

GOLD AND DIAMONDS IN INDIANA.

BY W. S. BLATCHLEY.

For a half century or longer it has been known that free gold in the form of minute grains and flakes occurs in a number of Indiana counties. Within the past few years this gold has been the subject of numerous articles in the newspapers, and public curiosity and attention have, therefore, been drawn to it. Many letters and inquiries relative to it have been received at the office of the State Geologist, and a large number of persons have called there to secure information regarding the distribution and quantity of gold in the State.

Moreover, the natives of Brown and Morgan counties have, while washing gold, happened upon a half dozen or more small diamonds, most of which have been found in the past five years. The finding of these has given additional interest to the question, and has led me to prepare the present paper, giving in detail what is known concerning the occurrence and distribution of gold and diamonds in the State. In company with Mr. R. L. Royse, of Martinsville, who has given the subject more careful study than any other one man, a special trip was made in May, 1902, through those portions of Brown and Morgan counties where the most gold is thought to occur. A second trip was made to Morgan County in October of the same year. From the information gathered on these two trips, as well as from all available printed matter on the subject, the present paper has been prepared.

ORIGIN OF INDIANA GOLD.

All gold found in the State up to the present time is "free" or "placer" gold, the particles ranging in size from those too small to be seen with the naked eye up to nuggets whose value was five to six dollars. Occasionally, a piece of quartz or other igneous rock is found which contains particles of gold, but in each instance this quartz is a pebble or boulder of drift origin. In one or two places, horizontal strata of a conglomerate occur, which have been said to show gold upon assay. This gold, if present, has found its way into the con-

glomerate through interstices in the overlying strata, or was a component part of the sedimentary material which originally formed the conglomerate. The rocks underlying the surface of Indiana are all of them sedimentary limestones, shales or sandstones. No igneous dikes or vertical veins are known in the State, and no quartz, slate, schist, granite, gneiss, mica or other igneous rock with which native gold is found associated occurs except in the form of boulder or pebble of glacial origin. Gold has, up to the present, been found in about twenty counties of the State. In almost every instance these counties lie within or along the border of the drift-covered area. In one or two counties which lie in the driftless area, gold has been found in small quantity in regions covered by the alluvium or washings from the melting glaciers. There is little doubt but that gold occurs in greater or less quantity in the gravel or sand deposits of every county whose surface is wholly or partly covered with glacial debris. It is, however, only along or near the borders of the glaciated area that it has been found or is known to occur in sufficient quantity to pay for the labor of its separation from the sand, gravel, and other rocks and minerals with which it is found associated.

Taking into consideration its distribution, as above given, and also the fact that we have in Indiana no native beds of igneous rock which could give origin to the gold, there remains but one conclusion as to its source, namely: *It was brought in by one or more slow moving glaciers from some point far to the north or northeast and deposited by the melting of those glaciers on or near the places where it now lies.*

A number of these great glaciers or moving masses of ice invaded Indiana during the so-called "Glacial Period." They had their origin in British America, in and about the region now occupied by James and Hudson bays, and their movement and the work which they did has been made clear by the study of similar glaciers now existing in Greenland, Alaska and other countries. Before the first of these glaciers invaded our State, the surface of its northern two-thirds was very similar to that of the present southern unglaciated portion. The bed or sedimentary rocks, composed of limestones, sandstones and shales, now buried deep beneath hundreds of feet of clay, sand and gravel, then formed most of the surface. Decay and erosion were in action then as they are today. Sunshine and rain, wind and frost, trickling rills and strong streams, were ever at work, softening and sculpturing and wearing down the exposed rocks—forming clays and sand and gravel and bearing them away to lower levels. At the close of that period this area of surface rock resembled that of today in the driftless area of southern Indiana, being cut up by erosion into

a complex network of valleys, ridges and isolated hills. Over these was a thin soil—formed from decaying rocks and vegetation—poorer, perhaps, than much of that which at present covers the surface of the driftless area, where the underlying limestones and shales have been the parent rock.

During this long period of erosion and decay, mild climatic conditions had prevailed. But a change in these conditions came gradually to pass. For some, as yet unknown, reason the mean annual temperature of the northern hemisphere became much lower. The climate of the regions to the east and south of Hudson Bay became similar to that of Greenland today, or even colder. The snow, ever falling, never melting, accumulated during hundreds of centuries in one vast field of enormous thickness. Near the bottom of this mass a plastic, porous sort of ice was gradually formed from the snow by the pressure from above. This ice mass or glacier took upon itself a slow, almost imperceptible motion to the south or southwestward. As it moved thus onward, great masses of partly decayed rock and clay from hillsides and jutting cliffs rolled down upon it and were carried on and on until, by the melting of their icy steed, they were dropped hundreds of miles from the parent ledge. Large, irregular masses of rock from the region in which the glacier was formed were either frozen into its nether portion or rolled along beneath it, and as the ice sheet moved they served as great stone drags, grinding down and smoothing off the hills and ridges and filling up the valleys, until the irregular, uneven surface of the old preglacial rocks was planed and polished. In many places these imprisoned rocks cut deep scratches or grooves—the so-called “glacial striae”—in the surface ledges over which they passed. These, to the geologist, are excellent guides to the direction in which the glacier moved.

From these striae, and from other evidence which it is difficult to otherwise explain, it is now believed that there were several distinct epochs in the glacial period. The great ice sheet which was first formed several times advanced and as often—by an increase in the temperature of the region which it entered—melted and receded; its retreat or recession being each time as gradual as its advance had been. Like a great army which has attempted the invasion of a country and has been compelled to withdraw, it would again assemble its forces and start in a slightly different direction. But perchance before it had reached the limit of its former invasion a force of circumstances would render a retreat necessary. Its advancing margin was not in a straight line, but in lobes, or long, gradual curves.

The first invasion of Indiana by one of these glacial lobes was from the elevated districts to the east and south of Hudson Bay. It, in time, covered a greater area of the State than any one of those which followed, and by it much of the gold and most of the diamonds of Brown, Morgan and other counties were brought where they now exist. When this glacier had assumed its maximum size, its southern or front edge extended across the northwestern corner of Pennsylvania and central Ohio to a point a little southeast of Cincinnati, where it crossed the Ohio River into Kentucky. Passing through Campbell, Kenton and Boone counties on a line nearly parallel with the Ohio River, and some five to eight miles south of that stream, it entered Dearborn County, Indiana, a little below Aurora, whence it passed in a southwesterly direction through Ohio and Switzerland counties and crossed into Trimble County, Kentucky. Here it turned more to the west, recrossed the Ohio into Clark County, and reached its southernmost point in this portion of the State near Charlestown. From here it bore to the north through Scott and eastern Jackson counties, and then followed approximately the line shown on the accompanying map until it entered Illinois. Since this first or oldest glacier covered most of the latter State, the name "Illinoian" has been given to the drift material which it brought down. The terms "older glacier" and "older drift" are sometimes also used when referring to it and its deposits. It is probable that the margin of this first ice sheet occupied only a portion of the glacial boundary, as shown in Indiana, at any one time.

Mr. B. F. Taylor has given the following graphic account of this first ice sheet at the time of its greatest advance into the region now comprising Indiana.

"When the glacier covered most of Indiana and crossed the Ohio River into Kentucky, the ice was at least 500 or 600 feet deep over the present site of Terre Haute and nearly as deep over that of Indianapolis, and it thickened gradually northward. If an observer could have stood on one of the hills in Brown County at that time, he would have seen to the east of him the great wall of the ice front extending south toward Kentucky, while toward the west it would have been seen in the distance stretching away toward the southwest. For hundreds of miles to the east and west, and for 2,000 miles or more to the north, the glaring, white desert of snow-covered ice, like that seen in the interior of Greenland by Nansen and Peary, would have appeared, stretching away out of sight, with not a thing under the sun to relieve its cold monotony. It is hard to think of Indiana and her neighboring sister states as being clothed in such

a shroud-like mantle as this. But it was in large part this same ice sheet, coming perhaps four or five times in succession, that covered the State with the inexhaustible soil of the drift, and made Indiana the fertile agricultural State that she is today.”*

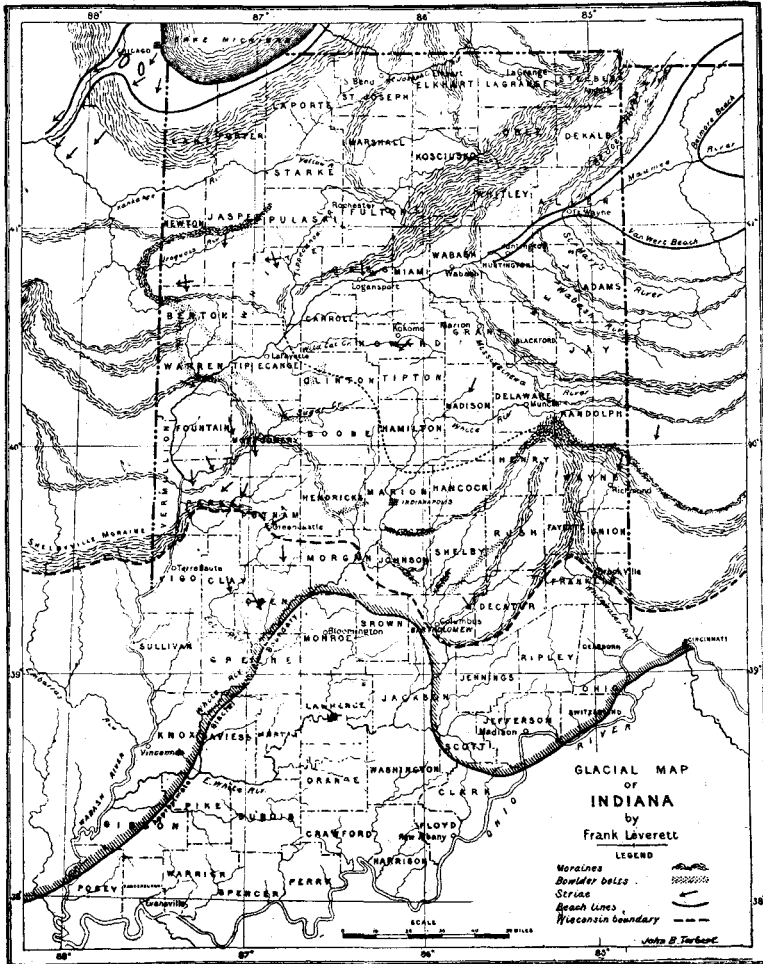


Fig. 1. Map showing the Approximate Glacial Boundaries in Indiana.
(From "Studies in Indiana Geography," p. 28.)

