

THE DISASTER IN THE WEST INDIES AND ITS EXPLANATION.

Now that we have in a measure recovered from the first shock of the West Indian disaster, our attention is turned from the appalling accounts of human destruction to the interesting details of the volcanic phenomena. It is a general rule that the intensity of an eruption is proportional to the volcano's quiescent period. For years the people of Martinique had lived in perfect safety under the shelter of Mont Pelée and they had lost all fear of danger. First warnings of impending danger began on May 3, when the volcano threw out dense clouds of smoke. During the next night these clouds reflected the glowing mass in the crater and rumbling noises were heard. Hot ashes covered the city of St. Pierre on the 4th; and at noon of the 5th a stream of boiling mud suddenly rushed down the mountain side to the sea. The speed of this flow far exceeded that of an express train; for it is said that the distance of five miles was covered in three minutes. This sudden rush caused the sea to recede some 300 feet and return in a tidal wave of considerable, though not serious, proportions. Cable communication with Martinique was interrupted in the afternoon of May 6, and the next news filled the world with horror. An entire city of 28,000 inhabitants had been literally wiped out of existence.

From the wild and exaggerated stories of the few survivors we gather the following details: Thursday, the 8th, at 7:50 A. M., there was a sudden, deafening explosion, and immediately the air was filled with hot sulphurous gases which withered everything they touched. It is said that the whole top of the mountain was blown off and fell in hot dust and shattered rock on the city, while mud and lava poured out of the opening thus made. An eye witness at Morne Rouge, a town $4\frac{1}{2}$ miles away, which was not destroyed, states that there were seven luminous points on the side of the mountain, just before the volcano burst, and that the explosion was followed by ten minutes of absolute darkness. Simultaneously with this explosion a tidal wave tore the vessels in the harbor from their anchorages and wrecked them on the beach. The "Roddam," which had a full pressure of steam on, was the only vessel to escape total destruction, and she worked her way flaming from the harbor, amid a shower of molten matter. In the city almost the entire population was immediately suffocated by the hot, poisonous gases. This is proved from the fact that almost all the dead were found face downward with their hands covering their mouths. It is supposed that the destruction was the work of but a few seconds. The short duration of this intense heat is shown by the fact that delicate fabrics were found uninjured among the badly charred victims. The terrific force of the explosion tore up huge trees by their roots and laid them flat; heavy blocks of stone were scattered about; stone buildings were entirely destroyed. Debris covers the city for a depth of 12 feet. According to the present estimates the loss of life was almost equal to that resulting from the tidal wave which followed the eruption at Krakatoa, when 36,000 people perished.

As yet few facts are obtainable of the eruption of Mt. Soufrière, St. Vincent, which occurred on the 9th of May. A large loss of life is reported and dust from the volcano spread over the Barbadoes Islands, 75 miles to the east. This eruption had probably a sympathetic connection with that of Mont Pelée. The topographical changes occasioned by these two volcanoes cannot be accurately given at present, because of the lack of exact scientific data. It is reported, however, that Mont Pelée, which was previously 4,528 feet high, has now considerably less elevation. Rivers that were obstructed have overflowed their banks, causing floods and landslides. Important submarine changes have also taken place, for in grappling for the broken cable off St. Pierre, the cable ship "Poyer Quartier" reports that she found the sea bottom 4,000 feet below the surface of the water, where formerly the depth was but a thousand feet. These changes may result in disaster to shipping until properly recorded by hydrographic survey.

Volcanic eruptions are generally attributed to the expansion of moisture in the heated subterranean rocks. The original theory that the earth is a liquid mass, covered by a thin crust of solid matter is now entirely discarded by scientists. Such conditions would seriously interfere with the rotation of the earth and the stability of the crust. We know the effect of the moon's and sun's attraction on the thin skin of ocean that covers the surface of our globe. Tidal waves are continually sweeping around the earth in a

direction contrary to the earth's rotation. In comparison with this we can easily see what a tremendous drag to the rotation of the earth would result were the entire earth a liquid mass covered by a mere shell of solid matter. Scientists tell us that the wave produced would be so powerful as to make even a solid steel crust of 300 miles of thickness yield like India rubber to its deforming influences. The theory of a molten interior was based on the observation of volcanoes and on the fact that the temperature of the earth increases on the average one degree for every fifty feet of descent from the surface. Following this theory come others, in which the earth is supposed to have a solid core and an outer crust, between which is a layer of liquid material. Any displacement of the crust covering this liquid layer, whether resulting from contraction of the earth or other causes, would force the lava to the surface through the weakest spot. In refutation of this argument the conditions at Hawaii might be considered. The crater of Mauna Loa is 13,650 feet above the sea level, and that of Kilauea is 4,040 feet. These mountains are not over 35 miles apart and yet both are filled with lava. How could such varying levels be maintained, if both craters were fed from the same source? This query has forced many to believe that the liquid matter was contained in local, vesicular spaces beneath the crust. Both of these theories were brought forth to reconcile the requirements of physics with those of geology,



