DIAMONDS IN ARKANSAS

A Brief Account of the Discovery and Investigation and

OFFICIAL REPORTS

of Geologist and Mining Engineer on the Occurrence of Diamonds in Pike Co., Ark.

Arkansas Diamond Company

A Corporation Organized and Existing Under the Laws of the State of Arkansas

Owning and Operating the Diamond Mines in Pike County, Arkansas

Office 204 Louisiana St.
LITTLE ROCK, ARK.

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ARKANSAS

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ON THE

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Contents

Statement of Original Investors.

To the Public:

About two years ago diamonds discovered in Pike County were called to our attention. The fact seemed incredible, but upon satisfying ourselves that they were genuine diamonds, we looked up the geological reports on that section, and found that Dr. J. C. Branner, now connected with the Leland Stanford Junior University of California, in geological reports made by him during the year 1890, described the soil upon the surface of which the diamonds were found as peridotite.

We then decided to spend a few thousand dollars to secure control of the land in the diamond-bearing territory, and fully investigate the possibilities of the discoveries. We obtained contracts upon the land, and then sought the best authority on diamonds in this country. On all sides we were referred to Dr. George F. Kunz of New York City as an expert authority on gems, and a geologist of international reputation.

Two of us went to New York to interview him. Dr. Kunz was very much interested, but said he could not accept the employment offered. His work as a geologist has been along scientific rather than commercial lines. However, he sent for Dr. Henry S. Washington, whom we employed to make an investigation and report for us. Dr. Kunz continued to take an active interest in the discovery, and at his own expense visited the locality, and has, as senior geologist, prepared jointly with Dr. Washington, several scientific reports relating to the diamond discovery.

Dr. Washington, after an investigation extending over a period of a year, on October 30, 1907, made a very favorable report, which is fully set out in this pamphlet.

In the late spring of 1908 Mr. John T. Fuller, an American mining engineer, returned to this country from South Africa, where for five years he had been in the employ of the De Beers Consolidated Mines, Limited, during the greater part of that time being manager of the Kimberley and Du-Toits Pan diamond mines. Dr. Kunz called our attention to him, and we were most fortunate in securing his services. On account of his years of experience in mining diamonds he

was the character of expert we were looking for. His report is fully set out in the following pages.

The reports referred to are made by the best men we could find, without aid, hindrance or suggestion on our part. They are made by men who are in no sense promoters, who are not interested financially in the property, and we place absolute reliance upon them. They demonstrate beyond a doubt the following:

That diamonds equal in quality, luster and value to any ever discovered have been found on the property.

That nature placed the diamonds where they have been found.

That more exist.

That they are in quantities to warrant the opening of the mines on a large scale.

That the prospects of mining this property at immense profit are exceedingly flattering.

That we own practically all the diamond-bearing peridotite so far discovered in that locality.

Mr. Fuller has been ultra-conservative in estimates of output and profit. With our crude methods, imperfect machinery, and inexperienced labor, he gives us credit of recovering .21 carats per load. We know that more than half of the material washed was the over burden of vegetable soil not bearing diamonds. Our manager, Mr. John C. Peay, recovered 14 carats from 20 loads, .70 carats per load, and has made other runs as good.

Notwithstanding these results, accepting the estimate of .21 carats per load, with the plant to be erected in operation, the company should wash, in a six months' run, 90,000 loads, which would net about $130,000.00. Should our average reach .70 carats, the profits would be nearly $600,000.00 in six months.

Our surface finds exceed anything that was discovered at the African mines at a corresponding period of their exploitation. We, therefore, feel that we can safely count on a production of at least .25 or .30 carats per load, the usual South African return, and a return that would pay handsomely.

We have expended a large sum in land rights, expert investigation, preliminary development plant, and exploration

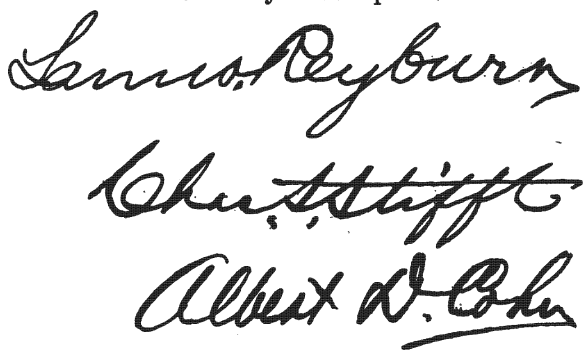
tests. We have proceeded in the most careful, deliberate and businesslike manner, without the influence of any excitement or mining fever. Having concluded that the mine indicates large operations, it now becomes necessary to employ a larger capital of ready money than we can afford, hence our proposition to take a joint stock interest in the corporation, which will provide capital to equip the property and run the mine on an adequate scale for a period of six months or more.

The Arkansas Diamond Company has been incorporated by conservative business men of Little Rock. It has an authorized capital of $1,000,000.00. It has acquired the "Reyburn-Stifft" lands on which Mr. Washington and Mr. Fuller have made the accompanying reports. It is offering treasury stock for sale to raise money to pay balance due on land, and to equip and operate the mine in accordance with the plans of Mr. Fuller.

We present this proposition having the fullest confidence in its ultimate outcome as a money-making investment. Having eliminated every chance of risk that we could, we feel justified in inviting the investing public to coöperate in the enterprise.

In view of the probabilities of other offers with or without merit, after the publication of this report, we particularly desire that the undertaking fostered by us should stand in its fair and proper light before the public. Accordingly, full and free inquiry is invited from those interested, whether or not they contemplate the purchase of stock.

It is understood that the company reserves the right to reject or reduce the amount of any subscription.



Little Rock, Arkansas, January 1, 1909.

Report of John T. Fuller

CONSULTING MINING ENGINEER

Late Manager Du Toits Pa 'n Mine, DeBeers Cons. Mines, Ltd., Kimberley, South Africa,

ON

Property of the Arkansas Diamond Company.

Little Rock, Ark., Nov. 11, 1908.

ARKANSAS DIAMOND COMPANY,

Little Rock, Ark.:

GENTLEMEN—I submit the following report and map of the diamond-bearing area on your property near Murfreesboro, Arkansas:

SITUATION AND SURROUNDINGS.

Name of Property.

Arkansas Diamond Company.

Location.

State—Arkansas.

County—Pike.

Nearest Town—Murfreesboro, county seat of Pike County, about two and one-half miles northwest. Population, by census of 1900, 200.

Nearest Large Town—Little Rock, capital of State. Population, about 50,000. Distance from property, about 120 miles.