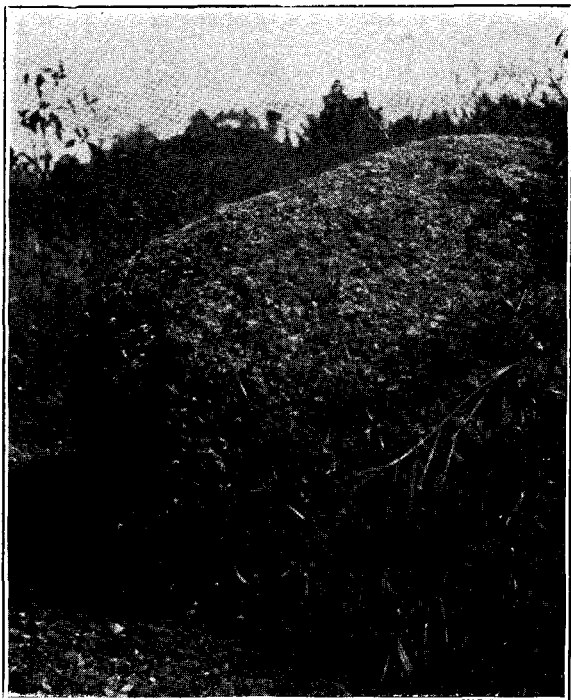
After reaching the line marked on the map as the "Approximate Glacial Boundary," the ice of this first glacial invasion melted away and left its drift, composed of a motley mass of materials, exposed

*Studies in Indiana Geography, 1897, p. 102.

to the agencies of water, wind and frost. What is known as the "*First Interglacial Interval*" then ensued, during which a vegetation arose on the surface of the Illinoian drift and for a long period flourished and decayed, in the manner as does the vegetation of our present surface. As a result a black mold or soil was gradually formed, which is now concealed beneath deposits of silt called "loess" in southwestern Indiana, and beneath the drift of later glacial invasions in the northern part of the State. How long this "interval" lasted no one knows, but evidently hundreds of years, as shown by the thickness of the soil mentioned and by other evidence which the geologist can take into account.

A "Second Glacial Epoch" or invasion then occurred, during which the ice brought down much thicker deposits of drift than in the first. At many points east of Indiana this second glacier extended much farther south than the first, but in this State its southern border only reached the dotted line shown on the map and named by Professor Chamberlain, the "Wisconsin Boundary," because this glacier invaded the driftless area of that State farther than any other. Of the drift in Indiana brought down by this second glacial invasion, Professor Chamberlain has written in part as follows: "The border of the 'newer drift,' slightly ridged, may be traced diagonally across the northeastern part of Montgomery County, the center of Hendricks, the northeast corner of Morgan, the southwest portion of Johnson, striking the basin of the East White River near Edinburg. It here closely approaches the border of the unglaciated area of south-central Indiana; but, if my discriminations are correct, it does not come in contact with it. There are heavy accumulations of drift near the northern border of Brown County, and along the eastern border of Morgan County, which take the form of morainic hills, especially in the latter region; but these, I think, belong to the 'older drift,' since they have suffered much erosion, resulting in complete drainage, deep oxidation, and seeming ferrugination of the subsoil. The newer drift is composed of fresher clays, less deeply oxidized, and but feebly modified superficially by drainage erosion. The aspects of the older and newer drifts are here, as elsewhere, quite clearly differentiated, though the border limit is not always clear and conspicuous. On encountering the basin of East White River, the newer drift border comes in association with the remarkable fluvial phenomena of 'Collett's Glacial River.' This was one of the great avenues of discharge from the ice border, and has left its record in broad belts of gravel gathering into a great trunk stream. The edge of the newer drift sheet is interrupted and ob-

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b



(a) Large Gneissoid boulder in the valley of Gold Creek,
Morgan County.
(b) Iron pipes and hose used in sluice-box operations on

scoured by these fluvial deposits, but it seems to have formed a lobe, reaching down the basin into Jennings County, the glacial river lying on its western border. The eastern edge of the loop runs north diagonally across Decatur County, the southeastern portion of Rush, the northwestern part of Fayette and of Wayne, in the northern portion of which, and the southern part of Randolph, it recurves to the southeast to form the Great Miami loop in Ohio."*

Between the time when the ice sheet of this second glacier melted and retreated from Indiana, and the final disappearance of ice from the State, several other glaciers invaded the territory now included within her borders. The boundary or terminal moraines of these, as far as determined, are shown on the map. Whenever a glacier has reached the limit of its advance and there halted a sufficient length of time to deposit a large amount of debris, such an accumulation is called a "terminal moraine." This moraine does not consist, as is often supposed, of numerous large boulders, which have been dropped on the surface in more or less regular concentric lines. Such boulders are only an accompaniment and constitute but a very small fraction of the moraine proper. The main portion usually consists of a thick bed of compacted tough clay in which are many pebbles and boulders of small size, and often pockets of gravel and sand. Such a moraine may be a number of miles in width and consist of many small parallel ridges, or it may have a number of subordinate ridges branching off in every direction from the main one. These unite, interlock, separate, appear and disappear in an intricate and eccentric manner. Several of these subordinate ridges are often plainly discernible. The component ridges are themselves exceedingly irregular in height and breadth, being often much broken and interrupted. When very complex, the term "morainic system" is often given to a terminal moraine.

I have been thus explicit regarding the two principal glacial invasions of Indiana, because it is along their terminal moraines or boundaries; and in the narrow strip of territory separating these moraines, that most of the gold and all of the diamonds of the State have been found. This gold and these diamonds were skimmed or swept up by the advancing glaciers from their original home somewhere in the Hudson Bay region, and were brought down by these glaciers and deposited in their terminal moraines. Gold is liable to be found in the glacial gravel deposits of any portion of the State and especially in those which lie directly on the bed rock. It is,

* "The Terminal Moraine of the Second Glacial Epoch," in Third Annual Report U. S. Geological Survey, 1883, p. 333.

however, only at the edges of these main terminal moraines, where the material composing the drift has been most weathered and washed, and where streams flowing from the moraines have deposited beds of gravel over the bed rock in their valleys, that the gold has been accumulated in greatest quantity.

MINERALS ASSOCIATED WITH THE GOLD.

The particles of gold are always found associated with a fine, black magnetic iron sand. Along the border of the moraines mentioned this sand can be seen in gullies along the roadsides and on bare places on the hills. Every heavy rain washes it out of the clay and other loose material and carries it, with the associated gravel, pebbles, gold particles and other minerals down into the lower levels. This sand is composed of fine particles of magnetite, a very rich ore of iron, whose composition is oxygen 27.6 per cent., iron, 72.4 per cent. The ore in its native home occurs in extensive beds and also in crystals or particles, widely scattered in granite, gneiss, mica schist, and clay slate ledges. It is in such rocks that gold is found native, and it is very probable that the gold and iron sand now found intimately associated in Indiana were at one time constituents of the same ledges in the wilds of the country now known as British America.

Besides the black sand, one of the most common minerals found in the residue of the gold seeker's pan is "*menaccanite*." This is an ore of iron and titanium, iron-black in color, and resembling hematite in general appearance. The pieces found mingled with the black sand and gold vary much in size, sometimes weighing several ounces, but usually less than that of a navy bean in bulk. It is an axiom among the gold seekers that the larger the pieces of this mineral found in the pan, the richer the yield of gold. Menaccanite occurs usually in thin plates or seams in quartz and doubtless had its origin in the same locality as the gold.

In the residue of every pan, in company with the black sand and gold, are also numerous minute "garnets" of various shades of red, ruby red, purple, greenish and black. There are none of them transparent enough to be termed precious garnets. Their original location was in the mica and hornblende schists, gneissoids and other igneous rocks of the far north.

The above mentioned minerals are the common ones which are always found associated with the gold. Those of less common, or even rare occurrence, are pieces of native copper, pebbles or rounded

pieces of sphalerite or zinc blende, pyrites, marcasite, hematite, limonite, corundum, quartz of many varieties, red jasper, amphibole, zircon and cyanite. None of these, unless it be the pyrites and limonite, are native of Indiana. All others were brought in from far northern regions, thus furnishing additional evidence as to the original home of the gold which they accompany.

THE DISTRIBUTION OF GOLD IN INDIANA.

Under this heading will be given in detail such facts as are known concerning the presence of gold in those counties of Indiana where it has been noted.

The earliest printed record of the finding of gold in Indiana which has come to my notice is in the Journal of the Franklin Institute for June, 1850, as follows: "Professor Frazer read to the meeting (of the Franklin Institute, May 17, 1850) a letter from Prof. T. A. Wylie, of the University of Indiana, announcing the discovery of gold in the vicinity of that place, and exhibited specimens of the gold, and of the black sand in which it is found. 'The gold has been found in the beds of the rivulets in Morgan County, about twenty miles northeast; in Jackson County, about twenty miles southeast; in Brown County, about twenty miles east, and in Greene County, about fourteen miles west of Bloomington, as well as at certain intermediate points, but not in the immediate vicinity. Where it has been found it is always in connection with a black sand which the washers call "emery." This sand is found at the bottom of the streams, usually at the upper end of the sandbars, or on the margins of the streams where there is a sudden turn, and in such places as it would be naturally deposited on account of its density. The coarse gravel is sifted and washed in the usual way until nothing remains but the dense black sand. On examining closely with the microscope, there are to be perceived interspersed through it red particles of different shades, and some few yellow and green particles; of the red particles some appear to be merely colored quartz, while others are plainly distinguished by their crystalline form as garnets, and some of the darkest probably pyrope. The black particles are readily separated into two sorts by the magnet. Those attracted by the magnet, which amount in some specimens to 5 per cent. of the whole, are evidently *magnetic oxide of iron*. The remaining black grains agree precisely with Dr. Thompson's description of *titanate of iron* or *menaccanite*.' The gold is in flat scales, a good deal resembling in its appearance that from California."

"Professor Frazer remarked that from the account of Professor Wylie, it did not appear that this new gold field was likely to prove profitable in the working, but that it was of great interest, both in a geological and mineralogical point of view, and gave rise to an interesting inquiry as to the original locality of the minerals associated with the gold, since they are of a nature inconsistent with the rock formations of that portion of the United States."

BROWN COUNTY.

The northern boundary of this county is about 30 miles nearly due south of Indianapolis. The county is bounded east by Bartholomew, south by Jackson and Monroe, west by Monroe and north by Morgan and Johnson counties. It contains an area of 320 square miles, the surface of which is very broken, except in the southeastern corner, where there is a large area of level table land. The "Knobs" of southern Indiana, stretching northward from Floyd County, attain in "Weed Patch Hill," south of Nashville, the county seat, their highest elevation—1,147 feet above sea level.*

Salt Creek, the principal stream of Brown County, is composed of three main branches, the "North," the "Middle," and the "South" forks, which unite near the southwest corner of the county, and flow thence through Monroe and Lawrence into East White River. Thus almost the whole watershed of the county, together with a considerable portion of Jackson on the south, is drained by this stream. Bean Blossom Creek has its source in the northeastern part, its principal tributaries in northwestern Brown being Bear and Lick creeks, both flowing nearly south. Just across the northern boundary in Morgan County, and in a valley nearly parallel with the county line, is Indian Creek, flowing in a general western direction. High ridges surround Brown County on all sides, while from east to west and southwest three similar ridges traverse the county, all connecting on the divide near Trafalgar, in Johnson County. The first and most northern constitutes the southern bluff of Indian Creek, and is called "Indian Creek Ridge;" the second, south of Bean Blossom is known as "Bean Blossom Ridge," and the third, passing nearly through the middle of the county, is named "Central Ridge." All

* Weed Patch Hill is thought by many persons to be the highest point in Indiana, but it is exceeded by a number in Randolph County—the actual height of the most elevated one measured being 1,234.4 feet above tide. This is what is known as the "Summit" on the Peoria Division of the Big Four railway, between Green's Fork and Martindale Creek. Several hills south of the "Summit" are thought to be 50 feet higher, so that the highest point in the State is about 1,285 feet above tide, or 138 feet higher than Weed Patch Hill.

these ridges slope gently to the south and west but present steep faces to the north and east.

