Cases of Lightning Discharge.

By G. E. V. Thomas, A.M.I.C.E.

Communicated by H. N. Ridley.

The study of lightning phenomena is of great interest and importance, and as the conditions which obtain in Malaya are extremely favourable for the observation of such phenomena, as regards the frequency and violence of thunder storms, it is somewhat surprising to find that the accounts so far available are few. Those here given are of interest as being descriptive of unusual effects.

In well-marked cases of the destructive effect of lightning on trees, the tree struck is completely shattered. Such instances are familiar, probably because they are immediately apparent as the result of a severe storm; but the gradual decay and death of a number of trees in the vicinity of one struck, which would seem to be a frequent after-effect, is a form of damage which, as far as the writer can ascertain, has not previously been noted.

The following account, from the diary of Mr. H. N. Ridley, Director of Gardens and Forests, S. S., describes such an effect, which occurred in a coco-nut plantation in Singapore.

"May 3rd 1898. Visited Siglap and saw a place where, more than a month previously, a tree was struck by a tremendous flash. From this tree in a semicircle (there being none on the outer side) eleven more trees died. The deaths appeared to radiate out from struck tree gradually. Three were still standing; they bore young fruit and flowers, but the whole of the foliage looked as if burnt. One was still alive and putting up a fresh leaf. One, covered with fungi, had been dead some time. Why this progressive death? Inspector tells me he saw a similar case where, some time after the death of coco-nuts, some mangosteen trees withered away in like manner.

A similar instance recently occurred in the Botanical Gardens, Singapore, and was brought to the writer's notice by the

same observer. In this case two trees (*Erythrina* and *Detarium*) appeared to have been struck simultaneously. Though the damage apparent was very slight and confined to the bark, decay began in the *Erythrina* within ten days. Another *Erythrina* adjoining died soon after, but the *Detarium* was unhurt. Another example occurred on Government Hill, when a sugar palm was struck (May 2nd, 1899). The writer saw the tree two hours afterwards and obtained the following account from a native eye-witness. "About half past one there was a single peal of thunder, very near, but I saw no flash, only a general glare. Less than one minute afterwards smoke came from the tree and then flames, about half way up the trunk. The fire went up very quickly and I ordered the tree to be cut down." When the writer saw the tree, the fibrous material which covers these palms was still smouldering, but the closest examination failed to reveal any traces of damage other than that caused by fire, and the surrounding trees were quite unhurt. Three months afterwards, however, the similar palms in a radius of twelve or fifteen feet from that struck were completely dead.

A remarkable point in this instance is that although the palm struck was over sixty feet in height, and surrounded by others even taller, the flash should have struck it in the middle. Mr. Ridley has noted a similar case in which an explosion took place in the fork of a Rambutan tree only six feet above the ground between the base of the fork and a birds-nest fern, and set fire to the roots of the fern. There was no damage done to this tree except from burns, but a chicken at its base was killed.

The first of the following accounts, furnished by Mr. A. Knight, is of particular interest, as the phenomena noted were of an unusual kind and did not occur during a storm. Mr. Knight writes:—"On the 12th September, 1898, I was driving home from town, and when in the lower part of River Valley Road I saw a flash in front, and there was a loud report which made my pony start forward. On reaching my house, Grassdale, I found that the ladies of my household had been much startled by the explosion. Two of them had been near the entrance, standing facing towards town, while two others were walking from the direction of town and were about a third of a mile from the house. To the former two a flame-coloured flash seemed to fall

in front of them; to the latter two a bright light seemed to be thrown in their faces and the loud report was instantaneous. These two afterwards detected a sulphurous smell, and all felt a sensation like an electric shock. There had been some distant thunder and rain shortly after noon. It had afterwards been bright but stormy looking; and though clouds were gathering in the evening, there was at that time no thunder or lightning. Shortly afterwards there was heavy thunder near, followed by a copious shower. A. K."

