GEORGIA GOLD MINES

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ESSAY

ON THE

GEORGIA GOLD MINES.

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Of Augusta Geo

INTRODUCTION.

In attempting an essay on this subject, in which it is intended to convey an accurate idea of the gold mines, the author is fully aware of the difficulties he has to encounter, and approaches the subject with great diffidence, under a conviction of his inability to do it the justice it merits. If apology, under such circumstances, be necessary, it will be found in the necessity of inviting the attention of the scientific and experienced, to the development of this important branch of our domestic industry. The simple fact that all the mines of the state, have their business conducted without the aid of the experience of older mining countries, would induce a belief that an association which would promote an interchange of ideas, and a diffusion of such useful knowledge as could be obtained by sending a competent person to examine the mining business of other countries, would have a most salutary effect. Should the following remarks result in the desired improvement or induce more competent persons to take up the enquiry and aid in improving the mining industry of Georgia, the author will be amply rewarded, for the time devoted to this essay.

In accordance with recent approved geological arrangements, the deposit or branch mines will be first considered, and then the vein or ridge mines. The process of separating the gold from the ore, will also be attended to. A description of the Shelton mine is added with a drawing of the lot.

Deposit or Branch Mines.

That the deposits of which we are to write, owe their origin to the mechanical agency of water, there can be no doubt; but there are persons who believe that the agent producing them, has acted suddenly and that these immense beds of gravel have been collected together at one and the same time. If they reflect, however, they will discover reasons to modify their opinions, and adopt a more plausible and perhaps correct theory. The geological character of this part of the country, is denominated *primitive* according to Eaton, *primary* by Bakewell, and *inferior stratified* or *non-fosilliferous* by De la Beche. I have generally applied the word *original*, to distinguish these rocks from the others. They are gneiss, mica and talcose slate, hornblende and granite; the predominating rock being the first named and alternating, in strata of various thickness, from three inches to thirty feet. The gneiss occurs, indurated, more frequently, however, in a state of decomposition, but still occupying its original position. When indurated, it formes the skeletons or bases of the ridges, while the decomposed portion, yielding readily to the action of water, is washed away leaving vallies. On this irregular surface, rest the deposits, consisting of rounded or "rolled" and angular fragments of quartz, gneiss, hornblende, &c. with smaller fragments of cyanite, garnets, catseye, jasper, pyrites, and brown oxide of iron, which often cements them all together, and causes them to appear as if burned without heat. Owing chiefly to the extensive range of the garnets, it is only in the river deposit, that they occur in abundance. The gravel of the branches, had evidently resulted from the disintegration of the rock in their neighborhood. In this gravel, as it is called, which varies from one foot to four feet in depth, the gold is found, and generally at the bottom of the bed. Above the gravel there is a bed of sand, with scales of mica, varying from three to twenty feet deep, on a bed of clay with angular fragments of quartz, from 0 to five feet deep. The fragments of rock forming this gravel, have the "*rolled*" appearance, according generally, with the size of the stream of water adjacent to the deposit. This shews, at once, that the agent producing these deposits, has acted slowly, and when we remember that caloric, electricity, air, water, &c. have been at work chemically and mechanically, for at least six thousand years, we cannot be surprised that the hardest of the rocks, have in the course of ages, yielded to the incessant action to which they have been subjected. Over this irregular surface the rivers, when urged by a freshet, rush with inconceivable fury, and they then have a transporting power, sufficient to carry large blocks over rocky shoals, and to deposit them (where an eddy is caused by a sudden bend in the river) in places far below their former location. These eddies, having but a small transporting power, soon permit an accumulation of rocks, sand, &c.

and by protecting the strata beneath, they frequently produce other phenomena in the directions and levels of the stream.