United States Geological Survey Location.

Arkansas—"Caddo Gap Quadrangle."

Diamond-bearing area lies on east bank of Little Missouri River, near the junction of that stream with the Prairie Creek, in Sections 21 and 28, Township 8 south, Range 25 west.

TRANSPORTATION AND COMMUNICATION.

Wagon Roads.

The property is connected with the following wagon roads:

Road to Murfreesboro, two and one-half miles to northwest.

Road from Murfreesboro to Norvelle, six miles to northwest.

Road from Murfreesboro to Pike City, ten miles to northeast.

Road from Murfreesboro to Delight, fourteen miles to east.

Road from Murfreesboro to Cooley's Crossing, six and one-half miles to west.

Condition of Roads—Fair. Are capable of taking a heavy traffic at most times of the year.

Railroads.

Connections are made at Norvelle, Pike City, Delight, and Cooley's Crossing with branch lines, connecting with the main line of the St. Louis, Iron Mountain and Southern Railway at Prescott, ninety-five miles from Little Rock, and at Gurdon, eighty-one miles from Little Rock.

Rail communication direct to the property can easily be made when the line of the Memphis, Paris and Gulf Railroad from Nashville, Arkansas, to Murfreesboro is completed. The construction of this line is now under way, and is expected to be in operation by May, 1909.

The above mentioned railroad connects with the main line of the Kansas City Southern at Ashdown, Arkansas, some forty miles southwest of Murfreesboro.

TOPOGRAPHY.

The property lies in a hilly and broken country, intersected by many streams and creeks. The soil, as a rule, is fertile, especially in the creek and river bottoms.

Cotton and corn are the main crops raised in this section at present.

The whole region is naturally heavily wooded. A large amount of excellent timber has already been cut from this section, and there is still a plentiful supply remaining.

The highest elevation on the property is about 420 feet above sea level, while the highest elevation in the township is 535 feet above sea level.

The climate, as a rule, is healthy. No serious trouble from sickness need be feared, if ordinary sanitary precautions are enforced.

GEOLOGY.

The diamond-bearing rock occurs in South Africa in what is there locally known as a "pipe," which is the neck, or vent, of an old volcano, filled up solid with the diamond-bearing rock.

This rock is technically known as peridotite, a rock of a bluish green color, and known in Africa as Kimberlite, or more popularly as blue ground.

That the diamond-bearing rock found on your property in Pike County is peridotite is unquestioned. That it occurs on the property in a "pipe" similar to its occurrences in South Africa has been, to my mind, sufficiently demonstrated.

The use of the term blue ground in connection with this rock is apt to be, and is, misleading. Many people are deceived by this term, and take it for granted that diamonds occur in a soft clay soil or ground, which presents no difficulty or great expense to wash and concentrate.

This is distinctly not the case. This blue ground, or peridotite, as it will hereafter be termed in this report, varies considerably in hardness over different parts of the "pipe." In most cases the peridotite will disintegrate readily on a few months' exposure to the atmosphere and change to a dull grayish green or yellowish green color. The effect of this exposure to the variations of heat, cold, and moisture of the atmosphere is remarkable. Large lumps of peridotite, as big as the trunk of a man's body, and which, when deposited fresh from its original bed, has the hardness of sandstone, will soon crumble and fall to pieces. After weathering for a few months, which may vary from two to

six, the disintegrated material can be easily pulverized, washed, concentrated, and the inclosed diamonds recovered.

The harder varieties of the peridotite, which may and do occur in the same "pipe" with the softer variety, and which are known as hardibank, present an entirely different problem. No amount of exposure to the atmosphere will have any practical effect on its disintegration. To be treated at all, it must first be crushed by powerful gyratory crushers and crushing rolls. The diamonds are then extracted in the same manner as from the atmospherically disintegrated peridotite.

The economic and successful method of treatment of this hardibank, which in hardness is equal to the hardest quartzites, is still in a more or less experimental stage.

The concentrate from this diamond-bearing peridotite contains many other minerals besides the diamond, among which may be mentioned mica, hornblende, magnetite, olivine, garnet, etc.

In no instance have the above mentioned minerals or any other mineral, except the diamond, been found in the diamond-bearing peridotites of such quality as to have any commercial value. In other words, there is no commercial by-product (as has often been extravagantly asserted) from the mining of diamonds.

It is not within the scope of this report to go into a detailed description of the chemical or microscopical nature of this rock, nor is it necessary to discuss whether or not the eruption which brought it to the surface was violent, quiet. or otherwise. It is sufficient to say that the Arkansas peridotite resembles in every essential particular the diamond-bearing peridotites of South Africa, and that the most essential commercial detail, the actual finding of diamonds within its mass, is fulfilled.

The rock strata surrounding this Arkansas "pipe," as far as known at present, are quartzites and sandstones, with a more recent overlying coarse conglomerate.

Judging from the experience with the African "pipes," to which, as I have said, this Arkansas occurrence has been demonstrated to be in every essential similar, this Arkansas "pipe" containing the diamond-bearing rock will extend

practically vertically downward to an unknown depth. It may or may not be funnel-shaped for the first one hundred feet or so. The chances are that it will be. This means that at one hundred or so feet in depth the area of the "pipe" will be less than at the surface. However, a point will be reached where this contraction will cease, and the "pipe" will then continue down in a fairly uniform manner to unknown depths. There may be a number of local expansions and contractions at various points, but in no case has it yet been known to contract sufficiently to seriously cause alarm as to the "pinching out" of the deposit.

