LETTERS TO THE EDITOR.

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Mont Pelée Eruption and Dust Falls.

FALLS of dust are caused in two ways; either the dust, as for instance Sahara sand, is transported by means of the lower air-currents over wide areas, or matter is ejected from volcanoes, thrown high up into the air and carried by the upper currents, falling eventually in places at great distances from the seat of disturbance. The eruption of Krakatō is a good example of the latter case, while the dust fall that occurred last year in March and was recorded in northern Africa, southern and northern Europe is a good representation of the former kind of dust fall.

The occurrence of such falls of dust is very interesting meteorologically, because they afford us means of increasing our knowledge of the actual movements of the air-currents, both low down and high up in our atmosphere. Falls of dust originating from volcanic eruptions are perhaps of greater interest, because the dust in such cases is thrown to very great heights, and we are able to deduce the directions of the currents at this elevation, there being no other method of doing so available.

To those interested in the movements of these upper currents, the recent disastrous eruption of Mont Pelée in Martinique may afford us some valuable information on this subject. From the accounts of the eruption already published, it is found that it occurred on May 8, and we gather from the information supplied by the British schooner *Ocean Traveller*, and printed in the *Times*, that when the ship was about a mile off St. Pierre, the volcano on Mont Pelée exploded. That the eruption was on a stupendous scale is undoubted from the numerous descriptions already made public, and the report from the British steamer *Esé*, which passed St. Pierre, that "she was covered with ashes although five miles distant from the land, and from on board nothing could be seen owing to the impenetrable darkness," gives some idea of the result of the disturbance. Later reports have indicated a further spreading of the dust, the island of Dominica recording a fall of sand on its southern boundary.

It is interesting for a moment to make a brief survey of the atmospheric circulation in the lower and upper reaches of the atmosphere in the region of the West Indies and to the north and south, and see whether we can trace out the probable path of the fine dust thrown into the air.

An examination of the fine pressure charts published in Bartholomew's "Atlas of Meteorology" tells us that during the month of May the West Indies lie between, but a little to the west of, two high-pressure regions, the more northern one being situated in the Atlantic Ocean and that to the south over the centre of South America, the intervening belt being one of low pressure. We also know that the sun has a declination of about 17° north at this time, and as the island of Martinique is situated in latitude about 15° north, the sun therefore passes daily near the zenith of that place, or, in other words, the sun is exerting its greatest heating power. In consequence of this fact, the low-pressure belt has a maximum in this region, and a low-pressure area means that the air is rising from the earth's surface into the higher regions. The two high-pressure areas already mentioned correspond to downcast shafts of air, i.e. air moving from higher to lower regions. With our present knowledge of atmospheric circulation it seems most probable that the heated air, rising into the upper reaches of the atmosphere from the low-pressure region (which includes the West Indies), bifurcates in a north-easterly direction in the northern hemisphere and in a south-easterly direction in the southern hemisphere. Since these currents of air must again reach the earth's surface, where they fall they will give indications of high pressure, i.e. indications of descent of air. As the two high-pressure areas already mentioned lie in the correct positions and directions in relation to the West Indies, it seems very probable that these are the downcast shafts corresponding to the upcast shaft or low-pressure area.

If the circulation above mentioned be correct, then, as the region of the volcanic eruption of Mont Pelée lies in this low-pressure area, some of the finest particles ejected to the upper reaches of the atmosphere might possibly be carried in these

currents and begin to fall in these high-pressure areas. They may also, if the dust be thrown sufficiently high, reach that elevated current of air travelling from east to west and make a circuit of the earth, as was the case in the eruption of Krakatō.

The most favourable position in the northern hemisphere to observe this fall of dust, should there be such, would be probably in the middle of the Atlantic Ocean, and this could only be recorded by passing ships. Since, however, the descending air moves in a spiral manner and in the direction of the hands of a watch, some of this current reaches Britain as a south-west wind, and it will be interesting to see whether any fall be recorded. There seems little doubt, however, that, just as in the case of Krakatō, a great fall of dust fell to the westward of the volcano, so we shall probably soon hear in this case of such records from Mexico and Central America.

Further, the eruption of Krakatō was responsible for the magnificent coloured sunsets that were observed nearly all over the world, and as these were due to the fine dust particles ejected from the volcano—particles at very great altitudes—so it is quite probable that similar effects will ensue from the eruption of Mont Pelée.

It seems desirable, therefore, that information relating to the present eruption should be collected while facts are still in the memory of those who have observed them, and that a complete account be recorded similar to that published on the Krakatō eruption. It is satisfactory to learn that already expeditions are about to be sent from the United States of America to investigate the scene of the eruption.

WILLIAM J. S. LOCKYER.

Symbol for Partial Differentiation.

IN my college days we used the symbol $\left(\frac{du}{dx}\right)_y$ or $\left(\frac{au}{dx}\right)$ (if there was only one other independent variable y) as the differential coefficient when y was constant. I still keep to this symbol. Thus, if k is a certain kind of thermal capacity, $\left(\frac{dk}{dt}\right)_v$ or $\left(\frac{dk}{dt}\right)_p$ or $\left(\frac{dk}{dt}\right)_\phi$ are in my thermodynamic work perfectly definite. The mathematicians have introduced the convenient symbol for a partial differential coefficient $\frac{\partial u}{\partial x}$ and in much work there is no doubt about the meaning. But even in hydrodynamics there is trouble. In thermodynamics there is so much trouble with this symbol that I venture to ask for help.

The German translator of one of my books uses the same symbol $\frac{\partial k}{\partial t}$ for each of the above quite different things. Baynes in his thermodynamics does the same, and so do all other writers; it seems to me that everybody is doing this without thought. Are they writing for the average examination man who does not need to think, or for the real student? If the letter ∂ is to be retained, would it not be possible to use $\frac{\partial k}{\partial t}$ or $\frac{\partial k}{\partial p}$ or $\frac{\partial k}{\partial \phi}$ in the above three cases? I encourage my own students to use ∂ , and I speak in the interest of such men. For myself it does not much matter, as I mean to continue using the symbolism of my youth.

JOHN PERRY.

May 6.

The Pines of Western Asia.

ON p. 15 of NATURE of May 1, it is stated that Herr Hugo Bretzl, in a thesis for his Doctorate at Strassburg, has shown that "the Greeks realised such facts as the absence of the pine in all the countries which intervene between Macedonia and India." That this statement is erroneous is proved by the following facts relating to the distribution of Macedonian and other species of *Pinus* in the countries alluded to. *P. Pinea*, Anatolia and Syria; *P. sylvestris*, Asia Minor, the Caucasus and Tauria; *P. halepensis*, Anatolia, Transcaucasia, Syria; *P. Brutia*, Asia Minor, the Lebanon, N. Persia; *P. Laricio*, Asia Minor. To these should be added various species of *Picea* and *Abies*, which the Greeks may have included under *Pinus*.

J. D. HOOKER.

THE pine referred to is *Pinus excelsa* Wall., which forms a feature of the Macedonian Mountains and also of the Himalayas,