W. P. B. dec 1859.

THE

GOLD PLACERS

OF THE VICINITY OF

DAHLONEGA, GEORGIA.

REPORT

OF

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AND OF

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ASSAYER TO THE STATE OF MASSACHUSETTS,

TO THE

Yahoola River and Cane Creek Hydraulic Hose Mining Company,

WITH A

DESCRIPTION OF THE HYDRAULIC PROCESS OF MINING

AND AN

HISTORICAL NOTICE OF GOLD MINING IN GEORGIA.

BOSTON:

1859.

INTRODUCTION.

On the Sources of Gold in Nature.*

Gold is obtained in Nature either from veins or beds in the rocks or from placers. In the rocks, it is sometimes diffused throughout the mass in fine particles, but is generally in connection with veins of quartz, through which it ramifies in ragged masses and filaments, or is enclosed in masses of pyrites.

In placers the gold is in loose, rounded masses; in scales or grains, or in impalpable dust, disseminated in gravel, sand and clay, and is transported like them from place to place by water. The gold, like the pebbles, is thus worn into rounded masses and grains by constant rolling and attrition. It is a golden detritus, formed by the breaking down and washing away of the upper portions of pre-existing rocks and veins. The gold is thus in a secondary condition, having been broken from its original matrix, and spread out with the fragments of the rocks and veins over the surface of the country. The great agent of this abrasion and transportation of the rocks was water, often in powerful currents, or river torrents, over what are now the tops of the hills. This is proved by the existence of ancient river-beds high above the streams in California, in Georgia, and other gold regions. Along the valleys of rivers now flowing, we find elevated terraces or benches formed of river drift or detritus, precisely like that along the banks of the streams, and also containing gold. Traces of former rivers extend higher up than the well-marked terraces, and there is abundant proof that in the remote past the courses

* Extracted from the Report of William P. Blake, Esq., to the Chestatee Hydraulic Company, New York, May, 1858.

of the rivers were different, and that the volume and velocity of the water were much greater than now. In the changes which have taken place since these ancient streams flowed at such high levels, many ravines and valleys of rapid descent, in which great quantities of detritus and gold have been deposited, are now left entirely dry. These are known among miners as *dry ravines*, and generally yield a large amount of gold.

The size of the fragments of gold in placers is determined, in the first place, by the original size of the masses or filaments in the veins; and, secondly, by the amount of wear to which they have been subjected after their liberation from the enclosing rock. In general, coarse fragments of gold are found with coarse drift, while the much-rounded and water-worn pebbles and fine gravel, such as we find in brooks of moderate currents, are accompanied by fine gold, generally in small scales. The wearing of all the fragments of gold among the stones produces a large amount of fine dust, which is disseminated either in the sand or clay.

Thus, by the agency of drainage-water, gold is distributed with gravel over hills and valleys and in the beds of the rivers. In all the deposits the greater part of the gold settles to the bottom, and is generally found resting upon the surface of the rocks, or the *bed-rock* of the miners. It is not laid down in one uniform layer, but by the action of the former currents was concentrated here and there, as in the deposits now forming in rivers. The old deposits, however, being upon high ground, have been more or less worn away by the modern drainage channels, and thus a more perfect and uniform distribution of the gold has resulted. A part of it has been washed down into the valleys and deposited in the flats along the streams.

All these accumulations of gold in gravel and sand, which have been broken from veins and beds and spread out by water, are now generally known as *placers*. The elevated placers are commonly known in California and Australia as *dry diggings* or *hill diggings*, while in Georgia they are called *surfaces* or *hill deposits;* those along the streams are denominated *deposits* or *deposit mines*, and correspond to the *river diggings*, *bars* and *flats* of the Californian miner. It is this class of placers—the deposits—which has been worked in Georgia and the Carolinas, while, in general, the gold on the hills has not been touched.

The mixed gravel, gold and sand, is commonly known among geologists as auriferous drift, or auriferous detritus, and is frequently referred to by these names in the following descriptions.

Historical Notice of Gold Mining in Georgia.

The principal gold region of Georgia is confined to a belt from one to five miles in width, stretching in a north-easterly and south-westerly direction, parallel with the Blue Ridge, through Habersham, White and Lumpkin counties, and beyond into Alabama. The region of country including these mines was originally owned and inhabited by the Cherokee Indians, but there is reason to believe that they were entirely ignorant of the existence of gold in their soil. Their ornaments were of silver, and gold ornaments were not known among them.

According to Wheeler,* the first piece of gold found in the United States, was picked up in 1799, by Conrad Reed, a boy twelve years of age, in the bed of a small stream on his father's farm in Cabarus county, North Carolina. It was about the size of a small smoothing-iron, and was kept for several years in the house to hold the door open, and then sold to a silversmith for three dollars and a half. In the same stream many pieces of gold were afterwards found at intervals of several years, the largest being the *twenty-eight* pound lump so often cited. In 1829, the placers were opened in Burke and McDowell counties, in the same State, and from these mines the gold was traced southward into Georgia, where it was first discovered on Duke's Creek, in Habersham, now White county, in part, in the same year. The first fragment found weighed three ounces, and was taken out by John Witheroods, of North Carolina, but his claim of priority of discovery in Georgia is disputed by Jesse Hogan, also of North Carolina, who claims to have first taken out gold on a branch of Ward's Creek, in Lumpkin county, not far from Dahlonega, then in the Cherokee nation. From this time, new discoveries were constantly made until the gold was traced across Georgia into Alabama. At that time Habersham was an organized county, but the rest of the gold region was in-

* History of North Carolina, ii. p. 64.

cluded in the Cherokee nation, over which the United States exercised a supervisory care. The richness of the newly-discovered mines soon brought together a large number of miners from Georgia and the adjoining States. These commenced mining chiefly on the lands of the Cherokees, and on that portion now included within the limits of Lumpkin county, the Chestatee River then being the eastern boundary of the Cherokee nation. This rush for the mines brought into the country thousands of men of great diversity of character, many of them dissipated and regardless of the future. Shanty groceries were set up all over the country, where whiskey was freely sold, and mountebanks attended with all kinds of tricks and shows, in the endeavor to share the easily-gotten gold of the miners. Drinking, gambling and fighting were rife, and laws were little known and less cared for. The poor Indians saw with dismay their beautiful hill-sides, where they and their fathers had chased the deer for centuries, occupied by these centres of vice and immorality, and their lovely valleys and cool dells dug over and rendered hideous to the sight. These were known as the "times of the intrusion." To protect the Cherokees from this intrusion the United States stationed troops about five miles below where Dahlonega is now situated. The attempt was made to drive back the intruders beyond the Chestatee into Habersham county, where mining was also in progress, but with little or no success. While the miners were being driven from one creek or valley they would return to another, and so the robbery of the Cherokees continued. Parties often formed to cross the river in the night, and secure as much rich gravel as possible from some selected spot, with which they would recross the river in order to wash it out during the next day. Many deposits were stealthily worked and in great precipitation and haste, only the best spots being selected.

In 1830 the State of Georgia extended her laws over the Cherokee nation, and formed the whole of the territory west of Chattahoochee into one county, and called it Cherokee. This county included a territory now containing twenty-three organized counties. Over this territory the State placed troops, known as the *Georgia Guard*, to protect the occupant rights of the Indians and prevent intrusive mining. This guard was insufficient for that purpose, and the intrusive mining continued until the county was surveyed by the State and the

mining region laid off into forty-acre lots, and drawn for by a State lottery in 1831 and 1832, and the lots granted to the fortunate drawers. Intrusive mining then ceased and "swindle mining" commenced, which has continued more or less on unoccupied lots ever since.

The gold obtained for the first series of years was from the alluvion of the streams, by a very simple process. The alluvial deposit was removed by digging and throwing off from pits, until the gravel was reached; this gravel then was thrown up into a sluice trough or box, and raked down into baskets made with white oak splints, and held by a man until the sluice of water from the trough washed the sand and decomposed slate from the gravel; the sand, &c., passing through the basket into what was then called a *gum rocker*. This rocker was made by hollowing out a half cut of a tree, and was eight or ten feet long, with transverse bars across it to catch the gold. The whole was kept constantly in motion by a man or boy rocking it; the sluice of water passing through from end to end. As soon as the man with the basket had washed one basket of gravel, he threw it into a pile; this basket was then replenished, and thus the operation went on. At night the rocker was cleaned out, and the gold separated by panning. Improvements in alluvial washing were rapidly made—perforated sheet and cast iron plates were introduced instead of the basket—other kinds of rockers, larger and better, long toms, riffles, jacks, boilers and bumpers were introduced, all being better, perhaps, than the first simple plan, but operating upon the same general principle, and all intended to separate the gold from the alluvial deposit with greater facility. By these means, simple it is true, and used with very little capital, and the operations carried on by men ignorant of the proper mode of working mines, immense quantities of gold were obtained. Many, in "times of the intrusion," enriched themselves and went home; others, then and since, wasted all they made.

After the distribution of the lots among the citizens of Georgia, many of them were worked by companies of negroes brought up from the low country; their labor in the mines being much more profitable than on the plantations. By this organized and directed labor the gold was extracted very rapidly, and in great quantities, from many of the deposits.

As the deposits became gradually taken up and worked, attention was directed to some of the veins which were found

to abound in the hills, especially about Dahlonega. In Habersham county, at Loudsville, two or three veins attracted considerable notice from their size and richness; the most important is now known as the Sprague vein, which has been worked upon down to water level for a quarter of a mile, and is still rich, though not worked. Other rich veins were opened at Nachoochee, and between them and Loudsville.

In the vicinity of Dahlonega several veins have yielded thousands of dollars without much expense for mining. Very little capital has been devoted to their examination by sinking the shafts down below the water level, at which point most of them have been abandoned for want of the means to put up pumps and the necessary fixtures for deep mining.

In 1838 a Branch of the United States Mint was established at Dahlonega, where large amounts of gold were received for coinage. It is still in operation, and pieces coined there may be known by the letter D above the date. Before the establishment of this Branch Mint the gold was taken in many directions, to the mint in Philadelphia, and to North Carolina and New Orleans. A large amount, however, was never deposited for coinage.

From the best data that can be obtained it has been stated that from the year 1829 to 1839 the yield of the mines was 16,000,000 pennyweights. For the next ten years probably not more than 4,000,000 of pennyweights were taken out, owing to the decrease of mining in the deposits. The statistics of the mints do not exhibit the true amount taken out. A large amount of the gold when the richest placers were being worked was sent off into Kentucky and Tennessee in exchange for stock and provisions. Money was freely furnished by banks and individuals at the north for the purchase of gold-dust at low rates, and much of the gold was manufactured without having been deposited. The following summary, given by Mr. William P. Blake, in a report to the Chestatee Hydraulic Company, shows the amount which had been deposited in the mint up to the close of the year 1855.

TABLE SHOWING THE AMOUNT OF GOLD FROM GEORGIA, DEPOSITED AT THE PHILADELPHIA MINT AND DAHLONEGA BRANCH, UP TO THE CLOSE OF THE YEAR 1858.

Period.	*Philadelphia.*	*Dahlonega.*	*Total.*
1828 to 1837	$1,763,900 00		$1,763,000 00
1838 to 1847	566,816 00	$2,978,353 00	3,544,669 00
1848	3,870 00	251,376 00	254,746 00
1849	10,525 00	225,824 00	236,349 00
1850	5,114 00	204,473 00	209,587 00
1851	2,490 00	154,723 00	157,213 00
1852	3,420 00	93,122 00	96,542 00
1853	1,912 00	56,984 00	58,896 00
1854	7,561 00	47,027 00	54,588 00
1855	1,733 50	56,686 36	58,419 86
Total, ...	$ 2,366,341 50	$4,068,568 36	$6,434,909 86

In addition, 39,681 dollars were deposited at the New Orleans Branch Mint ; and 14,342 dollars at the Assay Office in New York, making, in all, six millions four hundred and eighty-eight thousand nine hundred and thirty-two dollars, ($6,488,932.) The deposits for the first nine years from 1828 to 1837, amounting to one million seven hundred and sixty-three thousand nine hundred dollars, ($1,763,900,) were of gold obtained from the placers of the river flats alone.

