ANNUAL ASSAY OF THE COINAGE.

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It is provided, by the acts of Congress establishing and regulating the United States mint and its branches, that there shall be an annual scrutiny of the results of the operations of each year, in order to verify the fidelity with which the coinage is kept up to the legal standard, both as to weight and as to the degree of fineness of metal. This scrutiny is conducted by a commission, consisting of three members acting *ex officio*, and ten or twelve others appointed by the President of the United States. The annual assay of the coinage of 1870 was conducted at the mint in Philadelphia, on the 13th, 14th, and 15th days of February, 1871, by a commission composed as follows:

Ex-officio.—Hon. John Cadwalader, Judge of the United States District Court for the Eastern District of Pennsylvania; H. D. Moore, Collector of the Port of Philadelphia; and United States District Attorney, A. H. Smith.

Appointed by the President.—Prof. Joseph Henry, Smithsonian Institution; Prof. John Torrey, United States Assay Office, New York; F. A. P. Barnard, President of Columbia College; J. E. Hilgard, Assistant Superintendent of Weights and Measures; Hon. H. R. Linderman, Philadelphia; Prof. Fairman Rogers, Philadelphia; John J. Knox, Deputy Comptroller of the Currency; Hon. John P. Putnam, Boston, Mass.; E. B. Elliott. Esq., Washington, D. C.; Robert J. Stevens, Esq., San Francisco, Cal.; M. C. Read, Esq., Hudson, Ohio.

In order that the test may extend to every coinage of the year, the law requires that, at each delivery of coins made by the chief coiner to the treasurer, a certain number of pieces of each denomination shall be taken by the treasurer, in presence of the assayer, indiscriminately from the mass, carefully labelled, and placed in a chest having two independent locks, the keys of which are kept, one by the treasurer and one by the assayer. The branch mints being under the direction of the director of the principal mint, the coins reserved, as above described, at those establishments, are transmitted for examination to Philadelphia.

On the meeting of the commission, which takes place annually on the second Monday in February, all the packages of reserved coins are placed before the commissioners, and opened by them in presence of the director of the mint. The coinages of the several mints are kept separa e from each other, and the gold coins are kept separate from the silver. The commission is then arranged by the chairman into two committees, one for the trial of the weights, and the other for assaying the fineness.

The weighing committee thereupon takes, from the gold coins and also from the silver coins, of each mint, a certain number, not less than ten, embracing also more than one denomination, if there are varieties; and these are weighed in bulk. They also take any number of pieces, not less than five, and of differing denominations, if there be such present, to be weighed singly. All these are placed with the mint marks downward, and the weighing is conducted by the committee themselves, or by experts under their scrutiny. It is usual, finally, to weigh the whole mass of the gold coin, and also the whole mass of the silver coin, from each mint, which remains in the hands of the committee after the selection of pieces for assay.

The committee finally examines the weights ordinarily employed in the mint, and tests their accordance with the standards prescribed by law.

The committee on assaying takes, from the coins left by the other committee, a sufficient number for its purposes, and causes a portion of each parcel to be melted into an ingot. From each of these ingots a sample is then taken for assay. A convenient number of single coins, of different denominations, is also selected from each parcel, from which samples are taken in like manner. In the case of silver, the sample for the assay of mass is not cut from the ingot, but taken by granulation in water, previously to pouring the liquid metal nto the mold.

The gold is assayed by cupellation and quartation; the silver, by precipitation. The weight of the metal, to be tested, employed in each assay for gold, is one half a gramme. This is weighed out upon a balance sensitive to the twenty-thousandth of a gramme (the ten-thousandth of the weight employed). All the lesser weights are decimal subdivisions of this half gramme. The weights used in this process are kept in a box, with two independent locks, the key of one of which is in possession of the director of the mint, and that of the other in that of the Judge of the United States District Court for the Eastern District of Pennsylvania, who is *ex officio* chairman of the commission.

The samples, from which the metal for assay is taken, are hammered, and subsequently laminated between rollers, to facilitate the adjustment of the weight by cutting off minute portions. Each lamina is stamped with a distinctive number. Side by side with the coin assays, a test assay is conducted, in which the metal used is pure gold, cut from a roll kept for the purpose in the box containing the weights. As the standard fineness of the coin of the United States is 900 parts by weights of pure gold to 100 of alloy, the test assay is made upon $\frac{900}{1000}$ of a half gramme.

Silver is then weighed out for the quartation, from a roll of the pure metal, kept also in the box with the weights; and the several samples, properly enveloped in sheet lead, are placed in order, according to their numbers, and transferred in like order to the cupels. After being withdrawn from the muffle, the buttons are hammered, annealed, and laminated between rollers, each lamina being finally stamped on one end with its number. The specimens are then rolled into cornets, with the numbers visible on the external end, and are then deposited in the separate cells of a little platinum basket-like apparatus, which suffices to hold, in very small compass, sixteen or twenty specimens, to be treated all at once. This is immersed in a matrass or alembic of platinum, where the specimens are first boiled for ten minutes in nitric acid of 22° Baumé, and then twice successively, for the same length of time, in acid of 32° Baumé.