The bed rock composing the body of most of the ridges and hills of Brown County is a soft, bluish knobstone shale, which weathers readily into a plastic clay. In places beds of sandstone occur; while the crests of the hills are capped with a chert-like bed of Keokuk limestone with its characteristic accompaniment of "geodes." This limestone forms the surface rock in the eastern part of Monroe County, and its presence on the tops of the hills of Brown shows that this county was once covered by a level surface of limestone continuous with that of Monroe to the westward. The valleys of the county, now containing its richest soil, have been eroded by flowing streams, leaving the strata of the hills as they were originally deposited by sedimentation in an ocean which covered this region ages before the dawn of the "Glacial Period."

Only the northern third of Brown County is within the glaciated or drift area. The northwestern part of Hamblin Township and the greater portion of Jackson Township are covered with drift accumulations as far south as Bean Blossom Ridge, the drift being found on the slope of this ridge nearly 200 feet above the water in the stream. Boulders of granite, gneiss and jasper, three to five feet in diameter, occur frequently in this region. In the Salt Creek valley, northeast of Nashville, but little drift was seen. Bean Blossom Ridge, then, marks the southern limit of the first and only glacial invasion of Brown County, and it is only north of this ridge that gold in anything like paying quantities has ever been found in the county. Collett, in his "Report on Brown County,"* calls attention to this fact, and says: "Against and upon this *wall-like* ridge the stranded ice seems to have been continually massed; and, melted by each recurring summer's sun, it sent torrents of water south across the county, wearing slight depressions in the ridges, as at Low Gap and the source of Greasy Creek, bearing fine sediment, some gold dust and black sand, and but few or no pebbles or boulders. This flood was long continued—first flowing clear across the county, at a high level, and even across parts of Jackson—next following the synclinal axes of the underlying rocks, it excavated South and Middle Forks of Salt Creek, and finally following another synclinal, adopted the direct line of dip by the North Fork.

"During this time the underflow from the glacier was also working a channel in the disintegrating shale along the east side of the county, by Bean Blossom, and finally left the interior basin of the

* Geological Survey of Indiana, 1874, pp. 77-110.

county subject only to the action of its own water-shed. Down these side cuts to White River immense bodies of water, bearing some ice with boulders and gravel, have flowed. The long continued melting of ice loaded with the most enduring debris of the Laurentian rocks, as greenstone, quartzite, quartz, gold and magnetite, deposited large quantities of these imported materials in Bean Blossom Valley. The rapid current of the ice water would naturally carry down stream the lighter sand and gravel, and sort out and leave behind the heavier rocks, gold and magnetite in considerable quantities. Afterwards as the ice foot withdrew toward the north, this melting, sorting, sifting process was carried on north of Indian Creek Ridge, for a *longer time*, as is indicated by the greater width and depth of that creek valley, where gold and the heavier minerals will only be found beneath the present surface, which is largely built up above the bed rock."

The earliest mention of gold in Brown County which I can find in print, other than that of Professor Wiley above quoted, is that of Richard Owen in 1862,* which is, in part, as follows:

"The chief interest of Brown County attaches to its gold region, which we were enabled to examine advantageously. Although some prospecting has been done on 'Bear Wallow Hill,' on head waters communicating through Lick Creek to Salt Creek, as also in what they term the gravel of Greasy Creek (a deposit of disintegrated shales), the main localities in which success has attended the gold washings in this county are on Hamblin's fork of Salt Creek, three-quarters of a mile in a direct line from the west limit of Bartholomew near Mt. Moriah postoffice. Here we found extensive preparations in the way of sluices and hose, rockers and 'long toms,' picks and shovels, etc. Notwithstanding the rain, we panned out enough to convince ourselves that the black sand in many of the pockets contains a considerable amount of gold particles.

Occasionally they pan out flat scales worth from a dollar to a dollar and a quarter. Judging from what I saw here and elsewhere in Indiana of the gold localities, I should venture the opinion that the gold is invariably associated with drifted quaternary materials, derived from a matrix, which finds its mountain home at least from 400 to 600 miles distant, and more probably double that distance, in a northerly direction."

Collett, in his "Report on Brown County," treats the subject more in detail. In part, he says: "Gold is found in the bed or on the bars

*Geological Reconnaissance of Indiana, p. 119.

of all the brooks that flow into Bean Blossom from Indian Creek Ridge, and on the streams which flow from the foot of the "drift backbone" in the northeast corner of the county, as South Bean Blossom, North Salt Creek, etc. Fine dust and minute scales may be found further within the county wherever black sand and small pebbles indicate former currents of ice water, even as far south as Elkinsville. Single individuals, at favorable points, by hard, patient labor, have been able to make from \$1.00 to \$1.50 per day. Companies and careless workers have not averaged more than 25 cents per day. During the excitement a few years since, several companies took leases, made sluiceways and prepared long toms and rockers. The returns were not satisfactory. It is probable that the best "pay dirt" lies at the deepest part of the rocky trough in which the creeks now have their course. By bores the line of greatest depth may be ascertained, and by shafting the richest dirt—possibly in paying quantities—may be brought to the surface. Reasoning from the facts observed, this would be true of Bean Blossom, and especially, from its greater width and probable great depth, also of Indian Creek Valley. This is mentioned as a reasonable deduction, warranted by the facts and not for the purpose of exciting a mining fever. It is estimated that the amount of gold found in the county to date (1874) will equal \$10,000 in value, and the best nugget weighed at one dollar and ten cents."*

During our trip in May, 1902, Mr. Royse and myself drove over the greater portion of Jackson and Hamblin townships, which form the northern third of Brown County. We conversed with a number of men who do little else than pan gold along the streams, and incidentally "panned" in a number of places ourselves. In the gutters along the roadsides, especially those on the ridges below the top level of the drift, the black magnetic sand could be seen in quantity. Our first panning was done one-half mile west of Georgetown, the material being taken 15 feet above the level of a fork of Bean Blossom Creek. The residue showed a quantity of black sand and four "colors" of gold. Another pan taken from the creek bed showed 11 colors. Mr. Royse has had assayed a conglomerate found in the hillsides and bluffs along this and neighboring streams, with a result of \$1.40 per ton, flour gold. This conglomerate is formed of iron oxide, pebbles, geodes and pieces of shale cemented together with carbonate of lime, and lies just above the shale composing the hills.

The valleys of the streams in Brown County are, as a rule, much narrower than in Morgan County. Along each side of the stream is

* Loc. cit., p. 107.

a strip of bottom land of varying width, composed of gravel, clay and soil, the gravel resting upon the bed rock or blue shale. It is this gravel, next to the bed rock, that is richest in gold. Most of the surface of these strips is cultivated, and the owners will not allow the "gold hunters" to pan except in the beds of the streams. These beds have most of them been washed many times in succession, a new supply of gold being eroded during each freshet from the gravel beds along the banks. These beds, which form the base of the lowlands or cultivated bottom lands of the valleys, were formed during the melting of the glacier, when the streams flowing through the valleys were much wider and stronger than now. The gravel and sand composing them was then deposited, and the soil, for the most part has been formed since then by decaying vegetation and annual overflow.

After every freshet the children seek gold along the rocky bottom of each rill and stream and often find pieces worth 25 to 40 cents. Much of this is found lodged in minute crevices at the bottoms of small waterfalls. I was told that two boys, just east of Spearsville, had sold \$42 worth in a single season, which they had thus gathered along the smaller tributaries of the north Branch of Salt Creek.

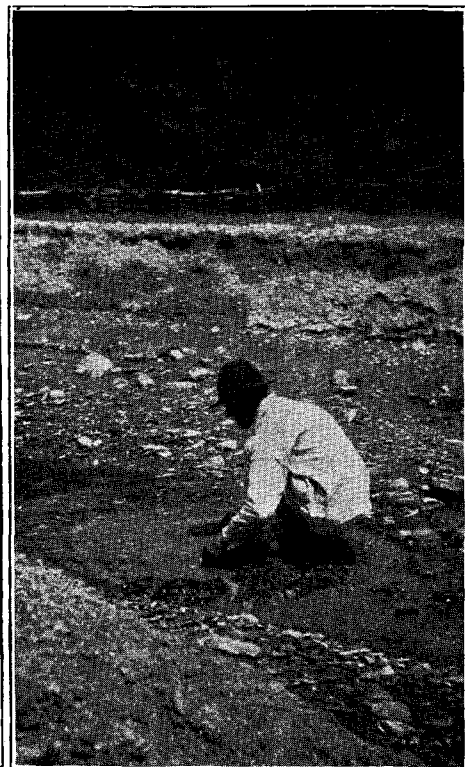
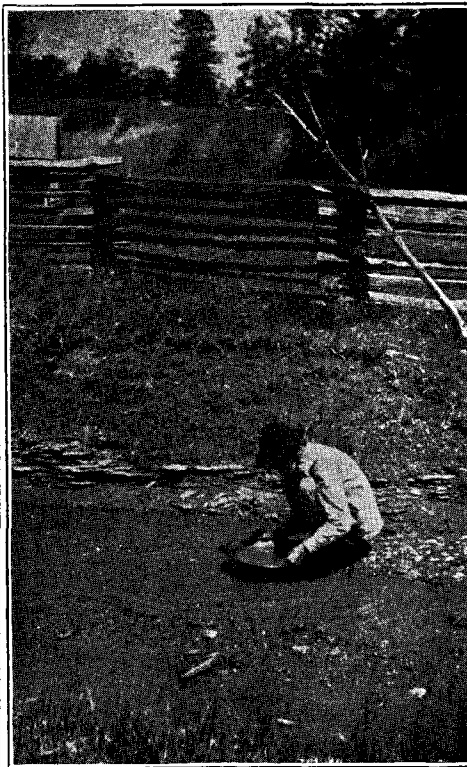
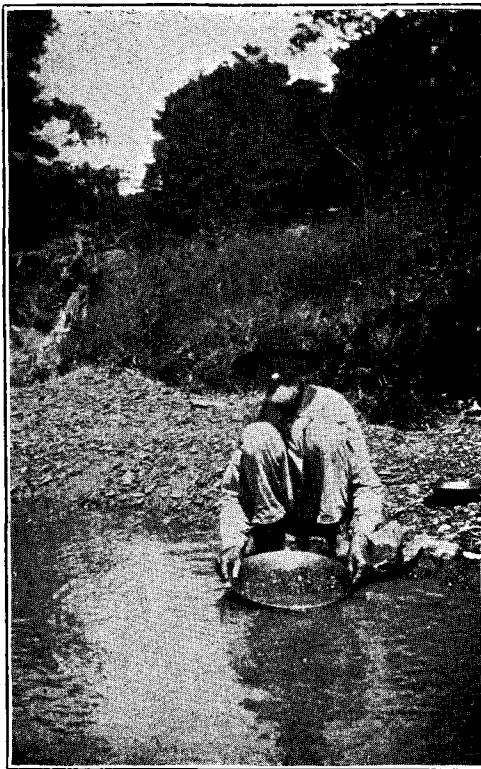
One of the best known and most reliable gold hunters in Brown County is W. J. Merriman, better known as "Uncle John" Merriman. He is 69 years of age, has panned gold more or less each year for 49 years, and has done little else for the past 20 years. He resides near a branch of Lick Creek, about six miles northwest of Georgetown, and has washed gold along every stream in northern Brown and part of Morgan counties. The largest "nugget" he ever found was taken on Bear Creek and weighed 132 grains, valued at \$5.50. He has found a number of pieces which ran as high as \$1.00 to \$1.25 in value; but most of what he secures is in the form of "colors" or minute flattish particles. He states that the coarsest gold in Brown County is found in what is known as "Gosport Hollow," a tributary of Bear Creek. He also estimates that the gravel beneath the soil of the lowlands will average 25 cents per cubic yard in gold.