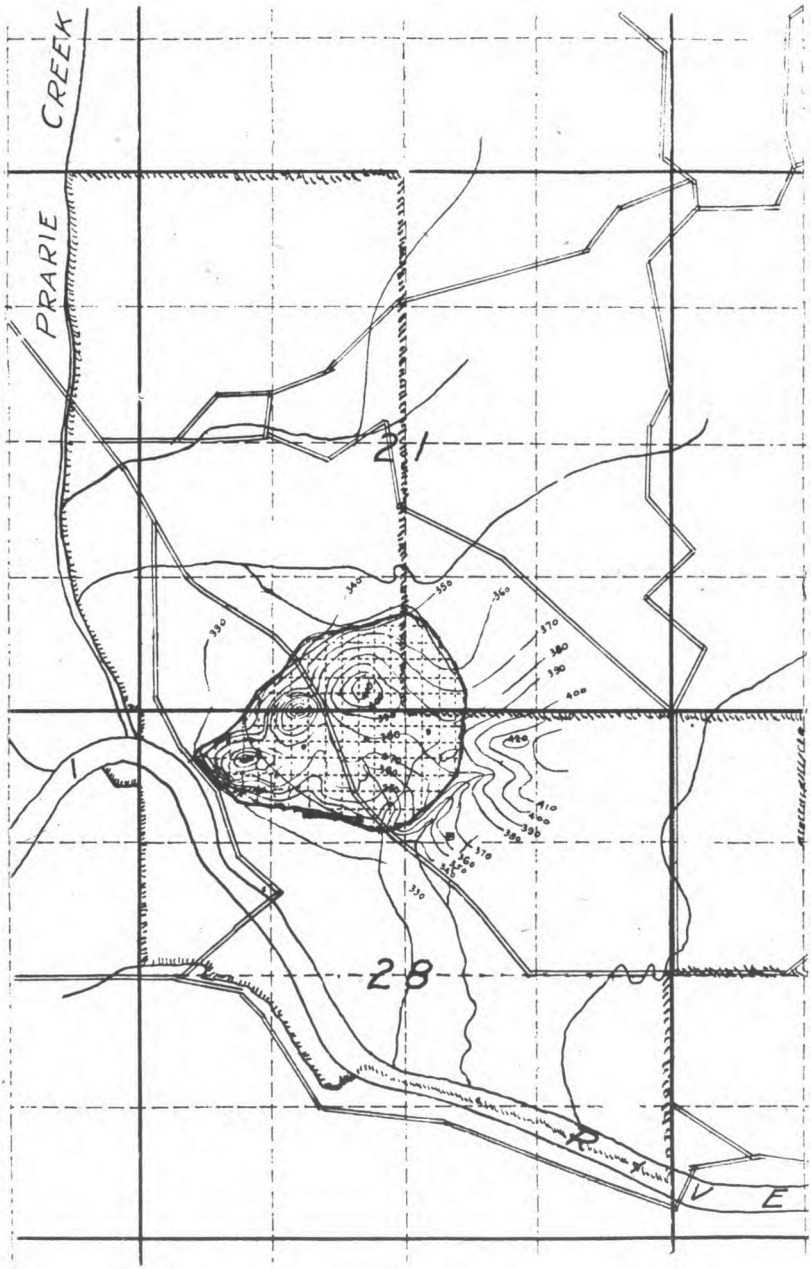
To illustrate: The deepest mine at Kimberley is now down three thousand feet, with no exhaustion of deposit in sight. The area of the peridotite at this point is greater than at the 2,160-foot level in the same mine.

We may, therefore, with a large degree of confidence, expect to be limited in depth only by economic and engineering considerations, and not by a failure of continuity of the deposit.

In two places within the peridotite area can be seen the outcrop of a dike, or volcanic rock, from five to six feet wide, of a light blue color. This dike cuts through the peridotite with a strike nearly east and west. It is most probable that this dike rock contains no diamonds, and that it will be found on further excavation to be of a similar nature to the barren dikes and floating reefs which occur in the mines at Kimberley.

There is a second small dike, about twelve inches wide, exposed in the Prairie Creek at the point where that stream empties into the Little Missouri River. This dike is undoubtedly peridotite, and will no doubt be found to join the main body of peridotite on your property at some point which future excavation will disclose.

In consideration of the fact that extravagant claims have been made, based on the theory that this dike necessarily leads to another "pipe" that is claimed to exist somewhere on the land on the opposite side of the creek, attention is called to the fact that the South African "pipes" have many small dikes radiating from them, which lead nowhere in particular, and "pinch out" entirely a short distance from the



"pipe." In one case at Kimberley mine the De Beers Company followed such a dike, which seemed to lead to an adjoining "pipe" (the St. Augustines mine), about 1,800 feet to the west. This dike, which is from eight to ten feet wide, was followed on the 2,160-foot level for about 700 feet and then abandoned, as no diamonds were found in it. The St. Augustines mine has been abandoned for a number of years, and is absolutely unprofitable as a commercial proposition, several companies having already come to grief in the attempt to work it.

DESCRIPTION OF DIAMOND AREA.

Referring to Map.

The semi-elliptical area shown on the map represents the "pipe" in as accurate a manner as can be done at present. I carefully went over the whole of this area, noting all points where the peridotite has been exposed, either by natural agencies or by test pits, and feel safe in saying that the area, as mapped, is approximately correct. This peridotite area is approximately sixty acres in extent.

On a line which lies practically through the three hills shown on the map as west, middle, and east, and extending through the northeast corner, are the outcroppings of the hard peridotite referred to as hardibank. In the northeast corner, which lies in the southwest quarter of the southeast quarter of Section 21, there are about eight acres of the "pipe" area owned by a Mr. Mauny (to be referred to later).

To the south of the above mentioned hills the ground falls away gradually to the river. The volcanic area south of the hills is composed of a much softer peridotite, which has weathered in place to a depth which may reach forty feet, and will probably average at least twenty feet. This portion of the area, which is also the largest portion, being thirty-five to forty acres in extent, can be excavated easily without, or

with a minimum use of explosives, to at least the depth indicated—that is, twenty feet.

Overlying the greater part of the whole area to a depth which does not exceed one foot is a black vegetable soil, locally known as "gumbo." This soil contains some peridotite and a mixture of other rocks and soils brought in by the surface waters. A large number of diamonds have been found in this soil.

That the diamonds found in this soil have been derived from the underlying peridotite is unquestionable.

Before any attempt was made to wash and concentrate the peridotite, some two hundred diamonds were picked up by chance.

One diamond was found "in place" several feet below the surface, embedded in the peridotite, proving that the diamonds picked up on the surface had also been derived from the underlying peridotite.

It is well to bear in mind that a great proportion of the first two hundred stones found were accidentally found, during the operation of erecting a small washing plant and clearing up the grounds of stumps and gumbo, no systematic search being made for them. The surface finds in this way are remarkable, and exceed anything that was discovered at the African mines at a corresponding period of their exploitation.

As an offset to the above very favorable showing, attention must be called to the fact that most of the stones so far recovered have been found on the south slope, already mentioned, of the volcanic area. This is a place where, if any natural concentration of the weathered rock has taken place, the concentrate would naturally collect; therefore, the underlying peridotite may average lower in values than the excellent surface showings might lead one to expect.

It is not to be understood from the above statements that the finds of diamonds have been entirely confined to this south slope. Stones have been picked up by chance at various places over the volcanic area. This fact, together with the reported finding of some thirty-five odd stones, by means of crude washing operations in the northeast part of the area, prove that the diamonds are not confined to any one section of the peridotite area.