It is the universal testimony of those who have worked in the placers of Georgia, that the gold is generally in larger lumps and particles, or is coarser than in the placers of the western parts of North Carolina, in Burke, McDowell and Rutherford counties. Mr. Blake also observes that "The quality of the gold is excellent, rarely yielding less than 90 per cent., or 900 parts in 1,000, the difference being silver. The standard of gold of the United States consists of 900 parts of gold to 100 of alloy. The annexed table gives the averages of a great number of assays of the gold from the principal Georgia mines :

AVERAGES OF ASSAYS.

Auraria, Lumpkin county, vein and placer,	950
Dahlonega, " " " "	925
Lewis Mine, " " "	899
Calhoun Vein, " " "	900
New York Vein, Lumpkin county, vein,	900
Loud Deposit, " " placer,	880
" " " " "	830
Asbury & Craig's, " " "	819
Pasco Mine, Cherokee county, vein,	950
Bell Mines, " " "	975
Stricklan. " " "	950
Elrod, Hall county, "	906

"If we leave out the assays of the gold from the Loud deposits, which is peculiar for the amount of silver it contains, the average of all these mines is 928 thousandths. The average of the California gold is 875 to 900 parts in a thousand. Gold which assays 900 parts is worth 93 cents a pennyweight, at the mint."

The rapid decrease in the quantity of gold mined after 1838, was due to the fact that most of the deposits had been worked out by the old methods, or ceased to be largely profitable. The side streaks of pay-gravel above the water level and the hill deposits or surfaces, had not began to attract attention, and could not be worked for want of water. Then came the reports of the California mines, and soon the Georgia mines were almost abandoned. Miners going from their labors in Georgia with full experience in deposit washing, were confident of success in the yet virgin deposits of California, and few were disappointed. From 1849 to 1859, but little was done in the Georgia mines, but it is evident that by introducing water by canals, as in California, and washing down the hills by the hydraulic process, a new era of mining will be inaugurated. A new and fresh spirit of enterprise needs to be excited among the people, for though the county is rich, not only in gold, but in its agricultural capabilities, the population is comparatively poor. The mass of the people have neglected agriculture, especially those who, even for a time only, have lived by mining. The population has always been shifting, and many now prefer mining to any other employment. These dig about in the old diggings, and with a long tom, pick, and spade, make a living for themselves and families, content, in general, if they realize enough to sustain life. The dissipation and habits of former days have not wholly died out; many men who yet rely on their work in the mines for their subsistence, barter all their gold for whiskey, tobacco, meal and bacon. The gold may not be sufficient to obtain the needed quantities of all, but the gallon of whiskey must be had; the deficiency falls on the meal and bacon. At the present time, white labor can be freely had at Dahlonega, and its vicinity, for from fifty to seventy-five cents a day.

The county has many permanent and intelligent inhabitants devoted to both mining and agriculture. Dahlonega, the capital, has a population of about 800; has a brick Court-house, an Academy, three Churches—Baptist, Methodist and Presbyterian. When the county was organized in

1832, the place was named New Mexico, but in 1833 was incorporated as Dahlonega, which is the Cherokee name, signifying yellow money, and may be more properly written or pronounced *Tau-lon-e-ca*, or *Tah-lon-ne-ghe*.

THE HYDRAULIC PROCESS OF MINING.

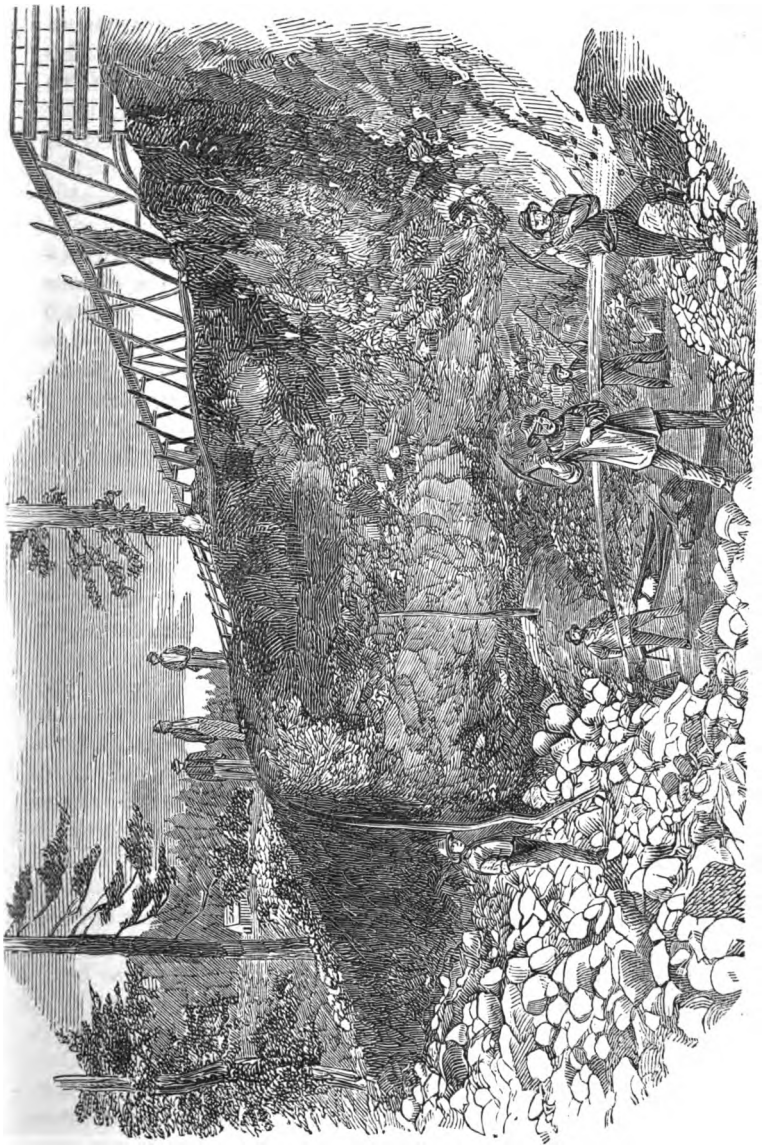
BY WILLIAM P. BLAKE.

In California, as in other gold regions, the attention of the miners was first given to the deposits along the streams, for in such places the gold was not only more uniformly and certainly present, but water was at hand with which to separate it from the gravel and clay. As the number of miners increased and the deposits became crowded or worked out, the hills and dry hollows were prospected, and pay-gravel from the richest placers was carted or wheeled in barrows to some neighboring stream, and there washed. It soon became evident that the elevated placers or "dry diggings" were so extensive that water could be conveyed to them by canals and ditches, much more profitably than to attempt to carry the earth to the water. The first ditches were upon a small scale, but were found to be so profitable and to produce such great results, that more extensive and expensive canals were immediately projected. Rivers were ascended for miles, near to their sources in the Sierra, where their waters had not lost the icy coolness of the snow fields from which they came, and were turned aside into canals, which wound with a uniform grade around the irregular slopes of the hill-sides, until the water was delivered at the placers on the tops of the hills. The great power thus saved by keeping the water at such an elevation above the surrounding streams was soon realized; the old machines were thrown aside, and even the sluice in its turn gave way wherever practicable to the *Hydraulic process*, which for rapidity and efficiency has not been surpassed. In this process, the force of a jet of water under great pressure is made available for excavating and washing the auriferous earth. The water issuing in a continuous stream, with great force, from a large hose-pipe, like that of a fire engine, is directed against the base of a bank of earth and gravel, and tears it away. The bank is rapidly undermined, the gravel is loosened and violently rolled together, and cleansed from any

adhering particle of gold, while the fine sand and clay are carried off in the water. In this manner, hundreds of tons of earth and gravel may be removed, and all the gold it contains liberated and secured with greater ease and expedition than ten tons could be excavated and washed in the old way. By this method, all the earth and gravel of a deposit is moved, washed, and carried off through long sluices by the water, leaving the gold behind. Square acres of earth on the hillsides may thus be swept away into the hollows, without the aid of a pick or shovel in excavating. The earth is not handled; in fact, water performs the labor, and moves and washes the earth at one operation, while in excavating by hand the processes are necessarily entirely distinct. The value of the process, and the yield of gold by it as compared with the old methods, can hardly be estimated. The water acts constantly with uniform effect, and can be brought to bear upon almost any point, where it would be difficult for men to work. It works on at the base of toppling banks of boulders and clay, regardless of the crash which must soon come as the foundations are ripped out and washed away by the fury of its onslaught. Great indurated masses of dirt which are thus made to fall upon the washed bed-rock below are soon broken up; the earth and gravel are carried off down the sluice, and only the largest masses of rock are left behind. The process is especially effective in a region covered with trees, where the tangled roots would greatly retard the labor of workmen. In such places, the stream of water washes out the earth from below, and stump after stump falls before the current, any gold which may have adhered to the roots being washed away. The pressure is obtained simply by the weight of the water, it being conveyed from a ditch or reservoir above, in stout hempen hose or plank boxes, fitting tightly end to end. A head or pressure of from sixty to one hundred feet is employed, according to circumstances.

The annexed engraving is from a daguerreotype of the mining claim of Messrs. Blake, Tyler & Webster of Michigan City, California, and shows the operation of the hydraulic hose upon a bank of auriferous gravel charged with quartz boulders.

In California the whole art of placer-mining was revolutionized by this hydraulic process, and the production of gold received a fresh and lasting impulse. Square miles of surface on the hills, rich in gold, which have lain untouched, now yield up their treasure to the hydraulic miner. In that



region, where labor can scarcely be obtained, and is so costly, water becomes the great substitute for it, and, as we have seen, is more effective and economical in its action than the labor of men. Every inch of water which can be brought to bear upon a placer is valued as the representative, or producer, of a certain amount of gold. Wherever it falls upon the auriferous earth it liberates the precious metal, and if the gold is uniformly distributed through the earth, the amount produced is directly as the quantity of water used.

As a labor-saving process the results of this method compare favorably with those obtained by machinery in the various departments of human industry where manual labor has been superseded. With one pipe of an inch and a half or two inches aperture, and a pressure or head of ninety feet, a boy can excavate and wash as much auriferous earth in one day as ten or fifteen men could without its aid. It is common to estimate the work of a pipe as equal to the labor of ten men; in some locations a pipe of the size mentioned might effect more than twenty men in the same time. The water is ever active and untiring, and works as rapidly in inaccessible places as upon an exposed bank. The quantity of earth moved will of course vary greatly at different places, depending chiefly upon its character; whether sandy, a mixture of clay and sand, or clay alone. The amount of gravel and boulders also varies greatly in all gold placers. From measurements made last year in North Carolina, where a pipe of medium size had been in use at the Wilkerson placer, I estimated that with a head of sixty feet and a pipe of one and a half or two inches in diameter, over a thousand bushels of earth could be moved and washed in a day. If this estimate is correct, earth which contains only the twenty-fifth part of a grain of gold in a bushel, or about two mills' worth, will pay about two dollars a day to a pipe. In washing by this process, it is essential that the fall or descent of the bed-rock from the point being washed should be sufficiently rapid to insure a swift current in the waste water, so that it will carry the loosened sand and clay away in suspension or force it along the sluice boxes.

It is to the ingenuity and enterprise of the miners of California that this great advance in the art of placer-mining is due. The great bulk of the gold now obtained is produced by hose-washing and sluicing; showing conclusively the great extent and importance of the dry or hill-placers. To show, also, the extent to which the operations on this class of placers

have been carried in California, and the importance of water at an elevation in gold mining districts, the following general statements and tables, compiled from official sources, are presented.

It is stated* that at the close of the year 1858 there were 5,726 miles of artificial water-courses for mining purposes in the State of California, constructed at a cost of $13,575,400. This estimate is exclusive of several hundred miles of new ditches in course of construction, and of the many subordinate branches of the ditches, the aggregate length of which is estimated at over one thousand miles. Most of the ditches have been constructed by individuals, or small companies of from three to ten persons, but the works compare in their magnitude and cost with the most important public works.

The following table shows the number of ditches in the principal mining counties at the close of the year 1858, with their lengths and cost of construction. It is compiled in part from the Reports of the County Surveyors and Assessors, and in part from the pages of the California Register, where the names of over three hundred and seventy Water Companies are given in one table.

TABLE OF DITCHES FOR MINING PURPOSES IN CALIFORNIA IN 1858.