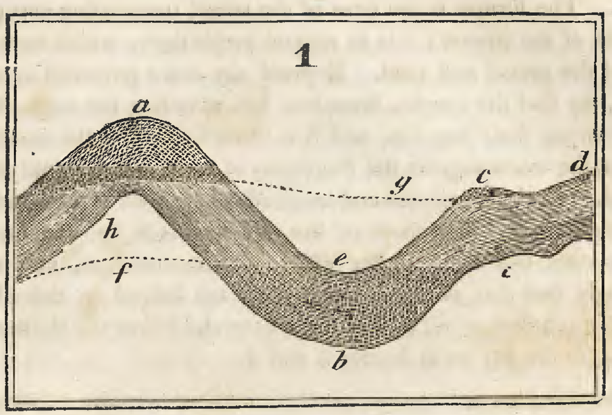
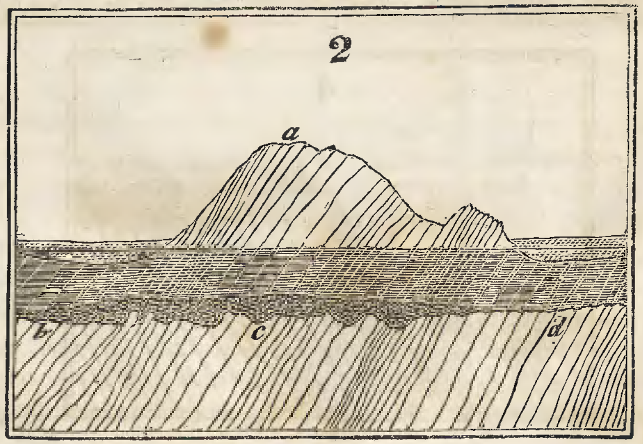
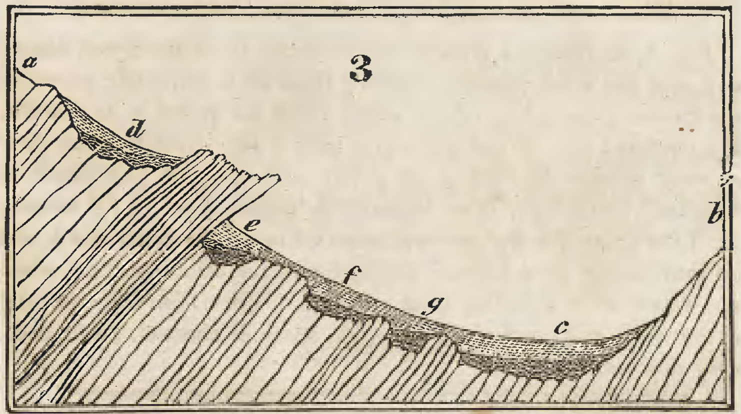
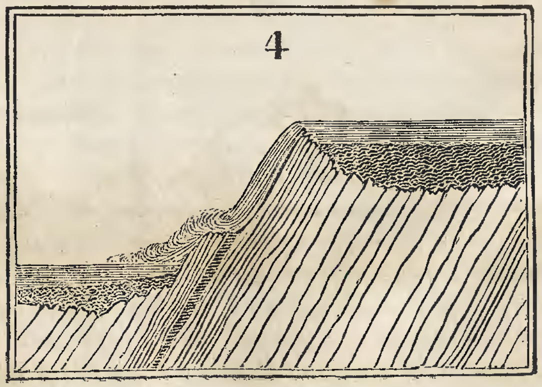


Fig. 1, represents a portion of a river, or (on a horizontal plane) *a*, *b*, *c*, *d* and *e* are deposits, resulting from the transporting power of the currents, caused by eddies which arrest the gravel in its descent. It is observed that all water courses, have a disposition to make their channel straight by cutting off points and filling up the bends or "bights," which latter is an indisputable consequence to the former; for if the points *f* and *g* are ever worn off to *h i*, the deposits *a b*, will be formed and soon become covered by sand, &c. deposited, when the waters were subsiding from a freshet. Vegetation will encroach as the water will require only a certain width of channel, for its ordinary descent.



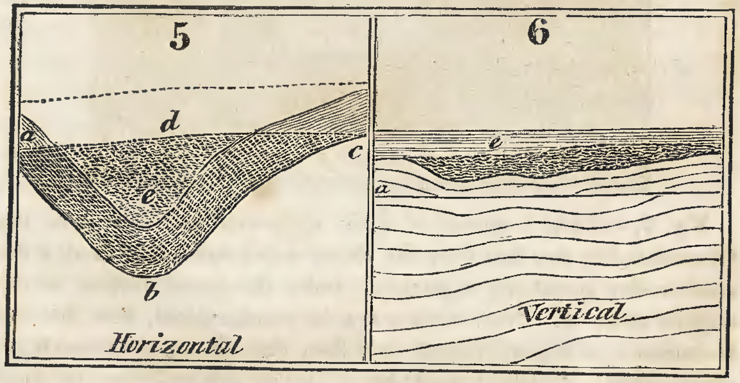
In Fig. 2, the manner in which shoal deposits are formed is exhibited; *a* is a stratum of indurated gneiss, and *b*, *b*, are decomposed strata. The former is the base of the ridge, terminating abruptly on the side of the stream; *c* is its ragged projections, which have intercepted the gravel and gold. Beyond the more powerful agency of rivers, we find the creeks, branches, &c. abrading the original strata and forming their deposits, and it is remarkable that the smaller the stream, the more angular the fragments of rock, and the gold is more ragged. As the transverse and longitudinal sections of these branches are more various than those of the rivers, it is to be expected that the deposits will occur under different circumstances, and we accordingly find that in some places they are lodged on the edges of strata, in others they fill up hollows, above and below which, the strata run out to the day as in figures 3 and 4.