The Island of Martinique, Showing the Location of the Volcano, the Ruined Town of St. Pierre, and Fort de France, in which the Survivors are Gathered.

which called for the existence of fluid matter at a small depth from the surface of the earth. At present geologists have pretty generally discarded these theories as unnecessary; for it is claimed that the powerful pressure due to the earth's contraction would prevent material from attaining a liquid form. Immediately on release of this powerful pressure, however, the matter would become fluid and pour out of the mountain in the form of lava. As stated above, the power which causes the upheaval is attributed to the expansion of imprisoned vapor. From the fact that volcanoes are usually found near the sea, it was at first argued that the water oozed down into the heated regions, either of its own weight or by capillary attraction. Many scientists think this theory to be absurd, for they argue that it would be impossible for the water to enter a region under such compression, also that long before reaching a sufficient depth it would be turned into steam and forced back through the very channels by which it entered. The most plausible theory, and one now pretty generally accepted, accounts for the presence of water in heated rocks as having occurred during their crystallization period. These rocks, in the course of time, were deposited in the sea by the action of rivers. After many ages, the water-bearing rocks are covered to a great depth under layers or "blankets" of deposited matter, and the heat there encountered finally brings the water to a sufficient tension to cause an explosion.

For months after the eruption of Krakatoa red sunsets were seen all over the world, and were attributed to the volcanic dust thrown into the air. This fine dust, commonly called ashes, is merely the rock which is shattered and pulverized by the force of the explosion. In all probability the same phenomenon will follow the West Indian eruptions and in the course of a month red sunsets should be seen in New York. As in the case of the Krakatoa eruption, the dust will probably travel toward the east, following the upper currents of the air which flow in a direction opposite to that of the trade winds.

A marked series of seismic and volcanic disturbances are now occurring over a wide region, but whether these are in any way connected with the eruption of Mont Pelée is merely a matter of conjecture. We have already shown that the volcanoes in Hawaii are not connected, though they are very close together, and we may look upon this series of disturbances merely as a coincidence; for one would suppose that the other volcanoes in the West Indies would be active before the more distant volcanoes of Central America. According to precedent, Mont Pelée should continue in activity for a long period, her eruptions growing weaker and weaker as years pass by. What future changes will result from this disturbance it is hard to tell. Considerable light will shortly be thrown on the situation by the large body of scientists who are already flocking to the scene of the disaster. A short description of the unfortunate island might be of interest. Martinique has an area of 381 square miles and a population of about 190,000, of which number about 5,000 are laborers brought from India and over 5,000 laborers from Africa; also about 500 Chinese immigrants. The remainder of the population is largely native negroes, the white population numbering in all about 10,000. A large share of the interior of the island has never been brought under cultivation, although it has been occupied by the French almost constantly since 1636, a period of 267 years, the only interruption in French control being the period from 1794 to 1802, when the island was held by the British. Slavery existed until 1848, when it was abolished in this as well as other French colonies. Notwithstanding the fact that a large part of its interior has never been brought under cultivation, the island is described by Reclus as "one of the most densely populated spots on the globe; on the arable islands people are packed as closely as in such industrial centers as Lancashire, Flanders, or Saxony."

Mount Etna Railroad.

The circular railway which passes around Mount Etna is interesting on account of the geological conditions encountered in its construction as well as the nature of the country which it passes through. In many points of the route the surface consists of layers of lava, and more than twenty-two miles of cutting had to be made across the lava, which is hard as granite. In this way the line, which is only 70 miles long, required no less than four years to execute. The road leaves the station of Borgo and mounts first across a region of flourishing vegetation, among vineyards, wheat fields and orange orchards, but soon it enters an arid and treeless portion, and runs between hillocks of lava until it reaches a fertile strip at Belpasso, a district which suffered greatly from the eruption of 1669. The road again passes through the small town of Misterbianco, which was destroyed by the same eruption, and reaches Paterno, with its miniature volcanoes, which throw out salt mud, and its ferruginous springs. Farther on is Aderno, which has a waterfall and a river, two things which are quite rare in Sicily. Then the route passes through Bronte, which has been often threatened with destruction by lava, and was especially in danger in 1832 and 1843. The last station is Giarre-Riposto, from which it is easy to reach Messina or Catania. This road will be very much appreciated by tourists, and will also serve as an outlet for the products of this populous region.