HISTORY.

The following is a brief history of the discovery of and operations on the property to date.

1890.

The first mention of the peridotite of this region was made as early as 1842, but no report was ever made of any accuracy until 1890, when the volcanic area was mapped and reported on by John C. Branner, State Geologist. (See the Geological Survey of Arkansas, Annual Report for 1890.)

1906.

No more notice was taken of the area until J. W. Huddleston, of Murfreesboro, purchased the property, having an idea that it might contain minerals, such as gold, silver, or copper.

1. In August of the above year Huddleston picked up the first two diamonds.

2. The stones were sent to C. S. Stifft, jeweler, of Little Rock, who pronounced them true diamonds.

3. During this year more diamonds were found and were submitted to the following firms: Messrs. Arnstein & Bro., of 65 Nassau Street, New York; Messrs. Mermod, Jaccard & King Company, of St. Louis, Missouri; Messrs. Bolland & Sons, of St. Louis, and to Dr. George F. Kunz, of New York, all of whom pronounced the stones to be genuine diamonds.

4. C. S. Stifft, jeweler, of Little Rock; A. D. Cohn, merchant, of Little Rock; S. W. Reyburn, president of the Union Trust Company, of Little Rock, and J. C. Pinnix, lawyer, of Murfreesboro, formed a company and purchased or secured options on as much land as possible, on and about the volcanic area, in the name of S. W. Reyburn, as trustee.

5. On the advice of G. F. Kunz, S. W. Reyburn and associates secured the services of Dr. H. S. Washington, consulting geologist, of 149 Broadway, New York, to report on the property.

6. In October, 1906, Dr. Washington made his first report. This report was not very favorable, and more prospecting work was recommended.

7. Diamonds continued to be found, and in January Dr. Kunz, of New York, visited the property.

1907.

8. In January, 1907, the porperty was again reported on by Dr. Washington. This report is very favorable. (See extracts later.)

9. Mr. Zinsser, of Hansen, Zinsser & Power, attorneys and counsellors at law, 38 Park Row, New York City, was taken into partnership by S. W. Reyburn and asosciates.

10. Prospecting and testing work was carried on by various men in the employ of S. W. Reyburn and associates, at irregular intervals, with frequent finds of diamonds.

1908.

11. In May of this year a small washing and reducing plant was purchased and erected.

12. Messrs. George F. Kunz and Henry S. Washington presented a paper on "Diamonds in Arkansas" before the American Institute of Mining Engineers. (See transactions A. I. M. E.)

13. In June of the above year the writer made his first report on the property.

14. During a part of June, July, and August of this year considerable work was done in clearing the property of stumps and plowing loose the gumbo.

The washing plant was run at irregular intervals during this time, but the plant was so inadequate and the work so costly as compared with what was actually accomplished that operations were stopped until such time as a properly designed plant, capable of handling a large quantity of peridotite, can be installed.

EXTENT OF PROPERTY AND TITLE TO SAME.

The property you control, shown on the map inclosed within the shaded lines, comprises about 900 acres, of which area the peridotite covers, after deducting the eight acres claimed by the Mauny tract, fifty-two or more acres.

This entire property is held under warranty deeds and contracts of purchase.

There is still due on the purchase price about $73,000.00, the terms of payment of said amount being secured by the contracts made with the original landholders.

The land outside of the peridotite area was secured, not with the idea that it might contain diamonds, but to secure water rights, flooring space, and land for the necessary buildings and concentrating works.

It is to be noted, however, that all mineral as well as surface rights are held for this land.

The title to all of the property carrying the peridotite and most of the property secured for operating purposes, as before mentioned, has been examined by competent lawyers, and said titles are approved.

Estimating that the whole peridotite area covers sixty acres, which is a conservative estimate, and conceding eight acres of this to the Mauny tract, leaves you in possession of eighty-five per cent of the whole.

The area of this peridotite on your land will, I am reasonably sure, prove to be in excess of fifty-two acres when entirely uncovered.

OPERATIONS.

The mining and washing operations up to the present have consisted chiefly of haphazard experimental tests of the surface soil and peridotite, during the course of which five hundred odd stones have been recovered.

A small test plant, consisting of a tube mill, sizing screen, and a jig, operated by a small engine, was in erratic operation for about two months, with surprisingly good results, in consideration of the inadequacy of the plant and the erratic use to which it was put. The chances are that as many diamonds were lost as were recovered by this plant.

A number of test pits have been put down in various places by Dr. Washington and others for the purpose of gaining some idea of the nature of the underlying peridotite.

Three bore holes, as indicated on the maps, have been put down with a diamond drill to the depths shown—that is, 205 feet, 184 feet, and 79 feet.

These holes are in the peridotite for the entire distance sunk, and the peridotite continues beyond the bottom of the holes to an unknown depth.

The behavior of the cores from these holes has been watched to gain some idea of the weathering qualities of the peridotite at depth, and the results have been satisfactory.

Beyond this, no actual work of any importance has been done.

DIAMONDS.

The total number of diamonds recovered to date, by chance or concentration from the peridotite area, is as follows:

From the property of the Arkansas Diamond Company, 505 stones; from the Mauny tract, in the same "pipe" as far as known, 35 stones, making a total of 540 stones.

The 505 stones found on the Arkansas Diamond Company's property have a total weight of 217 carats, giving an average weight of 0.42+ carats, or nearly one-half carat per stone.

The largest stone so far found weighs six and one-half carats.

The character and excellence of these stones has already been reported on by Dr. Kunz and Dr. Washington. (See extracts from Dr. Washington's report.) Personally, I am not competent to judge of the quality or value of these stones, being in no sense of the word a gem expert, but during my experience as mining engineer and mine manager with the De Beers Consolidated Mines, of Kimberley, South Africa, many parcels of stones passed under my observation, and the parcel of 505 stones found on the Arkansas property bears a very favorable comparison with an average parcel of stones from the Wesselton mine. The Wesselton mine stones have an average value of about $10.00 per carat. This average value per carat, I feel safe in saying, the Arkansas diamonds will equal, provided the present price of diamonds is maintained.

Three stones, weighing $2\frac{5}{8}+\frac{3}{64}$ carats, $2\frac{7}{8}$ carats, and $\frac{1}{2}$ carat, now in possession of Mr. Huddleston, have been valued

in the rough at from $160.00 to $180.00. Taking a mean value of $170.00 would give an average value, for the three stones, of about $28.00 per carat. These three stones, be it noted, are not picked stones, but are the three stones first picked up by chance on the diamond-bearing area by Mr. Huddleston himself.