The specimens are then taken out, washed in distilled water, heated to redness, and finally weighed again.

Out of 8 separate assays of gold made by the commission for the present year, 3 gave exactly 900 parts to the 1,000, 1 deviated $\frac{1}{10}$ of a part, and 4 deviated $\frac{2}{10}$ of a part in 1,000. The law allows a deviation, technically called the "tolerance," of the two whole parts in 1,000, either above or below the legal standard; but the mint officers work, of course, as closely to standard as possible, without regard to tolerance. The results of the mint assays for many years show that the tolerance is unnecessarily large; and in the new bill for the regulation of the mint business, recently proposed by the Treasury Department, the tolerance is reduced to 1 part in 1,000.

The silver assays are made by weighing out 1,115 parts of the metal under trial, these parts being milligrammes. This weight is taken because, at the lowest limit of deviation from standard allowed by law (which, for silver, is 3 parts in 1,000, the standard fineness being, as before, 900 in 1,000), there will be just 1,000 parts of pure silver in the specimen. A test assay is also made by weighing out 1,005 parts of silver absolutely pure, which is subjected to the same processes as the specimens under scrutiny. All the specimens and the proof metal are introduced into numbered bottles, nitric acid is added, and a gentle heat is applied. The solution being complete, precipitation is effected by introducing, from a pipette, into each bottle, 1 decilitre of a standard solution of sodium chloride, so prepared as to contain, in this measure, 542·74 milligrammes of the salt—the quantity necessary to precipitate 1,000 milligrammes, or 1 gramme of silver. As the case never, or at least very rarely, occurs, in which the specimen is at the lower limit of tolerance, this dose of salt leaves some small amount of silver unprecipitated. The precipitate is therefore made to subside by agitation; and for this purpose a mechanical agitator is employed, put in motion by power derived from the shafting in the coining department, which expedient contributes greatly to economy of time.

When the liquid is clear, a small pipette is used, graduated so that each division indicates a quantity of the re-agent sufficient to throw down 1 milligramme of silver; and the number of these parts which are required to complete the precipitation fully, corrected by the indications of the proof assay, exhibits, when added to 897, the proportion of pure silver in 1,000 parts of the metal under trial.

In the recent assay of the silver coinage, out of 7 specimens, 2 were found to be in exact accordance with the standard; 1 was found to be $\frac{4}{10}$ of $\frac{1}{1000}$ above: 2 others were $\frac{8}{10}$ of $\frac{1}{1000}$ above; another, $\frac{1}{1000}$ below; and another, $\frac{1}{1000}$ above. As the tendency of silver alloys is to irregularity of distribution, in a greater degree than is true of those of gold, it is reasonable that the limits of "tolerance" for this metal should be greater; but these assays show that the amount of deviation, from the standard, allowed by law is considerably too great. The new mint bill proposes to reduce it from $\frac{3}{1000}$ to two and a half $\frac{1}{1000}$; but this reduction is by no means sufficient. There is no need that it should exceed $\frac{2}{1000}$.

HOW DO YOU PROVE YOUR PLUMB RULE?

A TECHNICAL LESSON.

The following particulars are authentic, and I remember all the parties. I shall condense from memory. The matter in dispute was a brick wall which fell shortly after its erection, the downfall of which, I believe, was accelerated by a downpour of rain. When the builder put in his bill for payment, his client refused to acknowledge any claim. The wall was certainly built, and the wall was certainly dowr. The client contended that it was badly constructed, and that it was put up in an unworkmanly manner; the builder, on the other side, was ready to swear and prove that it was erected by competent workmen, and that it was executed in a creditable and workmanlike manner.

The case had to be settled in the law courts, the builder being the plaintiff. The defendant secured the services of a clever, well known counsel, who was known to have a knowledge of architecture. When the builder was giving his evidence, he was submitted to a severe cross examination, in which his practical knowledge cut a very sorry figure. The particular point of the question turned upon the plumbing of the wall, whether it was truly perpendicular, and whether the plumb rule was correct. The builder said he was ready to take his oath that the wall was plumb, and that the plumb rule was quite correct.

"Listen for a moment, gentlemen of the jury," cried the defendant's counsel, "while I put this master-builder to the test. You will be able to judge of his practical acquaintance with his profession from the answer he gives. Well, Mr. Builder, you are ready to swear upon your oath that the wall was plumb?" "Yes." "You are?" "Yes."

"Will you be so good, Mr. Builder, as to turn round and tell those twelve intelligent jurymen in the box, how you know that your plumb rule was correct?"

