break-through into the fourth northwest cross-entry, covering an area of about 125 square feet in each entry, in addition to three rooms into which the fire had spread.

An effort was first made to extinguish the fire with water, using buckets and fire hose attached to a water line from one of the mine pumps. The smoke, however, was so dense that the persons handling the buckets and fire hose could perform but little execution. In the meantime Mr. Gregory, the mine manager, appealed to the United States rescue station at Urbana, Ill., for assistance. There being no available help at that point, the call was forwarded to the chief station at Pittsburg, where, immediately on receipt of same, word was wired the mine officials that a party with helmets would be en route to the mine at once. After two days of fruitless effort trying to extinguish the fire by the method above mentioned, it was decided to seal off the affected district and await the arrival of the Pittsburg parties.

Mr. John Ruteledge, an assistant, arrived at the mine with oxygen helmets and other rescue apparatus the evening of the 14th. The seals were then broken and the fight again resumed with water. The fire by this time had traveled a distance of 60 or 70 feet back from the face. By the use of the helmets they were able to reach the fire with water from the hose and a continuous fight was kept up until the morning of the 16th, by which time the fire in the third northwest was practically extinguished. Just at this time the slate began to fall, driving the fighters back and covering up the fire hose entirely. It was then found necessary to again put up the brattices and exclude the air from the fire pending the arrival of a fresh supply of hose, etc. A few hours later the seals were again broken and an attempt made to advance on the fire in the fourth northwest, and the fire was driven back a short distance, but by reason of the entry having been closed by falls they were unable to advance the full distance covered by the fire and the fight was then reluctantly abandoned and air-tight brattices erected across each opening leading to the burning district. This section of the mine remained sealed off until the 31st, at which time the brattices were taken down and no trace of fire or heat was found. The property loss as reported by the mine management was $2,065.45, to which should be added the loss in business by reason of the entire mine having been idle nine days.

Mr. Gregory commends both the helmets and Mr. Ruteledge and assistant who used them very highly, and makes the statement that had the helmets been on hand when the fire was first discovered, it could have been extinguished at an expense of a very few dollars before any serious damage had been done.

Viola Mine, Sullivan County.—Shortly after 3:30 o'clock (firing time) Saturday evening, May 29, a fire occurred at the face of the second southwest cross-entry, the coal in the face of the entry having ignited from a shot, and before being discovered it had traveled back along the pillars quite a distance from the face of the entry.

The same methods for extinguishing this fire were adopted as were used at the Keystone Mine, except the use of the oxygen helmets, which were not asked for by the mine management.

After several days fruitless effort and a large expense trying to exinguish the fire with water, the fight was abandoned and the fire was sealed off, eleven air-tight brattices being required to complete the seal.

The entire mine was idle until June 24, at which time all the workings except the sealed-off district resumed operation. We have been unable to learn the financial loss incurred.

Big Vein Mine, Clay County.—June 27th, about 6:30 p. m., the entire tipple was completely destroyed by a heavy wind storm. The mine was idle until August 12, by which time a new tipple was erected and operation resumed.

The property loss was estimated at $3,000. Loss in business was probably an additional $4,000.

Vandalia No. 316 Mine, Parke County.—During the month of December the air shaft and escape shaft (both in the same opening) caved in a distance of 15 feet from the surface. The cost for repairs amounted to $515.58.

Summit No. 2 Mine, Greene County.—About 4 o'clock Sunday morning, November 28, fire was discovered in the pump room, located near the bottom of the hoisting shaft, by the night engineer, who had gone down in the mine for the purpose of making some repairs on a mine pump.

The origin of the fire is not known, but it is presumed that the timbers were ignited from some one of the miners' lamps when putting on their clothes preparatory to leaving the mine at 2:25 a. m. This was about one and one-half hours before the night engineer discovered the fire, during which time it had gained considerable headway.

The engineer immediately set about trying to extinguish the fire with water, using a fire hose attached to one of the mine pumps, and had gotten it practically under control when the steam line by which the mine pumps are furnished steam, burst. Thus the pumps were put out of commission and there were none others available on hand with which to fight the fire.

The alarm was then sounded, and Supt. McQuade, who resides in Linton, was notified by telephone of the fire and existing conditions. He, in company with John Templeton, superintendent for the Coal Bluff Mining Company, hurried to the mine, and on going below to investigate found that the fire had spread from the pump room to the crossbars and other timbers on the shaft bottom and into the curbing in the main hoisting shaft. The top of the hoisting shaft was then covered with boards and sand to shut off the draft from the fire. Twenty-four hours were then consumed in fruitless efforts to procure water from the Linton city water line, located some three-fourths of a mile distant from the shaft. Failing in this effort, repairs on the mine pumps were finally effected, fire hose attached and the fight resumed, the mine pump and mine water being used, and at 5 o'clock Tuesday morning, the 30th, the fire had been gotten under control. The pumping, however, continued during the entire day to make sure all the fire was extinguished.