Mr. Knight's second account also describes a form of discharge about which very little is known. It is unfortunate that no photograph was obtained, as it would seem from comments in a recent electrical journal that no photograph ever has been obtained of this phenomenon, and it has been customary to discredit statements as to its appearance. Mr. Knight's note differs from the more usual accounts, in which the ball of fire is said to run about before bursting, but is closely analogous to a case quoted by Dr. Oliver Lodge,* in which however the ball is described as of a reddish yellow colour, changing to vivid white. Mr. Knight's account is as follows:—"On the 14th October, 1898, there was a very severe thunder squall—strong wind, violent rain and much thunder, not very distant. It came on suddenly, about 7 p.m., as we were going down to dinner; and as I was about to take my seat at the end of the table, facing the back of the house, I saw an explosion in the air, like that of a fireball or bomb, probably four or five feet above the ground, and there was a loud bang. The light appeared greenish white. There is no doubt that it was in the back garden, as it was located there by some neighbours whose line of sight was at right angles with mine."

Mr. Ridley reports also the two following cases of globular lightning, differing from that of Mr. Knight in that the phenomena occurred outside the storm. "Some few years ago, I was sitting in my verandah, about 7 p.m; it was quite dark, and there was a thunderstorm going on over the Economic Garden. Suddenly there was an intensely brilliant flash and instantaneous explosion close to the house. My back was towards the garden,

* Lightning Conductors and Lightning Guards. Prof. O. J. Lodge.

so that I only saw the reflection of the light. Mr. Feilding was at the time passing along the road below the hill on which my house stands, when he saw a ball of fire descend in a curve, slowly, about 50 yards from the house, close to the ground, between him and the house. It appeared to explode with a tremendous noise. Careful examination of the grass where the ball fell showed no trace of burning or other mark. Simultaneously with this phenomenon, a large tree (*Irvinia*) in the Economic Garden was struck by lightning, but hardly injured. This stroke was the last flash of the storm."

(2) "A thunderstorm was taking place over the Bukit Timah Road, beyond the Economic Garden, one Sunday about two years ago, at between one and two p.m. The sky was bright, but not cloudless, and the sun brilliant over my house, and I went out on the lawn to look at the distant storm to the North. I saw a zigzag flash apparently about three-quarters of a mile away, and, almost absolutely simultaneously, a peal of thunder came from behind me, and behind the house to the west. I saw nothing to account for this, but Mr. Robertson-Glasgow, who was sitting in a room facing west, saw a luminous body, not ball-shaped, though more or less rounded, moving in a downward curve to the South, till it disappeared behind some trees, and was followed by the thunder. It was less bright than the sunlight."

The only local cases of damage to buildings reported are those at the Cape Rachado and Muka Head Lighthouses. The writer was fortunately able to inspect the former not long after the occurrence, and found it to be an interesting example of side flash, a discharge having left the very fine "Lightning Rod Conference" copper conductor at a bend and made sundry holes in solid masonry walls, traversing two rooms and finally being dissipated over the sheet of rain water collected in a courtyard. The Lightkeeper's report shows that in this case the "expenditure of observers" deprecated by Dr. Lodge, nearly occurred, as the matting under two low wooden beds, on which some of the lighthouse attendants were lying at the time, was torn to pieces. The report concludes:—"In that time Serang, Tindal and two Lascars is inside the room grate of the Almighty pity there had not been anything happen."

The Muka Head case (October 9th, 1897,) affords another example of the inefficacy of the old-fashioned single conductor, which was supposed to protect a building of any size if only it were high enough, and had nicely sharpened points and an earth resistance measuring a fraction of an ohm. From the interesting report by Mr. Wills,* the Lighthouse keeper, it would seem that a flash struck the conductor, leaving evidence by tearing off a gunmetal brace about half way up. The discharge then left the heavy copper rod and proceeded to earth by a thin telephone earth wire, thirty feet of which was completely deflagrated. From some further reports collected by the writer, it would seem that Penang Hill would form an excellent site for observation, as the disturbances noted by the Signal Sergeant stationed there are exceptionally freakful and violent. He states that in April, 1898, a telegraph pole was cut in half horizontally as if it were sawed off." The telegraph wire was also cut in three or four places and three insulators broken. On another occasion, a discharge passed through a large earthenware jar, making one hole of several inches in diameter, and a second of less than one inch, and finally excavating part of the floor near the jar.

An attempt to explain the conditions which serve to bring about results like these is not within the scope of the present notes, but the writer may, perhaps, be permitted to invite further lightning notes, accompanied where possible by photographs. Such records are of the greatest possible assistance in promoting the general knowledge of a series of phenomena about which there is still much to be discovered.

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*Kindly furnished by Mr. O. V. Thomas, Acting J. Supt. Govt. Telegraphs, Penang.