County.	*No. of Ditches.*	*Aggregate length, Miles.*	*Capacity in Inches.*	*Cost of Construction.*	*Assessed Value.*
Amador, ...	36	531	.....	880,400	280,600
Butte, ...	.....	400	.....	.....	.....
Calaveras, ...	54	550	12,019	1,600,000	991,000
El Dorado, ...	43	1,150	.....	1,600,000	617,970
Klamath, ...	.....	64	.....	104,000	.....
Mariposa, ...	10	65	.....	135,000	.....
Nevada, ...	86	696	.....	1,700,000	953,700
Placer, ...	35	550	.....	1,550,000	283,160
Plumas, ...	92	201	16,775	600,000	210,000
Sacramento, ...	8	163	.....	800,000	.....
San Joaquin, ...	2	21	.....	108,000	.....
Shasta, ...	24	104	9,000	300,000	.....
Sierra, ...	70	183	.....	.....	420,650
Siskiyou, ...	16	.....	.....	.....	100,000
Stanislaus, ...	3	13	.....	56,000	.....
Trinity, ...	94	163	.....	500,000	.....
Tuolumne, ...	14	425	.....	1,481,000	.....
Yuba, ...	34	241	.....	700,000	.....

* See California "State Register" for 1859.

The following are some of the principal ditches by n but the list might be greatly extended. The authorities which it is compiled seldom state the *size* of the ditche their capacity, thus leaving it difficult to determine the w of really the greatest magnitude.

Name.	*County.*	*Source of Water.*	*Length miles.*	*Cos*
Butte,	Amador co.,	North Fork Mokelumne,	50	$400,(
Table Mt.,	Calaveras,	San Antonio Cr.,	65	60,(
Union Water Co.,	"	Stanislaus R.,	78	320,(
Bear Creek,	Mariposa	Bear Creek,	19	12,(
Middle Yuba,	Nevada,	Middle Yuba,	26	100,(
El Dorado Water Co.	Placer,	El Dorado Canon,	18½	30,(
Deer Creek Water and Mining Co.,	Sacramento,	Deer Creek,	14	100,(
Clear Creek,	Shasta,	Clear Creek,	53	140,(
Tuolumne Hydraulic Co.,	Tuolumne,	Tuolumne River,	60	300,(
Columbia and Stanislaus,	"	Stanislaus,	80	600,(
Auburn and Bear River,	Placer,	Bear River,		75,(

It is stated that most of the California ditches pay f one to three and five per cent. per month on their cost, a deducting all expenses of repair and management.

In a little work entitled *California and its Resources* Ernest Seyd, the following are reported as accurate st ments of the profits of some of the California water com nies :—

Columbia Water Company,	4	per cent.	per m
Canal and Rich Gulch,	12	"	"
Ditch on the head of Rich Gulch,	6	"	"
Two Flumes in Butte County,	5	"	"
Prairie City Canal Company,	3	"	"
Coon Hollow Canal,	10	"	"
Two Ditches at Coloma,	5	"	"
Rock Creek Ditch, near Georgetown,	5	"	"
Natoma Water Works, (Mormon Island),	12	"	"
Auburn and Bear River,	20	"	" an

" All these are works made by capital borrowed at extr agant rates of interest."

" A small ditch at Jackson, which cost $1,700, pays $1 a day."

" The South Fork of the American River Canal cost tween $600,000 and $700,000, and yields a profit of $2,5 a week. The water companies in Nevada county pay fr six to thirty per cent. per month." Page 37–38.

Most of these ditches require costly fluming across deep ravines or valleys, and on the course of one of the canals now being constructed, [1858,] the water is to be carried across a valley in a suspended flume, 2,800 feet in length, sustained by towers rising 130 feet above the bottom of the valley below. These enterprises are seldom undertaken by those engaged in mining, the tenure of the placers being such that water is sold out to each claim at so much per inch for each day of eight or ten hours. When water was first introduced, the most extravagant prices were paid for a supply of a few inches, in localities where the yield of gold was very great, and in many cases where the supply was limited, the same water was used twice or thrice over, passing from one claim to another, until it became so thick that it would scarcely flow. The price per inch of water in 1851, was about $3,00 ; so that a claim using twenty inches a day, paid sixty dollars for water. The price gradually decreased to fifty cents, and is less at the present time. When water is sold by the inch it is delivered to the consumers from a horizontal aperture one inch high and twenty-four inches long. This opening is at the side of a box twenty-four inches square and six inches deep, and is opened or shut by a slide. The opening is graduated to half inches, and the slide is pushed in or drawn out until the desired flow of water is obtained. As the box is kept full of water from the ditch, the delivery is under a constant pressure of six inches. As an example of the extravagant prices paid for water when first conducted to the high placers, I extract the following from my Report to the U. S. Government :*

"Water was first brought to the Nevada Hills by the Rock Creek Ditch. This was seven miles in length, cost about $14,000, and yielded, from the sale of water, $30,000 in the first two months. Water was sold several times over, or, rather, it was used by several parties in succession, until from the quantity of fine slime in suspension, it became thick, so that it would no longer run. For a supply of eight inches, the first parties paid two ounces a day ; the second, twenty-four dollars ; the third, one ounce, and so on down to four dollars. The aqueduct was afterwards sold for about three

* *Report of a Geological Reconnaissance in California, &c.* New York, 1858. Page 268.

times its original cost, and has since paid fair dividends even for California. Water is now sold for fifty cents an inch, [1854.]"

A correspondent of the *Philadelphia Ledger*, in October, 1858, writes as follows: "People said the mines of California could not be worked in the dry season, for want of water. But within the last five years they have made 4,405 miles of artificial canals for mining purposes, at a cost of $12,000,000, and at this time another 1,000 miles are being constructed. Now, a vast deal of this canalling is over the most wild, rocky and precipitous country; jumping over awful chasms, and plunging down fearful abysses; trestle work, story piled upon story, and wooden fluming zigzagged at every angle, (rough, as yet, truly, but with strength adequate to its purpose,) may be seen winding for miles and miles its tortuous course, leading mountain streams far away from their native channels, and giving to the driest diggings water superabundant. The water-fall at the end is generally very great, and it is turned to curious account."

The Rev. Dr. Bushnell, in writing upon the characteristics of California, thus describes the Hydraulic process: "In the mining country, the natural beauty of the scenery is defaced by another process. Here a thin but stately growth of evergreens is sprinkled over the generally graceful slopes and roundings of the hills, and a pure crystal stream leaps along down the trough of the hills, over cliffs of rock and pebbly beds. But the miner comes. Finding gold that will 'pay' in the soil, he rents a head of water from the Ditch Company, whose ditch, bringing on the water from some level far up the Sierra, flows it along from hill-top down to hill-top, and across from one hill to another, leaping hollows and ravines on wooden trestle work, sometimes even 200 feet high, till it reaches a point abreast of his placer, and directly above it. Bringing it down the hill in an immense cotton hose, with a nozzle pipe like that of a fire-engine, he plays it into the side of the hill, with a pressure of perhaps 150 feet fall; tears down the hill, acre by acre, and floats it off, rolling the loose stones with it down his wooden trunk or sluice, in which the gold is arrested, and so continues till he has carried off a large section of the hill-side, even 100 feet deep. His neighbors are doing the same thing, right and left. Pits also are sunk downward, and tunnels bored in level into the sides of the hills,

and the earth from so many burrows is piled at their mouths. The trees are cut down for timber and firewood. The stream of the valley runs thick with creamy richness, and the cliffs and pebbly beds are covered fifty feet deep with stones and mud-washings. The result is a most horrid desolation, of which every line of the natural beauty is gone for ever.*

From California the construction of ditches and the application of the hydraulic process extended to Australia, and within two years past was introduced into North Carolina by Dr. M. H. Van Dyke. In Georgia a company was formed last year to wash the placers along the Chestatee River, but owing to unexpected delays in the completion of the ditch, operations have not yet fairly commenced. The first pipe put in full operation in Georgia was by Mr. Hezekiah Kelly, on lot 793, belonging to the Georgia Gold Company.

Several attempts have been made by others to use cotton or canvas hose, but these were not made strong enough to bear the strain of an effective head of water. With a head of less than sixty feet satisfactory results may not be expected, especially where the auriferous earth is firmly packed, and consists, in great part, of stiff red clay highly charged with oxide of iron. Not only the *head* but the *volume* is important, for the stream not only has much greater effect upon the bank in cutting it away and dislodging heavy boulders, when a heavy mass of water impinges violently upon it, but the mass or quantity of water is required to form a bold stream or current to carry away the tailings. On this subject Mr. Charles Ellet, Jr., in answer to inquiries made by the Hon. T. L. Clingman, through the Smithsonian Institution, makes the following statement, and gives other observations upon the capacity and grade of ditches, which are also appended.†

"The power of water is, generally, the product of the fall, or *effective* head into the volume discharged. But, in this particular application, I cannot admit that principle, and am of opinion that, the head being constant, the effect will depend much on the *mass* of water discharged by a single pipe. In other words, that it will be found better to discharge through the largest manageable orifices—that a greater effect will be produced by the column discharged from one pipe of two inches bore, than by those from four pipes of one inch

* New Englander, xvi. i., Feb. 1858, p. 158.

† First published in the *Washington Globe*, February 9th, 1857, together with Mr. Clingman's letter of inquiry.

bore—though the volume and velocity are the same in each case. To obtain good results requires large, concentrated masses of water.

"It makes no difference whether the conducting pipes leading from the canal to the orifices of discharge are perpendicular, or follow the slope of the ground. At least, the difference can be reduced to a very small quantity. What is required is simply very large pipes, to convey the water from the canal to the orifice or discharge."

* * * * * *

"The following calculations meet the cases submitted by Mr. Clingman, assuming his canals to be of rectangular sections:

"Canal three feet by three feet:

Slope 2 ft. per mile—mean velocity 1.7 ft. per second.
" 4 " " " 2.5 "
" 6 " " " 3.2 "
" 8 " " " 3.7 "

"The volumes delivered by this ditch, and with these slopes, will be—with slopes of

2 ft. per mile—1.7 × 9=15.3 cubic ft. per second.
4 " 2.5 × 9=22.5 " "
6 " 3.2 × 9=28.8 " "
8 " 3.7 × 9=33.3 " "

"But if the dimensions of the ditch were six feet by three feet, the results would have been for the velocity:

Slope 2 ft. per mile—velocity 2.1 ft. per second.
" 4 " " " 3.1 "
" 6 " " " 4.0 "
" 8 " " " 4.6 "

"And the volumes delivered by this ditch would be—with slope of

2 ft. per mile—2.1 × 18=37.8 cubic ft. per second.
4 " 3.1 × 18=55.8 " "
6 " 4.0 × 18=72.0 " "
8 " 4.6 × 18=82.8 " "

"Mr. Clingman should observe particularly these facts, viz.:

"The large ditch, six by three, with a fall of only two feet per mile, will convey thirty-eight cubic feet of water per second.

"The smaller ditch, three by three, with a fall of eight feet per mile, will only convey thirty-three cubic feet per second.

"The large ditch, with the small fall, carries some fifteen per cent. more water than the small ditch with the great fall.

"Again: the total head to be used is supposed to be 100 feet, and the length of canal ten miles.

"The larger ditch, with a fall of two feet per mile, delivers its water at an effective height of

100—10 × 2=80 feet.

"The smaller ditch, with a fall of eight feet per mile, delivers its burden at an effective height of

$$100—10 \times 8 = 20 \text{ feet.}$$

"If I wished to compare the relative *powers* of the water borne by these two ditches, I should express them by the products of their respective volumes into their effective heads—assuming, of course, that the water in each case would be discharged through orifices of equal size:

"The power of the smaller ditch would be expressed by $33 \times 20 = 660$.

"The power of the larger ditch would be expressed by $38 \times 80 = 3040$.

"The large ditch would therefore do more than four and a half times as much work as the smaller one—though it is only twice as large as the smaller.

"The discharge of a round orifice, one inch in diameter, under

"A head of 30 feet will be 147-1000 of a cubic foot per second.

"A head of 60 feet will be 215-1000 of a cubic foot per second.

"A head of 80 feet will be 240-1000 of a cubic foot per second.

"A head of 100 feet will be 267-1000 of a cubic foot per second.