On two different occasions Mr. Merriman has kept a careful account of the results of a month's work—Sundays excluded. One month yielded him \$34; the other, \$40. He claims that he can average \$1.25 a day during the panning season, which runs from March to November, except in times of summer drought. During his panning he has found several diamonds, which will be mentioned on another page.

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b

c



(a) Uncle John Merriman, the veteran Brown County gold hunter, at his favorite work.

(In b and c are seen the typical lowland deposits of gravel resting on the bed rock—here the Knobstone shale.)

We took dinner with Mr. Merriman and then accompanied him along the creek below his home. Armed with a trowel, gold pan and small basin, his only working outfit, he began operations by scooping up with his trowel a pan full of sand and gravel. After thoroughly mixing it with water by stirring it for a minute or two, he began the process of "panning," or washing. In fifteen minutes he had reduced it to a tablespoonful of black sand in which were 14 colors, or fine particles of gold. The next pan yielded 24 colors, and the third one 16, one of which was large enough to make a noise when it fell against the bottom of the pan. The residue of black sand and gold in each pan was dumped into the small basin, to await a complete separation at some future time. The thought came to me while watching "Uncle John" at his pan, as it has many times since, "If a man, by working thus, ten hours a day, can secure \$1.25 from gravel picked up in the bed of a stream, what could be done with advanced machinery working on the richer virgin beds of gravel which underlie the lowlands of all the valleys hereabouts?"

Leaving "Uncle John" at his favorite labor, we drove across to Spearsville, in the northwestern corner of Hamblin Township, noting on the way the black sand in many places in the roadside gullies. From Spearsville we went three miles in a southeasterly direction along one of the tributaries or sources of Salt Creek. Here we found at work another gold hunter, W. W. Young, who has spent many years in the mining regions of the west, but for the past five years has been washing gold in Brown and Morgan counties. On the day we met him, he had dug to the shale or bed rock a trench 24 feet long, two and a half feet wide and six inches deep, along a bar at one side of the bed of the stream. From this he had taken almost \$2.00 worth of gold. Another man who had worked alongside of him, but who was inexperienced, had secured but 40 cents worth. Young, as well as most other gold seekers of Brown and Morgan counties, scouts at the theory of the gold being brought in by glaciers. He declared that "it was born and raised right there,"—in other words that it was native to the rocks, but he has never been able to find a vein of it to prove his assertion.

Mr. Young showed me a report from the United States Mint at Philadelphia, dated July 12, 1901, showing that the mint had received from him 14.05 ounces of gold, the fineness of which was 909½. For this he received \$250.07, aside from the charges of \$1.56 for melting and refining. Silver to the amount of 61 cents was found as a natural alloy of the gold, by the mint authorities. He stated that he had panned this gold in nine months' time, working probably three-fourths of the period.

The quality of the drift gold found in Indiana is of the best, as it will average 22 or more carats, as against 16 to 18 for California gold, and 14 to 16 for Klondike gold. The largest piece found at any time by Mr. Young, weighed sufficient to bring \$2.00.

At least 70 square miles of northern Brown County lies within the drift-covered gold-bearing region of the "First Glacial Invasion." The gold occurs in the clay, gravel and sand beneath the soil on the hills, and more abundantly in the gravel deposits which underlie the lowlands in the valleys. The latter will probably not aggregate more than three or four square miles of this area, for the streams are small and the valleys narrow. It is in this gravel of the lowlands, if anywhere in the county, that advanced processes of placer mining could be made profitable. The question of a permanent water supply would be a serious one, as most of the streams are dry several months in summer. By constructing permanent dams in several of the valleys enough water could probably be conserved to tide over the dry season. There is no doubt but that large quantities of gold exist in the county. Only a person experienced in hydraulic and placer mining, who is conversant with the latest improved machinery for that purpose, will be able to state whether the process of its separation can be made a profitable one.

CASS COUNTY.

This county lies about 85 miles a little west of north of Indianapolis. It contains 420 square miles, and is wholly within the drift-covered area, but the Devonian and Niagara limestones outcrop in a number of places along the Wabash and its large tributary, Eel River, which joins it at Logansport, the county seat. In the vicinity of Logansport, numerous beds of gravel ranging in thickness from one to 32 feet, lie immediately above this bed rock. From one of these beds, near the northern part of the city, Dr. Robert Hessler has secured a number of small flakes of gold. These were picked up, incidentally, without panning, and go to prove that gold is widely distributed in the drift gravel deposits of the State. Most of these deposits are, however, so deeply buried beneath clay, sand, soil and other material that there is no way of determining the presence of gold and no way of securing it were it present in large quantity. It is only along the edges of the moraines or in places where the gravel deposits rest on outcrops of bed rock, that the gold-bearing gravel is accessible.

CLARK COUNTY.

This county lies in the southern part of the State, opposite Louisville, Kentucky. The first glacial invasion covered its northeastern third as far south as Charlestown. From near Fourteen Mile Creek, three and a half miles northeast of this place, Rudolph Bastian has recently sent me a quantity of black magnetic sand containing large numbers of small garnets and a few grains of free gold. He states that he has opened up a shaft 15 feet in depth in a hill composed of soil, sand, clay and gravel, a section of the shaft being as follows:

	<i>Feet.</i>
Soil, yellow	2
Sand, black magnetic.....	4
Clay, blue	6
Sand, white	2
Clay, blackish	1

In the black sand of the stratum, he states that he can find numerous particles of gold in every panful which he washes. The black sand and garnets are finer than those found farther north, and it may be that the deposit is but the diluvium or wash from the streams which flowed from the melting glacier of the Brown County region.

DEARBORN AND OHIO COUNTIES.

These counties lie along the Ohio River in the southeastern corner of the State. The edge of the Great Illinoian, or first glacier which invaded Indiana, passed through Ohio County. Dearborn County is, therefore, wholly covered by the drift of that glacier, and lies within the interval separating its border from that of the Wisconsin boundary. Boulders are common in each of the counties and a piece of native copper weighing 26 ounces was found near Tanner's Creek, Dearborn County, a number of years ago. Of the presence of drift and gold in the two counties Prof. E. T. Cox has written: "The most remarkable prolongation of glacial drift southward is seen in Dearborn and Ohio counties, Indiana, and Boone County, Kentucky. In the two first named counties the drift is found in greatest force along the hillsides bordering Laughery Creek, resting upon the bluish clay shale beds of the Hudson River group, and 150 feet above the bed of the stream. The entire drift deposit is fully 50 feet thick, and is made up of the usual material, stratified clays, sand and gravel, above which there are numbers of massive granitoid boulders. One of these boulders I estimated to contain over 100 cubic feet.

"The lower bed of sand and gravel, which rests upon the Silurian bluish clay shale, contains a portion of gold dust, and gold washing has been carried on here in a small way for some years. When I visited this locality, about one mile a little north of west from Hartford, Ohio County, there was to be seen the ruins of what had been extensive preparations for washing this gold sand in sluice-boxes, but the scheme had fallen through for want of funds and the confidence of those who had at best lent it but feeble financial support.

"Dr. George Sutton, accompanied me from Aurora, and we went to Mr. Miller's house, close by, and had him bring his spade and a tin pan, and try to wash out some gold in our presence. After scraping off a small portion of the surface, a spade full of gravel and sand was thrown into an old pan with coarse holes in the bottom and the fine material that would pass through the holes was sifted out into the washing pan. In a few moments Mr. Miller succeeded in separating some particles of gold mixed with a quantity of black, magnetic sand. There is no means of getting water to this place in sufficient quantity and at a reasonable cost, but if hydraulic washing could be resorted to it is possible that considerable gold might be washed out. It is not my object, however, in saying this much of the drift gold in the vicinity of Hartford, to incite capitalists to take hold of the property with a view of profitable mining, but to call attention to the fact that gold is found there, and as one of the evidences that the whole deposit has been brought from ancient rock beds that are not found in places south of the great lakes, and that it is veritable glacial drift. This is not the only spot where gold has been found on this creek. I am told that it has been washed out of the sands on the opposite side of Laughery Creek, in Dearborn County, on the farm of Preston Conway."*

In 1882, Dr. George Sutton, of Aurora, who had accompanied Professor Cox to the gold-bearing deposit described above, wrote of it as follows:

"Along the valley of Laughery Creek, a stream which enters the Ohio River a few miles below the mouth of the Miami, may be seen deposits of auriferous drift. They are not stratified like the terrace formations seen along our rivers, but lie in irregular accumulations along the valley. At the bottom of the small streams that have cut across this drift are seen deposits of black sand which principally consist of magnetic iron ore. It is in this sand that gold is found. Seven miles from the mouth of Laughery may be seen a deposit of this drift about a mile and a half in length, nearly half a mile in

* Geological Survey of Indiana, 1878, p. 106.

width, and about 100 feet in thickness. Some portions of this Laughery drift are so rich in gold that it is seen with the unaided eye, and almost pays a fair remuneration washing for it. My attention was directed a few weeks since, by the owner of the farm on which this drift is found, to a small excavation which had been made in washing for gold. It was by measurement six feet long, five feet broad and about two feet deep. He informed me that from this place \$8.00 worth of gold had been obtained, and that a man had washed from the drift on his farm gold to the value of \$16.50. The gold is found in the form of dust, flattened scales and small nuggets. Only that which could be seen with the unaided eye was saved.”*

In a recent letter, Dr. J. B. Miller, of Laughery, Ohio County, one of the owners of the farm near Hartford on which the gold occurs, gives the following account of the attempts at washing the gold since the time of Dr. Sutton's visit: “In 1885 we leased the mine to a company, which prospected for about eight or ten days and took out \$8.00 worth of gold, but they had not sufficient water, and could not raise enough money to put in pumping works and force the water to a reservoir on the top of the hill. The owners themselves afterwards worked the mine for three days and took out \$6.00 worth of gold, but had not sufficient water to run it half the time. We used a sluice box, and if we had had water, we could have made \$1.50 a day per man, just from surface mining. This gold is on three farms in Ohio County, and one in Dearborn County. The soil is black, sandy, and consists of freestone and boulders, no limestone, but much conglomerate, run together by action of heat. The limestone is all around it but none on the gold producing land; you can see gold on the large stones on a sunny day. We never tried to go to bed rock, but intend to sink a shaft this coming fall. The largest piece of gold which we found was the size of a grain of wheat. It is mostly in fine scales, but of a very fine quality.”

