

S. I saw an account of a tornado in which not only were branches torn from some trees while the tree was left standing, but the bark on one side was sometimes scraped away, and splinters of wood and even straws were found sticking endwise in the stumps of trees as if they were fired into the wood from a gun.

T. Very good. Let me see how many of you can get from the papers or other books at your homes descriptions of such tornadoes. In what countries might we expect such to occur?

S. In countries where great extents of air might be set in motion by the warming of the earth and air by the sun, like the middle of the United States.

Another S. When a shot is fired from a gun or a rifle, it is gas which blows the bullet out. How fast would the gas be moving out of the gun, then?

T. About 1,600 feet per second, more or less. A breeze blowing so fast would cause all the boulders about the school-house to fly like cannon balls. It would, of course, blow away the school-house in splinters, and uproot or snap off every tree.

S. Was there ever a wind like that?

T. There have been tornadoes recorded in which a small portion of the wind would appear to have very nearly that velocity.

And I might also mention that winds have been caused nearly as strong by a process not very unlike your pop-gun, only the barrel was the steep side of a high mountain and the still air round about.

As I will make you find out some time after this, a stone allowed to fall from a state of rest will move faster and faster as it falls. When it has been falling for one second of time it has a velocity of about thirty-two feet. To have the velocity of a gun shot—1,600 feet per second—it would be required to be falling for fifty seconds. That would require it to fall from a height of about 4,000 feet, nearly four-fifths of a mile.

Now, let us suppose that on the face of a very steep mountain ridge, about a mile high, a landslide the one thousandth part of a cubic mile should suddenly take place. Five million tons of air would have to rush into the vacant spot left by the landslide, which would be about four thousand times heavier—twenty billion tons. As this tremendous mass would be plunging downward for about a minute with a velocity increasing until it became as great as a cannon ball, the five million tons of air would be practically plunging down after it, not so fast, altogether, because the air would start to close in on each side as the mass moved down. The valley below would receive the shock of the 20,000,000,000 ton projectile, and the blast of the wind would be as the blast from the mouth of a cannon.

S. Did anything like that ever happen?

T. Yes, very much like it. Some of the landslides on the Alps come near it. The drop of the landslide is not vertical, and its course would have to be longer in order to acquire the same velocity. But within the last ten years, a great landslide came down into one of the Swiss valleys and plunged up on the other side for a very great distance; and the force of the wind on each side of the slide itself, overturned trees, snapped them off, tore the branches of others, and for a great distance bombarded forests and cliffs with flying debris carried by the wind set in motion. On a future occasion I shall read you a description of this or another landslide, to show what the gentle zephyrs can be made to do if they are only hurried fast enough. And that is the mystery of the tornado-velocity given by the motion of vast masses of air whose inertia is deflected into a comparatively small whirl which sweeps the earth. The rain and the electric display are merely the other natural accompaniments depending on the different conditions of the moving masses of air.

For the REVIEW.]

Evening Stars.

For some time back there has been a plentiful lack of evening stars in the sky, and observers have been doing quite a lot of grumbling about it. Venus has not been seen in the west after sunset since last April, Jupiter not since August, Mars not since September, and Saturn not since October, or early in November. Mercury was supposed to be doing duty as evening star from November 7th to January 6th, and during three or four weeks of that time he was bright enough, and stayed up long enough after sunset to play the part in quite good style. But our old friend, the weather-fiend, put his veto on the performance, and refused to pull up his curtain of dirty grey cloud. The curtain was up often enough during those three or four weeks, both by day and by night; but a ragged patch of it was always to be found over that part of the south-west sky where Mercury was trying to show himself during the hour or hour and an half after sunset. So, at least, it was here, where not a single observation was got; and I have not heard of any having been got anywhere else.

Before the end of the present month three out of the five brightest planets may be seen as evening stars. One of them is technically an evening star already, but it is not likely that she has yet been seen except by a few observers who have taken special pains to look her up, or who have been exceptionally lucky. Another one has been visible in the evening for some time, but