Three other stones, having a gross weight of 4.80 carats, have been cut by Tiffany & Co., of New York. These three diamonds, after cutting, yielded a net weight of 2 carats, or a loss in weight of 2.80 carats, or 58 per cent, which may be considered satisfactory.

The following values have been placed on these stones:

No. 1, net weight $\frac{3}{4}+\frac{1}{64}$ carats—$175.00 per carat.

No. 2, net weight $\frac{15}{16}-\frac{1}{32}$ carats—$75.00 per carat.

No. 3, net weight $\frac{3}{16}+\frac{1}{64}$ carats—$60.00 per carat.

This gives an average value, for the three cut stones, of $103.33 per carat.

As to what the yield in carats per load (sixteen cubic feet) of this Arkansas "pipe" will be, it is impossible to state definitely at present.

To determine with any degree of exactness the average yield of any diamond mine, it is necessary to actually mine and concentrate at least from twenty-five to thirty thousand loads of peridotite. The greater the number of loads, the more accurate the results.

By taking the very incomplete records which were kept of the few washing operations carried out, the indications are an average yield of 0.21 carats per load of sixteen cubic feet. This fact, however, has not been sufficiently demonstrated to be accepted. In this connection, however, it may be mentioned that diamond mines are operated at a large profit in South Africa, with an average yield of only 0.13 carats, and less, per load—the Jagers Fontein mine, with an average yield of about 0.13 carats, being an example.

It has been remarked that no diamonds of large size, fifteen carats or over, have been found in this "pipe," as are found in several of the "pipes" in Africa. It is well to remember that the sale of diamonds of this size is limited, and in times of financial depression ceases altogether.

Large diamonds must be cut into a number of smaller stones to become salable. This is an expensive operation,

and entails a considerable loss in the gross weight of the stones.

It is a well-known fact that during the recent financial depression the De Beers, De Toits Pan, and Jagers Fontein mines, which produce diamonds of large size, were shut down completely, while Wesselton, Bulfontein and Premier mines, which produce mostly small stones, have been in continuous operation.

OTHER REPORTS.

There have been made, to date, three regular reports on this property—two by Dr. Washington and one by myself.

Besides the above, there have been numerous magazine, newspaper and technical articles written of the property, among which may be mentioned:

1. "Diamonds in Arkansas." Transactions of American Institute of Mining Engineers, February, 1908, by George F. Kunz and H. S. Washington.

2. "Further Details as to the Arkansas Diamonds." Jewelers' Circular Weekly, August 14, 1907.

3. "The Production of Precious Stones in 1906." By Douglas B. Sterrett, of the U. S. Geological Survey.

4. "The Production of Precious Stones in 1907." By Douglas B. Sterrett, of the U. S. Geological Survey.

5. "Note on the Forms of Arkansas Diamonds." By Kunz and Washington, American Journal of Science, September, 1907.

6. "Has Arkansas a Diamond Field?" By Robert S. Lanier, American Review of Reviews.

EXTRACTS FROM DR. WASHINGTON'S REPORT, WITH COMMENTS.

The following extracts are taken from the report of Dr. H. S. Washington, consulting geologist, of New York City, whose reputation is well known. Report dated October 30, 1907:

1. "In my opinion, all the diamonds found are derived from the peridotite, and more exist and will be found within its mass."

Comment: The above opinion has been verified by many finds of stones.

2. "The amount of this igneous rock is very great, and its extension downward is indefinite, and its exploitation in this direction will be probably limited only by mining considerations.

"No diamonds should be found outside of the igneous area, except some which have been derived from the weathering of the upper portion of the igneous mass, and which have been washed beyond the igneous area, especially to the south of it."

Comment: There have been no authentic finds of diamonds, to date, outside of this volcanic area.

3. "You control practically the whole of the igneous area, in which diamonds may be expected to occur, and sufficient land outside of this, including water rights, for all purposes of mining."

Comment: See map and references to above, on page 14 of this report.

4. "The character of the diamonds, as regards quality and size, may be considered to be very satisfactory, and a larger proportion of those extracted should meet with a ready sale at prices comparable with those obtained from other localities.

"Nothing definite can be said as to their abundance, but the indications are that they are present in the peridotite in considerable and probably remunerative amounts."

Comment: It has been demonstrated that the diamonds do occur in considerable amounts, and if the peridotite continues to yield over the whole or the greater part of the "pipe" area, as well as the preliminary tests indicate, the diamonds certainly do occur in remunerative amounts, at the present price of diamonds.

5. "To sum up, I believe that you own the first and only locality in the United States where diamonds are known to occur in the original rock, and the indications are that they are probably present in sufficient quantity, and are of such average size and quality, as to render the exploitation of the

locality remunerative. At any rate, the chances in its favor seem to me to be so great that I think they justify the investment of considerable capital in the enterprise, with good hopes of financial success, under proper management.

[Signed] "HENRY S. WASHINGTON."

Comment: It might be mentioned in connection with the above that large capital has been invested in a number of cases in South African diamond mines on much less favorable evidence, and far less hope of success than is presented by this Arkansas "pipe."

OTHER OCCURRENCES OF PERIDOTITE IN PIKE COUNTY.

In at least two other localities in this township the peridotite is thought to occur:

1. In Section 14, Township 8 south, Range 25 west, it is claimed that peridotite exists.

I personally visited this section, and, although the rock in question has the appearance of peridotite, I would not swear that it is so, without an examination of a thin section with a microscope. In one place in this section considerable work has been done, in the way of tunneling, excavating, and washing the rock, but no finds of diamonds have been reported. It might be noted, from the characteristics of the community, that had such finds been made everybody would have known about it.

A short distance from the above mentioned is another tract under which the peridotite is supposed to lie. At the time of my visit sufficient work had not been done to prove this conclusively. Two shallow pits had been put down, and what is apparently a much decomposed peridotite uncovered. As to whether or not it is peridotite, the same proof as stated above applies. No diamonds have yet been reported.

2. A tract of land in Sections 21 and 22 of the above-mentioned township is also claimed to contain a peridotite "pipe" of sixty acres, and lying one-half mile or so from your "pipe." I personally visited this locality, but the work done was practically nothing, and I would not feel justified

in giving any opinion as to the probable size or nature of the "pipe," if any exists. Again, I would not swear to the rock uncovered, without examination with a microscope.