It is easy to conceive that such substances as may be moved by any of the disintegrating agents at *a* and *b*, would descend towards *c*, and that *d e* and *f* would intercept a part of them. The greatest accumulation, however, would be at *c*, as the side *b* may have no receptacles as that of *a* has, owing to the face of the strata resisting the agent better than that of the latter, which also may be more decomposed and easily so abraded as to form receptacles and undermine veins at *a*.

The gravel in these branch deposits, is composed of fragments of quartz and such other rocks as occur in the immediate vicinity and over it there is generally a bed of clay from one to five feet deep, in which there are fragments of quartz with sharp angles. Besides the deposits on rivers and branches, which have unequivocally resulted from their mechanical agency, there are others, at present above the levels of the streams in the neighborhood. Their extent and the fact that the gravel is frequently very much rounded, seem clearly to indicate a *force* at least equal to that producing similar effects on the Chestalee, but being covered with *red clay* like that over the branch deposits, we are thus prevented from attributing the effect to its agency. If it were necessary to account for their formation by the river, then we may suppose that the following process was pursued.



Any stream having a bend as in Fig. 5, may abrade its banks *a b c*, until it becomes nearly straight, making deposits similar to *a* Fig. 6; and when it has attained the direction *a d c*, the greatest abrading action of the water, will be on the bottom near the middle of the river, and thus it will be cut deeper, leaving the deposits *e e* high and dry. The very reverse of this may happen, for the nature of the strata in the direction of *a d c*, may admit of abrasion towards *b* and not in any other, and consequently the river encroaches on *b*, with the same result as before, leaving *e e* high and dry, to receive a growth of vegetation. I am of opinion however, that these deposits and many on the branches, are of a date anterior to those previously noticed, on which the stratum of sand occurs. I rely chiefly on the evidence of the following facts already stated, that the sand contains scales of mica, and varies in depth from three to twenty feet; that it contains also, vegetable remains in a layer of black or bluish mud or clay, of a yellowish color, resting on the gravel and running into the sand above. The remains are in a state of decomposition, but sufficiently preserved to indicate the same botanical characters, exhibited on the vegetation of the present banks.

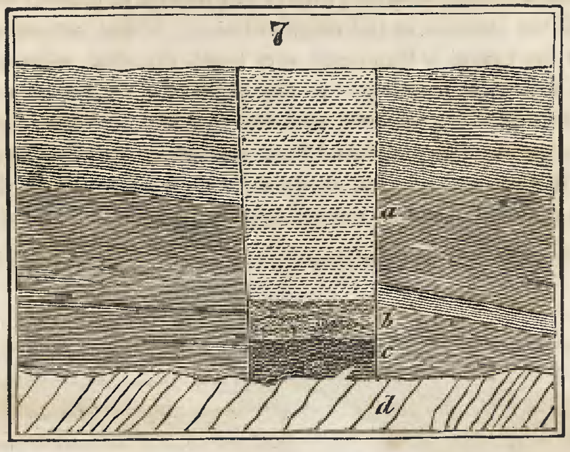
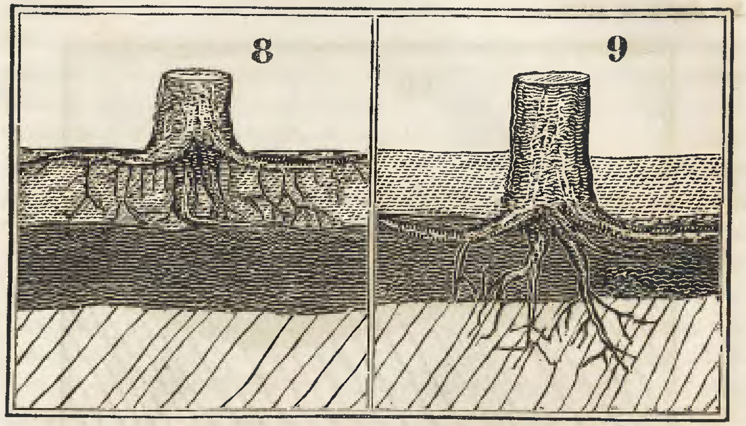