"A ditch of rectangular section, six feet wide and three feet deep, with a slope of two feet per mile, would deliver, as above, 38 feet of cubic water per second. As each pipe, with a head of 80 feet, would discharge 240-1000 of a cubic foot per second, this ditch would keep in action $38 \times 1000 \cdot 240 = 160$ pipes of one inch bore.

"This system of working the gold mines must be very effectual. But a great deal of its success will necessarily depend on the skilfulness of the entire arrangement.

"In my opinion, every care should be observed to convey the largest mass of water attainable, to deliver it at the greatest possible height, and to discharge it against the soil to be washed through the large manageable pipes.

"There are many practical questions connected with this business which should be considered; but they depend for their solution on the shape of the ground, etc.

"Some allowance must be made in the calculations for the necessary loss of water on the way from the stream to the diggings; but this loss will depend on the character of the soil.

"If the soil is argillaceous, it would be advisable to form basins on the line of the canal, wherever it can be done without adding materially to the cost.

"The water ought not to be drawn directly from the shallow canal into the pipes which convey it to the orifices of discharge. There should be interposed a large iron pipe, or a penstock; or the canal, if the ground permit, should be made very deep at that point, so as force the water into the pipes under a sufficient head.

"Short bends in the pipes should be avoided. The larger the pipes, and the clearer they are kept from all sorts of obstruction, the more violent will be the discharge, and the better the results.

"It is not improbable that it will be found advisable to place the branch of discharge pipes on a *rest*, and handle them by some simple machinery, so as to permit the nozzle of each pipe to be put very close to the soil—nearer than a man could safely stand. Under such heads as we are considering, and with such a column as I would use, gravel and large stones will be scattered about with great and dangerous violence. In fact, it is the difficulty of standing near enough to handle the pipes, which will be likely to put a practical limit to the column and the velocity of discharge.

"The canal should be allowed to spread out into basins wherever the shape and character of the soil will permit it. These wide places will serve as reservoirs, and frequently save much water."

Next to the hydraulic process or hose-washing, the most important application of water in placer mining is in *sluicing*. The sluice is a long channel or raceway, cut either in the surface of the bed-rock or made of boards. The former is known as the *ground sluice*, and the latter as the *board sluice*. The ground sluice is cut in the softened surface or outcrop of the bed-rocks, which are generally of slate, presenting upturned edges like the leaves of a book. In the softened mica slates this resemblance is very great, and the surface is highly favorable to the retention of particles of gold. It is easily cleaned up, as one or two inches in depth of the surface may usually be scraped off with the shovel. The board sluice is generally twelve or fifteen inches in width, and from eight to ten inches deep, and is made in convenient lengths, so that one can be added to another, until a length of two or three hundred feet or more is obtained. False bottoms of boards are often used to facilitate the retention of the gold, while the stones and gravel are swept away by the rapid flow of the water. Long bars or *rifflers* are generally preferred to cross cleats or holes. The fall or rate of descent of the bottom of the sluice is varied according to circumstances, being arranged to suit the size of the gold and the nature of the drift. One or two feet in a rod, or one foot in twelve, is a common inclination, and with a good supply of water will cause stones several inches in diameter to roll from one end of the sluice to the other. The earth, stones, and gold as they enter these sluices with the water, are all mingled together, but the current soon effects a separation; the lighter portions are swept on in advance, and the gold re-

mains behind, moving slowly forward on the bottom until it drops down between the cleats or bars. The larger stones and coarse gravel are swept on by the current, and after traversing the whole length of the sluice are thrown out at the lower end. The operation, as in the hydraulic or hose process, with which the sluice is always combined, is a continuous one, and requires comparatively little labor or attention, except to keep the sluice from clogging. In some localities, where the depth of the auriferous gravel and overlying clay and soil is not great, water may be used to as great advantage in the sluice as under pressure. It has this advantage, that the auriferous earth may be washed as high up as the source of supply. The process is a close imitation of the operations of nature in concentrating gold in the deposits along streams.

REPORT

UPON THE

GOLD PLACERS

IN THE VICINITY OF

DAHLONEGA, GEORGIA,

WHICH MAY BE WASHED BY WATER FROM THE YAHOOLA RIVER.

BY

WILLIAM P. BLAKE,

GEOLOGIST AND MINING ENGINEER.

[*Reprinted with additions from the Report published in October*, 1858.]

JUNE, 1859.

NEW HAVEN, CONN., *June*, 1859.

To the President and Directors of the Yahoola River and Cane Creek Hydraulic Hose Mining Company.

GENTLEMEN: Having spent several months in the vicinity of Dahlonega, and extended my observations and notes upon the gold placers since I reported upon them to Messrs. Hamilton & Van Dyke, last October, I have availed myself of the opportunity you have afforded me on the occasion of reprinting the Report, to make several additions.

REPORT.

THE portion of the great gold-belt of Georgia to which my attention was directed, is in Lumpkin county, and in the vicinity of Dahlonega. This place was early selected as the most central and convenient point for a settlement in the Gold Region, the richest mines and deposits being found in its immediate vicinity. It is located on a high ridge of considerable extent, being bounded by the Chestatee River on the south, on one side by the valley of Cane Creek, and on the other by the Yahoola River; the two streams last mentioned being tributaries of the Chestatee. The tract thus bounded contains about five and a half square miles, or 3,500 acres, within the gold-belt, as shown on the accompanying map.

The general direction of the summit, or "divide," of the ridge is N. E. and S. W., trending nearly with the rocks of which it is composed. These are chiefly hornblende slate, mica slate, gneiss, and a metamorphic sandstone. In some places the hornblende slate is almost as hard and compact as trap-rock, and, having a dark-green color, much resembles it. The whole ridge, with its spurs between the creeks, is traversed with gold-bearing veins parallel to the main axis, or nearly N. E. and S. W. They are found outcropping at various points, some of them near the town, and others in the valleys of the branches. Many of them have been worked, and others are known to exist by the accumulation of their fragments, and gold in the creeks.

The ridge attains an elevation of about 500 feet above the Yahoola River at its mouth, and gives rise to several creeks, or *branches* as they are generally called, which flow in deep lateral valleys on each side ; those on the east into the Yahoola, and those on the west into Cane Creek. The number and general direction of these branches will be seen by reference to the map, which, however, does not represent all their subdivisions, and the almost numberless side-ravines and hollows which diverge from the main valleys.

Most of the creeks flow nearly at right angles to the course of the strata and the veins, and thus intersect the latter in succession. The valleys are very deeply cut into the rocks, and are the result of the long-continued wearing action of the waters, which have broken out an enormous amount of vein-stones, and mingled the gold with the fragments. In this manner each stream became a rich deposit of gold, or a concentration, after the manner of a sluice, of all the gold originally contained in a vast amount of rock. The rapidity and ease with which the rocks are worn away by running water in that region, is surprising to those who have not become familiarized with the extensive decay and softening which the rocks undergo, at the south especially, in the gold region. Mica slate, gneiss, hornblende slate and even granite, become so softened to a depth of many feet below the surface, that they may be cut into with a shovel or a hoe, and excavated like clay. In most places these decomposed rocks are very red ; the color being produced by a large amount of oxide of iron, derived from the decomposition of pyrites, which, by furnishing sulphuric acid in the soil, has undoubtedly hastened if not caused the rapidity of decomposition of the rocks. The quartz contained in the rocks, either in grains or in veins, does not become softened or changed by this process of decay, so that when the softened rock is cut away by the streams the "vein rocks" or quartz seams, are left in fragments along their beds, together with the gold which may have been associated with them. By the prolonged attrition or rolling together of these quartzose fragments, they are broken up, and the gold is liberated, and, being the heaviest, sinks below all the gravel and sand, until it reaches the bed-rock or surface of the slate. In this manner gold deposits are formed along streams. When in the progress of the wearing action of a stream it suddenly obtains a new and better channel, the old one is

drained, and thus becomes a dry ravine or hollow. The larger streams or rivers, with comparatively wide valleys, by changing their direction leave bars of gravel or shingle on either side, which is rich in gold, and when in the course of changes of elevation of the country, or by the deepening of the river valleys, these bars of auriferous gravel are left above the level of the stream, they are known among gold-washers as hill-deposits or high placers. They correspond in their formation and position to the terraces of geologists, and serve to mark the former levels and courses of the streams.

In the region under consideration, a vast amount of detritus, or drift of gravel, sand and clay, resulting from the abrasion of the rocks, in the manner described, is now found along the courses of the present and the ancient beds of the streams, precisely as in other gold regions. The whole surface of the country is cut by hollows and ravines, which in their formation correspond with the dry ravines and gulches of California. Gravel or river-shingle is found at several points high up on the hills, and is rich in coarse water-worn gold.

Each of the streams represented on the map was found to have a continuous and remarkably rich bed of gravel, expanding in some places over an area of several acres, and in others contracting to within a few feet of the channel. In some places, where the rocks have not been softened by decomposition, the valleys are very narrow, and the current of the branches is so swift during freshets, that all the gravel is swept onwards, leaving only the smoothly water-worn surface of the rock. In such places there is little or no gold, except in crevices or fissures in the rocks.

The gravel or shingle of all these deposits is chiefly composed of quartz—the fragments of veins—varying in size from mere sand to masses as large as the fist, and in some localities to six and eight inches or more in diameter. Where the valleys expand, and there are broad flats, the gravel is generally overlaid by clay, its depth varying from a few inches to several feet. As in these deposits, the chief part of the gold is found at the bottom of the layer of gravel, below the clay, resting on the surface of the rock, it is necessary in the ordinary way of mining, to first throw off the soil and clay to reach the gravel, which is the only part subjected to the process of washing. The operation is usually performed by sinking pits

from ten to twelve feet square, the clay being thrown out on one side and the gravel on the other, after being washed.

The deposits about Dahlonega were all washed in this way, and yielded hundreds of thousands of pennyweights of gold in a very short time. In the old ways of working, however, only a portion of the gold was obtained; and it is the common belief of those most familiar with the deposits, that at least half of it was left behind. That a very large amount is still there, cannot be doubted by any one who will examine the old workings, and note the enormous heaps of gravel confusedly piled together on all sides, while here and there large stumps and trunks of trees show that the ground about them has never been moved. Even the ground which has been washed contains a considerable portion of gold, left in it by reason of inattention at the time of washing, or by the rudeness and imperfections of the process. The best evidence of this is, that the old gravel heaps of many deposits in that region may be profitably rewashed in the ordinary way.

The principal stream deposits of the tract will now be briefly described.

Stream Deposits.

Tah-lon-e-ka Branch, formerly known as Winfield Branch.*—This stream rises in the northern edge of the gold-belt, and flows into Cane Creek. Its course is marked by piles of gravel and deep pits, showing that a great amount of work has been done in it; yet large stumps of trees that have never been removed, are quite numerous. A fork of this stream, known as the Bath Branch, pours over a ledge of rocks; below this, a great amount of gold has been taken out. Some of the pits yielded ten pennyweights to the hand, and the whole deposit is considered to have averaged at least five pennyweights. It was very roughly worked, or "*gouged out*," in the time of the intrusion, before the Indians had left. Many large trees, which must have attained a great size before the mines were found, are yet standing along the deposit. There are probably some fine leads of gravel in the points of the hills, running through them parallel with the Creek.

* This is said to be the proper pronunciation of the Indian word now commonly rendered *Dahlonega*—signifying *yellow metal.*

Several dry hollows or ravines, leading down into this valley, were noted, and are probably rich in gold.

Dunkin Branch.—This flows a little south of west, and empties into Cane Creek. It is about a mile in length, and has a favorable fall, or descent for washing, down to within a few hundred yards of its mouth, where the deposit becomes too level to be washed with a pipe. It was a remarkably rich gold deposit throughout its length, and afforded much coarse gold. At its upper end but little work has been done, owing to the want of water. This would be a fine place to work with the hydraulic method, as the gravel is very favorably placed, and is abundant. Several pans full of sand and gravel, were washed out here, and gold found in every instance. Some of these trials were upon the gravel of the old heaps. On the north side, the valley slopes gradually up from the Creek to the high ridge, and we here find broad hill-deposits, or high placers. These are extensive, and present very favorable indications for richness, and are likewise well situated for washing.