In connection with the occurrence of these other "pipes" claimed to exist, supposed to exist, or otherwise existing, it may be stated that several hundred "pipes" containing peridotite are known to exist in South Africa in the same region. The character of the peridotites in these numerous "pipes" is practically the same, with the one important exception that the very great majority contain either no diamonds at all, or so few diamonds as to make their recovery unprofitable.

This fact holds true, not only in the case of "pipes" several or more miles apart, but also in the case of "pipes" not over eighteen hundred feet to two thousand feet apart.

Examples.

Kimberley mine (very rich), is only eighteen hundred feet to St. Augustines mine, which is very poor and unprofitable.

De Beers mine (very rich), is only two thousand feet to Belgravia mine, which is practically barren.

MINING STATISTICS.

Labor Supply.

The local supply of labor is limited in numbers and inferior in quality.

A sufficient supply for preliminary operations can, I suspect, be drawn from the many small sawmill towns in the district, or can be brought in from other parts of the country. Once a mining industry has been established in a locality as accessible as this, a plentiful supply of suitable labor will come in of its own accord.

Great care will have to be exercised in the choosing of men for employees on the property, as danger of theft will be great. Some system of detection of theft and fraud will have to be devised.

The average prices paid for labor in this district are:

Laborers, $2.00 per nine-hour day.
Mechanics, $4.00 to $4.50 per nine-hour day.
Bookkeepers, $3.30 to $4.00 per nine-hour day.

Fuel.

Coal within easy access from Arkansas, Texas, and other fields. Firewood plentiful on the property.

Timber.

Abundant and of excellent quality for mine work. Sufficient supply on property for a number of years.

Water.

The water supply is unusually excellent. The Little Missouri River, which runs by the property for over a mile, on which the water rights are held, gives a constant, though variable, supply for the whole year, which at all seasons would be sufficient for all washing, concentrating, etc., requirements.

The Prairie Creek, which also borders the property for a distance of over a mile, and on which the water rights are held, gives a fairly constant supply at most seasons, although it is apt to run very low in the summer months. At present the bed is dry in most places, there being only a few pools at irregular intervals along its length; however, as stated above, the Little Missouri will give all the water required.

Mining Stores.

All kinds of mining stores, explosives, and livestock are obtainable at Little Rock, at reasonable cost.

The nearest well-appointed foundry and machine shop is also located at Little Rock.

Estimates.

I submit the following preliminary estimates of the cost of buying and erecting a mining, reduction, washing and concentrating plant, together with the necessary transportation lines, capable of handling six hundred loads of sixteen cubic feet per day of nine hours:

1.	Washing and reduction plant	$20,000.00
2.	Engine, pumping and boiler plant	12,000.00
3.	Steam shovel	6,000.00
4.	Transportation lines	8,000.00
5.	Buildings	7,500.00
6.	Livestock	1,200.00
7.	Erection costs	12,000.00
		$66,700.00

It is to be understood that the above is not a final estimate, that these figures are subject to revision when the actual design and construction of the plant is undertaken. However, I think that such a plant can be purchased and erected at, or within, the amount named.

Operations.

I estimate that the cost of operating the above-mentioned plant for a period of six months, with an output of six hundred loads (of sixteen cubic feet) per day, for say one hundred and fifty working days, would be as follows:

1.	Salaries and wages	$35,000.00
2.	Explosives	2,000.00
3.	Coal, stores and supplies	19,000.00
4.	Renewals and repairs	4,000.00
		$60,000.00

The output for the above-mentioned period should be approximately ninety thousand loads of sixteen cubic feet, at a cost of $60,000.00 for operation, or $0.66+ per load.

Capitalization.

I therefore estimate, in round numbers, the working capital required to complete the purchase of the land, purchase, erect, and operate the above-mentioned plant for a period of six months, to be $200,000.00, made up as follows:

1.	Plant	$ 66,700.00
2.	Operation	60,000.00
3.	Purchase of property	73,000.00
		$199,700.00

Amount of Peridotite.

I further estimate, on a basis of thirty-five acres of decomposed peridotite, extending to a depth of twenty feet, there can be mined, without the use, or with a minimum use, of explosives, approximately 1,900,000 loads of sixteen cubic feet.

As to what tonnage can be expected at depth is, of course, at present impossible to say. But even should the "pipe" prove at depth to be equal only to the smallest of the Kimberley "pipes," the tonnage capable of being mined economically, provided the diamond contents is maintained, will be enormous.

Diamonds.

During the period of this six months' run a considerable number of diamonds should be recovered. As already stated, it is impossible to make any definite statement at present what average number of carats per load can be expected. I think, however, that it will be at least as good as the Jagers Fontein average of 0.13 carats per load on the south slope already referred to. Provided no decline takes place in the price of diamonds, and estimating that the diamonds from this "pipe" are in the same class as Wesselton, with an average value of $10.00 per carat, the six months' operation, as indicated above, on a basis of 0.13 carats per load, would produce $117,000.00 in diamonds.

It is to be distinctly understood that sufficient data from this Arkansas "pipe" has not been obtained to estimate on the number of carats per load, and that such data is only obtainable by actually operating on a large scale for a long period of time.

The above figures, as to carats per load and value per carat, are given to illustrate how great the possibilities are, even by taking the average of one of the lowest producers in Africa, as to carats per load (Jagers Fontein), and combining it with the price obtained from one of the lowest grade mines in Africa (Wesselton).

CONCLUSIONS.

In conclusion, I beg to state that this Arkansas "pipe," of which you own by far the greater part, is the first, and to date the only, known occurrence of diamonds, in the original matrix, on the Western Hemisphere.

I consider that sufficient finds of diamonds have been made on your property to justify the formation of a strong company, and the expenditure of a large amount of money in the exploitation and proving of same, with a greater hope of financial success than is usually offered by an undeveloped mine.

There are hundreds of bona fide mining propositions put on the market every year with far less justification or hope of financial success than, it seems to me, your venture promises.

In regard to the Mauny tract, already referred to, which contains but a fractional part of the volcanic area: it would of course, have been better to have owned this tract also. Not so much for the diamonds which it may contain (although of course that is a consideration) as for the avoidance of all possibility of expensive litigation in the future over claim lines, or claims for damage to property, which are bound to arise sooner or later where two independent companies operate in the same "pipe."

However, this is looking some distance in the future, and should the mine prove sufficiently profitable to ever reach the underground state of mining, some mutual working agreement will no doubt be arrived at.

