Characteristics of Gold, and the Manner of Distinguishing it when Found.

Gold *invariably* exhibits something of the peculiar yellow color which it is known to possess in a pure state; but this color is modified by various metals with which it may be mixed. Thus it may be described as having various shades of gold-yellow; occasionally approaching silver-white, occasionally resembling brass-yellow of every degree of intensity, and even verging on steel-gray in some specimens from South America.

The lustre of gold is highly metallic and shining, and owing to the small amount of oxydation at its surface, it preserves its shining lustre even after long exposure in contact with other substances. Thus the shining particles are often seen in sand when the quantity is barely sufficient to repay the cost of working, notwithstanding the value of the metal. Even however, if the surface is dull the true color and appearance are easily restored by rubbing, and when polished it takes a very vivid lustre, which is preserved for a long time in the atmosphere.

Native gold seems with some slight modifications to agree with the geological relations of its varieties; yet any mode of arrangement deserves little serious notice. The gold-yellow varieties comprise the specimens of the highest gold-yellow colors, though there are some among them which have rather a pale color; they include most of the crystals and of the imitative shapes, in fact the greater part of the species itself. The brass-yellow native gold is confined to some of the regular and imitative shapes of a pale color (which is generally called brass-yellow), and, as it is said, of a less specific gravity than the preceding one; but this does not seem to ever have been ascertained by direct experiment. The grayish-yellow native gold occurs only in those small flat grains which are mixed with native platina, and possess a yellow color a little inclining to gray; they are said to have the greatest specific gravity of them all. The real foundation of this distribution seems to be the opinion, that the first are the purest, the second mixed with a little silver, and the third with platina. It is not known whether the latter admixture really takes place, but is certain that several varieties of gold-yellow native gold contain an admixture of silver.

In color and lustre, inexperienced persons might mistake various substances for gold; these are chiefly iron and copper pyrites, but from them it may be readily distinguished, being softer than steel and very malleable; whereas iron pyrites is harder than steel, and copper pyrites is not malleable; for although the latter mineral yields easily to the point of a knife, it crumbles when we attempt to cut or hammer it, whereas gold may be separated in thin slices, or beaten out into thin plates by the hammer. There can thus be no possible difficulty in distinguishing these various minerals in a native state, even with nothing but an ordinary steel knife. From any other minerals, as mica, whose presence has also misled some persons, gold is easily known by very simple experiments with a pair of scales, or even by careful washing with water, for gold being much heavier than any other substance found with it (except platina and one or two extremely rare metals), will always fall first to the bottom, if shaken in water with mud, while mica will generally be the last material to fall. This is the case however fine or few the particles of either mineral may be.

Gold therefore can be distinguished by its relative weight or specific gravity, and by its relative hardness, from other bodies which resemble it. It is described generally as soft, completely malleable and flexible, but more accurately as softer than iron, copper or silver, but harder than tin and lead. It is useful to know facts of this kind, as a simple experiment that can be made with instruments at hand, is often more valuable than a much more accurate examination requiring materials not immediately available. Thus if it is found that a specimen (perhaps a small scale or spangle) is readily scratched by silver, copper or iron, and scratches tin and lead, it may, if of the right color and sinking rapidly in water, be fairly assumed to be gold.

The weight of gold, as of all substances, it is convenient to estimate relatively, and in comparison with the weight of an equal volume of water. The relative weight, or specific gravity as it is called, of gold is remarkably high, the lightest varieties being twelve times heavier than water, and pure gold nineteen times.—This is expressed by saying that the specific gravity of native gold is 12—19, and the number determined by comparing the weight of the mineral in water and air.

When a piece of gold is broken (which is not done without difficulty—greater in proportion to its purity), the fractured edges are very uneven and torn, exhibiting a peculiar fibrous appearance, known to mineralogists as "fine hackly." This fracture indicates that the mineral is torn asunder and not really broken, and is a proof of considerable toughness.

The form in which gold is found is various. It is sometimes crystalline, in eight or twelve-sided regular figures, passing into cubes, but the crystals are generally small and rare. In case of such crystals being found, it is well worth knowing that they possess a value as mineralogical specimens far beyond that of the gold which they contain.

More frequently the metal is found in lumps or grains, called by the Spaniards pepitas, varying in size from that of a pin's head to masses weighing nearly 100 lbs. troy.

The gold of California yields 89·58 per cent. pure gold, and is therefore about equal to that obtained from the washings of Miask (the richest district in Western Siberia, and that producing the largest pepitas), and superior, as the assayer remarks, to the gold dust from Senegal.