Stover's Branch.—This was one of the richest branches in the whole tract, and gives every evidence of it along its course. It has many branches or divisions running up to the high ridge, all of which were rich. It is crossed by the remarkable belt of gold-bearing slate, called the *Pigeon Roost Streak.* This is soft and decayed, and has been largely excavated along what is known as the Dry Hollow. This opening is about 300 yards in length, and the whole rock seems to be charged with gold. Several trials of it showed gold in every instance. Quartz veins of considerable size extend parallel with this hollow on the west side. Soon after the discovery of the gold, over five hundred men were working in this branch at one time, and the yield for one day along the whole course of the stream is known to have been 6,000 dwts.

Pinchbeck Branch.—This stream has a narrow valley, which contains gold, and has been worked, but was not as rich as most of the other valleys.

Fish Trap Branch.—This is one of the most important valleys in the tract, and the miners formerly contended that it was richer than Stover's. It has many subdivisions, and exposes a great amount of deposit gravel on an inclination favorable for washing out by the pipes. At the mouth, and along

the Chestatee, into which it runs, there are high deposits of river gravel, said to be very rich.

Rattlesnake Branch.—This is a long but very small brook, which, in the lower part of its course, runs over a belt of hard slate, and is without good deposits. It has been extensively mined upon, higher up, where it subdivides, but the deposits are not as extensive as on the other streams of the same length.

Adair Branch.—This, together with an adjoining small valley leading down from the ridge in which the Finley vein is worked, were rich, and contain a great amount of pay-gravel. The vein branch was extremely rich in rough, coarse gold, evidently broken from a vein.

Bob. Ralston Branch.—This, next to Dunkin Branch and Stover's Branch, is, perhaps, the best in the tract for the hydraulic washing. The deposits are very broad and rich, particularly along the upper part of the valley This may be counted upon for an enormous yield of gold when properly worked. Although these deposits would yield well if worked over the second time in the ordinary way, they have hardly been touched since the first working. On lot No. 1049, the rocks are hard, and the valley narrow. Hill deposits are found on the right bank, near the mouth.

*Amazon Branch.**—This heads near the town of Dahlonega, and has been worked for its whole length. At one or two points the rocks are hard, and the deposit narrow; but on either side there are rich surfaces and hill deposits. The belt of soft auriferous slate crosses near the head of this branch.

During the progress of these examinations, many trials of the earth were made by panning. The samples were taken from various points along the deposits and the hill-sides, and gold was found in every instance without exception. The whole soil and earth of the region is so impregnated with gold that it would be difficult to obtain a panful without one or more particles. After the rains, the gullies along the roads, in

* At the time of the "Intrusion" of gold-diggers upon the hunting-grounds of the Cherokees, a party of men who commenced mining in this valley were suddently set upon by an almost nude Indian woman of powerful frame, who jumped down into their pit and cudgelled them without mercy, until they were glad to escape with their lives. I have, therefore, taken the liberty of describing the branch under this name, which differs slightly from that by which it was formerly known among the miners.

some places, contain so much gold that the poor, and the blacks, frequently scrape them out and wash the sand. These results, together with the other observations, were sufficient to convince me that there is an enormous amount of gold still remaining in these deposits. It became evident that the original washings were conducted without method or care, so that the gold was not only but partially removed, but a very considerable part of the pay-gravel on the bed-rock was never reached, and rests untouched to this day. Large forest-trees, and stumps of others, of great age, may be found in many places along the best parts of the deposit, and show that there, at least, the ground has not been worked. So also where the clay and sand were very thick, and it was difficult and expensive to throw it off from the pay-gravel in the ordinary way, the work had been abandoned. A different or more methodical and thorough working, could not have been expected during the excitement attending the first discovery of the gold, and the general ignorance of the best methods for its collection. Even the heaps of washed gravel may be expected to pay for rewashing by the hydraulic method; while the portions formerly untouched or but partially worked may be relied on for great profits. The experience in the mines of North Carolina, where Dr. Van Dyke has introduced this method, is, that the stream-deposits, where the descent of the bed-rock is rapid enough to carry off the waste water and tailings, give the most profitable results. This has been the case at the Walton Branch, where the gravel had been repeatedly washed over in the old way. The whole course of the stream has been washed out clean with the pipes, with the most profitable results.* It is important to observe that most of the deposits in the tract described are favorably situated for washing with the hose; the descent or fall of the stream being sufficiently rapid to carry off the tailings.

Along some of the branches there are at intervals side streaks or leads of pay-gravel, a little elevated above the present beds of the streams, and some still higher up and of great breadth. These are the hill deposits or high placers, being the former beds of the streams. These have, almost without an exception, remained untouched for want of water and knowledge of their richness; and they may be relied upon

* This washing was commenced and has been conducted by Mr. Hamilton.

for a great and very profitable yield of gold when washed off with the pipes.

Some extensive deposits of this character are found along the north side of Dunkin Branch, extending from near its head half-way to its mouth. On this side of the valley the surface slopes gradually upwards, and, during the first excitement of deposit mining, was the site of a small mining and trading village. This slope appears to be underlaid with auriferous gravel, for the gravel has been followed up from the bed of the creek at several points, and is exposed in the deep cuts made by the drainage water along the roads leading up to Dahlonega. The unworked portion of the deposit at the upper end, above the flowing water, may be regarded as a hill deposit also, and there is every indication of there being rich washings at that point. There are some streaks of pay-gravel on the opposite or south side, but there the banks rise more abruptly to a high ridge; at the mouth, however, where the deposit merges into that of Cane Creek, there is a point of land favorably situated for washing, where there is a hill deposit.

There is a very heavy outcrop of quartz—a true quartz ledge like those in California—on the north side near the mouth, which has furnished an immense amount of quartz gravel. It is probable that at some point along the line of this ledge there is much coarse gold, but as yet no defined gold-bearing vein connected with it has, to my knowledge, been found, but gold occurs in the soil on the ridge.

On the Yahoola River, there are hill deposits at various points. On lot (*e*), upon the left bank, east side, there is a fine placer of well-rounded river gravel or shingle and coarse water-worn gold, overlaid by a bank of stiff clay about ten feet thick. A panful of this gravel taken from the bed-rock at the side of a pit, which had just been worked out in the ordinary way, yielded me several particles of gold, one of them nearly a quarter of an inch long. A large amount of kyanite sand is associated with the gold, and many of the fragments are sapphire-blue in color, so that they resemble true sapphires. An interesting and important vein cuts through the rocks on this lot, and has been slightly opened near the river. This, possibly, has supplied a great part of the gold to the deposit. This lot is below the mouth of Ward's Creek, and

may be reached by the ditch of the Yahoola Company, without crossing the river at the high trestle.*

I am informed by persons well acquainted with the mines and long residents of Dahlonega, that there are many other points along the Yahoola, on both sides, where there are rich hill deposits.

On the Chestatee river, below the mouth of Fish Trap Branch, hill deposits rich in gold are found at several points, particularly on the left bank, where there is a terrace-like deposit of river-shingle and coarse boulders over a foot in diameter, at an elevation of about forty feet above the stream. There is a second bench below, but high enough to work off with the hose-pipes or by sluices. This deposit has been worked slightly during the winter season while water could be had upon it. On the right bank, deposits are found nearly opposite the others, and are said to extend round to Cane Creek and up its valley. On the mouth of Fish Trap Branch these hill deposits present a favorable appearance. Other deposits were noted above this point near the mouth of Rattlesnake Branch.

Hill deposits are also found near the mouth of Bob Ralston Branch, along the valley of Tahloneka Branch, Bath Branch, and at several points on Cane Creek. In the valleys of most of the Branches there are rich beds of auriferous gravel, in the banks on either side, and only a little elevated above the water, which have not been thoroughly worked, being inaccessible and difficult to reach by the old methods. Deposits of this character are frequently connected with leads of gravel extending off from the main deposit into dry ravines or side-hollows.

Soft Slate, Bearing Gold.

Through all this tract, there is a remarkable belt of decomposed slate; which seems to be permeated with gold, for almost any shovelful of the decayed rock will show numerous particles when washed. This belt extends in a northeast and southwest direction, and is generally known in that region as the *Pigeon Roost Streak*, it being highly developed and

* At the time the first Report was made in October, 1858, I was not aware that it was in contemplation to wash any of the placers on the left bank of the Yahoola; consequently, they were not described or referred to.

astonishingly rich on the south side of Cane Creek, in the elevation known as Pigeon Roost, where it has been extensively mined for a long time. An innumerable number of thin, parallel quartz veins or seams, traverse this slate parallel with its bedding, and form a distinct belt. The gold was probably formed in connection with these veins, for they are sometimes found to contain nearly half their bulk of the precious metal. That the gold is also disseminated in the wall-rocks, or film of slate on each side, there is little or no doubt; thus in working such a mine, the enveloping slate must be secured as well as the quartz. The rock is a very fine-grained micaceous slate, and at several points is very much decomposed to a depth of many yards, and is so softened on the surface in places that when loose and dry it is as light as an ash-heap, and may be blown away by the winds. On the Pigeon Roost outcrop large quantities of this soft slate are thrown into the gullies of the hill-sides during dry weather, so that the first shower of rain shall carry away the powdery rock and leave the gold behind.

The veins upon Pigeon Roost are peculiar in several respects, and may be regarded as a large vein divided up into many parallel quartzose sheets or layers with slate between. These layers sometimes extend unchanged in width for several yards, but oftener expand and contract so that large bunches are formed which are sometimes highly pyritic. Many of the thinnest seams, not thicker than binders' board, carry large amounts of gold, being in part composed of it in ragged filaments, holding the quartz together. The auriferous veins are, however, more frequently from half an inch to one and a half or two inches thick, while at many points they reach a thickness of one foot. Thus, upon lot (*a*), which has been extensively mined upon by Mr. Lawrence, there is a vein a foot wide, which has been followed one hundred and fifty feet or more.

The belt of this peculiar slate is not a continuous one, but is interrupted at several points, alternating apparently with strata of hornblende slate.

There are indications of the streak within the limits of the town of Dahlonega, but the greatest and most important expansion is upon lots (*d*) (*c*) and (*b*), on the slope facing the Yahoola. On these lots very large amounts of this material, with the included vein, have been excavated and washed. On (*d*) there is an open cut in this soft slate 200

feet long, fifty wide, and averaging thirty in depth. The slate and veins were carted to stamps and are reported to have yielded 25,000 dollars. On the lot (*c*) the slate is red and pink in color, and has been largely excavated. An open cutting was commenced in 1835 and was worked for six years, the slate and veins being carted a mile to stamps and washed. I am informed by a miner long a resident in Dahlonega, that it never yielded less than a dwt. a day to the hand, and a portion was worth twenty dollars a bushel.

The slate is traversed by several thin veins parallel to a larger and in some places heavy vein, bearing pyrites in bunches. The thin veins are very regular in their conformity to the layers of the slate, and often contain cubes of iron pyrites.

A vein on lot (*b*) was very rich in gold, and is commonly known as "Vein ——," but was not specially indicated on the former map. It is probably the same as the *Moseley Vein*, extending on the opposite side of the river. This belt of decomposed slate is most favorably situated for washing: streams of water from pipes directed upon the ashy soil will carry it off with great rapidity and separate the gold; while at the same operation the vein-stones will be cleansed from adhering slate and loose gold, and be left ready for sorting and crushing. This is an important feature of the project, for immense quantities of rich vein-stone will be washed out. The very richest part of the veins, those in which the gold forms the principal part of the weight, would be collected with the gold in the sluice, but the other portions would undoubtedly pay largely for crushing. Indeed, the hydraulic process is the *true mining process* for this class of thin veins. It is difficult to follow them by the ordinary mining operations, especially as there is no guide for the eye as in well-defined veins of ore. It has frequently been found that in mining on these belts in the ordinary way, the miner had excavated his drifts and cuttings within a few feet of a remarkably rich seam without ever striking it. When the whole surface is uncovered and washed away, deep down into the hill, such rich leads and streaks, scarcely visible to the eye, would not escape working.

Since the foregoing was published, the importance of the hydraulic process for mining or washing out the thin veins has been demonstrated by the results of Hezekiah Kelley, Esq., the superintendent of the operations of the Georgia Gold Company. Having obtained water enough for one small pipe by

a ditch about two miles in length, he has been washing down the loose and decayed slate in the old open cut upon the course of the veins. The results were that enough loose gold was obtained in the sluices to pay a heavy profit, while all the vein-rock required for a good mill of eight stamps was thrown out at the lower end of the sluice-boxes; being thus obtained without cost and in a much better condition for crushing than it would have been if it had been mined in the ordinary way. Up to the time of my leaving Dahlonega, the yield in gold with this pipe was estimated to be from ten to twelve dollars a day.