The builder hesitated for a moment, and then replied: "I know it was correct, for my workmen are always careful and particular with their work."

"I am not disputing the character you give your workmen," replied the counsel; "I merely ask you to tell the jury how you know that the plumb rule worked with was correct?"

"I know it was correct," repeated the builder, "because it was made the same as all plumb rules are made, and used by men in the habit of using them."

"I must ask you again, Mr. Builder, to be so kind as to tell the jury and me how you are certain that the plumb rule was true? or, in other words, let us know how you prove your plumb rule?"

This was a poser.

"Now, Mr. Builder," continued the defendant's counsel, "you have come into court to make a claim against my client; you swear that the wall was built properly plumb, and that it did not tumble down from bad workmanship. I now ask you, as a respectable builder, to just explain to the jury the method of practically constructing and proving a plumb rule. You are no doubt aware that if a plumb rule be not correct, the work that it is applied to will not be correct. I am ready to prove that it was not correct, that the wall overhung. Geometrically speaking, it was out of perpendicular; consequently, the work was badly executed, and I deny that you have any claim for payment."

A silence for some minutes reigned, and then the plaintiff made one or two ineffectual attempts at explanation, but got so confused that he completely broke down.

"It is needless, you see, your lordship, and gentlemen of the jury, for me to carry this case much further. I will simply conclude by saying, here is an instance of the deplorable consequences attending rash assertions and wrongful claims. Men are found to come forward to make a claim for what they have no right to, or have forfeited, and are ready to fortify their unfair demands by swearing that they know practically what they do not know. Well, gentlemen of the jury, as the master-builder, when in the box, was unable to prove his plumb rule, perhaps he will not take it amiss for a lawyer to tell him how to practically construct and at the same time prove a plumb rule, which may be depended upon, for plumbing a straight wall, or any other description of perpendicular work. Take a piece of board a little more than the proper length, breadth, and thickness which you require. With a pair of compasses strike a circle on its face, within a few inches of each end. Plane straight on the edge until the sides of the circles are touched; repeat on opposite edge. When this is done, your piece of board will be of a parallel breadth. Then a line drawn through the center, with a slit for the cord, and an opening for the play of the "bob," will complete your plump rule. I am not an architect, gentlemen of the jury, but I believe no architect, builder, or workman, will say I have not given a practical method for proving a plumb rule. One word more, gentlemen: I think when a master-builder comes into court, and takes it upon himself to swear that his work was properly executed, he ought to be able to give us proof, when asked, of the workmanlike manner of its accomplishment. I now ask a verdict for my client."

The jury unanimously declared in favor of the defendant, the foreman saying that he himself, and his fellow jurors, were of opinion that the wall was badly constructed, and out of plumb, and that that was the reason of its fall.

It may be asked here, was the counsel for the defendant technically correct in his method of proving a plumb rule of any length? And it may be further asked, how many master-builders, and workmen, too, are there at the present hour, who, if called upon suddenly, could practically demonstrate, in proper language, the geometrical construction of a simple plumb rule, or straight edge? However astounding it may seem, I have come across many workmen who could not, without some thinking and groping, properly set out the egg oval opening, or "bob" hole, in their plumb rule. Archimedes is reported to have said, that if a prop, or position, and a lever, were given to him, he would move the world. Technical knowledge is the prop, the position, and the lever; and, without the ambition of the great Greek mathematician, it will enable a man, at some time or other, to lift himself in the world, and, morally and socially speaking, lift up the world at the same time.—*Builder*.

A Subterranean Pond---Eyeless Fish.

It is well known that great trouble and expence have been caused by the sinking of a portion of the track of the new Jefferson Railroad, where it crosses a swamp in Ararat township, Pa. It has been found, says the *Montrose Republican*, that under the swamp is a subterranean pond, of several acres in extent and of considerable depth. This pond is covered by about six feet in depth of black earth, which supports a heavy growth of woods. The trees are mostly soft maple, pine, hemlock and birch, many of them ranging from six inches to three feet in diameter. Last fall it was discovered that the subterranean pond contains many fish, of the kind usually found in ponds in this part of the country—pickerel and "shiners" among others—but all without eyes! In the darkness of their subterranean abode, they have no use for the organ of vision. The Ball Pond, about a mile and a half distant, is now "growing over." A considerable part of it has become subterranean within the last twenty years, and, probably, before many years it will be entirely covered like the other. This pond is about twenty acres in extent. For some distance from the shore, it is filled with a dense growth of water-lilies, and these no doubt, furnish the foundation on which the superstructure of earth is commenced.

LUNAR RAINBOWS are not so uncommon after all. We never saw such a sight ourselves, but many of our readers have if we may judge from the testimony now coming in. We cannot however, find room for the letters already received on the subject, and can only express the hope that our numerous correspondents may live to see other equally glorious celestial sights.