The cost for repairs, including labor and material was estimated at $1,600. Loss to business due to mine being idle $4,000. The persons engaged in fighting the fire were:

John Templeton, superintendent Coal Bluff Mining Co.
John Boyle, superintendent Vandalia Coal Co.
Wesley Harris, assistant superintendent Vandalia Coal Co.
Mike White, superintendent Vivian Collieries Co.
N. F. McDonald, mine boss, Vandalia Coal Co.
Tom Bolin, miner.
A Baley, miner.
C. West, miner.
Thomas Small, superintendent United Fourth Vein Coal Co.
Hugh Rice, miner.

These gentlemen made a brave fight in the face of a great danger from falling slate, blinding smoke, heat and dangerous fumes arising from the burning coal and timbers, and to their perseverance and undaunted bravery is due the fact that the entire plant was not destroyed.

MINE DIRECTORY

CLAY COUNTY.

Name of Company.	Address of Company.	Name of Mine.
Brazil Block Coal Co	Brazil	Brazil No. 1.
Brazil Block Coal Co.	Brazil	Brazil No. 4.
Zellar-McClellan Co.	Brazil	Superior No. 4.
Crawford Coal Co	Brazil	Crawford No. 2.
Crawford Coal Co	Brazil	Crawford No. 6.
Crawford Coal Co	Brazil	Crawford No. 9.
Crawford Coal Co	Brazil	Crawford No. 10.
Indiana Block Coal Co.	Saline City	Crawford No. 1.
Coal Bluff Mining Co	Terre Haute	Plymouth No. 3.
American Clay Mfg. Co	Brazil	Monarch.
Eureka Block Coal Co	Terre Haute	Eureka No. 5.
Treager Bros	Brazil	Treager.
Harrison Coal and Mining Co	Clay City	Harrison No. 4.
Schrepferman Coal Co	Brazil	Schrepferman.
Hall & Zimmerman	Brazil	Wizard.
Sam Pyrah	Brazil	Pyrah.
Progressive Coal and Mining Co	Brazil	Progressive.
Big Vein Mining Co.	Terre Haute	Lewis.
Vivian Colliers Co	Chicago, Ill.	Vivian No. 1.
Vivian Colliers Co	Chicago, Ill	Vivian No. 2.
United Fourth Vein Coal Co	Linton	Island Valley No. 4.
O. S. Richardson Coal Co	Brazil	Gifford No. 2.
German Coal Co	Brazil	German.
C. Ehrlich Coal Co	Turner	Klondyke No. 3.

DAVIESS COUNTY.

Horney & Winterbottom	Washington	No. 3.
Mutual Mining Co	Cannelburg	Mutual.
Mandabach Bros	Washington	Mandabach.
Winklepeck & Overton	Raglesville	Winklepeck.
Daviess County Coal Co	Montgomery	Montgomery No. 4.

FOUNTAIN COUNTY.

Rush Coal Co	Toledo Ohio	Indio.

GREENE COUNTY.

United Fourth Vein Coal Co	Linton	Black Creek.
United Fourth Vein Coal Co	Linton	Dickason.
United Fourth Vein Coal Co	Linton	Sponsler.
United Fourth Vein Coal Co	Linton	Antioch.
United Fourth Vein Coal Co	Linton	North Linton.
Vandalia Coal Co.	Indianapolis	Vandalia No. 2.
Vandalia Coal Co.	Indianapolis	Vandalia No. 4.
Vandalia Coal Co.	Indianapolis	Vandalia No. 5.
Vandalia Coal Co.	Indianapolis	Vandalia No. 6.
Vandalia Coal Co.	Indianapolis	Vandalia No. 8.
Vandalia Coal Co.	Indianapolis	Vandalia No. 9.
Vandalia Coal Co.	Indianapolis	Vandalia No. 20.
Vandalia Coal Co.	Indianapolis	Vandalia No. 21.
Allinace Coal Co	Chicago, Ill	Gilmour.
Summit Coal and Mining Co	Bloomfield	Summit No. 2.
Green Valley Coal Co	Jasonville	Green Valley.
Alliance Coal Co	Chicago, Ill	Lattas Creek.
Queen Coal and Mining Co	Jasonville	Queen.
Calora Coal Co.	Indianapolis	North West.
Coal Bluff Mining Co	Terre Haute	Twin No. 4.
Coal Bluff Mining Co	Terre Haute	Twin No. 5.
Cherry Hill Coal Co.	Linton	Cherry Hill.
Letsinger Coal Co	Bloomfield	Letsinger.
Morehead Coal Co	Midland	P. & I.
Enterprise Coal Co	Linton	Lyons.