Veins.

In addition to the description just given of a very important class of veins (which might be appropriately called *sheet veins*), further facts regarding veins in that section are important for the bearing they have upon the extent and richness of the deposits. My attention, however, not having been specially directed to the number of the veins, the following must not be regarded as a full enumeration or description of those that are known. There are many which are not mentioned, or indicated on the map, which have been worked at different times in the manner peculiar to the region. In fact, hardly a month passes in which some discovery of a new vein or of new rich places or pockets upon veins already known is not made. At the time of preparation of the former report, much interest was excited by the discoveries at the Finley vein, situated on the high ridge a little south of east of Dahlonega, and it was thus noticed:—

"One of the most remarkable is the Finley vein, now being worked, from which a short time ago several masses were taken consisting of nearly equal bulks of gold and quartz. If the decay and wear of the ridge had extended a little deeper, these great masses of gold would have been found on the surface or in the deposit below.

"From the Passmore vein, over 10,000 dollars' worth of gold was taken out in twenty days, by digging in the soft slate.

"Mr. Joseph Singleton and Mr. Lawhorne, in September last, opened upon a vein, half a mile from the Court House, which showed a large amount of free gold in coarse particles adhering to the quartz. A little below this vein a very rich high deposit is found."

A new opening was made last winter near the head of Stover's Branch upon a pyritic vein, since known as the Britton vein. The upper portion was very cellular or honeycombed quartz, and contained a large amount of fine gold hardly visible to the eye, but giving a beautiful "string" in the pan on being crushed and washed. The pyrites is found in the vein lower down, and there is no doubt that the upper and cellular parts of the vein were once similarly filled; the pyrites having, through the agency of surface waters and slow access of air, decomposed out, leaving a skeleton of quartz with the particles of gold.

On the lot of the Georgia Gold Company, No. 793, the principal vein has been followed by an open cut in the soft slate, this being the point at which Mr. Kelley is now working. On the opposite side of Cane Creek, near the southwest corner of the lot, a second and parallel belt of veins crosses the stream. Here, by sluicing off the soil and debris of the veins, Mr. Kelley opened six veins in succession, all parallel and trending about thirty degrees east of north, with a dip or inclination of sixty-five to seventy degrees. The *Kelley vein* is pyritic, and varies from two to ten inches in width.

In this connection we should not omit to notice the remarkable gold vein which was opened in the bed of the Chestatee River last summer. This, though beyond the limits of the tract proposed to be reached by the water of the Company's aqueduct, is in the same gold belt, about four miles from the Court House, and only two from the point on Ward's Creek where the washing is first to commence. The vein was discovered by following up the gold deposit along the river; the gold in fact being traced to its source in the rock. It occurs in a very hard hornblendic slate, and is not accompanied by any great outcrop or lead of quartz. It is a narrow vein or seam, scarcely over two inches wide, averaging perhaps less than an inch, but bearing in places as much as half its bulk of gold, in ragged irregular masses, penetrating quartz and a seam of carbonate of lime, and associated with a telluret of bismuth in beautiful silver-white masses, which Dr. Jackson has shown by analysis to be the rare species *Bornite*. When this vein was found, the gold was visible for a foot or two only, but as the excavation progressed, it was found to extend for several feet, and could be distinctly seen by persons standing on the bank. The most magnificent gold

specimens ever seen, uncrystallized, were taken out of this place before a depth of fifteen feet was reached. Their beauty was greatly enhanced by the perfect preservation of the rock, there not being a particle of rust or decomposition. So compact was it, that the excavation could only progress by blasting, and at one time about 3000 dollars' worth of gold was thrown out at a single blast. Many of the rocks, which could be easily lifted in one hand, were valued at hundreds of dollars. These facts are sufficient to show that astonishingly rich veins are not confined to the newly-discovered gold regions —the El Dorados, California and Australia—but that they still exist and may yet be discovered in the gold region of Georgia.

In order to prevent misapprehension, and to render the character of the veins better understood, I present, in addition, the following general conclusions to which I have arrived, after extended observations from the Chestatee River southwestward along the gold belt:

1st. The auriferous veins are mostly narrow and not uniform in their width or development, for great distances horizontally.

2d. Though small and thin, they are numerous; thus yielding in the aggregate as much vein-rock, perhaps, as could be obtained from a smaller number of thicker and more persistent veins.

3d. They are in general extremely rich, the ratio of gold in bulk to the bulk of barren rock, being greater than in thicker and better-defined veins of other sections.

4th. In general, the gold is present in coarse particles, and is found not only in connection with pyrites, but ramifying in ragged masses and filaments through solid quartz, in which no pyrites is visible.

5th. Gold is seldom uniformly distributed along the course of the veins, but is generally accumulated in bunches, pockets, or shoots, the extension being *vertical* rather than horizontal. Thus while one part of a vein may be surprisingly rich, the same vein a few feet distant may be without a particle of gold.

6th. The phenomena strengthen a conclusion previously formed from the examination of gold veins in greenstone in California, that gold is of igneous origin, that it is volatilized, and rises in vapor from below, in connection with other vapors, ~~or, possibly, heated water~~, and is condensed in the fissures of the

rocks with other metals and minerals, especially sulphids, tellurids, arsenids, and the oxyds of iron, chromium and titanium, all of which are found with gold in Georgia and elsewhere.

The broken and in general local richness of the veins of the tract and vicinity, renders systematic mining upon them in the ordinary way expensive and hazardous, though it is by no means certain that many of them cannot be successfully followed to great depths. Indeed, none of the veins in that region have been fairly tried ; as in nearly every instance mining in shafts has ceased as soon as the rock became hard enough to require blasting, or the water ran in too rapidly to be removed by buckets. There is hardly a shaft over 100 feet deep in the tract, and nearly all that have been sunk followed rich shoots or pockets to the water-level, and were then abandoned.

By the free use of the water in hose-washing and ground-sluicing, so as to uncover considerable areas of the bed-rock in succession, it must be that many new veins will be brought to light and their rich points exposed. The tedious and uncertain labor of the prospector for veins will thus be performed in the course of the regular washing of the placers. In the operations upon lot 793, water at an elevation has been found to be the most important mining adjunct, even where employed in sluicing alone, without the use of the hose and pipe. Thus the discovery of six veins by Mr. Kelley, was one of the results of uncovering the surface of the rock by ground sluicing.

As fast as veins are exposed they should be carefully examined and tested, and shafts should be sunk on them at any rich points which may be followed to great depths, or as long as the quartz yields profitably, while the expensive and uncertain labor of prospecting by galleries underground should be avoided, except in rare cases, the surface explorations by the aid of the pipes being substituted. By adopting this plan of working only the rich portions of the veins as they are exposed in washing, great and rapid returns may be expected without much outlay. The company should have one or more quartz mills, to which all the vein-rocks obtained in washing, or by following rich shoots, can be carried for crushing. Water from the ditch may be used to drive these mills during the night, after washing by the hose has ceased, unless

there should be an abundance of water during the day. It would be well to have mills at several points, or near to the veins, so as to avoid the expenses of carting the ore great distances. The newly-introduced rock-breaker would be an important adjunct to each mill, and when some additions are made, so that quartz will be broken to powder, the machine may be substituted for stamps, and, being portable, may be removed from point to point, as the place of washing changes. These machines can also be driven by a small stream of water taken from the main ditch. A rock-breaker at the stamps not only performs the labor of breaking up all the large masses of ore, but reduces them to a uniform size; so that it may be fed regularly and by measure to the stamps, thus insuring their regular and efficient action. With one of these machines attached, a large mill would not be required, as the quantity of ore which might be passed through the stamps would be greatly increased.

Geology, and Minerals associated with the Gold.

Of the metamorphic rocks already mentioned as forming the ridges of the region, the most prominent or prevailing is the hornblende slate. It is seen in the public square at Dahlonega, forms the hill on which the mint stands, and extends to and beyond the valley of Dunkin Branch. It is generally very much decomposed on the surface, appearing as a soft ochrey or rusty rock, but the unchanged portions are very dark green or black. Further south, at Cane Creek, below the lot of the Georgia Gold Co., the rock is less changed, and forms a series of rough outcrops, which break up into prismatic and slaty fragments, the surfaces of which are brilliant with the cleavage planes of the crystals.

The mica slate forms parallel zones or belts, and is, in general, the vein-bearing rock. At the upper margin of the placers this rock is very compact and fine-grained, and splits into broad flag-stones and thin sheets like roofing slate. It is intersected by a granitic dyke, which may be seen on the road-side leading to Loudsville, after crossing the Yahoola. This mica slate appears to contain beds of metamorphic sandstone, and of this there is little doubt, though the beds are not as distinct in their lithological characters as at other points in the tract, and beyond it towards Loudsville. Thus about

a mile northeast of the bridge on the Yahoola, there is an outcrop of semi-metamorphosed sandstone, which may be traced at intervals for twelve miles or more in a north-easterly direction, to the base of one of the spurs of the Blue Ridge. This sandstone may be the equivalent in age of the elastic sandstone, or *Itacolumite*, though it is not elastic nor so micaceous and free from iron as that rock, or its outcrops further southeast, and in the Carolinas. The sandstone in general has a dark drab color or rusty gray, and in the unchanged portions is bluish gray. It is intercalated frequently in thin beds or lenticular masses with layers of mica slate, which, in all probability, was once beds of shale.

South of Cane Creek, near Pigeon Roost, there is a great outcrop of a siliceous sandy rock, bearing a large amount of specular iron in thin scales, interleaved with the grains of sand like the scales of mica or Itacolumite. Magnetite is also found at that place interstratified in thicker layers. These rocks are similar to those described by O. M. Lieber, Esq., the geologist of South Carolina, as members of the Itacolumitic group in that State. The specular iron forms with the sand a true schist,—a *specular schist*, which in decomposing or crumbling down under the action of the weather, furnishes a large amount of the little black scales to the gold deposits—this, together with the magnetite, constituting a large part of the black sand of the deposits.

No bed of limestone is known in the vicinity, or nearer than the limestone belt of Gainesville, twenty-five miles distant, where the undoubted Itacolumite or elastic sandstone occurs.

The principal minerals of the region in addition to the specular and magnetic iron, are ilmenite, rutile, iron, copper and arsenical pyrites, kyanite, and garnets; all of these except the pyrites being common in the auriferous sand. There are doubtless many other species which will be brought to light when washing is conducted on a large scale; but as yet I have not seen any of the rarer minerals taken out of the washings, such as zircon, sapphire, monazite, etc., which are abundant in the gold sands of North Carolina. It is said, however, that beautiful rose-colored stones were once taken out of one of the deposits near Dahlonega, which, from the descriptions given, were probably corundum or ruby. It would not be surprising if diamonds should be found in the concen-

trated sand, when the sluices are cleaned up after washing a large amount of the auriferous deposits. The Itacolumitic character of the rocks is the best indication we now have; this formation being known to be the source or matrix of diamonds in Brazil, India, and the Urals, as also in North Carolina and Virginia. Diamonds are also said to have been found in the gold washings of Hall county, twenty-five miles south of Dahlonega, near Gainesville. It would therefore be well to examine the heavy sand which is left in the sluices or with the gold, after continued washing with the pipes.

Ilmenite is one of the most widely-diffused minerals in the gold deposits, and is frequently found in the quartz veins associated with gold; as, for example, in the interesting vein in the Chestatee River. It is generally in broad thin plates, or curved, flattened crystals, shooting through the quartz. In this form it is abundant along the Pigeon Roost streak, and appears to be more directly associated with the gold in veins, than specular iron or magnetite.

Tetradymite or bornite is another interesting associate of the gold, but has not been observed of late nearer than the Fields vein in the bed of the Chestatee, four miles distant, where it occurs in thick foliated masses in and around, and sometimes interleaved with the gold. From descriptions given me by Rev. J. J. Singleton, of a mineral once obtained from the vein on his father's lot, on the east bank of the Yahoola, and not far from Dahlonega, I do not doubt that this was also tetradymite or bornite. The mine is not now worked.

Proposed Aqueduct.