One thing more with regard to the above mentioned tract. It lies, so far as known, on the edge of the "pipe." Should the "pipe" prove to be funnel shaped, as already referred to, this tract, or a greater part of it, will be cut out at depth.

There has been no proof shown to date that the "pipe" is or is not funnel shaped, but it is one of the possibilities.

All of which is submitted.

Report of Dr. Henry S. Washington.

NEW YORK, N. Y., October 30, 1907.

Mr. Sam W. Reyburn, Trustee, Little Rock, Ark.:

DEAR SIR—I submit the following report on the diamond-bearing property owned by your company near Murfreesboro, the report being based on two examinations of the property made by me in October, 1906, and January, 1907, at your request.

LOCATION.

The property in question is situated about two and a half miles southwest of Murfreesboro, the county seat of Pike County, Arkansas, on the left bank of the Little Missouri River, near the junction of the Prairie Creek with that stream. A wagon road connects the property with Murfreesboro, and this in turn is connected by road with the terminals of two short branches of the St. Louis, Iron Mountain and Southern Railway—one at Nathan, six miles to the west, and the other at Pike City, ten miles to the east.

GEOLOGY.

The portion of the property controlled by you which is of special interest and importance in connection with the occurrence of diamonds is a roughly elliptical area, about 2,400 feet long by about 1,800 feet wide, comprising about forty-four acres. This is the surface exposure of what is known as a volcanic neck—that is, the channel filled with solidified lava by which the molten rock reached the surface. The upper portion of the volcano which formerly covered the area has been destroyed by erosion, and all that remains is the throat filled by the column of lava which did not reach the surface. Surrounding this neck are massive quartzites and sandstones, through which the lava forced a passage, and overlying these

are rather thick beds of a coarse conglomerate, which were deposited subsequent to the destruction of the volcano.

The igneous rock is called technically peridotite, and is composed largely of the minerals olivine, augite, biotite, magnetite, and perofskite, with much glass, the presence of this last implying that the molten mass solidified not very far beneath the surface. While this peridotite is quite fresh and tough in some of the surface exposures, over the greater part of the area it has been profoundly altered by the weather, resulting in the formation at or near the surface of a soft, loosely coherent and readily friable material, of a pale olive green or yellowish color, which are called the "green and yellow grounds," respectively. This form of decomposed peridotite lends itself very readily to simple processes of excavation and washing. Beneath this upper layer, which attains depths of forty feet, as shown by the diamond drill, and which may average twenty feet in thickness, the peridotite is harder and less decomposed, but the cores from the drill submitted to me by you for examination indicate that even this is very considerably altered, so that its excavation and crushing will not be difficult, and so that, furthermore, it will probably disintegrate rather readily on exposure to the weather.

While peridotites are rather uncommon, they are met with in other parts of the United States, as at localities in Kentucky, North Carolina, Pennsylvania, and New York. Their special significance in this connection lies in the fact that peridotite is the diamond-bearing rock of the Kimberley and other South African mines, which are the only localities where, heretofore, diamonds have been found in the original rock. The Murfreesboro rock, which I have examined microscopically, and of which chemical analyses have been made, closely resembles that of the Kimberley mines as regards its chemical composition and the chief minerals which it contains. The two rocks differ, however, in that the Arkansas one was a lava which solidified quietly and as a very compact mass some distance below the surface, while the African ones were ejected by explosive eruptions, forming a fragmental rock known as breccia. These differences, however, are due to causes outside the rock mass itself, and can have little to do with the occurrence of diamonds in it. Therefore, though there are other minor differences, the general close resemblance between the

two rocks renders a presumption in favor of the possible presence of diamonds in the Murfreesboro peridotite a reasonable one, even though the great majority of known peridotites are not diamond-bearing.

As to the shape of the mass below ground, the features presented by other extinct volcanoes and the general geology of the surrounding territory make it probable that the stock or mass of peridotite extends downward to an indefinite distance and with walls more or less approximately vertical. At the Kimberley mines, on the other hand, the mass is distinctly funnel-shaped (owing to the explosive character of the eruptions), so that the diameter contracts with depth, so much so as to be economically unworkable in some cases.

THE OCCURRENCE OF DIAMONDS.

Since the first diamond was discovered on August 1, 1906, about 150 stones have been found. None of these come from outside the limits of the igneous area, and most of them have been found on the surface. But (as I have been informed by you), three or four diamonds have been obtained in the concentrates derived from washing the green ground, and one diamond exists which was found some feet beneath the surface and embedded in the green ground itself. This specimen has been carefully examined by myself and two other competent authorities, and the result of this examination leaves no doubt that it is in its original position in the rock and that it was not inserted artificially. This fact is of great importance as constituting material proof that all the diamonds found are derived from the peridotite and justifies the assumption that more occur in the rock, and are to be obtained from it by proper methods. This conclusion is corroborated by the presence of diamonds in the concentrates, the fact that all the diamonds found on the surface were within the igneous area and none outside of it, and by the correspondence between the Murfreesboro peridotite and that of South Africa, in which diamonds are incontestably known to occur in quantity. Indeed, all the evidence at hand is positively in favor of this view, and is becoming more and more cumulative as more diamonds are found, so that I have no hesitation in ex-

pressing my conviction that the diamonds found are derived from the peridotite and that more exist in its mass.

The only other alternative hypotheses to account for the presence of the diamonds are that they occur in the conglomerate which surrounds and formerly overlaid the igneous area, or that the locality was "salted." As to the first, although diamonds frequently occur in such conglomerates, yet the facts set forth above are sufficient to disprove such an origin. To test the matter positively, I did considerable panning of the gravels and sands of the adjacent streams (which are largely derived from the conglomerate), but without finding a single diamond. Furthermore, although the surrounding non-igneous part of the country has been diligently searched for diamonds by many parties, we have heard of no reliable account of the finding of any, outside of your area.

The hypothesis that the locality has been "salted" was carefully investigated by you and by myself, and we both came to the conclusion, for reasons into which it is needless to enter here, that such a theory is not tenable. Since then, the constantly increasing number of stones found, both on the surface and in the concentrates, while the work has been under the supervision of absolutely reliable parties, justifies our former conclusion and permits us definitely to exclude from consideration the possibility of fraud in the occurrence of the diamonds.

I may add that, though diamonds have been found in glacial deposits in some of the Northern States (derived from unknown Canadian sources), such an origin for the Arkansas stones is quite out of the question, as the glaciated area does not extend to within hundreds of miles of Arkansas, and the local concentration is too great.

CHARACTER OF THE DIAMONDS.

