others are converted into true steam: such a result would only ensue, if the explosion were sufficiently tedious to permit the caloric to pass from This one part of the mass of water to another. supposition is inadmissible under the conditions, and disproved by experiment. The dispersion of the water is usually attributed to the agency of interstitial steam, but there is evidence to prove that we are more correct, in stating that it is due to the direct action of interstitial caloric. The error has arisen from performing experiments, and ascertaining the effects produced by the *gradual* reduction of pressure on the surface of heated water, by withdrawing steam through a safetyvalve or stop-cock, a process in no way analogous to that which takes place in an explosion. A familiar instance of the direct repulsive action of heat on water, is afforded by placing a drop on a smith's anvil, and striking it with a bar of red-hot iron; the water is dispersed with a loud report, but no steam is produced. Water absolutely free from air may be heated to between 270 deg. and 280 deg., usually separating into its ultimate atoms with explosive violence but still without producing true steam. If we regard the matter from this point of view, we see how erroneous is the idea that water can explode per se. As well might we state that the plates forming a boiler exploded. The water is perfectly passive in the transaction. Its particles are separated in the first instance, and these, in their turn, separate the plates which contained them the moment before. One great fact may be adduced in support of our explanation of the phenomena. There are hundreds of instances on record in which every pound of the many tons of water which the boiler contained, vanished on explosion. Yet it is certain that this water could not possibly have been converted into steam. There are, it is true, instances where boilers have burst, yet remained nearly full of water; but none of these explosions have been absolutely instantaneous, or very violent in their effects. In such cases, the catastrophe may, perhaps, be correctly attributed to the rapid generation of steam on the sudden reduction of pressure.

Steam power can never be worked with safety until we have an organized system of inspection established throughout the length and breadth of the land. There is scarcely an explosion on record which cannot be traced to the imperfect original construction of the generator, or the deterioration of the plates. We have ere now alluded to this branch of the subject, and may return to it at another time.

SILICATED SOAPS.

Soap, strictly speaking, was formerly understood to mean a composition of oil or grease with an alkali, but the term has now a more extended application. Various other substances than grease and oil have been employed as mixtures, and are held to be legitimate constituents of soap. Formerly resin was extensively employed for this purpose; but owing to its scarcity since the war commenced, and the high price thence resulting, its use has been almost abandoned, and silica—the chief ingredient of sand and quartz—is now largely substituted. When pure, it is insoluble in most acids, or in water; and it is actually infusible in fire. Yet it can be converted into a liquid; and it is used to mix with soap; hence originated the term "silicated soap." Quartz sand subjected to a high degree of heat, and mixed with a caustic alkali, such as soda or potash, becomes soluble, and this is the substance now largely employed as a substitute for resin in soap making.

The application of the silicate of soda as a soap mixture has been long known, but several patents have recently been obtained for improved modes of treating and mixing it.

On October 14, 1862, Dudley B. Chapman, of Milford, Massachussetts, obtained a patent for making a silicated soap, which is described in his specification as follows :--- "One part by weight of an alkaline silicate (such as silicate of soda) one part by weight of vegetable flour or farina, and one half part by weight of sal soda. The sal soda is to be melted with a little water, in a kettle, over a slow fire; the flour is then thoroughly mixed with it, after which the alkaline silicate is added, and the whole thoroughly incorporated together. This composition is to be mixed with soap made of grease or oil and alkali, when it is in the liquid state, and the whole of the ingredients boiled together for a few minutes." It is stated that vegetable flour assists the silicate in combining with the soap, and a larger quantity of the silicate may thus be used with a given quantity of soap. It also makes a firmer soap, and prevents it from efflorescing. The claim is for "the combination of a carbonate or caustic soda, an alkaline silicate and vegetable flour, with soap or a saponified oil or fat substance."

On January 20, 1863, Mr. Dudley obtained another patent for a silicated soap, described in his specification as follows:—"Hitherto the method of using soluble alkaline silicates in the manufacture of soap has been to make a soap in the usual manner, by boiling a hydrated alkali with grease, oil or tallow, one or more of these combined with resin; and while the soap was in a fluid state, to reduce the soluble alkaline silicate to a fluid, by the addition of water, then mixing it with the soap.

By this process an alkaline silicate containing an excess of free alkali (that is, more than sufficient alkali to hold the silica in solution, which most alkaline silicates do) cannot be used to advantage, because the excess of alkali in the silicate granulates or opens the scap in such a manner as to precipitate the silicated solution to the bottom. Therefore the use of highly alkaline silicates in scap has been generally abandoned. By my process I can use in scap a silicate containing any quantity of free alkali, and in such proportions that in some cases the quantity of alkaline silicate used will exceed in weight all the other ingredients combined, thereby materially cheapening, as well as improving, the quantity of scap.

"In manufacturing by my process, I first ascertain the quantity of free alkali which the silicate to be employed contains. I next, by the addition of water, reduce the silicate to a fluid or gelatinous condition; and when ready for use have it heated to about forty degrees (Centigrade). I next take a quantity of any one or more of the following