"Water for washing out the gold on this tract must be brought in a canal or aqueduct from the Yahoola River; this stream, from its position and quantity of water, being the best adapted to the purpose. According to Mr. Simeon McCurry, who has levelled from Dahlonega up the valley, a canal in order to deliver the water at a height of 250 feet above the Yahoola river at the placers, must be twelve miles in length, and may have a descent of four feet to the mile. With a less grade the water could of course be thrown higher; but at the elevation mentioned the principal deposits could be thoroughly washed. The high ridges, although containing gold in veins and in the soil, do not offer rich leads of gravel, and cannot be reached by the water."

The foregoing is given as presented last October, when I was not aware that the water of Cane Creek was also available, though in less quantity, and at a less elevation than could be had by a ditch from the Yahoola. Since that, also, the route has been re-levelled and staked by the Rev. J. J. Singleton, who finds that the water may be delivered as high as the base of the Court House in the Square at Dahlonega. More recently the route, as laid out, has been surveyed and plotted by my brother, Theodore A. Blake, C. E. His map is drawn to a scale of 1320 feet to an inch, and represents the numerous and tortuous windings of the ditch in following the hill-sides. The length of the aqueduct is thus increased to twelve miles, although in a direct line the point of starting is not over six miles from Dahlonega.

The course of the aqueduct and its relation to the mining ground is also shown on the Map of the Gold Belt in Lumpkin Co., which accompanies this report. The principal groups of gold-bearing veins and the placers about them are indicated by the shaded portions.

As the head of water attained by the ditch is much greater than is required *at first* in washing the deposits, it might be advantageously employed in ground sluicing from the level of the ditch downwards for 90 or 100 feet, or until it reaches a point not over 90 or 100 feet above the gravel to be washed by the hose and pipe. Small reservoirs may be made in the hollows or ravines, where the water could deposit the greater part of the fine slime it would hold after being so used in the sluice.

In conclusion I desire to express my conviction, after the extended examination I have made of the tract, that with proper management success cannot fail to attend the delivery of the Yahoola water upon these placers, which are so extensive that it will require many years to exhaust them.

REPORT

UPON THE

GOLD PLACERS

IN THE VICINITY OF

DAHLONEGA, GEORGIA,

WHICH WERE REPORTED UPON BY WILLIAM P. BLAKE, ESQ.,

IN AUGUST 1858.

BY

CHARLES T. JACKSON, M. D.,

ASSAYER TO THE STATE OF MASSACHUSETTS.

REPORT OF DR. JACKSON.

To T. C. A. Dexter, Esq., Treasurer, Yahoola River and Cane Creek Hydraulic Mining Company.

In accordance with your request and instructions, I left Boston on the 8th instant, and repaired to Dahlonega, Lumpkin County, Georgia, and made a full and minute examination of the Gold Region, reported upon by Mr. Wm. P. Blake in October last.

Having, on two previous explorations of this gold region, in 1853 and 1854, made myself pretty well acquainted with the various placers or deposits of gold, and with the principal auriferous veins in that district, much of my present work consisted in a review of localities which I had previously explored, though some additional researches were made, and to a much greater extent, during my present survey.

I found that all the veins which are represented on Mr. Blake's map of the gold belt, really exist, and to the full extent described, and that they are all correctly reported, as to productiveness.

By testing with the pan, the soil and the rocks of these veins, gold was always obtained, in proportions that would pay in large operations.

The gold is found in both the slate rock and in the thin quartz veins, which alternate with the strata; also in the soil arising from the decomposition and disintegration of the slate rocks.

It is certain, that in the immediate vicinity of the veins the gold is most abundant, and that in the placers they enrich as we descend to the bed rock; but still I found it quite impossible to find any of the soil entirely free from gold, and it is my belief that not a square rod of land in the gold belt can be

found that will not give a show of gold, in a pan of earth, of three or four quarts' measure.

I had some hundreds of panfuls of the soil, from all parts of the district, and from various depths, washed by experienced hands, under my immediate direction, and found gold in every pan. Gold is therefore found generally diffused in the soil, but it is more abundant near auriferous veins, and near the bed rock, in the different mines or placers.

I examined with care, level in hand, the elevations of the different ridges and ravines, with a view to the determination of the practicability of washing for gold by means of the Yahoola ditch about to be constructed, and I find that a long and narrow ridge, called the "*back bone*," which extends from lot 793 (the Georgia Gold Co's lot) to near the Finley veins, on lot 1,048, carrying the Golihau and Britton's veins, is too high to be reached by the waters of the ditch, but the ravines on the branches of the numerous tributaries of the Chestatee and the Yahoola rivers, are reached by the water, as are all the deposit mines along the course of these rivers and their branches, and also those of Cane Creek. So also I find that the upper portion of Pigeon Roost streak, a very rich gold mine, cannot be reached by the waters of either the Chestatee or Yahoola ditches. The lower deposits, on the sides of the hills and on the numerous branches, may all be reached with a sufficient head of water, for washing out the gold. The land, not reached by the water, may be estimated at three miles in length, by from one-quarter to half a mile in width. All the rest of the belt is fully commanded by a head of water, adequate to the purpose of gold washing.

I find on consulting with Mr. Singleton, the engineer, who has levelled the whole route of the water works, that the head of the water at Dahlonega hill, will be 275 feet above the level of the river at that point. This is vastly more head than is needed for the lower ravines and branches; hence the water may in its descent be employed to drive the wheels of a mill, near the village of Dahlonega, and still the water will have abundant head for the washing operations.

I found on inquiry of numerous respectable persons familiar with the Yahoola River, that there is little danger to be apprehended of a want of water in that river in the driest seasons; the river receiving its supplies from mountain springs chiefly. At the time of my visit, the rivers were all very high,

so that I could not gauge the waters to any advantage, there being at this time almost a *freshet*.

There can be no doubt as to the practicability of the enterprise of bringing the waters of the Yahoola River to Dahlonega, for gold washing.

About one-fifth of the ditch is now made, and hands can be put on to complete the work very soon. The high trestle aqueduct is the chief difficulty to overcome. This will be 240 feet high at its highest point, and 1,000 feet in length. This work, of course, should be made strong, so as to last for many years without essential repairs.

I understand the whole work is to be taken on contract, and that it will be executed accordingly. The ditch is let out in small portions, so that there is no danger of failure of the parties to complete the work, even though it might not prove profitable to them.

I find the deposit mines are all admirably situated for the ready removal of the tailings, or earth washings, from the water-works. I know of no situations that can be compared with these in this country for the above-named purposes. The descent of the branches of all these streams is very rapid.

It is the general opinion of the people of Dahlonega, who are competent to form a reliable opinion, that the hydraulic works of the Yahoola will be successful. Several returned Californians, competent to judge, from their previous experience in such matters, are decidedly convinced of the value of this new enterprise, and look upon it as a matter of certainty that it will prove successful and highly profitable.

The Georgia Gold Company's property is commanded by the waters of this ditch, but may also be worked by a ditch from the upper waters of Cane Creek, so that they can choose between these waters.

I learned that the Georgia Gold Company are about to recommence their mining operations, which had been suspended for some time on account of financial difficulties in New York. This company will have to adopt the hydraulic system of working at their mines, and I have no doubt that large profits will be obtained, for the auriferous rocks at this location are decomposed and disintegrated to the depth of more than eighty feet, the soil so formed being very light, and like ashes when dry. It will wash away with great ease and leave the gold behind. The thin quartz layers are rich in gold, and the

rocks near them are also charged with gold, so that rich returns may be obtained by washing out these thin quartz veins.

It is said that the general average of the soil at this gold mine yields three cents per bushel, value of the gold obtained, but near the quartz veins the decomposed rock will average over ten cents per bushel, and some rich pockets are occasionally found from which much gold is obtained.

Gold is found both diffused in the soil formed from disintegrated rocks and in the rocks themselves. It is always associated with specular iron ore, Ilmenite and a little magnetic iron ore, these constituting the black sands of all the gold mines.

I have no doubt as to the origin of the gold. It was raised as a metallic emanation, with the vapor of chloride of iron, the latter changing into specular and magnetic oxides of iron, by the agency of water and heat; while the chloride of gold, mechanically brought up by the heavy chloride of iron vapor, was deposited in its metallic state. This theory is sustained by all the phenomena presented in the gold mines of the country, with the exception of the pyritiferous veins, where the gold probably was raised in combination with the materials that formed the pyrites. Copper and iron pyrites are very rarely found in the gold-belt of Dahlonega, but specular and magnetic iron ores are very abundant, from half an ounce to an ounce of it often being obtained with the gold, per pan of three or four quarts' measure.

The origin of specular and magnetic iron ores is well known, both from observations made in the craters of Vesuvius, Stromboli, and Etna, where they are seen to arise from sublimed and decomposed chloride of iron; and from laboratory experiments, by which they are easily made.

The original observations and experimental researches, on the formation of specular iron ore by sublimation, were made by Gay Lussac. The application of the same theory, to explain the origin of native gold, silver, and copper, in certain localities, is my own.

With regard to the practicability of the hydraulic method of working these gold placers, and many of the decomposed rocks for gold, I have not the slightest doubt of its being the best method of operating, and in this view all persons in Dahlonega, competent to give a reliable opinion, as before observed, coincide with me.

The want of water on the mining grounds is all that has

stood in the way of profitable workings heretofore. It was obvious, on seeing the great activity of the gold washers of Dahlonega, subsequent to the late heavy rains, which furnished a temporary supply of water, and from their general success in obtaining profitable returns while working only with a "*tom*," that the application of water by the hose will certainly give profitable returns in gold. Many old deposits that have been washed over several times before, give still from fifty to seventy-five cents. per day per hand, as the lowest yield, while in some placers not before washed, the yield per hand per day was from $5 to $10. I saw in one place, 21 dwts. of gold obtained from ninety bushels of soil, taken off from the bed-rock by Mr. Asbury, near Town Creek; and he informed me that two days before he obtained 44 dwts. from the same measure of soil. This was worked by four men—one to dig and load the earth into the cart, one to drive the team, and two to wash the earth in a "tom," a washing trough, having a sieve-like perforated iron-plate at the lower end, and a riffle-box underneath it to collect the gold. No mercury was employed, and only the coarse gold was saved.

I called upon the Recorder of Deeds at Dahlonega, and inquired of him if Drs. Van Dyke & Hamilton had recorded at his office full leases of the water of the Yahoola River, and of their lands for gold-washing, on payment of 10 per cent. royalty on the gold obtained, and was assured that such was the case, and that the records were all made, and that the whole extent of water and land required was secured by legal grants.

I rode over the principal lines of section of the proposed canal or ditch, and saw what was already done, and observed the level of all points where the canal and trestle were to be established, and noted the places which would not be commanded by the water in sufficient power for gold-washing by the hydraulic method.

I am fully satisfied that more land is commanded by these waters than can be washed in half a century, and that the numerous dry ravines and small branches of streamlets will prove very productive in gold.

As to the cost of the water-works, it seemed to me to be so very low that I could not believe it possible that they could be completed for $50,000. I therefore called for a copy of the estimate, which was given me by Dr. Hamilton, and is annexed to this report.

To my objection that the contractors might fail, the reply was, that no one person had so large a contract, as to render it probable that any failure would take place. Labor is very cheap and abundant at Dahlonega, and white men take the contracts with great readiness. No negroes were employed on these works while I was at Dahlonega.

Estimate of the Cost of the Yahoola Works, by contract.

13¼ miles of ditch, @ $3 20 per mile,	$3,800
25,000 cubic yards of cuts, @ 10 cents per yard,	2,500
150,000 feet hard lumber delivered at the different small trestles, @ $3 50 per hundred,	4,250
2,000 feet hard lumber for the big trestle, delivered @ $4,	8,000
180,000 sawed lumber for flumes, and delivered at $3,	5,400
8,000 feet plank hose, @ 50 cents per foot,	4,000
200 kegs of nails delivered,	1,000
1,000 feet leather hose,	1,700
50	450
Wages of Superintendent,	1,500
	$32,600
Works that cannot be done by contract, supposed to cost:	
Blasting,	2,000
Ropes, blocks, and tools,	1,700
Pent stock, tail races, &c.,	2,000
Day laborers on small trestles—thirty hands 150 days, @ 75 cts. per day,	3,375
Day laborers on big trestle—sixty hands 150 days, @ 75 cts. per day,	6,750
	48,425
Contingencies,	1,575
	$50,000

The Yahoola works can be constructed as estimated above.