MINE DIRECTORY—Continued.

GIBSON COUNTY.

Name of Company.	Address of Company.	Name of Mine.
Princeton Coal and Mining Co	Princeton	Oswald.
Fort Branch Coal and Mining Co	Fort Branch	Fort Branch.
Wyoming Coal Co	Francisco	Francisco.

KNOX COUNTY.

Knox Coal Co	Bicknell	Knox.
Lynn Coal Co	Bicknell	Lynn.
Freeman Coal Co	Bicknell	Freeman.
Home Coal Co	Bicknell	Bicknell.
Washington-Wheatland Coal Co	Wheatland	Wheatland.
Tecumseh Coal and Mining Co	Bicknell	Tecumseh.

PARKE COUNTY.

Brazil Block Coal Co	Brazil	Brazil No. 9.
Brazil Block Coal Co	Brazil	Brazil No. 12.
Zellar-McClellan & Co	Brazil	Superior No. 2.
Zellar-McClellan & Co	Brazil	Superior No. 3.
Zellar-McClellan & Co	Brazil	Superior No. 5.
Fairview Coal Co	Mecca	Fairview.
Otter Creek Coal Co	Chicago, Ill	Mary No. 1.
Parke County Coal Co	Rosedale	Parke No. 2.
Vivian Colliers	Chicago, Ill	Lyford No. 1.
Vandalia Coal Co	Indianapolis	Vandalia No. 316.
James Moore	Kingman	Moore.
W. P. Harrison	Kingman	Harrison.

PIKE COUNTY.

Ayrshire Coal Co	Oakland City	Ayrshire No. 4.
Ayrshire Coal Co	Oakland City	Ayrshire No. 5.
Central Indiana Coal and Mining Co	St. Louis, Mo	Muren.
S. W. Little Coal Co	Evansville	Blackburn No. 1.
S. W. Little Coal Co	Evansville	Blackburn No. 2.
S. W. Little Coal Co	Evansville	Littles.
Muncie Coal and Mining Co	Muncie	Petersburg.
Winslow Gas and Coal Co	Winslow	Winslow No. 4.
Winslow Gas Coal Co	Winslow	Winslow No. 5.
J. W. Welsh	New York, N. Y	Hartwell No. 1.
J. W. Welsh	New York, N. Y	Hartwell No. 2.
J. W. Welsh	New York, N. Y	Hartwell No. 3.
Peacock Coal and Mining Co	Indianapolis	Peacock No. 2.

PERRY COUNTY.

Lincoln Coal and Mining Co	Evansville	Lincoln.

MINE DIRECTORY—Continued.

SULLIVAN COUNTY.

NAME OF COMPANY.	ADDRESS OF COMPANY.	NAME OF MINE.
Alliance Coal Co	Chicago, Ill	Rainbow.
Alliance Coal Co	Chicago, Ill	Phoenix No. 4.
Alliance Coal Co	Chicago, Ill	Hocking.
Alliance Colal Co	Chicago, Ill	Citizens.
Sunflower Coal Co	Dugger	Sunflower.
Consolidated Indiana Coal Co	Chicago, Ill	Consolidated No. 25.
Consolidated Indiana Coal Co	Chicago, Ill	Consolidated No. 26.
Consolidated Indiana Coal Co	Chicago, Ill	Consolidated No. 28.
Consolidated Indiana Coal Co	Chicago, Ill	Consolidated No. 30.
Consolidated Indiana Coal Co	Chicago, Ill	Consolidated No. 32.
Consolidated Indiana Coal Co	Chicago, Ill	Consolidated No. 33.
Vandalia Coal Co	Indianapolis	Vandalia No. 10.
Jackson Hill Coal and Coke Co	Terre Haute	Jackson Hill No. 2.
Jackson Hill Coal and Coke Co	Terre Haute	Jackson Hill No. 4
Gregory Coal and Mining Co	Shelburn	Keystone.
Dering Coal Co	Chicago, Ill	Dering No. 13.
Dering Coal Co	Chicago, Ill	Dering No. 14.
Alliance Coal Co	Chicago, Ill	Mammoth Vein.
Shirley Hill Coal Co	Indianapolis	Shirley Hill No. 1.
Shirley Hill Coal Co	Indianapolis	Shirley Hill No. 3.
Shirley Hill Coal Co	Indianapolis	Little Giant.
Shirley Hill Coal Co	Indianapolis	Clover Leaf.
Kettle Creek Coal Co	Terre Haute	Pearl.
Peabody-Alwart Coal and Mining Co	Chicago, Ill	Reliance.
Hamilton Coal Co	Linton	Hamilton.
United Fourth Vein Coal Co	Linton	Black Hawk.
Carlisle Coal and Clay Co	Carlisle	Viola.
Sullivan County Coal Co	Terre Haute	Freeman.
Hudson Coal and Mining Co	Farmersburg	Hudson.
Bellevue Coal Co	Carlisle	Belleveue.
Larsh Coal Co	Farmersburg	Larsh.