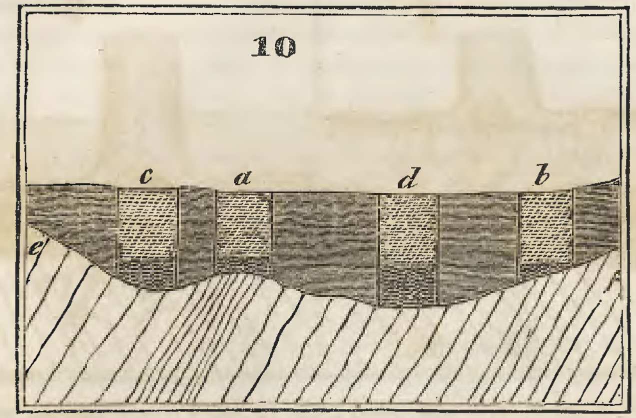
Fig. 7, exhibits a section of a pit, excavated on the bank of the Chestalee, fifty five feet from the river; *a* is a stratum of sand, *b* the mud or clay containing vegetables, and *c* the gravel resting on the original strata *d*. Now nothing can be more evident, than that this formation is of a more recent date than those in which no such remains occur. In fact it would seem that on this evidence, we must place the date of the latter, anterior to all vegetation. The clay and sand are now supporting a luxuriant growth of forest timber, of the same age as that on the mountains, and in excavating it is found that their roots penetrate only to the gravel and then spread; very rarely, however, passing through it, except in situations where the gravel runs out to the day. If vegetation existed anterior to these deposits,

it would be reasonably expected, that we should discover its remains, unless we admit the very sudden action of the agent, such as the rush of a great deluge, sweeping away the forests to some basin in which they will be converted into coal.



Figs. 8 and 9, represent, what under ordinary circumstances, would be the present and past position of the roots of forest trees. In the first instance, the growth is maintained by the sand or clay, but in the latter, by the original strata and gravel. From this description of deposits, it will be easy to recognise them wherever they occur. In testing lots, however, there are indications to be observed externally, by which we endeavor to form a correct outline of the original strata, independently of what appears at the surface. Experience is the only instructor on this point, and of course, the inexperienced must resort to the more certain criteria, furnished by the pickaxe and spade.

Fig. 10, shows how this is to be effected; *a* and *b* would be very discouraging excavations, but if we observe the directions in which the inclination of the bottoms of the pits run, we should be led to make excavations at *c* and *d*, which as they are in hollows of the outline, are receptacles to sustain whatever gold may occur in the deposit; *e* and *f*, are the extremities of the original outline before alluded to. The indications by the outline and bottom of the pits, are the best we are acquainted with, and ought to be closely examined. It may, sometimes occur, that deposits, similar to that described by Fig. 3, have been overlooked or abandoned, while that at *a* is worked out; but, before the works are entirely forsaken, they ought to be examined, particularly to ascertain that no such deposits as *d e f* exist on the sides of the ridges. The working of the rich Shelton Mine, in Habersham, was suspended during the inclement winter of 1831, while on a second deposit as *g* which yielded large particle of gold weighing 20 dwts. or more.

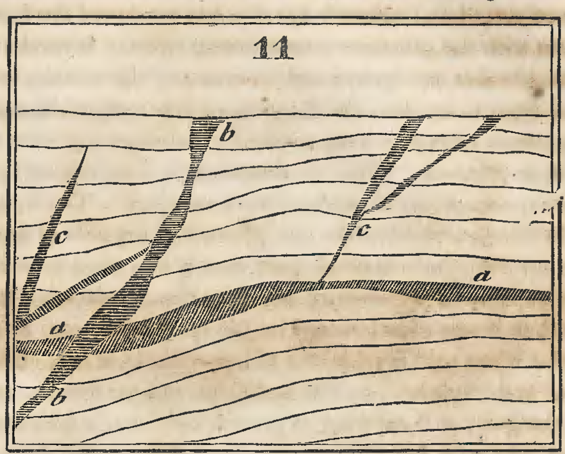


The surface mines are considered to be disintegrated veins, scarcely removed from their original position, and are not included in the list of deposits. They may be known by the quartz having very sharp angles.

