

Voltaic Action in Combination Teeth Fillings

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My attention was directed by personal experience to the practice among Nashville dentists, and, presumably, among dentists in general, of using what they call "combination fillings;" that is, tin fillings topped with gold. This combination gives no serious voltaic or electrical disturbance *in case the base metal is entirely covered by the gold, and is at no point left exposed to the saliva.* This is probably the way it was intended to be used by the originator of the combination fillings; but the case is very different when *both metals are left exposed at any point to the saliva.*

In my own experience, which is a case in point, I had ordered gold fillings and thought I had them; but in a very short time the base metal was dissolved away, undermining the gold cap. A discussion of the case with my dentist disclosed the fact that the fillings were combination fillings. My experience of having the base metal dissolved away when placed in contact with the gold is exactly what should be expected, and is fully explained by the well established laws of electricity.

On page 305 et seq. of General Physics, by Henry Crew, Professor of Physics in Northwestern University, is found the following statement concerning voltaic action: "The simple and well established facts of the voltaic cell are as follows: At the very close of the eighteenth century it was discovered by the Italian physicist, Volta, that all conductors of electricity can be divided into two classes. This division is based upon the following experiments. If we make a closed circuit out of several different metals, *i. e.*, if we make an endless chain in which each link is composed of a different simple substance, such as zinc, copper, gold, or tin, we see that no electric current is produced. All substances which when joined together at the same temperature in any order, produce no current, are called conductors of the first class.

"Volta found, however, that if into a circuit such as the above he introduced one link composed of a compound substance, such as dilute brine, or sulphuric acid, or copper sulphate, he *always* obtained an electric current. Conductors of this kind, which Volta called conductors of the second class, *always* undergo chemical decomposition when introduced into a circuit containing two different metals, and *always* yield a current.

"The modern name for a conductor of the second class is electrolyte, *i. e.*, any substance which is decomposed when a current passes through it. Conductors of the first class practically include only carbon and the various metals.

"Definition of a voltaic cell. It has been found by experiment that no two conductors when joined together will produce a current so long as they are at the same temperature. But the following combination, suggested by Volta, and named after him, 'the voltaic cell,' will always give a current: *The voltaic cell is defined as three or more conductors in series, each conductor being made of a different substance, and not all belonging to the same class.*"

It is thus very clear that gold and tin, two conductors of the first class, and saliva, a conductor of the second class, constitute clearly a voltaic cell, and the inevitable result of such a combination is just what takes place in every voltaic cell when two metals are put in contact and both are dipped into an electrolyte—a current flows and the baser metal is dissolved.

A number of prominent dentists whose attention has been called to this matter have assured me that this theory, and my own experience, are confirmed by their own observation. However, there are some who deny voltaic action in combination fillings. I consider it of scientific and economic importance that this matter be given wide publicity both among dentists and among the general public, for if there are dentists who insist upon imposing upon their patients in the use of combination fillings, our only defense is to let the public know the facts in the matter so that we may refuse to be imposed upon by such practice.

It should perhaps be again emphasized that voltaic action is only to be expected when *both metals are left exposed to the saliva*. However, as thermo-electric disturbance may be expected with the variations of temperature, as indicated in the above laws, it is my opinion from the standpoint of an electrician, that combination fillings are in no case to be preferred to pure gold.