VANDERBURGH COUNTY.

Diamond Coal Co	Evansville	Diamond.
Gibson Moore Coal Co	Evansville	Ingleside.
Sunnyside Coal Co	Evansville	Sunnyside.
Crescent Coal Co	Evansville	Unity.
Banner Coal Co	Evansville	First Avenue.

VERMILLION COUNTY.

Dering Coal Co	Chicago, Ill	Dering No. 5.
Dering Coal Co	Chicago, Ill	Dering No. 8.
Silverwood Coal Co	Cayuga	Eureka.
Clinton Coal Co	Clinton	Crown Hill No. 1.
Clinton Coal Co	Clinton	Crown Hill No. 2.
Clinton Coal Co	Clinton	Crown Hill No. 3.
Oak Hill Coal Co	Clinton	Oak Hill.
Oak Hill Coal Co	Clinton	Maple Valley.
Oak Hill Coal Co	Clinton	Buckeye No. 2.
Oak Hill Coal Co	Clinton	Klondyke.

MINE DIRECTORY—Continued.

VIGO COUNTY.

NAME OF COMPANY.	ADDRESS OF COMPANY.	NAME OF MINE.
Vandalia Coal Co.	Indianapolis	Vandalia No. 66.
Vandalia Coal Co.	Indianapolis	Vandalia No. 67.
Vandalia Coal Co.	Indianapolis	Vandalia No. 69.
Vandali aCoal Co.	Indianapolis	Vandalia No. 81.
Alliance Coal Co	Chicago, Ill.	Forrest.
Atherton Splint Coal Co	Atherton.	Atherton.
Coal Bluff Mining Co	Terre Haute	Riverside.
Otter Creek Coal Co.	Chicago, Ill	Mary.
Coal Bluff Mining Co	Terre Haute	Plymouth No 1.
Coal Bluff Mining Co	Terre Haute	Wabash.
Coal Bluff Mining Co	Terre Haute	Minshall.
Lower Vein Coal Co.	Terre Haute	Lower Vein.
Miami Coal Co.	Brazil	Miami No. 2.
Miami Coal Co.	Brazil	Miami No. 5.
Miami Coal Co.	Brazil	Miami No. 4.
Fauvre Coal Co	Indianapolis	Fauvre No. 2.
Deep Vein Coal Co	Terre Haute	Deep Vein.
Vigo County Coal Co	Seeleyville	Ray No. 2.
Grant Coal and Mining Co	Burnett	Grant No. 3.
Sugar Valley Coal Co	W. Terre Haute	Sugar Valley.
Dering Coal Co.	Chicago, Ill	Dering No. 6.
Domestic Block Coal Co	Kokomo	Domestic Blk. No. 1.
National Coal and Fuel Co	W. Terre Haute	National.
Glenn Ayre Coal Co	Terre Haute	Glenn Ayre.
Glenn Ayre Coal Co	Terre Haute	Glenn Ayre No. 2.
Otter Creek Coal Co	Chicago, Ill	Mary No. 2.
Pittsburg Mining Co	Terre Haute	Pittsburg No. 1.

WARRICK COUNTY.

Big Four Coal Co.	Boonville	Big Four.
Chandler Coal Co.	Evansville	Chandler.
C. Menden Coal Co	Evansville	De Forrest.
T. D. Scales Coal Co.	Boonville	Electric.
Caledonia Mining Co.	Boonville	Dawson.
Eric Canal Coal Co	Boonville	Erie Canal.
Red Shaft Coal Co	Newburg	Red Shaft.
J. Woolley Coal Co	Boonville	Castle Garden.
Worsham-Newburg Coal Co.	Newburg	Brizius.
J. Woolley Coal Co	Boonville	Polk No. 5.
Eberfeld Oil, Gas and Mining Co	Elberfeld	Elberfeld.
Epworth Coal Co.	Newburg	Epworth.
Big Four Coal Co.	Boonville	Big Four No. 3.
Henry Korff.	Boonville	Korff.
Sargent Coal Co.	Newburg	Sargent.

GENERAL INDEX.