source of wealth to the list of those opened to mankind by American inventive genius, and to record the fact that the Newburgh (N. Y.) Glass Manufacturing Company, organized to work the ore of that vicinity under this patent, are already successfully turning out quantities of glassware, with the two peculiarities of unequalled toughness and unapproachable cheapness. The artificial glass hitherto produced, requiring some thirty per cent. of soda or other oxides as a base, consuming much fuel, and losing much dross, evidently could never be cheapened sufficiently for many of the uses for which it is very desirable. The simplicity of this manufacture direct from the native article, the abundance and accessibility of the material, and the extraordinary tenacity of the product—common quart bottles of the Newburgh manufacture may be freely used in driving nails into solid timber without risk to their contents—must eventually extend existing applications of glass in a beneficent degree, and bring it into many uses from which it has hitherto been excluded. The native glass in this region, and in fact generally, being the silicate of iron, has a dark color, and it is yet to be seen how far it can be whitened by modification of the base and admixture of other bases, so as to become available for the finer purposes. That common window glass may be produced at a great reduction of cost, seems not to admit of doubt, and this alone involves great improvement in the structure of houses, in common horticulture, and in many other respects which will occur to the reader.

We have thought it of interest to numerous readers who may not have turned their attention to the chemistry of glass, to take this opportunity for giving a popular sketch of its character. And first·

What is Glass?—Most persons probably take for granted that glass is a simple mineral substance found in the earth, and would be surprised to learn that it is a *salt* formed by the chemical union of at least two and often three or four compound substances, and thus composed of from three to five very different and interesting ingredients. In fact, taking all the varieties of glass in actual use, it may be said to contain a dozen or more ingredients. Now, the popular notion of a salt is derived in part from the usual appearance of that class of substances in crystals, or small angular grains. Glass does not appear in that form, for the same reason that hot maple syrup, or any other melted sugar, "waxes" or candies when poured upon ice, as many of our readers may remember treating it in younger days in the maple orchards of new England. The reason is that, being cooled suddenly from the boiling point, the atoms are not allowed time to segregate and settle themselves into individual crystals, according to their natural disposition, but are overtaken by solidity as they are, in a single unitary mass. Suffer molten glass or any other salt to cool slowly enough, and its atoms will group themselves in multiplied units instead of one, forming a semi-opaque and crumbling mass: a striking instance and illustration in the lowest sphere, of that union of the kind and the individual which pervades the universe, from grains up to worlds, and from cell-life up to that of immortal spirits. Another part of the popular notion of a salt is derived from the ready solubility of most salts, and their consequent pungent effect upon the tongue. Glass is considered almost a synonym for insolubility; and yet it has all degrees of solubility according to its composition, and there is a kind of glass, differing from the common article only in the proportions in which the ingredients are combined, which will dissolve in water like any other salt, and not only yields a strong alkaline taste to the tongue, but will also wash the hands, if you please, of dirt and skin at once. It is sometimes used in making soap, but in Prussia this is prohibited, on account of its destructive effect upon textile fabrics. Hence we may understand the taste of a glass tumbler, although we can get at it only by imagination, because the substance is too hard to dissolve on the tongue.

But again, more particularly, what is glass?—Silicon, oxygen, and any metal or metals the maker chooses, according to the color or hardness he wishes to produce: the metals being necessarily taken in their oxides—of which that of sodium (soda) and that of potassium (potash) are most used—and the silicon also in its combination with oxygen, with which its quick and tenacious affinity for that element keeps it always united, forming silicic acid. Most persons who have observed rock crystal or quartz, everywhere veining or specking the rocks, or gleaming in sand, wherever sand is washed clean, have as little suspected that this apparently tasteless because almost utterly insoluble substance is an acid, as that glass is a salt. It is silicic acid, or one part of silicon with three of oxygen. The base silicon, like boron (to the analogy of which to carbon we referred in an article on borax) becomes a wonderfully interesting substance under the light of "chemic fire." From what has just been said, it is apparent that silicon is the main characteristic constituent of the inorganic earth, as carbon is of the animal and vegetable kingdoms. It is capable of the three allotropic conditions of boron and carbon, described in a former article, and is only hardened by the action of heat, unless exposed to air or oxygen, in which it takes fire and burns superficially; the silicic acid formed on the surface protecting the mass from oxidization. Silicic acid, silica, or quartz, can be melted by nothing short of the oxy-hydrogen blow pipe; but when heated with metallic oxides, the silicates resulting from union with those substances are melted at various temperatures, according to the metal involved, and the result is glass.

We might go on to describe numerous beautiful forms besides common quartz, in which silica presents itself in nature, such as opal, amethyst, chalcedony, cornelian, onyx, sardonyx, agate, and others, which owe their brilliant variety to various tinging materials, chiefly oxides of iron and other metals. Besides these, it is the stiffening in the framework of plants, and leaves, and animal cartilages. But as our object in setting out was merely to define the nature of glass, we close with a mere reference to the principal metals used in producing the usual varieties of that "salt."

What may be termed the highest variety of glass, is the *strass*, or "paste," used in imitation of precious stones. This is made with potassa and oxide of lead; the latter metal being remarkable