

barometer and saw it between 10 and 11 inches, and tried to record it, but was unable to write. I then saw it at ten inches, still decreasing fast, and just managed to note it in my book; its true reading therefore, was about 9½ inches, implying a height of about 29,000 feet. I was losing all power and endeavoured to rouse myself by struggling and shaking. I essayed to tell Mr. Coxwell I was becoming insensible, but I had lost the power of speech. I saw Mr. Coxwell dimly in the ring; it became more misty, and finally dark. I was still conscious, and knew I should soon be insensible, and I suddenly sank, as in sleep. On recovering consciousness I heard Mr. Coxwell say, "What is the temperature? Take an observation; now, try." I could neither see, move, nor speak, but I knew he was in the car trying to rouse me. I then heard him speak more emphatically, "Take an observation. Now, *do* try." I then saw the instruments dimly, and Mr. Coxwell very dimly, then more clearly, and shortly afterwards said to Coxwell, "I have been insensible," and he replied "You have, and I nearly." I recovered somewhat quickly, and Mr. Coxwell said "I have lost the use of my hands; give me some brandy to bathe them." His hands were nearly black. I saw the temperature was still below zero, and the barometer reading 11 inches, and increasing quickly. I resumed my observations at 27, recording the barometer reading 11.53 inches, and the temperature minus 2°. I then found that the water in the vessel supplying the wet bulb thermometer which I had by frequent disturbance kept from freezing, was one mass of ice. Mr. Coxwell then told me that whilst in the ring he felt it piercingly cold; that hoar frost was all round the neck of the balloon, and on attempting to leave the ring he found his hands frozen, and he had to place his arms on the ring and drop down; that he found me motionless, with a quiet and placid expression on the countenance, that he at first thought I was resting myself; that he then spoke to me without eliciting a reply, and then observed my arms hanging by my side, and my legs extended, and found I was insensible. He then felt that insensibility was coming over himself, and that he could not assist me in any way; that he became anxious to open the valve; that his hands failed him, and that he instantly seized the line between his teeth and pulled the valve open two or three times, until the balloon took a decided turn downwards. This act is quite characteristic of Mr. Coxwell. I have never yet seen him without a ready means of meeting every difficulty as it has arisen with a cool self-possession that has always left my mind perfectly easy, and given to me every confidence in his judgment, in the management of so large a balloon. Six pigeons were taken up. One was thrown out at the height of three miles, it extended its wings and dropped like a piece of paper; a second at four miles flew vigorously round and round, apparently taking a dip each time. A third was thrown out between four and five miles and it fell downwards. A fourth was thrown out at four miles when descending; it flew in a circle and shortly alighted on the balloon. The two remaining pigeons were brought down to the ground. One was found dead, and the other, a carrier, had attached to its neck a note. It would not, however, leave, and when cast off the

finger returned to the hand. After a quarter of an hour it began to peck a piece of ribbon by which its neck was encircled, and it was then jerked off the finger, and it flew with some vigour finally towards Wolverhampton. One of the carriers returned to Wolverhampton on Sunday, and this is the only one we heard of. We descended in the centre of a large meadow belonging to Mr. Kersmall, at Cold Weston, seven miles and a half from Ludlow. The last ascent was from the Crystal Palace, on the 8th of September. We fell about four miles from Tilbury Fort. These eight ascents have led me to conclude—firstly, that it was necessary to employ a balloon containing nearly 90,000 cubic feet of gas, and that it was impossible to get so high as six miles even with a balloon of this magnitude, unless carburetted hydrogen, varying in specific gravity from 370 to 340, had been supplied for the purpose. It is true that these statements are rather conflicting when compared with the statements made by one or two early travellers who professed to have reached some miles in height with small balloons. But if we recollect that at three miles and three-quarters high a volume of gas will double its bulk, we have at once a ready means of determining how high a balloon can go, and in order to reach an elevation of six or seven miles it is obvious that one-third of the capacity or the balloon should be able to support the entire weight of the balloon, inclusive of sufficient ballast for the descent. The amount of ballast taken up affords another clue as to the power of reaching great heights. Gay Lussac's ballast was reduced to 33 lb. Rush and Green, when their barometers, as stated by them, stood at 11, had only 70 lb. left, and this was considered a sufficient playing power. We found that it was desirable to reserve 500 or 600 lb., and although we could have gone much higher by saving less, still on every occasion it was evident that a large amount of ballast was indispensable to regulate the descent and select a favourable spot with the nicest accuracy. Secondly, it was manifest throughout our various journeys that excessive altitude and extended range as to distance are quite incompatible. The reading of the instruments establishes this, and it has been pointed out what a short time the balloon held its highest place, and how reluctantly it appeared to linger, even at a somewhat less elevation. It has been stated by an aeronaut of experience that strong opposing upper currents have been heard to produce an audible contention, and to sound like the roaring of a hurricane. Now the only deviation we experienced from the most perfect stillness was a slight whining noise in the netting, and this only when the balloon was rising with great rapidity. The balloon itself as it descends flaps about occasionally, but this occurs when it is in a collapsed state, and very likely it was under similar circumstances, and perhaps during a rapid descent, that the flapping of the lower part of the balloon was mistaken for a roaring wind. I may also say that the too readily accepted theory as to prevalence of a settled west or north-west wind was not confirmed in our trips, nor was the appearance of the upper surface of the clouds such as to establish the theory that the clouds assume a counterpart of the earth's surface below, and rise or fall like hills or dales. The formation of vapour along the