The art of making malleable glass, which is said to have been well understood by the Egyptians, but which has been for centuries lost, has been rediscovered by Louis Kauffeld, of Richmond, Ind., so the daily press says. Mr. Kauffeld is a lamp chimney maker, and has for years tried to devise a chimney that would withstand excessive heat. The new process, it is stated, renders possible the making of cooking vessels out of glass.

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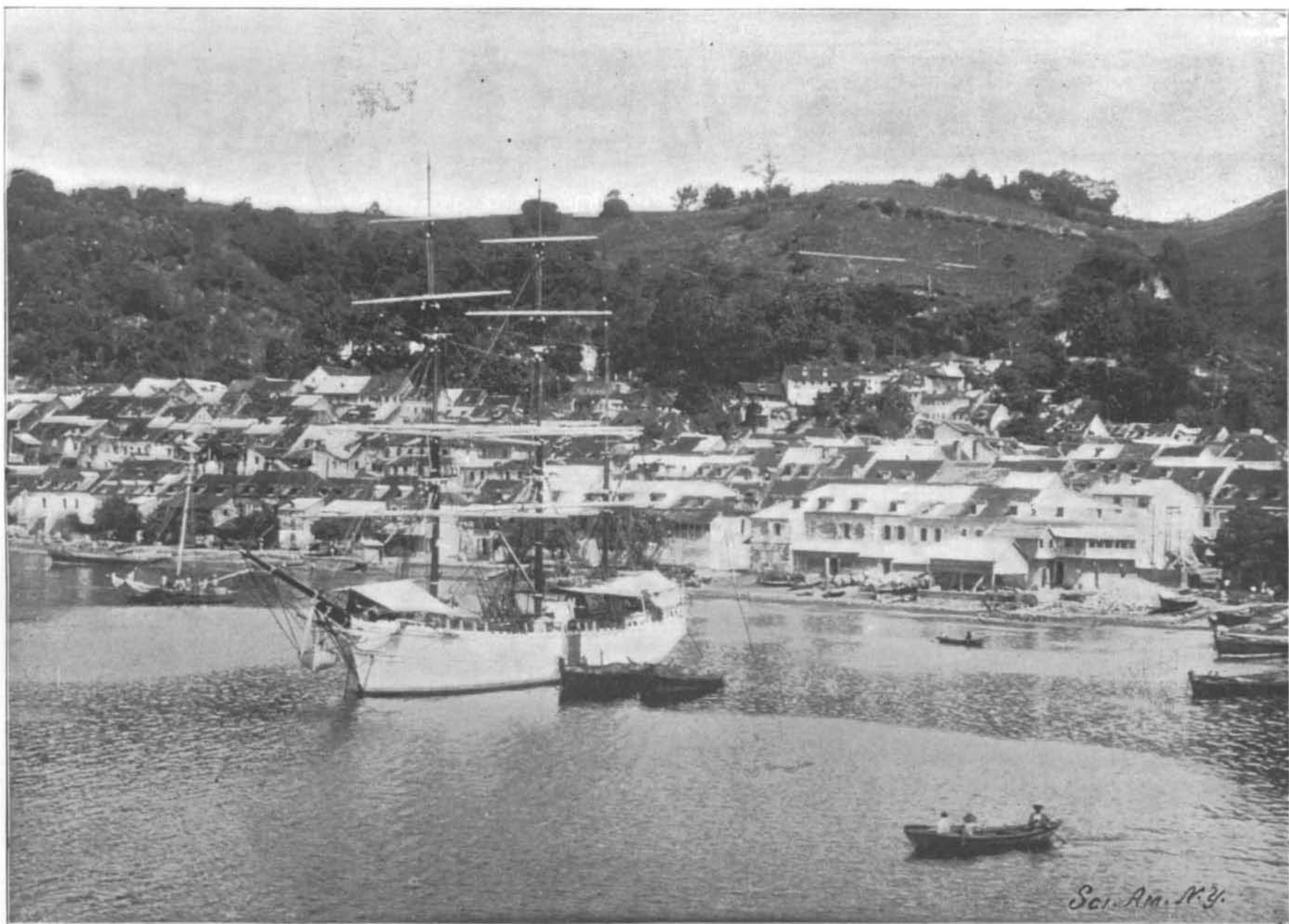
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The Cathedral is seen in the center of the town. Pelée's summit is to the right, cloud-capped.
The Roadstead and Town of St. Pierre, with the Ridge leading up to Mont Pelée in the Background.



Photos by Wm. H. Rau.

A Near View of St. Pierre from the Roadstead.

THE GREAT DISASTER IN THE WEST INDIES.—[See page 365.]