shows the average of 85.1 %. Of the cautionary signals displayed, 80.4 % were justified by winds exceeding twenty-five miles an hour at or within one hundred miles of the station.

THE FALL OF A BALLOON.[1]

IN the August (1882) number of *l'Aeronaute*, accounts were given of the different ascents made on the 14th of July of that year. Among these ascents that of Cottin and Perron was of especial

FIG. 1.

FIG. 2.

interest, not because of the length of the voyage, but from its brevity, and on account of the fall which ended it. The balloon had barely started from Paris when a rent was formed in the upper part, and the balloon descended at Saint-Ouen. This occurrence is not entirely unknown; but that which does not

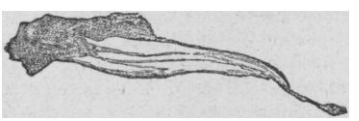

FIG. 3.

happen often is, that an artist, Mr. Jacque, chanced to be at his window, and was able to make rapid drawings of the balloon during its descent, and Mr. L. Gillon viewed the accident from the Place Wagram, and made three drawings.

Mr. Cottin, thinking that the aeronauts had not attached sufficient importance to his ascent, has published an account of it in a brochure, illustrating it with the drawings of Jacque and Gillon. He begins his statement, "It was sixteen minutes past four. The wind was blowing violently from the south-east. The temperature was 28° C. At starting, the voyagers felt nervous, and noticed some excitement in the movements of those who were assisting. Nevertheless, they started, saluting the crowd, who responded as only a sympathetic Parisian crowd knows how. They rose over the building which forms the corner of the Place Wagram. Thirty kilograms of ballast was thrown out; and, relieved of this weight, the balloon shot up. With one bound it was four hundred metres; another, and it had reached a height of six hundred metres. At this time it was just twenty-four minutes past four. The aeronauts felt that the balloon seemed to stop. They were told afterwards that they began to turn. Cottin felt a trembling of the basket. Some seconds passed. Then the noise of the flapping silk was heard."

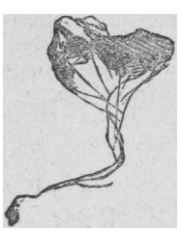

FIG. 4.

The balloon was torn when at a height of seven hundred and three metres, as shown by a pocket barometer which Cottin had with him, and saved in good condition. For the first hundred and twenty metres of the fall the motion was regular. Then a swinging motion began, and finally the fall

FIG. 5.

increased in speed. The oscillations increased enormously, and the basket swung through the air with a dizzying velocity. At times the balloon took up an almost horizontal position in the direction of the wind. This swinging continued till a point within a hundred and twenty or a hundred and thirty metres of the earth was reached. From this point the fall was nearly vertical, as the silk had formed itself into a parachute. During this period Mr. Perron threw out the last of the ballast, the guide-rope, and cut the cords of the anchor. Led by Perron's example, Cottin threw over a bottle of cold coffee, which, he remarks, 'might have injured or even disfigured them.'

[1] Taken, with the illustrations, from *l'Aeronaute*, June, 1883.

Suddenly, without any shock, the basket seemed to drop from under their feet. A moment later they were violently thrown down by the sudden stopping of their fall. It was twenty-seven minutes past four. The ascension had lasted eleven minutes, and two minutes were occupied by the fall of seven hundred and three metres.

They found themselves suspended about two metres from the pavement in the courtyard of a house in Saint-Ouen, the ropes and material of the balloon having caught on the roof. The yard was not more than four metres long by three wide. To complete their good luck, there was a flight of steps which gave them an easy means of reaching the ground.

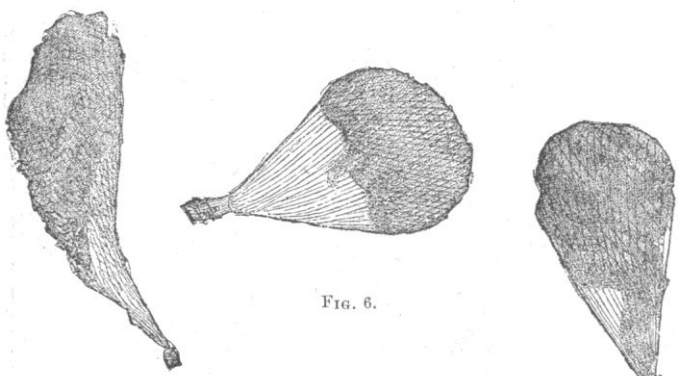

Fig. 6.

Mr. Jacque was in his studio, and saw the balloon in the air. Seeing that something unusual was happening, he seized a pencil, and hastily drew the successive forms which are reproduced in figs. 1 to 4. As to the drawings, he says, "I could only indicate very imperfectly the ropes and basket, which I could hardly see. It is necessary to remark, that the phases represented ought to be supposed as following closely one another, and constantly changing. I suppose that the time during which the fall was visible to me was about one minute, and the distance fallen five hundred metres. At the moment when I saw the balloon taking the last form (fig. 4), it was descending more rapidly, and disappeared behind the left slope of Montmartre. It did not seem more than one kilometre distant from me; but in this I was mistaken."

The sketches (fig. 6) of the fall as seen by M. L. Gillon are not accompanied by any explanation.

The figures are of interest as showing the form which a balloon takes when forming itself into a parachute, and give some indication of the resistance offered by the air. The parachute was doubtless of an imperfect form, and offered too great a resistance. It had, moreover, the fault of not having a central opening, on which account the air could only escape laterally, and gave rise to the fearful oscillations. In an actual parachute the central hole, of large size, allows easy escape to the air, and the oscillations are slight. It can almost be said that the resistance of a parachute increases with the size of the opening.

The balloon tore on its upper side on account of the disproportion in the ropes. The lower part, reversing, formed a closed parachute. It is not singular that the balloon should have taken such strange shapes while falling.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

ADDRESS OF THE RETIRING PRESIDENT, DR. J. W. DAWSON, AT MINNEAPOLIS, AUG. 15, 1883.

SOME UNSOLVED PROBLEMS IN GEOLOGY.

My predecessor in office remarked, in the opening of his address, that two courses are open to the retiring president of this association in preparing the annual presidential discourse, — he may either take up some topic relating to his own specialty, or he may deal with various or general matters relating to science and its progress. A geologist, however, is not necessarily tied up to one or the other alternative. His subject covers the whole history of the earth in time. At the beginning it allies itself with astronomy and physics and celestial chemistry. At the end it runs into human history, and is mixed up with archeology and anthropology. Throughout its whole course it has to deal with questions of meteorology, geography, and biology. In short, there is no department of physical or biological science with which geology is not allied, or at least on which the geologist may not presume to trespass. When, therefore, I announce as my subject on the present occasion some of the unsolved problems of this universal science, you need not be surprised if I should be somewhat discursive.

Perhaps I shall begin at the utmost limits of my subject by remarking that in matters of natural and physical science we are met at the outset with the scarcely solved question as to our own place in the nature which we study, and the bearing of this on the difficulties we encounter. The organism of man is decidedly a part of nature. We place ourselves, in this aspect, in the sub-kingdom vertebrata, and class mammalia, and recognize the fact that man is the terminal link in a chain of being, extending throughout geological time. But the organism is not all of man; and, when we regard man as a scientific animal, we raise a new question. If the human mind is a part of nature, then it is subject to natural law; and nature in-