FRANKLIN COUNTY.

This county lies northeast of Dearborn County in the southeastern part of the State; and wholly within the bounds of the “First Glacial Invasion.” Drift from the Wisconsin Glacier also covers the north-western corner, and the northeastern third, as will be seen by the accompanying map. Of this drift and of the presence of gold in the county, Dr. Rufus Haymond has written: “The superficial material

*“The Gold-bearing Drift of Indiana,” in Proceedings of the Association for the Advancement of Science, XXX, 1881, pp. 177-185.

resting upon the rocks consists mostly of yellow clay, mixed more or less with small pieces of broken limestone, gravel from primitive rocks, and, in a few localities, almost pure gravel is found, in others sand, and frequently sand and gravel mixed. In no instance upon the uplands or tops of the hills do the bed rocks penetrate through these materials, and we find them only where the drift has been worn away by the action of the streams. The drift varies from four or five feet to 40 or 50 in thickness upon the uplands. The slopes of the valleys and side hills seem to be covered with drift similar to that upon the high grounds, but not of equal thickness. Boulders of granite, hornblende, greenstone, syenite, gneiss and, in fact, of almost every species of metamorphic rock, are found all over the county, upon the highest as well as the lowest grounds. They are always found upon the surface and never beneath, except under slides or where gravel in the terraces has been washed over them. A single piece of native copper has been found in the county, weighing about six pounds. It was no doubt transported with the drift from Lake Superior, as it was rounded, and bore other evidences of attrition.

"In the northwest part of the county, in Laurel and Posey townships, upon Sein Creek and its branches, gold is generally disseminated in very small particles. A common panful of gravel and sand, when washed out, generally shows from two to three particles of gold in thin scales. None has ever been found larger than a grain of wheat. Though so generally disseminated, it is doubtful whether the quantity is sufficient to pay the expenses of washing it out. Gold has also been found upon Little Duck Creek, and here, as elsewhere, is found associated with black sand."*

GREENE COUNTY.

This county lies west and south of the center of the State. The border of the first or Illinoian Glacier passed in a northeast-southwest direction through its eastern half. The only mention of gold within the county which I can find recorded, is that of Prof. T. A. Wylie in the Journal of the Franklin Institute where he mentions gold as occurring with black sand in Greene County.

* "The Geology of Franklin County," in Geological Survey of Indiana, 1869, pp. 185, 190.

JACKSON COUNTY.

Lying below Brown County and south of the central portion of the State is Jackson, a county comprising 520 square miles. The border of the Illinoian glacier passed through its eastern half, and alluvium from that glacier covers much of the county. Gold has been found in a number of localities, chief among which is the bed of a stream on the farm of George A. Waggoner, near Freetown. Scales and particles to the value of about \$5.00, which had been panned from the gravel and sandbars of this branch, were brought to my office by Mr. Waggoner in 1899. From his statement I should judge that the gold is not present in sufficient quantity in any part of Jackson County to pay for working, other than by panning by parties who have little else to do.

JEFFERSON COUNTY.

In this county, which lies in the southeastern part of the State, along the Ohio River and wholly within the boundary of the Illinoian drift, gold has been found, as far as known, only on a stream about six miles north of Madison, the county seat. From the gravel in this stream, Mr. Clement J. Raffan, of China, sent me several small quartzite boulders which contained free gold. These boulders, he states, were found in small numbers in the gravel bars, and attracted his attention on account of the yellow particles in them. He has made no attempt to pan gold from the gravel of the stream.

JENNINGS COUNTY.

This county comprises 375 square miles of southeastern Indiana. It lies wholly in the interval separating the boundaries of the Illinoian and Wisconsin drift areas, that of the latter just touching its northwestern corner. The only record of gold within its bounds which has come to my notice is that made by W. W. Borden, who prepared a report on the geology of the county, and is as follows: "Some particles of gold have been panned from the bed of the south fork of the Muscatatuck. This gold was found in combination with the black sand washed down from the glacial drift of the uplands. The excitement occasioned by its discovery was very great at the time, and some useless labor was spent in sinking a shaft, as the drift and accompanying gold dust was foreign to the State."*

* Geological Survey of Indiana, 1875, p. 178.

MONTGOMERY COUNTY.

This county lies in the western-central part of the State, about 45 miles northwest of Indianapolis. The main stream flowing through it is Sugar Creek, which enters south of the northeast corner and passes diagonally across the county in a general southwesterly direction. It has a number of tributaries which, with their branches, are fed by springs which flow out of the great masses of clay, gravel and other drift material which form a thick bed above the underlying sedimentary rock. This drift belongs mainly to the Wisconsin sheet, as the county lies wholly within the bounds of the second glacial invasion. Professor Collett, in his report on the geology of the county, has given an interesting account of the effects of this glacier upon the surface of the county, in which he says: "The boulder drift deeply covers the eastern, northern and northwestern parts of the county, bearing internal evidence of its origin, as polished, striated and rounded pebbles and rocks imported from the Laurentian beds north of Lake Superior. When long concentrated by currents of water some notable deposits of gold dust and magnetite occur, associated on account of their approximate specific gravity, on the bars and riffles of the water courses."*

Again he says that just above the Iron Bridge across Sugar Creek, about a mile west of Crawfordsville, is a great mass of boulders capped with lacustral silt. The violent washing process that sorted these huge boulders, ground and pulverized some of the crystalline rocks, and considerable quantities, more than fifty dollars worth of gold dust and magnetite have been "panned" out by amateur collectors, on the ford bar.

Near the junction of Lye and Sugar creeks in the northeastern part of the county, he states that "on the land of Mrs. J. Naylor, Section 6 (T. 19 N., R. 3 W.), Mr. Edwin Cadwallader has collected several dollars worth of gold in flat scales, each pan showing 'color.'"

MORGAN COUNTY.

Morgan County lies just southwest of Marion County, near the center of the State, and comprises 409 square miles. It is bounded on the north by Hendricks and Marion, on the east by Johnson, on the south by Brown and Monroe and on the west by Owen and Putnam counties. The West Fork of White River flows diagonally through the county from northeast to southwest, and, with its tributaries, drains

* Geological Survey of Indiana, 1875, p. 370.

* Loc. cit., p. 407.

the entire area except the northwestern corner, from which three small streams pass westwardly into Eel River. The principal tributaries of White River from the north, along whose beds and lowlands most of the gold of the county occurs, are White Lick, Sycamore Creek and its tributary, Gold Creek, Highland Creek, Lambs Creek, Burkhardt's Creek, Fall Creek and Butler's Creek. Each of these streams has a number of smaller branches running into it, which are fed by springs. Most of them are dry in part of their courses during a portion of each summer.

The northern third of Morgan County, in which most of the gold occurs, is covered by the drift of the second or Wisconsin glacier, and the gold is a part of that drift. In the southern part of the county the drift is that of the first or Illinoian glacier, which embraced all the territory now included within the county. Of the Wisconsin drift Dr. Brown, who made a careful survey of the county, wrote as follows: "On the northwestern side of White River, in the northern tier of townships, the drift is deep and continuous, with its base of blue clay, and its upper member of yellow clay, with water-worn pebbles interspersed and an occasional boulder of granite on the surface. Some of these are very large. On Section 4 (T. 12, R. 2) I measured a boulder of flesh-colored granite, whose dimensions were: Length, 15 feet 4 inches; greatest breadth, 13 feet; height above ground, 11 feet 9 inches. South of an irregular line from Brooklyn to Eminence, the boulders almost entirely disappear, and, with them, the upper drift also leaving an irregular deposit of blue clay, constantly broken by the deep ravines which lay bare the underlying strata and cut the country into knobs."*

The "Lake" or valley, ranging from one to five miles in width, which extends from a little north of Eminence in a northeasterly direction past Hall and Monrovia, marks the point where the southern margin of the Wisconsin glacier rested for a long period, and down this valley much of the water from its melting ice was carried. The Indian Creek Valley in the southern part of the county was likewise the resting point of the southern edge of the Illinoian glacier. From each of these glaciers, whose crests doubtless towered far above the hills which prevented their farther movement southward, rapid streams flowed and bore down the gravel, clay and sand, with their accompanying gold, now found in beds beneath the lowlands of the present existing streams.

*Thirteenth Annual Report Indiana Department of Geology and Natural History, 1883, p. 79.

Of the gold of Morgan County, Dr. Brown wrote: "In the year 1850, some returned California gold miners observed the characteristic black sand in the ravines of northern Morgan County and immediately commenced "prospecting." They found gold in the tributaries of Sycamore and Lamb's creeks, and some of the more skillful miners were able to wash out \$2.00 or \$3.00 worth of gold per day for several weeks. But the excitement of an actual "placer mine" in Indiana brought together so many fortune hunters that every ravine was directly occupied and the sands were soon washed out, and the "gold fever" subsided. Within the last few years the excitement has been revived, and gold washing, to a limited extent, has been resumed, paying from 50 cents to \$1.00 per day. The gold is in very thin scales or in almost invisible grains, and is remarkably free from alloy of any kind.

"The origin of this gold is a geological problem of some importance, as the underlying rock is of comparatively recent date and shows no indications of trap dykes, quartz veins, or other geological disturbances. The only rational solution of the problem appears to be that which refers the gold to the blue clay, which is the lowest member of the drift. Where the clay forms the summits or sides of the hills, it is washed into gulches by the rains. The lighter and finer particles are borne onward with the current, while the heavy black sand and gold lodge among the rocks in the bottom. Fortunes, however, will never be made by gold mining in Morgan County."*

In our trip over a portion of northern Morgan County in May, 1902, Mr. Royse and I first saw black sand in the roadside gullies about one-half mile northwest of White River, in Section 17 (T. 12 N., R. 1 E.) and, washing a panful of gravel, found several colors of gold. From here we passed northwestwardly to Wilbur, stopping in a number of places along the west branch of Highland Creek, to prospect with our pans. From the gravel underlying a strip of lowland along the creek, about a mile south of Wilbur, we washed several pans, one of which yielded 41 colors, and all of the others from 10 to 20 each.