The vein or ridge mines, now claim our attention. The veins traverse the original strata in various directions, and the phenomena attending them, do not clearly indicate the origin of their formation. It is remarked, that the general direction of the strata, is a little to the east and west of north and south, say NNE. N. and SSW. S; and as these strata are confusedly or rather imperfectly crystalline, it follows, that besides the direction already given, the veins may take another depending on the angle peculiar to the crystalline structure of the rock. The crystals appear to be rhomboids, but are only distinctly so in the neighborhood of veins.

Fig. 11, is the plan of a vein traversing the strata, as *b b*, and a vein in the direction of the strata, as *d d; c c* are called leaders. These veins are formed of quartz of different characters, varying generally with the original rock in which it is found; it is sometimes crystallized in beautiful transparent six sided prisms, terminated by a pyramid at one end and attached at the other to other crystals, or more frequently to a nucleus of felspar, &c. In some of the veins, the quartz is compact, with a slightly conchoidal fracture, and an appearance which at

the mines in this variety, acquires for it the name of horn flint. The structure is frequently granular and slaty in the same specimen; there



are plates of talc interposed between the layers, and the gold occupies the same situation. The crystals of quartz are sometimes radiated from a nucleus. These various kinds of quartz are the gangues or matrices in which the gold is found, and besides gold, they contain iron pyrites in cubic and pseudomorphous crystals, filling irregular cavities, purple oxide of iron, ("Indian paint,") brown oxide of iron, sulphur, &c.

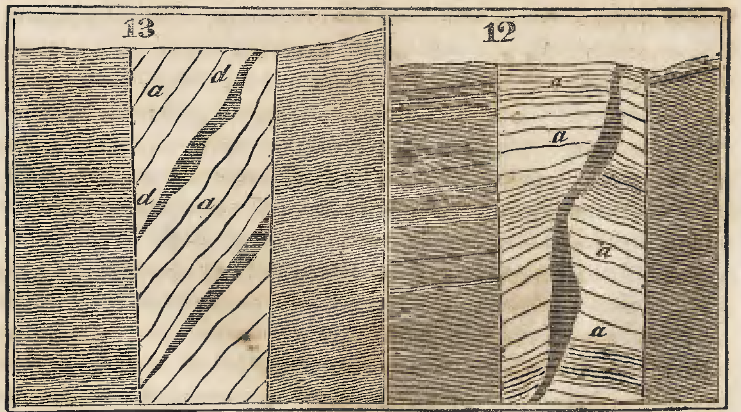


Fig. 12, is a vertical *section of a vein*, traversing strata *a a a a* which have obviously been disturbed, as they do not correspond with those on the other side of the vein.

Fig. 13, is another vertical *section crossing the strata* and exhibiting the vein *d d d* of Fig. 11; *a a a* are the strata and *b b* the veins.

If it is admitted that volcanic agency, has produced the fissures and filled them with the substances constituting veins. It would then appear probable that the quartz and elements of the metals, have been projected from below into the fissures, and that while the caloric was radiating, these elements were set free to combine and form the metals and their gangues. This idea appears well supported by various phenomena, concurring to produce such an effect. The interposition of gold in thin leaves between the plates and crystals of quartz, and its filling up irregular cavities, show that it was once in such a state as to be capable of insinuating itself into such places. It appears possible that it was disseminated in the quartz by heat, as it is well known that when gold is subjected to intense heat, it flies off in minute particles, and such heat as was sufficient to fuse quartz, may have evolved the gold, or if contrary to present opinions, it be a compound, may have formed it from its elements. "If we could detect nature in the act" of making gold, "it would be easy to imitate her," but as we do not find it in any other state than pure, or alloyed with some other metal and never half formed, we despair of ever discovering the "philosopher's stone." There may be something in the discovery, that quartz is an ore of silicium, and that quartz is, in this country, invariably the gangue or matrix of gold, but in the present state of chemical knowledge, we cannot satisfactorily account for the fact of their being found in such close alliance.

