

slid, and leaped downwards. When we reached the bottom, the little stream murmured gently, and, away beyond the boat, we saw something trailing, like the garments of a maiden. Our enchantment was half upon us, until we were fairly seated in the carriages, with the horses' heads pointing homewards.

Our old Canadian and his wife stood in the door-way to see us off. We turned away. The hour of the angelus rang pleasantly through the valley. And, on the mountain top, radiant in the setting sun, the lonely silver cross shone out like a loved and solitary hope.

ESPINGLE.

## THE YOUNG CHEMIST.

### LESSON VIII.—Continued.

THERE are other tests for silver and copper besides those already described; but it is not desirable at this time to notice a greater number.

It does not necessarily follow that one substance applied for the detection of another, can also be applied for its separation. Occasionally this may be the case; occasionally the reverse. Of the two tests mentioned in this lesson—hydrosulphuric acid and ferro-cyanide of potassium (prussiate of potash) the former is not only used as an indicator, but also as a separator; the latter is only employed as a test.

The separation of silver from copper, supposing these two metals dissolved in nitric acid, can be easily effected by the application of the chemical knowledge imparted in this lesson. Mix together a solution of nitrate of silver and of nitrate of copper. In the first place, they cannot be separated by hydrosulphuric acid, inasmuch as this gas, as well as its aqueous solution, throws down both silver and copper; neither can ferro-cyanide of potassium be employed for the same reason. Another agent must therefore be sought for, and this agent has been already brought into notice. On previous occasions it was shown that chlorine, in almost any soluble or gaseous state, will throw down silver from its solutions; and common salt (chloride of sodium) furnishes a very ready means of using chlorine. But will common salt throw down copper; or will it exercise any reaction unfavourable to the throwing down of the silver? It will not; but it is as well to try the experiment. Add a portion of common salt to a portion of the solution of nitrate of copper—no visible effect will result. Pour into the mixed solutions of nitrate of silver and nitrate of copper, therefore, a solution of common salt so long as any precipitation takes place, and agitate the glass containing the solution until the white deposit (chloride of silver) coheres; when coherent, wash it with pure water, and separate the water by decantation; the silver in the form of chloride of silver will be obtained leaving the copper in solution behind. It has been assumed that the mixed solution of nitrate of silver and nitrate of copper has been made by adding each of these salts to water. The young chemist can, however, vary the experiment if he please, by commencing the operation at an earlier stage, and preparing his own solution of the two metals. For this purpose take about the fourth of a wine-glassful of aqua-fortis (nitric acid), and having diluted it with an equal bulk of distilled water, put into it the metals, silver and copper, to be dissolved, such as a small silver coin, say a five cent piece. Silver coins in Canada are not made of pure silver but of silver and copper, but the copper is in a very small proportion. The nitric acid will dissolve the two metals with evolution of reddish fumes. Hence the operation should be performed in the open air. The solution, if sufficient acid have been employed, will contain the whole metals. If it be merely desired to throw down the silver by means of common salt, the presence of a little extra acid is not detrimental, although it would interfere with the action of many other tests. Hence before the application of tests it is necessary to evaporate the solution to dryness, which will drive away the superfluous acid, and then dissolve in water. This latter process is not required to separate the silver from the copper by

means of common salt, which may be added in aqueous solution without further preparation.

The young chemist will, no doubt, have remarked that the solution in acid of the silver coin was tinged with blue, the blue tinge being caused by the copper: this would not have been the case if pure silver were concerned; the solution in the latter case would be perfectly clear. Now only one other metal, namely, nickel, is capable of imparting a tint of similar colour.

The solution of mixed nitrates which has been operated on being now deprived of its silver in the form of chloride, the copper may at once be separated by a very easy method; but it is not intended at present to diverge from the consideration of a certain group of insoluble chlorides, of which silver is at the head. J. W. F.