From Wilbur we passed eastward across the ridges to the breaks of Sycamore Creek. Here the best known of the Morgan County gold seekers, Wm. Stafford, or "Wild Bill" Stafford, as he is more commonly known, has washed gold for 30 years. He spent one afternoon with us along Gold Creek, a tributary of Sycamore. One pan which he washed contained 64 colors, several of which were larger than grains of wheat. He showed us one place on this stream where he and

* Loc. cit., p. 81.

a partner secured 272 pennyweights of gold between March 3rd and June 17th, by using a three and a half foot rocker. He stated that where one can get an average of 20 colors to the pan, it will always pay to run a sluice box or rocker. On the Thos. Staton farm along Gold Creek (northwest quarter and southwest quarter Section 27, 13 N., 1 E.), now belonging to Moses Gunter, six pans of gravel washed on April 8, 1903, yielded \$1.25 in gold.

Like most other gold hunters of Brown and Morgan counties, Stafford washes only the bars of the streams, paying no attention to the gravel deposits underlying the lowlands, mainly because the soil above this gravel is cultivated and the owners forbid its disturbance. He says that it pays much better to work out and pan a whole bar, sweeping the bed rock and cleaning out all the cracks where the coarsest gold has lodged, than to pan a little here and there as many do. The tyro can make but 25 to 40 cents a day panning along the streams of this region; the old experienced washer, \$1.50 to \$1.75 per day. He showed us a piece of gold whose value was \$4.70, which was the largest he had ever taken.

During our investigations in Morgan County we gave especial attention to the lowlands bordering Highland, Sycamore and Gold Creeks and their tributaries. In most places these lowlands are composed of two to three feet of gravel resting upon the blue shale or bed rock. Above the gravel is a foot or two of clay and above this a sandy or alluvial soil, ranging in depth from six to 12 inches, on which crops of corn and other cereals are raised. The streams, whenever full and swift, erode out a portion of the gravel, with its accompanying gold, carry it forward and build up bars farther down their courses. In this manner the annual supply of gold particles in and along the immediate stream beds is added to, or replenished, when lessened by the workings of the gold hunters.

About 45 square miles of northern Morgan County are overlain with the gold bearing drift. Mr. Royse has made practical tests of the material in a number of the lowlands of this area and has proven that it runs from 30 to 80 cents per cubic yard in gold.

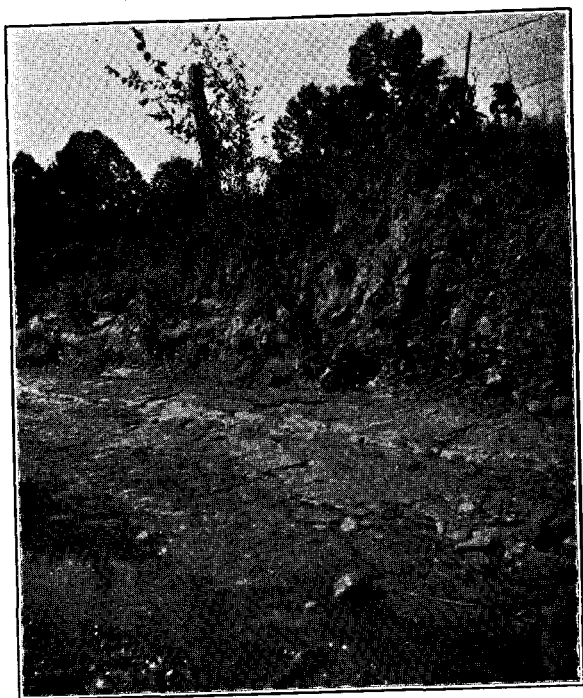
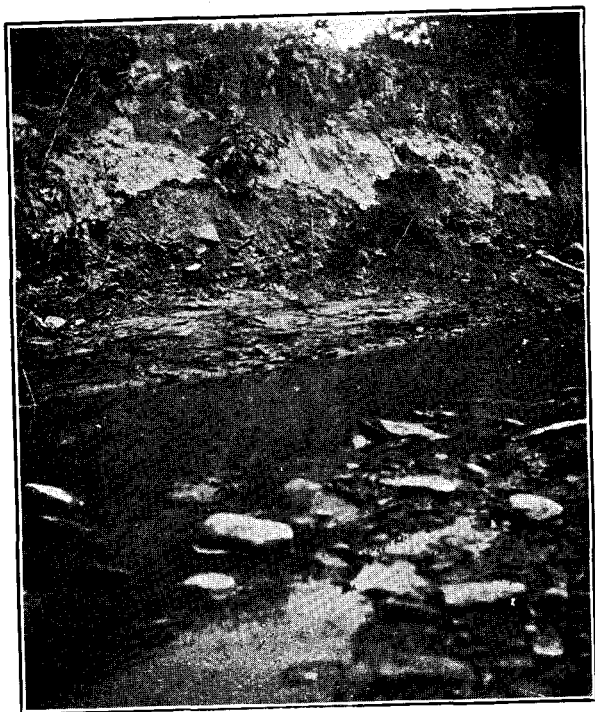
The most thorough of these tests was made on the land of Dr. Clark Cook, Section 30 (13 N., 1 E.), just north of the postoffice of Brey. Here 25 holes were dug through a strip of lowland to bed rock, the average depth being 3 feet 9 inches. From each of these holes 75 pounds of gravel was carefully panned, one-third being taken from the top, one-third from the middle and one-third from the bottom of the gravel stratum. In addition, miscellaneous gravel from the holes was added to bring the total up to 2,000 pounds. From this, gold to

the value of \$1.54 was secured. Allowing 3,000 pounds as the weight of a cubic yard of gravel, and deducting two-thirds for soil and clay, which were barren of gold, but must be handled, he had 77 cents per cubic yard for the matter composing the lowland.

In the winter and spring of 1903, a small dam of logs and stone was built across the east fork of Highland Creek, which runs through Dr. Cook's farm. The water which collected above the dam was guided through 550 feet of 8-inch iron pipe and 150 feet of canvas hose, and was used in tearing down and forcing through sluice boxes, a portion of the lowland clay and gravel deposits, near where the above mentioned tests were made. Three sluice boxes, each 30 feet in length, were constructed, with mercury at the bottom to catch the flour gold. The fall from dam to sluice boxes was but four to six feet, dependent upon the stage of water above the dam. This water supply was usually sufficient to allow working only a few hours a day, and before the final clean-up, a great freshet washed out both dam and sluice boxes, so that no definite results were obtained. The capital invested was too small to make a practical test of the richness of the deposits. It is understood that Dr. Cook will construct a more permanent dam, higher up the stream, and renew his efforts to determine just what the placer deposits will yield.

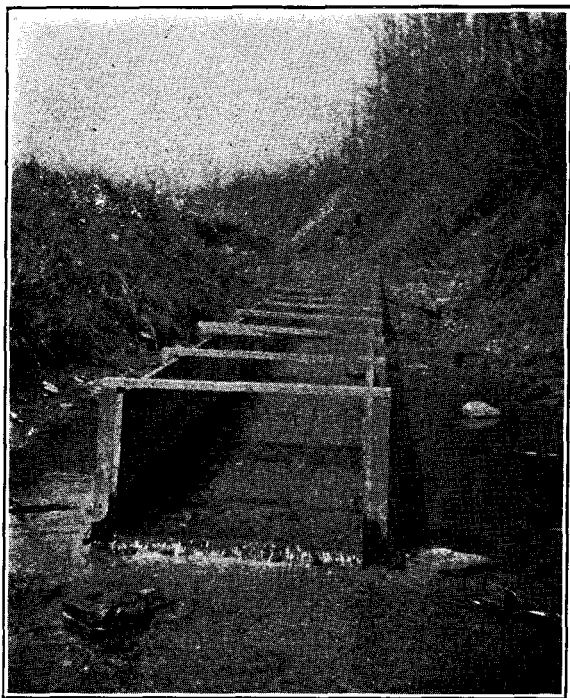
I visited the site of this embryo hydraulic plant on March 26, 1903, and found a number of gentlemen from a distance who had been attracted by the newspaper articles regarding the work. Among them was Adam Linn, of Tucson, Arizona, a miner in California and Oregon since 1854. He had made for a Chicago company a careful investigation of the lowland deposits of the surrounding region, and stated that the gold was more abundant than he expected. He gave it as his opinion that these deposits would yield from 25 to 40 cents per cubic yard, and thought that it would well pay to pipe in water 20 or 30 miles, provided a company could control a thousand or more acres of the lowlands. Otherwise, the expense would be greater than the output.

In the southern part of Morgan County, gold also occurs along all the streams. In what is known as "Dead Man's Hollow," in Washington Township, seven miles south of Martinsville, on a tributary of "Little Indian Creek," George Boardman, of Martinsville, and three other parties, washed out \$8.00 per day with a "blanket rocker" for a short time in February, 1903. Mr. Royse went down a week later, and panned in a number of places in this and intersecting hollows, securing 5 to 40 "colors" in every pan. He estimates the lowlands to equal in richness those of the northern part of the county.



VIEWS ON GOLD CREEK, MORGAN COUNTY.

PLATE IV.



SLUICE-BOXES USED IN SEPARATING GOLD FROM GRAVEL, ALONG
HIGHLAND CREEK, MORGAN COUNTY, MARCH, 1903.

In western Morgan County, in what is known as the "Burkhart Settlement," Ashland Township, four to five miles northwest of Paragon, the gold is equally abundant in the lowlands along the streams. John Merriman, the veteran Brown County gold seeker mentioned above, here once secured 264 colors, by actual count, in one pan.

From what I could see and learn, there is little doubt but that these lowlands of Morgan County are richer in gold than those of similar tracts in Brown County. The valleys in northern Morgan are also wider and more extensive than in the gold bearing portion of Brown. The accompanying illustrations will show the manner in which the lowlands bordering Gold Creek are composed. If in the western States similar deposits which yield only 12 to 20 cents per cubic yard pay for working, as it is claimed they do, I see no reason why, with improved dredges and machinery, these gravel deposits of Morgan County would not also pay. While Dr. Brown was doubtless right in saying "that fortunes will never be made by mining gold in Morgan County" under the methods in vogue when he wrote, those methods have materially changed, and what was considered worthless ore or placer deposits in the West a score of years ago, are now yielding riches to many men. Gold is undoubtedly present in Morgan and Brown counties, and perchance some day a mining engineer with experience and up-to-date machinery will prove that it is present in paying quantities.

PUTNAM COUNTY.

This county lies south of Montgomery, and about 40 miles due west of Indianapolis. It is wholly within the "Illinoian drift" area, and the border of the Wisconsin drift passes from northwest to southeast across its center. In the valley of a small stream flowing into Big Walnut Creek, two miles east of Bainbridge, some prospectors found gold about 40 years ago, and washed out several dollars' worth. My boyhood days were passed near this place, and I have often seen the holes which they had excavated. In November, 1902, I took a gold pan to the place, and with the aid of Ami Michaels, who now owns the land, washed out a number of colors, one panful of gravel producing 11. Mr. Michaels found quite a thick bed of the black magnetic sand in a well which he sunk near this spot. The gold does not probably exist in paying quantities in this region, but its presence is undoubted.