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Fig. 14, is intended to represent the earth *a a a a*, the strata *b*, a subterranean cavity in which (according to the original suggestion of

Sir H. Davy, since extended and modified by others,) some very combustible substance, as potassium, sodium, or calcium, or some substance powerfully attracting water, as *quick lime*, may predominate and to which water may have percolated, or more probably have penetrated, in consequence of the hydrostatic pressure of the ocean; in either case it would happen, that a violent eruption must take place, attended with all the phenomena of earthquakes and volcanoes; should the exploding gas have sufficient force and meet with quartz in fusion near the fissures, it would of course, force it into them, filling them more or less, according to the supply of quartz, and the projecting force of the gas. The location of these supposed fires, seems to be in a subterranean region, abounding with quartz and the materials of granite, as they are the most frequent of the substances filling veins. The granite contains the following metals, or substances having metallic bases, sulphuret of molybdenum, lead, zinc, and copper; sulphate of lead and of barytes; magnetic iron and plumbago. I am not aware, however, that the granites of Georgia, contain any of these metals. It is a question of importance to the miner, how far when working a vein, he should go with his excavations. I know of no rule that would apply generally, for although mines have been wrought in Chili and Peru, to the depth of nine hundred feet, yet as we have no such description of the geological formations of those countries as would answer the purpose of the miners, we are compelled to suspend the exercise of our judgment, until we know that analogous or equivalent circumstances, exist in the geological character of those countries, and of this. Gold is said to occur in "vast quantities," at the depths, mentioned above. I think it advisable, in experimental excavations, to follow the vein as long as we can perceive a trace, or until we arrive at such depth, that it could not, though tolerably rich be profitably worked. It is usual with us, to sink a shaft on the vein and assay the quartz as we descend, and as soon as we arrive at a rich place, to commence tunneling* and separating the gold. It would, however, more surely lead to the attainment of the knowledge so much needed, if the former course were pursued, and the tunnel delayed until we were satisfied, that we had gone as deep as is required. It is probable that rich mines are, every day, abandoned, in consequence of disappointments in shafts of twenty, thirty,

* I use the word tunnel, although the miner would probably express the same idea by the term "gallery," as in Jacob's Inquiry.

or forty feet. In working a shaft, in the decomposing rocks, or in clay, it will be requisite to curb them in a substantial manner with wood, as the work is sufficiently laborious and discouraging, without adding the risk of life. The roof of a tunnel should be stanchioned as the workmen proceed, and the number of stanchions, will depend on the consistency of the rock in which the excavation is made, and are never to be omitted, although it be in granite, for there are so many fissures in these rocks, that there is always danger to be avoided, by using the precautionary measures, adopted for those of a worse appearance.

Fig. 15, exhibits a method of stanchioning a tunnel, recommended

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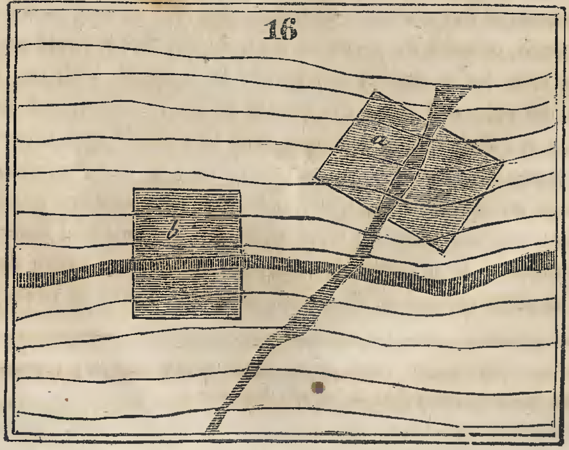

by its simplicity and economy of timber. Seven feet square is a good size for a shaft, in which it is intended to work two buckets by hand, although five feet will admit the free use of the tools, &c. without the buckets. Two of the sides of a shaft, should be in the same direction with the vein, and the other two crossing it, as exhibited in Fig. 16. It is not always requisite to commence a shaft on the vein at the surface, for if it dips much, it will soon run out as in Fig. 13. In such a case, it may be advisable, to begin so near to one side of the vein, that it may come into the shaft at any given depth. A vein may occur so near the side of a ridge, that it would be an advantage to drive a tunnel into the side as at Fig. 17.