There is a remarkable mixture of native gold with silver occasionally found in Siberia, and known under the name of "Electrum." Its color is pale brass-yellow, passing into silver-white. It occurs in small plates and imperfect cubes, and possesses many of the characters of pure gold, but it consists of only 64 per cent. of that metal and 36 per cent. of silver. It is at once known by its low specific gravity, which does not exceed 12.

Other mixtures of gold are (1) a rhodium-gold found in Mexico, and containing 34 to 43 per cent. of rhodium, having a specific gravity of 15·2—16·8, and a clear, dirty yellow color; and (2) a palladium-gold (containing 9·85 per cent palladium, and 4·17 per cent silver) found in Brazil and elsewhere in South America, in small crystalline grains of pale yellow color.—All the varieties of gold are readily fusible into a globule, which, when the gold is pure, is unaltered by the continuance of the heat. In this respect it differs entirely from iron and copper pyrites, which, on being exposed to the flame, give off sulphur fumes and undergo considerable change. In the case of gold containing other metals, these, with the exception of silver, may generally be got rid of by continuing the heat in the exterior flame with the addition of a little nitre. Before the oxy-hydrogen blowpipe, the metal is volatilized in the form of a purple oxyd.

Gold is not acted on by any the acids alone. When exposed to the mixture of nitric with hydrochloric acid (in the proportion of one part nitric to four of hydrochloric) called aqua regia, it dissolves without residue, the solution giving a purple precipitate with protochloride of tin, and a brown precipitate with protosulphate of iron. Electrum, the mixture of silver with gold alluded to, is only partially soluble in aqua regia, giving a residue of chloride of silver. The solution is acted on by protosulphate of iron.

The following simple mode of detecting attempts at imposition in gold dust is worthy of being recorded in this place.

Place a little gold dust in a glass tube or earthenware saucer and pour nitric acid upon it: then hold the glass or saucer over a flame, or upon a few embers, until red flames (nitric vapors) arise; if it be pure gold, the liquid will not become discolored; but if pyrites or brass-filings should have been mixed with it, the acid will become turbid, green and black, discharging bubbles of gas. After the ebullition has ceased, the residue should be washed with water, and acid again poured upon it, when the same effect may be observed, but in a less degree; and if the experiment be repeated till all effervescence ceases, it will finally leave the gold-dust pure.

The examination of rocks suspected to contain gold is a very simple matter, although the most convenient mode of actually obtaining the gold from the associated sand, mud or gravel, necessarily involves mechanical contrivances, and requires careful consideration. When a rock is supposed to be auriferous, or when the sands or other alluvial matter of a district are to be examined for gold, the rock should first be pounded fine and sifted:—a certain quantity of the sand thus obtained must be washed in a shallow pan, and as the gold sinks, the material above be allowed to pass off into some receptacle. The largest part of the gold is thus left in the angle of the pan; by a repetition of the process a further portion is obtained; and when the bulk of sand is reduced to a manageable quantity, the gold, if in too small a proportion to be readily removed (or the residuum in the latter case after the richer particles have been carried away), is amalgamated with clean mercury; the amalgam is next strained to separate any excess of mercury, and finally heated and the mercury expelled, leaving the gold.—In this way, by successive trials with the rock, the proportion of gold is quite accurately ascertained. Where the rock or gravel is rich, the amalgamation is unnecessary in a first trial, sufficient being obtained at once to give a large profit without any furthur process than simple washing.

Soap Moulds for Die Sinking.

Dr. Ferguson Branson, of Sheffel, writing in the Journal of the Society of Arts, says: "Several years ago, I was endeavoring to find an easy substitute for wood engraving, or rather to find out a substance more readily cut than wood, and yet sufficiently firm to allow of a cast being taken from the surface when the design was finished, to be re-produced in type-metal, or by the electrotype process. After trying various substances, I finally hit upon one which at once promised success, viz., the very common substance called soap; but I found that much more skill than I possessed was required to cut the fine lines for surface printing. A very little experience with the material convinced me that, though it might not supply the place of wood for surface printing, it contained within itself the capability of being extensively applied to various useful and artistic processes in a manner hitherto unknown. Die-sinking is a tedious process, and no method of die-sinking that I know of admits of freedom of handling. A drawing may be executed with a hard point on a smooth piece of soap, almost as readily, as freely, and in as short a time, as an ordinary drawing with a lead pencil. Every touch thus produced is clear, sharp and well defined.—When the drawing is finished, a cast may be taken from the surface in plaster; or, better still, by pressing the soap firmly into heated gutta-percha. In gutta-percha several impressions may be taken without injuring the soap, so as to admit of 'proofs' being taken, and corrections made—a very valuable and practical good quality in soap. It will even bear being pressed into melted sealing without injury. I never tried a sulphur mould; but I imagine an impression from the soap could easily be taken by that method."