VANDERBURGH COUNTY

Lies in the southwestern corner of the State, on the Ohio River, and wholly outside of the drift area. Collett, in his report on this county, says that "very minute quantities of gold and nuggets of copper are sometimes found. They were imported with the modified detritus of the glacial drift."*

WARREN COUNTY.

This county lies on the western border of Indiana, north of the center of the State, and wholly within both drift areas. Of the presence of gold within its bounds, nothing is known beyond what Collett has written as follows: "Virgin copper and gold are found in small quantities. These metals, with small nuggets of galena, were imported from the north with the rocks of the boulder drift. At Gold Branch of Pine Creek, N. W. quarter Section 23 (22 N., 8 W.), on a gravel bar formed of debris washed from the boulder drift, a quantity of gold, reported at \$70, was collected. An energetic Californian can 'pan out' from \$1 to \$1.25 per day at this and several other gravel bars in the county. An equal amount of labor expended at any ordinary avocation will bring better returns."†

Besides the above mentioned counties, gold has been found in minute quantities in Gibson and Pike, both lying along the border of the drift area, and in Sullivan, which lies in the interval separating the borders of the Illinoian and Wisconsin areas.

Enough has been said to show that gold doubtless occurs in every county within the drift area, but it is very improbable that it is accessible in paying quantities in any except Brown and Morgan; and there only under improved methods of separation.

DIAMONDS IN INDIANA.

While panning gold from the gravel and sand in the beds of the streams of Brown and Morgan counties, a number of small diamonds have been found by the gold seekers. I have seen eight of these and have credible information concerning several others. The earliest printed mention relating to any of them which I can find is that by Prof. E. T. Cox, as follows: "There have also been found in the drift of Brown County several diamonds, one of which weighed four

* Geological Survey of Indiana, 1875, p. 294.

† Geological Survey of Indiana, 1873, pp. 224, 244.

carats. On Little Indian Creek, in Morgan County, Mr. J. J. Maxwell found, some ten years ago, a diamond which weighed three carats. These are interesting facts, and point to the existence of a true diamond field somewhere in the beds of crystalline rock to the north.”*

A second record occurs in the Report on Morgan County, by Dr. R. T. Brown, as follows: “Two diamonds have been found in the drift of the Indian Creek valley. One is now in possession of Mr. Harry Craft, a well-known jeweler of Indianapolis. It is cut and set. It had a weight of three carats in its rough state. It was found near Morgantown. The other is somewhat larger and is uncut. It is in the possession of Mr. Maxwell, who resides three miles south of Martinsville. It was found on his farm. Both of these stones appear to have had an original connection with the drift of Indian Creek Valley.”†

The Maxwell diamond, mentioned by both Cox and Brown, is evidently the same, but they do not agree as to its weight. It was found in Washington Township, on Goss Creek, one of the tributaries of Little Indian Creek, in 1863, by Peter Davis, an old gold hunter, and by him sold to Mr. Maxwell. This diamond is without a flaw or blemish, and of a greenish hue. It is now owned by Mrs. James Maxwell, of Martinsville, Ind.

Dr. George F. Kunz, in his work, entitled “Gems and Precious Stones of North America,” states that “two diamonds have been on exhibition for several years at the store of Frederick N. Herron, Indianapolis, and are reported by him to have been found at some locality in Indiana. They are perfect elongated hexoctahedrons of two carats each. The stones are genuine diamonds, but the particulars of their occurrence and discovery have not been obtained, and therefore nothing definite can be stated regarding them.”

Besides these references, I have heard of the following Indiana diamonds which I have not seen: One George M. Tutterrow is said to have found two diamonds about 20 years ago while panning gold on Lick Creek, Brown County. One of them was sold in Indianapolis, and the other for \$15 to a jeweler named Butler in Morgantown. He is said to have resold it for \$75.

Mr. John Merriman, the pioneer gold hunter of Brown County, before mentioned, states that he sent several small diamonds which he had taken in Brown County to New York about 18 years ago. They were returned to him with the statement that they were genuine diamonds, but were too small to cut. He afterwards gave them to Harry

* Geological Survey of Indiana, 1878, 116.

† Thirteenth Annual Report Indiana Department Geology and Natural History, 1883, p. 83.

Craft, a jeweler of Indianapolis. Mr. Merriman has since found four small ones, which I have seen. He also reports that a Mr. Blevin found a diamond on the headwaters of Salt Creek, in northeastern Brown County, for which he received \$50.

The diamonds which I have seen from Brown and Morgan counties are as follows:

I. *The Stanley Diamond.* Found in September, 1900, by Calvin Stanley, on a branch of Gold Creek, Morgan County, in Section 28 (13 N., 1 E.), three miles northwest of Centerton and three miles west of Brooklyn. It was found in the bed of the stream at the base of a high cliff of blue shale, while panning gold. The stone was an octahedron of four and seven-eighths carats weight, with a yellow tinge, and had a small black spot, not quite central. Mr. Stanley showed it to jewelers at Mooresville and Brooklyn, and in time sold it to Mr. Royse, from whom it was purchased by C. E. Nordyke, of Indianapolis. The latter gentleman had it cut in Cincinnati into two stones. Their color is a peculiar greenish yellow and their weights are one and one-eighth and one and one-sixteenth carats respectively.

As noted on a previous page, the place where this diamond was found is along the border of the newer or Wisconsin drift area. It thus corresponds to the Kettle Moraine localities of Wisconsin, in which most of the drift diamonds of that State occur.

II. *The Young Diamond.* The second largest diamond which I have seen from Indiana was found by W. W. Young, a gold hunter mentioned above, in 1898, on Lick Creek, Brown County, four and a half miles south from Morgantown. It is an oblong dodecahedron of the "silver cape" variety; i. e., between a white and yellow in color, and weighs one and twenty-one-thirty-seconds carats. It is a very clear or "pure water" stone, without flaw or carbon speck, and is still in possession of its finder.

III. An almond shaped, pink hexoctahedral stone, weighing but one-eighth carat, was found by John Merriman on Lick Creek, Brown County, and is now in the possession of Chas. Nordyke.

IV. A small yellow hexoctahedral stone, weighing three-sixteenths carats, found by Mr. Merriman on Lick Creek, is now in the possession of R. L. Royse.

V. A small light brownish-yellow hexoctahedron, weighing five-thirty-seconds carats and found by Mr. Merriman on the same creek, is also in the possession of Royse.

VI. A blue rhombic dodecahedron, weighing eleven-sixteenths carats, was found by Mr. Merriman on Gold Creek, Morgan County, in the vicinity of the place where the Stanley diamond was found. It is now owned by Royse.

VII and VIII. Two small, pinkish diamonds, weighing one-eighth carat or less each, were taken near Brey, Morgan County, in May, 1903. They were secured by Mr. Royse from the tailings below the sluice boxes operated on the farm of Dr. Clark Cook.

It will thus be seen that four of the diamonds came from the "older" or Illinoian drift, and four from the "newer" or Wisconsin drift. The minerals found associated with these diamonds have been mentioned on a preceding page. The diamonds, like the gold, are not native to Indiana, but came in as glacial drift from some point in British America.

THE ORIGINAL HOME OF THE DIAMONDS AND GOLD.

Not having made a special study of glacial geology, I am unable to give an opinion, based on personal investigation, of the approximate location of the original home of the gold and diamonds found in the drift of this State. I have, therefore, brought together under this last heading the views of some of the more prominent glacial geologists of the United States regarding the subject.

Sixteen or more diamonds have, within the past 20 years, been found in the drift-covered area of Wisconsin and one near Milford, Clermont County, Ohio. These range in size from twenty-one carats down. The most of those taken in Wisconsin were found while washing drift gold. Their discovery has created much interest among people who are studying the glacial problem in this country and also much speculation as to the original source or home of the diamonds and gold. Prof. W. H. Hobbs of the University of Wisconsin, has given especial attention to the subject and has published two papers regarding the diamonds and their probable source.* From the first of these papers I quote at length as follows. After giving a short history and description of the different stones he says:

"All of the Wisconsin diamonds, with the exception of those from Plum Creek, were obtained from the deposits of glacial drift. The Plum Creek diamonds were obtained from the bed of the stream in immediate proximity to glacial deposits. It is clear, therefore, that the stones must have reached their late resting places in the drift through the agency of the ice mantle, and we should, therefore, study the directions of glacial movement throughout the region to discover the law of their distribution and to glean any facts that may be within our reach regarding the ancestral home, or homes, which

*"The Diamond Field of the Great Lakes," in *Journal of Geology*, VII, 1899, 375.

"Emigrant Diamonds in America," in *Popular Science Monthly*, LVI, November, 1899. Reprinted in *Annual Report Smithsonian Institution*, 1901, 359-366.

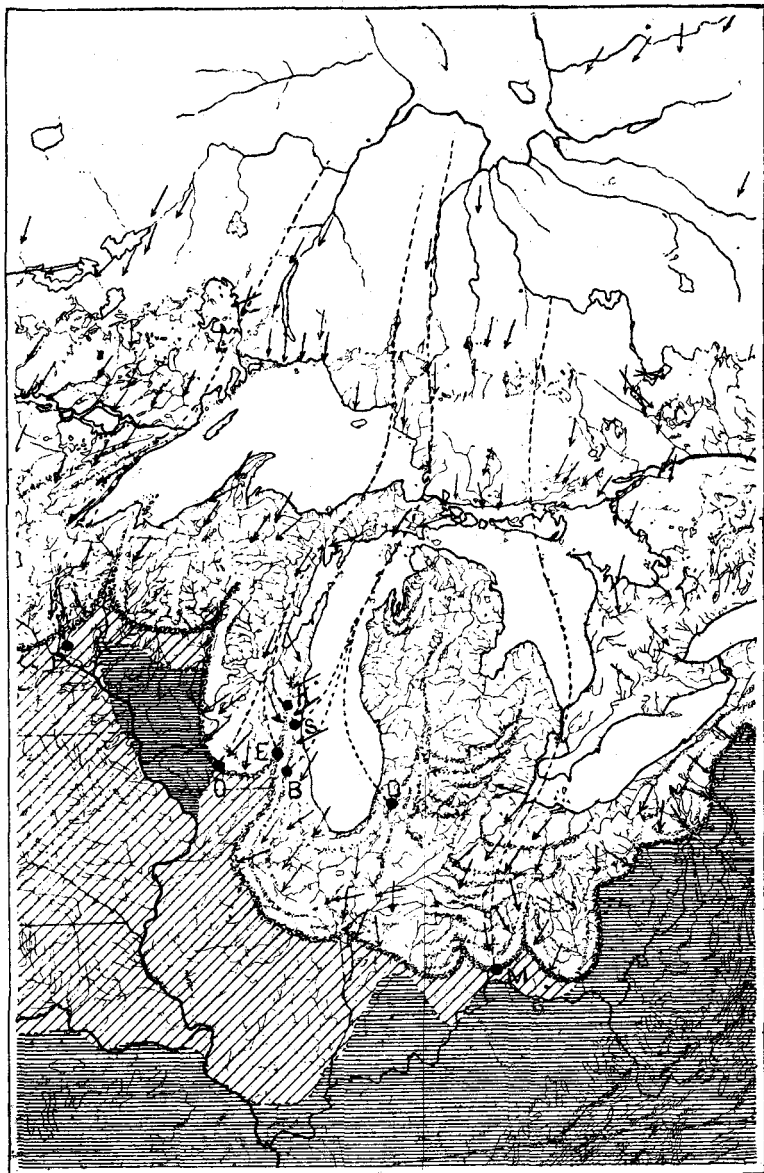
they occupied before they were carried away by the ice. The accompanying map of the lake region is based on the glacial map of Chamberlain, but revised and also extended to the north so as to include the results of later studies. * * *