(Signed), B. HAMILTON.

As to the high trestle aqueduct, it is possible that it may cost, (if made as substantial as it ought to be,) a little more than is estimated, and perhaps it would be safe to add 10 per cent. to the estimated cost of that work, and to give it *greater strength.* Its highest point will be 240 feet, and its length 1,000 feet, as I was informed by Judge Singleton, the surveyor of the route.

On examination of persons who are familiar with hydraulic gold-washing, I found that it is perfectly easy to prevent any poacher from stealing the gold washed out by the pipes, even when it is necessary to leave the gold on the bed

rock. It is only necessary to throw dirt upon the surface, or to cave down a bank of earth on it, which prevents all attempts at collecting the gold by any other means than that of the water power and pipes.

Some nuggets may be taken, but practical difficulties are found by the thieves, for a large nugget is sure to excite inquiry as to where it was obtained, &c., so that rogues are found out and punished or sent away from the town.

With energy, economy, and common honesty, the Dahlonega mines cannot fail to richly repay any company that shall so work them, by hydraulic means; and I look, with confidence, to the most prosperous future for Dahlonega, and to the satisfactory results for the companies.

Respectfully your obedient servant,

CHARLES T. JACKSON, M. D., *State Assayer.*

WASHINGTON, *December* 30*th*, 1858.

P.S.—The foregoing Report was made by me, in reply to a series of direct interrogatories, contained in my letter of instructions. Greater fulness and details are rendered unnecessary, since they are contained in the Report of Mr. Wm. P. Blake; my Report being as it were an endorsement of his. I would add, that all the facts which have come to my knowledge, since this Report was written, have served to corroborate the statements made in it, and to justify my original opinions.

C. T. JACKSON,

Assayer to the State of Massachusetts.

BOSTON, *Sept.* 17*th*, 1859.

LETTER

UPON THE

MINING DISTRICT ABOUT DAHLONEGA.

BY

JOHN H. BLAKE, ESQ., OF BOSTON.

DAHLONEGA, GA., May 17, 1859.

T. C. A. DEXTER, ESQ.:

DEAR SIR:—From personal observation, I have now the satisfaction of being able to verify all the statements made by Dr. Van Dyke, during his recent visit to Boston, concerning the territory in this place and vicinity in which you are interested, as also those contained in the printed report of the "Gold Placers of Dahlonega., Ga.," by Prof. Wm. P. Blake, and the subsequent report made to yourself and associates by Dr. Charles T. Jackson. I coincide in the opinion expressed by these gentlemen, that the richest portion of the gold belt of the country lies in the northern part of Georgia, embracing the section of the country described in their reports.

The rock in which the gold-bearing quartz veins occur is in place, though so far decomposed as to crumble by pressure of the hand—when dry it falls to powder, and can be almost as readily washed away by a stream of water from a hose directed upon it as ashes. It is needless to add, that it is in a condition peculiarly adapted for the application of the "hydraulic hose" method of working for gold which has of late years proved so successful in California;* but this is

* By the California State Register, published in 1857, it appears that returns were made of two hundred and fifty-eight canals for conveying water into the gold district, varying in cost from four hundred dollars, to six hundred thousand dollars, and amounting in the aggregate cost to many millions of dollars.

not all in connection, for the country is so broken,—so made up by hills and ravines, that very extensive excavations may be made and an incalculable amount of material removed, and carried out of the way, leaving deposited, upon the hard bed rock, the gold disseminated through it, with little more manual labor than that required to direct the stream from the hose pipe. I cannot conceive of a country better adapted to the new mode of working, which it is proposed to employ, than this.

Numerous auriferous quartz veins will, by this process, be exposed to view without manual labor or increased cost, and it is the opinion of many residents here, familiar with the country, among whom are many "returned Californians," and experienced gold miners, that these veins will prove more productive, in their yield of gold, than the washings. To extract the gold from these veins they will require to be reduced to powder, for which purpose very simple machinery only is needed, and nearly all the parts of it can be made upon the spot where it is designed to be used. The power may be obtained from the water of the Yahoola River, conveyed by the canal now in process of construction, during the night, or at such times as it is not required for the use of the hose. As regards representations which have been made, of the abundance of gold in this section of country, I am well satisfied of their truthfulness, from my own examinations and observation. But our opinion on this subject prevails here, and many years' experience has shown that day wages can be earned by the slow process of panning; and that, not unfrequently, the fortunate adventurer has "*made his pile*," and gone away satisfied. Since the time of the occupancy of this part of Georgia, (known as the Cherokee country,) by the Cherokee tribe of Indians, it has been worked for gold by the inhabitants, and by numerous adventurers from other States, in a rude way—each man for himself, digging his hole where or near to where he could obtain water sufficient for panning, and trusting to luck and industry for success. No systematic mining has yet been done here, and no one knows, or can form a reasonable conjecture, as to the value of the gold which has been obtained, it being for the interest of those very properly termed "swindle miners," to keep to themselves what they obtained, in order to avoid rendering a royalty or percentage of their gains to the owners of the soil. It is,

however, well known that by the crude methods of working hitherto used, over sixteen millions ($16,000,000) of dollars in value of the precious metal has been obtained.

When we consider the hundreds of tons of gravel, sand, and decomposed rock to which I have alluded, that can be removed by a single hose in a day, if applied at the base of a hill and within a ravine, I confess I am sanguine as to the results to be obtained by turning the waters of the thriftless Yahoola into the virgin hills, and directing it through fifty-six inch hose under a pressure of from fifty to two hundred and fifty feet head, in despite of my determination when I came here not to be so.

I have had opportunity, since I have been here, to converse with many gold miners, who went from this place to California, at the time of the discovery of gold in that country, and also many well-informed residents of this part of the State, and all concur in opinion, as regards the statements made in the Reports before referred to, so far as regards the abundance of gold in the territory controlled by the water to be conveyed through your canal, and the adaptation of the territory for the purposes for which the canal is designed.

I have not heard a doubt expressed, by any one, as regards the profitable results which are expected to accrue from the enterprises of conducting the water of the Yahoola, and other rivers within the gold belt, and making them substitutes for bone and muscle, picks, shovels, and wheelbarrows, pans, long-toms and rockers. I may add also, for it is a subject of no small importance as connected with the enterprise of yourself and associates, that a very friendly feeling exists among the inhabitants of this district toward the undertaking in which you are engaged, and a disposition to render such aid as is in their power. This, it is true, is no more than right, and was to be expected, inasmuch as the whole country is deriving benefit from the capital distributed, and will continue to derive benefit, proportionate with the degree of success attendant upon the work. It is, however, satisfactory to know that the undertaking in which you are engaged is rightly appreciated.

It is not my intention to convey the idea, that the interest felt is confined to the inhabitants of this town or country; on the contrary, the successful working of the "hydraulic hose" method is looked forward to with much interest

by many others, for it will lead to similar enterprises, which cannot fail to be of benefit to the whole State.

I have spoken of the millions of dollars in value of the gold which has been coined from the workings in this vicinity: —the holes and piles of sand and gravel which have been moved in obtaining all the gold which has been obtained, are insignificant when compared with the whole of the undisturbed territory upon which the waters of the Yahoola Canal are designed to operate.

It has not been my intention, in writing this letter, to enter into any details of description, or do any thing more than confirm the statements which have been heretofore made. I trust I have not been so unguarded in my remarks as to lead you, or any one else, to suppose that, when the canal is completed, gold is to flow in upon you without further thought or care, as seems to have been the case with some who have commenced similar enterprises. The truth is, when the canal is completed, now under contract and in good hands, your work really begins, and unless conducted with good judgment and energy, and with that constant care which every branch of business worth pursuing requires, the waters of the rivers you are now making to swerve from their course, might as well flow on, for centuries longer, in their natural beds. The want of success attending very many mining undertakings in our country, may be traced to too sanguine expectations in the outset on the part of those engaging in them, resulting in lavish and careless expenditures for useless labor and machinery, and final discouragement and abandonment—often, too, at a time when their wasted capital and energy only was needed to lead to success. Evidences of the truth of this remark are to be found in every mining district, Dahlonega not excepted, as is to be seen in the costly but useless machinery scattered over the ground, and left to rust and decay.

The water of the Yahoola River is more than sufficient to supply the Yahoola Canal at the present time, and I am assured by those who have been many years residents of Dahlonega, that it is about as low now as they have ever known it to be. Should it ever be found necessary, a dam, several feet high, may be constructed across the river, below where it enters the canal, at little cost. The banks of the river are here abrupt and high, and no damage would result from back flowage, admitting the water to accumulate during the night.

The canal, so far as it is completed, is a permanent structure. The earth through which it is excavated, is a compact sandy clay, sufficiently tenacious to admit of the banks standing nearly vertical. There will be no waste of water by leakage. The country is heavily timbered with oak and pine, affording all the lumber required for trestles and flumes. A large quantity of timber has already been gotten out for these purposes. Two saw-mills, with upright saws, are now at work, preparing braces and plank required for the flumes; and a third, a circular saw-mill, will be at work by the time this letter reaches you.

As regards labor, there is no difficulty here in obtaining it. Dr. Van Dyke employs only white labor in constructing the canal. His day-laborers receive sixty-two and a half cents per day, without board, or fifty cents and board per day.

The face of the country is not unlike that of western Massachusetts. The soil is fertile and the climate healthful. No disease is peculiar to the country, and, so far as health is concerned, a New Englander may as safely venture here in summer as to go from his home to any of the New England States.

Very truly yours,

JOHN H. BLAKE.

SYNOPSIS

OF

SURVEY FOR YAHOOLA AQUEDUCT.

LETTER FROM MR. SINGLETON.

DAHLONEGA, *Dec.* 1*st*, 1858.

Dr. M. H. VAN DYKE,

DEAR SIR:—Attached is a synopsis of the survey which I have just completed for the Yahoola Canal. This synopsis, you will find, represents the length and relative positions of the ditchings, trestles, flumes and cuts, as they occur along the line of the canal. The canal taps the Yahoola River about one-fourth of a mile above Woody's mill, at the top of a waterfall, some six or seven feet high. This waterfall secures the entrance to the canal against all liability to injury from freshets, as a wide and rapid passage is afforded at this point for the surplus water.

I have graded the canal to the south end of the high trestle across Yahoola River, about one-fourth of a mile above Wimpey's mill. The whole distance, as far as graded, is twelve miles and two hundred and eighty-eight rods. I levelled from the above-mentioned trestle to Dahlonega, the present terminus of the canal, and found the distance to be one and three-fourth miles. The entire length of canal when completed to Dahlonega, will be fourteen miles and two hundred and eight rods. The water in the canal will be three feet above the public square in Dahlonega.

As directed by you, I gave the ditching upon the canal an inclination or fall of four feet to the mile. The trestles, flumes, cuts, and acute angles in the canal have eight feet fall per mile. The first one hundred feet below each trestle, flume, and cut, has eight feet fall per mile. I have given the high

trestle across the Yahoola, on account of its great height, and the immense pressure upon the trestle-work, ten feet fall to the mile. This will cause the water to pass more rapidly and in smaller volume.

The average fall or inclination per mile is four feet eleven and one-half inches.

The soil over which the canal passes is favorable both for excavation and for conveying water, being mostly clay, with occasional outcrops of mica slate.

Respectfully,

J. J. SINGLETON, Civ. Engr.

SYNOPSIS OF SURVEY FOR YAHOOLA CANAL.

Ditching.	*Trestles.*	*Flumes.*	*Cuts.*	*Remarks.*
		100 ft.		
			360 ft.	Greatest depth, 6′ 5″
1080 ft.				
		360 "		
140 "				
	180 ft.			
3820 "				
	100 "			
850 "				
			1179 "	At Gonge's, greatest depth 36′ 9½″
1260 "				
	480 "			
520 "				
		160 "		
200 "				
	140 "			
4420 "				
			93 "	9′ 10¼″ deep.
10,000 "				
	410 "			
8100 "				
			240 "	33′ 10″ deep.
5540 "				
	3800 "			Highest point, 66′ 7½″
14,720 "				
	80 "			
8300 "				
	1480 "			Across Yahoola, 238′ high.
58,950 "	6670 "	620 "	1872 "	TOTALS.

J. J. SINGLETON, Civ. Engr.

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ILLUSTRATIONS.