

the sides and at the base. What is regarded as 'smoke' is generally steam or watery vapor, and the supposed raging 'flames' are nothing more than the glowing light of a mass of molten material reflected on these vapor-clouds.

The popular but false notions of volcanoes have come to us from the earliest ages. The ancients had a reverential awe for the "fire engines" and their fear prevented them from making close observations and thereby obtaining a correct idea of volcanoes. But the question may be asked. How have we obtained our present knowledge of their phenomena since great dangers evidently beset the searcher for the truth concerning these "safety valves of our globe." ? Who, for example, would care to venture near Vesuvius when it vomits forth its streams of lava ? The dangers and difficulties attending such an undertaking are so great as naturally to lead the unsophisticated to believe the task of ascertaining the true nature of volcanoes quite a hopeless one.

To understand, therefore, how a correct study of volcanic action is made let us bring the matter home, and ask ourselves how we would make a study of a steam engine. Would we undertake to examine the workings of its various complicated parts when the full blast of steam is turned on, and the rapid movement of shafts and wheels baffles all attempts to follow them, and renders hopeless every effort to trace their connection with one another ? No ; rather would we ask the engineer to favor us by turning off the greater part of the steam supply, then, as the rods move slowly backwards and forwards, as the wheels make their measured revolutions, and the valves are seen successively opening and shutting, we have an opportunity of determining the relations of the several parts of the machine to one another, and of arriving at a just conclusion concerning the plan on which it is constructed. We should follow the same method with regard to volcanoes, which are in some sort, but great natural steam engines, and make investigations when the greater part of the force is cut off. The only difficulty in the latter case is that there are no friendly engineers to cut off the supply. But it must be remembered that nearly all volcanoes vary greatly in the intensity of their action at different periods, and by taking advantage of their quiescent mo-