"Within the domain of Canada the great wilderness region has been covered only by reconnaissance surveys and except in the territory bordering on the lakes there exist only a few scattered observations from which to construct a map of glacial movement. In the district to the southeast of James Bay some surveys have been made, but the material is not yet in print. In the region southwest and west of James Bay, which possesses also great interest, no data are available. * * * By plotting the diamond localities on the map it is seen that all but the Plum Creek locality are situated on the moraines of the "newer" or later ice invasion, and that the latter locality is quite near to the moraine, within the area of overwash. It is also worthy of note that all but one of the stones were found in one of the marginal moraines which marked the greatest advance of the ice during its later invasion. * * *

"The material from which the diamonds were derived must clearly have been to the northward beyond the lakes, in the wilderness of Canada. To explain the occurrence of so large a proportion of the stones in or near the outermost moraine, it is necessary to assume either that at the beginning of the second great advance of the ice the diamonds were imbedded in a loose material easily transported, and hence largely removed before the stages of retreat, or that they were imbedded in their matrix, which, from its limited extent, was largely abraded and removed by the ice during its initial stage.

"The first is the more reasonable assumption, by reason of the wide fan of distribution of the diamonds, and the number which has been found warrants the assumption that the number of stones at the source of supply must have been very considerable. It is likely that for every diamond that has been found there are a thousand still undiscovered in the drift.

"Professor T. C. Chamberlain has given his views in regard to the explanation of the occurrence of the diamonds in the large moraines near the outer limit of the later invasion as follows: 'The diamonds were probably separated from their original matrix in preglacial times by disintegration and accumulated in the bottoms of the valleys in the vicinity of their origin. The first glaciations were not sufficiently abrasive to remove the diamond-bearing gravels in the bottoms of the valleys, or at least not able to do so completely. The diamonds, therefore, do not occur frequently in the earlier drift mate-



GLACIAL MAP OF THE GREAT LAKES REGION

Driftless Areas.	Older Drift.	Newer Drift
Moraines.	Glacial Striae	Track of Diamonds.
Diamond Localities	E, Eagle.	O, Oregon
K, Kohlesville	D, Dowagiac	M, Milton
	P, Plum Crk.	B, Burlington

Fig. 2. (From Journal of Geology, VII, 1899, p. 382).

rial. Furthermore, the earlier drift material was less subjected to wash and now appears less abundantly as clean gravel, and hence a less proportion of the diamonds that may have been embraced in it have been found. The chances of finding diamonds scattered throughout the till is, of course, relatively small." * * *

"The problem of locating the area from which the diamonds of the drift have been derived is a fascinating one, and while the data now available are insufficient for its complete solution, they are of a kind to indicate that, with the increase of our knowledge likely to come in the next decade, the desired end may be reached. The first question which naturally arises is whether all the diamonds that have been found in the lake region have been derived from a common source. While there is no certain evidence that they have, nevertheless it would seem to be probable. Diamond bearing rocks are not so numerous that there is much likelihood of two unconnected areas being discovered in the region in question. Moreover the occurrence of diamonds with somewhat similar crystal habits over so large a territory would seem to be significant. * * *

"Provided a common source is assumed for all the diamonds of the region, this can only be located at the apex of the fan of diamond distribution on the hither side of the *névé* from which the ice moved. The wider this fan of distribution is found to be, the nearer is its apex carried toward the ice summit. The radial sides of the fan must be largely determined from the direction of striae within the Canadian wilderness, of which an adequate number have been recorded only from the immediate vicinity of the Great Lakes. Beyond these borders the *tracking* of the diamonds can be carried out only with a certain approximation to correctness. * * * The tracks of the lake diamonds which have been delineated show that the apex of the fan of diamond distribution probably lies somewhere in the strip of territory bordering James Bay on the east."

From a recent letter from Prof. G. Frederick Wright, of Oberlin, Ohio, an eminent authority on glacial geology, I quote as follows regarding the probable source of the drift gold: "Gold has also been found, as you see in my reports, in southern Ohio, and since then I have learned of its creating excitement in the glacial border of western Pennsylvania. We have done considerable work in Oberlin in tracing Canadian boulders to their probable source. The red jasper conglomerates found north of Lake Huron, and so far as I know limited to that region, are distributed all the way from the eastern border of this State to Keokuk, Iowa. I have seen many of these

boulders in Boone County, Kentucky, and in Brown County, Indiana. We have found Lake Superior copper as far south and east as Columbus, Ohio; or, at any rate, copper like that near Lake Superior. The evidence seems to be that the movement radiated chiefly from the region north of Lake Huron, extending from the 'Soo' to the Ottawa River. We have identified very closely 30 specimens from that region in our boulders in this State, and, with a fair degree of probability, 30 more."

Mr. F. B. Taylor, of Fort Wayne, Indiana, has for years, made a special study of glacial problems, especially of those pertaining to the glaciers which formed or modified the beds of the Great Lakes.

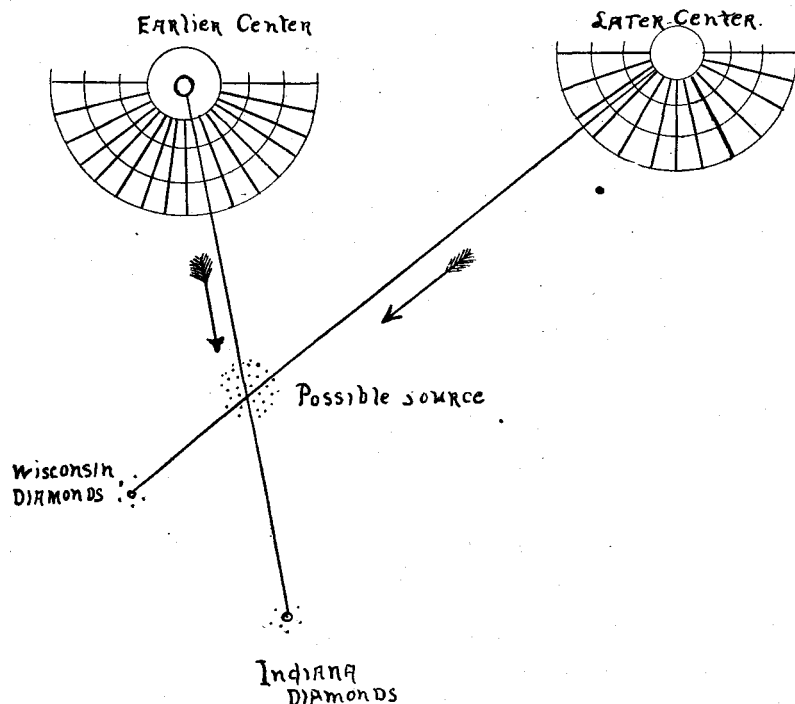


Fig. 3. Diagram illustrating possible source of Wisconsin and Indiana diamonds.

From him I have received a letter embodying the following views concerning the original home of the diamonds: "The fact seems pretty well established that the center of ice dispersion shifted gradually from west to east during the glacial period, or at the successive invasions. The last phase of glaciation in Indiana belongs to a time when the main center of dispersion was from a point on the Laurentide Mountains, far to the northeast.

"It is this last phase that gave the main expression to our top layers of drift. It seems to me probable that the gold and diamond bearing drift of Brown and Morgan counties was deposited at a time when the main center of dispersion was directly north, or nearly so, from Indiana, and if that is the case, it is not unlikely that the same source which supplied the diamonds of Wisconsin at a late stage of glaciation, supplied those of Indiana at an earlier stage.

"The accompanying diagram is a little too definite; for we can not tell with much accuracy just where the centers of dispersion were or just what deviations the ice-travel may have taken, so that the locus of the probable source is more indefinite than the diagram suggests.

"I have been led to this conclusion by the fact, as I remember it, that the gold-bearing gravels referred to are at the extreme margin of the drift and close to, if not identified with, drift that is older than that designated as 'Wisconsin'—this fact coupled with the shift of the center of dispersion.

"Another possibility is that the Indiana diamonds came from some small unknown eruptive tract in the Saginaw Valley or carboniferous area of Michigan. But no such area is known at the present time.

"A fine diamond was found in a creek bed a few miles south of the city of Cleveland many years ago. It was taken to Boston lapidaries and cut and sold for \$40,000. It would seem hardly likely that that one came from the same source as those of Indiana and Wisconsin by glacial transportation alone, unless we are to derive the Indiana diamonds from the Erie glacier lobe. Then the Cleveland stone might be attributed to the same source, but this would not include the Wisconsin stones."

Mr. Frank Leverett, one of the most prominent glacial geologists connected with the U. S. Geological Survey, has written me his views regarding the source of the Indiana diamonds, as follows: "It will be a difficult matter to determine the source of the diamonds through an examination of the glacial drift. There appears to be good evidence of movement from two widely different parts of Canada toward the region in central Indiana in which diamonds have been found. One movement, presumably the earlier, passed through the copper region of the upper peninsula of Michigan in a course east of south, carrying the copper across the southern peninsula of Michigan into Indiana and western Ohio. Another movement passed west of south from the region north of Georgian Bay across the southern peninsula of Michigan and northern Indiana into the region where the diamonds have been found, carrying boulders of red jasper conglomerate from ledges which outcrop north of Georgian Bay. I know of no

means at present for determining with certainty which of these ice movements brought in the diamonds.

"If there is but one source for the diamonds, a study of their distribution in the drift may throw them outside of the range of one of the two movements to which I have just referred. For example, should the diamonds in the future be found so far to the northwest as to be out of the reach of the ice movement from the region north of Georgian Bay, then they would be referable to the movement which passed through the Lake Superior copper region. It seems important, however, to make sure that the diamonds have been derived from but one source, and that question may remain unsettled for some years."

* * *

The above are the views of persons in every way competent to judge as to the original source of the diamonds and gold. With one accord, they pronounce them of glacial origin. They, for the most part, also believe that their original home was somewhere in the neighborhood of James Bay, British America. The Director of the Geological Survey of Canada has become interested in the subject and has begun the mapping of the Canadian Wilderness in this region, in order to determine more definitely the direction of the ice movement. It is not improbable that within the next quarter century a new El Dorado will be discovered among the igneous rocks of this far northern region, which will be as rich in gold and precious stones as any heretofore known to man.