The relative abundance and character of the diamonds is of great importance, on account of their bearing on economic considerations. The development of the area has not been, as yet, on a sufficiently large scale to enable any definite estimate to be made of the amount of diamonds per ton which the rock may be expected to yield. There has been, of course,

a certain amount of concentration of diamonds at the surface through the removal of the smaller and lighter particles of the decomposed rock by rain and wind, but, making allowance for this, the number of diamonds already found, and this with but little artificial concentration, would indicate that diamonds are probably present in the rock mass in very appreciable, if not considerable, amounts for such a rare constituent of the rock. But at present no one can speak with finality on this point, or give any approach to exact figures. It will be of interest to note, in this connection, that the South African diamond mines must be worked for some time before any idea may be had of their probable average yield, and that this is less than a half-carat per ton in the best of them.

The character of the stones, judging from those already found, is apparently very good. A large proportion are white, and most of these are of excellent quality and of a very high grade as regards color, brilliancy, and freedom from flaws. Indeed, some of the white stones are as fine as any ever found elsewhere. Some of the yellow ones, also, are of exceptional color and quality. The largest stone yet found weighs six and one-half carats, a number (including some of the best white ones) weigh two, three, four, and five carats, and the average of 111 stones examined is two-thirds of a carat. On the whole, therefore, while no very large stones have yet been found, the average size, as well as the quality, may be considered to be very satisfactory.

DEVELOPMENT.

Some further exploratory work remains to be done, especially with the diamond drill, to determine more exactly than we now know the limits of the igneous area, especially on the south side; the average depth of the more decomposed green and yellow grounds, and the character of the fresher rock at depth. But sufficient is known to indicate that any development of the property will be divided into two phases.

The first will be the extraction of the diamonds from the more decomposed upper portion, the green and yellow grounds. As this is readily excavated and concentrated by washing, the extraction of the diamonds from this material will be a sim-

ple problem and one that can be carried out inexpensively. The methods in use in South Africa will be available here, with the added advantage that the raw material will need little or no exposure to the weather for disintegration prior to washing, as is the case with the South African blue ground, and so will be immediately available. The amount of this easily worked-up material is very great. While exact figures cannot be given in the absence of sufficient data, I have provisionally estimated the total amount of green and yellow grounds available as from 250,000 to 400,000 cubic yards, or approximately 400,000 to 600,000 tons.

The firmer, less decomposed peridotite, which extends to an indefinite depth below these, will offer somewhat more difficulty, and will probably necessitate some crushing. But an examination of cores from the diamond drill submitted by you would indicate that a large part of this (at least as far as penetrated by the drill) is not as solid and as fresh as might have been expected, so that it will probably disintegrate considerably when exposed to the weather, and thus be rendered capable of ready washing and concentration. The depth to which this material can be profitably exploited, assuming an adequate abundance of diamonds, will be limited only by such practical considerations as the cost and difficulties of mining. Some of the Kimberley mines are profitably worked down to depths of about 2,500 feet, and we may confidently expect such depths to be readily attained in Arkansas as well, if the need arises.

PRACTICAL DETAILS.

For the purposes of washing and other mining operations a constant, though variable, supply of water is furnished by the Little Missouri River, which may safely be counted on to supply an ample amount of water. As you control a considerable tract of land along both banks of this stream, which is less than a mile from the center of the igneous area, and connected with this by lands also owned by you, you are fully protected in this regard.

Timber for mining purposes is abundant and cheap in the vicinity, and a portion of your tract is covered with for-

est, which will furnish a supply for immediate use at low cost. Coal for fuel is abundant in Arkansas, Texas, and Indian Territory, and should be purchasable and delivered at the locality for very reasonable figures, which you can ascertain more readily than I can. Transportation facilities for machinery, fuel, supplies, etc., is furnished by the two branch lines mentioned above, and their better connection with Murfreesboro, either by improved roads or by rail, may be confidently expected when development is under way. The machinery needed for development and exploitation is of a comparatively simple and inexpensive type, at least in the earlier stages, and its selection and installation, which need not be discussed here, should offer no difficulty and ought not to involve any very large immediate expenditure.

A sufficient supply of labor (chiefly white) is available in the vicinity, partly to be drawn from the lumber mills. The great difficulty here will be the danger of loss through theft of the stones, and the impossibility in the case of American labor of applying the preventive measures which are employed in South Africa. This difficulty, however, may be met by adequate supervision and division of labor, and need not be regarded as insuperable. I am not in a position to give any figures or estimates as to the cost of labor, or of the cost of mining in that locality.

CONCLUSIONS.

From the facts given above, as well as from others which the limits of this report force me to omit here, I draw the following conclusions as to the property owned by you:

1. In my opinion, all the diamonds found are derived from the peridotite, and more exist and will be found within its mass. The amount of this igneous rock is very great, and its extension downward is indefinite, and its exploitation in this direction will be probably limited only by mining considerations. No diamonds should be found outside of the igneous area, except some which have been derived from the weathering of the upper portion of the igneous mass and which have been washed beyond the borders of the igneous area, especially to the south of it.

2. You control practically the whole of the igneous area, in which diamonds may be expected to occur, and sufficient land outside of this, including water rights, for all purposes of mining.

3. The character of the diamonds as regards quality and size may be considered to be very satisfactory, and a large proportion of those extracted should meet with a ready sale at prices comparable with those obtained from other localities. Nothing definite can be said as to their abundance, but the indications are that they are present in the peridotite in considerable and probably remunerative amounts.

4. I can give you no figures as to the cost of mining, but, in a general way, I think that the large amounts of green and yellow grounds available can be worked very cheaply and the diamonds extracted at remunerative rates; and that, while the larger portion of the mass at depth will offer more difficulties, these should not be of such a character as to prevent remunerative exploitation, though these opinions are provisional in view of our ignorance of the relative abundance of the diamonds.

5. The locality is favorably situated as regards such features as accessibility, transportation, water, timber, fuel, etc. The supply of labor should be adequate, but offers the danger of possible theft, which, in my opinion, assuming an adequate supply of diamonds, is the most serious difficulty with which you will have to contend. But it should be possible to overcome this, at least in great part, by proper supervision and other means.

6. To sum up, I believe that you own the first and only locality in the United States where diamonds are known to occur in the original rock, and that the indications are that they are probably present in sufficient quantity, and are of such average size and quality, as to render the exploitation of the locality remunerative. At any rate, the chances in its favor seem to me to be so great that I think they justify the investment of considerable capital in the enterprise with good hopes of financial success under proper management.

All of which is respectfully submitted.