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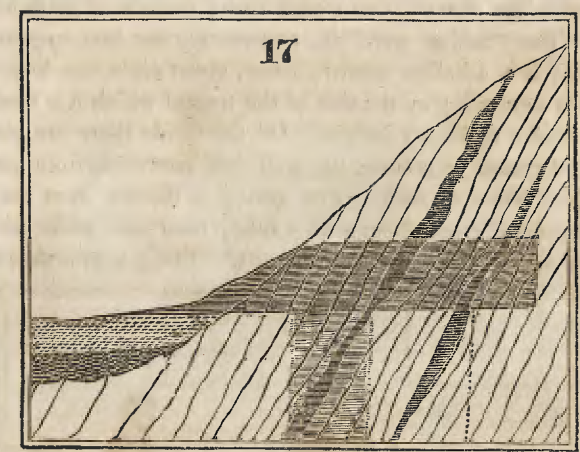
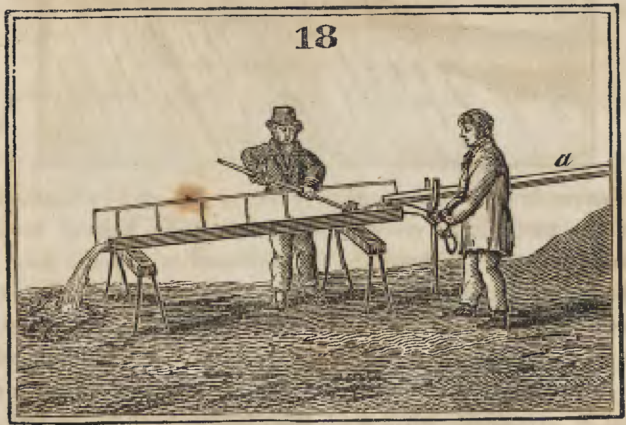


By this method, the chippings may be carried off in wheelbarrows, or even in carts, more conveniently, than when hoisted vertically the same distance. It should be remembered to give the floor sufficient inclination, to carry off whatever water may come into the workings. A tunnel of this kind is often necessary for the purpose above, but by commencing operations in this way, so much may ultimately be saved. An improved excavator waggon, working on railways, could be used to advantage, when a situation occurs of the kind just mentioned.

Separating Process.

There are two properties of gold of which we may take advantage, in separating it from the ore in which it is found. These are its superior gravity and facility of amalgamation with mercury, and its resistance to the action of antimony and heat; and the acids cannot aid, except in refining it from alloy with other metals, by a process called "parting." All machines for separating, must be adapted to one or the other of the former properties; they are therefore denominated gravitating and amalgamating machines. The most simple process is called "panning out," and is performed on the gravitating principle. A tin or other pan, entirely free from grease, about fourteen inches diameter, and two inches and a half deep, is filled with the auriferous gravel and taken to a branch or other stream, and the same is washed by stirring it and by inclining the pan, until the lighter substances are carried off, leaving the gold and a fine black ferruginous sand at the bottom. This is a very tedious process, but a person expert in the practice can secure every particle of gold, however minute. The "hollow gum" is, apparently, the first improvement in the pan; it is a hollow semi-cylinder, about eight feet long and of a diameter depending on the size of the tree of which it is made, say of from twelve to twenty inches. On the inside there are cleats or riffles fitted close, to prevent the gold they intercept, from passing; they project about an inch. The gravel is thrown in at the upper end, and there stirred about with a rake, until the water from the conductor *a*, Fig. 18, washes off the dirt. The gravel is thus thrown off, and a new supply put in to be acted on as before. When the work for the time is done, the contents of the gum are put into the pan, and the garnets, ferruginous sand, &c. washed off, thus completing the process. I should have mentioned that the gum was kept rocking by a man at the lever, as represented in the figure. Compared with the pan, there can be no doubt that the gum saves labor, but it, as certainly, in careless hands, increases the risk of not saving the gold.

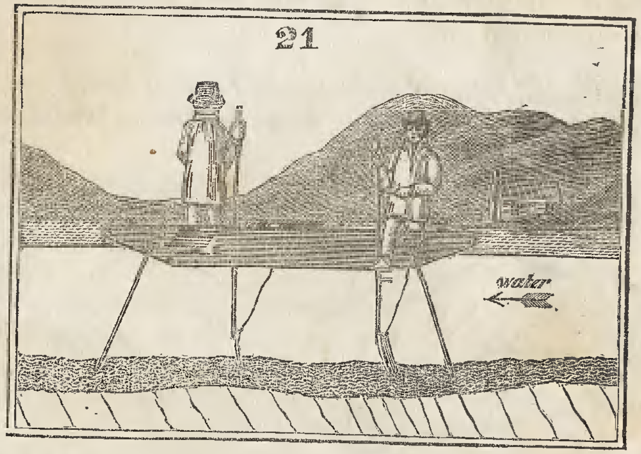


At Fig. 19, we have represented another machine. It consist of an inclined plane and box *c*, with bars across. Half of the plane at the upper end is solid and lined with stout sheet iron; auriferous gravel is there manipulated by a man and rake, and when sufficiently done, it is allowed to descend to the lower end of the plane, which is perforated and the gold, &c. thus passes into the box *c*, while the gravel is thrown out at *d*. If this machine is cleared, two or three times a day, it answers very well, but when neglected and the bars get filled up and clogged, it loses the light particles; the process is closed with the pans in this machine, like the former.