[Dr. B. has also employed different kinds of wax, and other plastic bodies; and in some of these cases a heated steel knitting-needle or point, was substituted for the ivory knitting-needle. He has sent several specimens to the Society of Arts, which show that from the gutta-percha or plastic cast, a cast in brass may be obtained with the impression either sunk or in relief.

Bituminous Coal for Locomotives.

We have received a letter from J. Amory, of Boston—agent of Baker's patent furnace, in which it is stated, that a locomotive fitted with the said furnace is doing well on the "Eastern Railroad." The "Western Railroad" is about to try the use of bituminous coals in place of wood, the price of which, has increased the expenses last year to a very large figure. When we consider that wood is so dear, and occupies so much room as a fuel, we wonder that our Eastern railroads have not found means to substitute coal for it long before this. There is surely plenty of inventive genius in New England to overcome any difficulty to its successful employment. In Pensylvania, quite a number of anthracite coal burning locomotives, are now in use, and we are informed, with perfect and profitable success. Anthracite coal is more cleanly for use, than bituminous, but the fields of the latter are so extensive in our country—being larger than those in all the other parts of the world put together—that we desire to see means adopted for bringing supplies of it from the West to our sea board. We want more coal companies than we now have. The price of coal is extravagantly high; because of the great consumption and constantly increasing demand for it. Coal mining is a profitable business; the capital invested in such a business is safe.

Reaping Machines—Who was the Inventor?

In the Journal of Agriculture, a British publication, the Rev. Patrick Bell, of Forfarshire, publishes a somewhat lengthy article on the reaping machine invented by him in 1828. In this he says:—"I believe that every honest and impartial observer will be satisfied that in America there was no movement whatever in the matter of reaping machines before August 1828, that after that period the first attempts were mere copies of mine, that by and by one maker after another deviated a little from the original, until latterly there was considerable change in the aspect of the reaper. If however, I am not blinded by partiality, in the latest metamorphosis, the theory and design of the original may be traced as the basis of the implement."

Great credit is due Mr. Bell for his ingenuity manifested in the machine referred to, but he has suffered his partiality to blind his eyes considerably. On the 17th of May, 1803, a patent was issued to Richard French, and J. F. Hawkins of New Jersey, for a machine for cutting grain, another to Samuel Adams, Dec. 27, 1805, to John Comfort, Bucks Co. Pa. Feb 26, 1811, to James TenEyck, Bridgewater N. J. Nov. 2, 1825, all previous, some more than 20 years, to the one granted Samuel Lane, in August, 1828. What most of these inventions were we have no means of knowing, as the records and models were destroyed in the conflagration of the Patent Office in 1836. But the machine of TenEyck patented in 1825, embraced the reel and a vibrating knife or sickle, and these were the only features of Bell's machine that he claims have been introduced into America.

But although Bell may have been the inventor, he was not the first inventor in Great Britain, even of these features of his machine. It has been repeatedly shown that Mr. Salmon of Woburn, England, employed the "scissors" or vibrating knives in 1807, and the reel was used by Mr. Henry Ogle, of Rennington, in 1825, contemporaneously with its employment in this country by TenEyck. Is it not very much more probable that the Rev. gentleman was indebted to his predecessors in England for these inventions, than that his successors in America were indebted to him when the inventions had been employed in this country previous to his using them, and when we consider the comparative ease of access between England and Scotland, and between Scotland and America? We are not disposed to depreciate the merits of the Rev. Mr. Bell, but we are tired of this disgusting attempt of his to assume to himself all the merit of the invention of the reaping machine, when he was more than 20 years behind American and other English inventors.

We hope that the early inventors referred to in our article if they be living (if not, their friends), will furnish us with accurate descriptions of their patent machines; if the original patents are still in existence, we should be very glad to get a sight of them. The object is one of considerable interest.

Trial Trip of the Ericsson.

This ship, with her *new* caloric engines, made a *private* trial trip down the Bay, on Friday last week. Owing to her cylinders leaking she made little progress, and came to anchor at Quarantine, and awaited fair breezes and a favorable tide to return.

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