## ÆTNA AWAKE.

TRAVELLING in Sicily not far from Catania, and it being announced to us that lava was issuing from Mount Ætna, we started with two guides to see the spectacle. Fortunately the spot where the liquid rolled out was on the verge of a piece of level ground, so that though the quantity which came pouring out was very great, its progress appeared to be slow; but in a few hours it had spread so far, that, finding there was no appearance of a relaxation of the activity of the mountain, the people who lived on its sides in a line with the direction which the lava was taking, were seized with the wildest terror. This we found to increase as we ascended the mountain, and was heightened by the statements of the charcoal-burners and others who were employed in the higher regions, and who had been compelled to fly before the burning torrent. It was a dreadful sight. The whole of that side of the mountain where the lava was descending seemed to be on fire; tremendous explosions shook the ground, and in the villages we passed through the people were all out of doors; some crying and praying to the Virgin and saints of various denominations for help in their affliction, others blaspheming as if the vocabulary of oaths among them were inexhaustible. To this uproar was added the sharp clang of bells ringing from the numerous churches and convents, under the absurd impression that this noise would check the progress of the eruption. Processions headed by priests in their vestments, carrying images of saints, on their way up the mountain, were frequently seen. Yet the lava continued to descend in obedience to that law which causes all fluids to seek a level; for neither the saintly images nor adjurations checked its progress. Still we were told of some remarkable instances of the course of a stream of lava having been changed by a few trees. In one instance, some trees at the entrance of a narrow gully prevented the lava from entering, and thus saved a large amount of property which would otherwise have been entirely at its mercy. It was not owing to the trees being planted closely together, but is supposed to be due to the repelling force of the vapour which issued from them; where, however, trees stood in such a position that the molten liquid could reach them, it made short work of them; it shrivelled the leaves, bit deeper and deeper into the trunk, which its weight finally overthrew, and what was once a flourishing orchard of olive-trees could only be distinguished by charred trunks.

Frequently during our ascent we met people coming down with loads on their heads; others not only carrying loads themselves, but bringing down laden mules. As we ascended, the grandeur of the spectacle increased; but to get a full and comprehensive view of the eruption, one ought to have been above it, or in a balloon. The number of channels into which it was divided rendering it impossible for a person on the side of the mountain to see more than a portion of the streams. According to those whose judgment can be best relied on, the volume of lava vomited forth during the first six days was at the rate of eighteen thousand cubic feet per minute, and its advance near the mouths at the rate of as many feet in the same time. The further from the orifice, the less the velocity; but of course this

depended principally on the slope of the ground. In some places it moved downwards with alarming rapidity; in others its progress was barely perceptible. The width of the principal current varied at one time from three hundred to five hundred yards, and its depth was estimated at fifteen yards. This enormous torrent of liquid fire plunged down a precipice fifty feet in depth in the form of a cataract, until it entirely filled the basin into which it fell, and gradually raised it to a level with the side of the mountain, the surplus portion, which continued to flow over it, running away down the bed of a river. Fortunately lava solidifies with so much rapidity on contact with the atmosphere, that the further it proceeds from the place whence it is erupted, the slower its progress becomes, until motion finally ceases altogether, and the fresh matter which comes forth finds it a barrier.

The most magnificent spectacle of all, however, during this eruption, was when the fiery torrent reached a forest composed chiefly of some hundred thousand oak, pine, and chestnut trees. Gradually, the lava ceased to flow, and the general opinion was that the eruption was at an end, and there was no further cause of fear, when, all of a sudden, it burst forth with greater violence than ever: but from an opening on the western slope of the mountain; and speedily spread over a district which had till that time escaped with trifling damage, presenting the appearance of a lake of fire. Long after this second eruption was at an end, and the surface had hardened, an opening here and there enabled one to see that the mass below it was still in a molten condition, and in some places the surface might be seen rising and falling like the sea when there is a gentle swell. This was probably caused by the gases generated below being unable to find a vent.

But though the serious eruption was at an end, the mountain was far from quiet; a prolonged rumbling sound was followed by an explosion, which threw large quantities of stones and ashes in the air, mingled with dense masses of vapour, which, on being liberated, expanded into enormous volumes, and floated away into the atmosphere. The din and uproar could hardly have been equalled if the Cyclops of old had been still hard at work there with thousands of Nasmyth's steam hammers. The extent of the atmosphere is such that we can hardly admit that it can be affected by any quantity of gas that can be poured into it from any source; yet it does not seem improbable that the incalculable quantity of poisonous gases which have issued from the mountain since it commenced active operations must have been sufficient to affect injuriously the health of the inhabitants over a large district.

An anecdote current respecting a German who ascended the mountain and looked into the interior through one of the openings, will assist in conveying the impression it produces on those who follow his example. He was seen ascending the mountain alone, and, after an absence of several hours, returned; yet not a word would he utter in reply to the questions addressed to him. The next day he was found drowned on the edge of the sea. According to the statement of a friend of his, he had long meditated suicide, and it is supposed that he had ascended the mountain with the intention of throwing himself into the molten lava, after the fashion of the well-remembered man of old, whose suicide was discovered by the mountain throwing out his sandal, but that the German's mind was so overpowered by the horrors of the scene he witnessed, that he could not carry out his intention, and descended to find a grave in a cooler and more tranquil fluid.

The effect produced by the decomposition of water during a volcanic eruption may be gathered from an occurrence which took place about twenty-five years ago. A large number of persons had assembled to watch the descent of a current of lava, when, all of a sudden, the end of it was seen to swell into a huge dome. A terrific explosion instantly ensued, which scattered an immense quantity of burning vapour and red-hot stones in every direction. Nearly seventy persons were killed, and every object in the