Fig. 20, appears to be an attempt to improve the gum by adding the inclined plane; *a* is a rectangular drawer instead of the gum or box *c* in the preceding figure, which is furnished with cleats, &c.; the water is distributed over the whole plane and the working is aided by the spring laths *b* on each side. This cannot be called an improvement as it is liable to all the objections which apply to the pan-gum or inclined plane, but especially to another which is the shape of the drawer, causing the water to act very forcibly in passing from one side to the other, and thus increasing the probability of the fine particles being carried off with it. The other machines in common use, are mere modifications of those already described. For those patented, the "Journal of the Franklin Institute" may be consulted. An arrangement tried by the author, is intended to unite the amalgamating to the gravitating process; it is used when the assay has shewn that mercury will be required to collect the minute particles. It is applied in the following manner. The preparatory washing of the gravel is to be effected in a revolving iron cylinder, similar to a bolter, which will also cause a separation of the large gravel to be discharged at the lower end. The gold and finer fragments of rock, garnets, &c. that have passed through the perforations of the cylinder, are to be swept over a perforated plane, the perforations being of such size as as to allow the largest particles of gold to pass through into rockers, on the principal of the "gum" but hinged by the edge instead of being hung on gudgeons at the centre. The machine, thus far, is capable of securing every particle having any appreciable gravity, but if there are as many minute particles as will pay the expense of saving, I then add the amalgamator, which receives the washings from the rockers and triturates them with the mercury.* There are not many deposit mines requiring the aid of mercury, and when used with the pulverized gangue of the veins or ridge mines, the process is some what different; heat, salt, or acid is then introduced with the ore, and a limited measure of water. The Mexican method is given in the Journal before alluded to. A mill for pulverizing, and a furnace for heating the quartz, are necessary to the vein mines.

* The drawings are in the patent office, although the machine is not patented, but will be as soon as opportunity offers.

Fig. 21, is a representation of the process by which gravel is obtained by boats from the beds of the rivers. A man forces his shovel into the gravel near one end of the boat, and when he thinks he has it deep enough walks to the other end, bearing down the handle, and thus loosening the gravel so that it may be hoisted into the boat by an assistant, who also works a shovel on the other side. In this way a boat and two men make five loads per diem. I have known a load to yield 6 dwts. although the average is much less.



Shelton's Gold Mine.—This mine is on the waters of the Soquee a branch of the Chattahoochie river, and with ranges of lots in the fifteenth district, forms the dividing ridge between the Soquee and Tallulah, a branch of the Savannah river. The Oaky mountain is to the north of 35 about a mile, and from the top of it Clarksville can be distinctly seen; it is probably the highest peak in this ridge, as there are no others intercepting a view of the Apalachian terminating ridges. The large branch running through 35, terminates at the base of the Oaky mountains, and is supplied by the springs that issue from it and the neighboring elevations. The surface of the lot is very uneven, as may be seen on inspecting the sections attached to the plan. One corner of the lot appeared to be eight hundred feet above the level of the branch. The geological arrangement of the rocks is not ascertained. Gneiss predominates; there are strata of mica and talcose rocks, and fragments of quartz are abundantly scattered over the surface, indicating veins. The bottom described by the dotted lines, is alluvial and fit for cultivation; on the smaller branches, tolerable patches could be obtained, especially on No. 2. The branches 1, 2, and 3, are always wet and afford sufficient water to wash out the gold; the main branch could easily be made to work machinery for that purpose; all the other branches are dry, except in rainy weather, or after a wet season.

The great deposit of gold, was found on No. 1 and is supposed to have been disintegrated from veins on the adjacent ridge. No. 2 affords some beautiful and rich specimens, and I am told is considered fully as valuable as No. 1 although it has not been worked, except in some experimental pits.

Plan and sections of lot 35 in the eleventh district of Habersham, Geo. on which is the celebrated mine, known as Shelton's Gold Mine.

A, Stone ciphern road to Clarkesville.—B, John Fruc.—C, Watson's House.—D, This space between the dotted lines, fit for cultivation.