The Zeppelin Air-Ship.

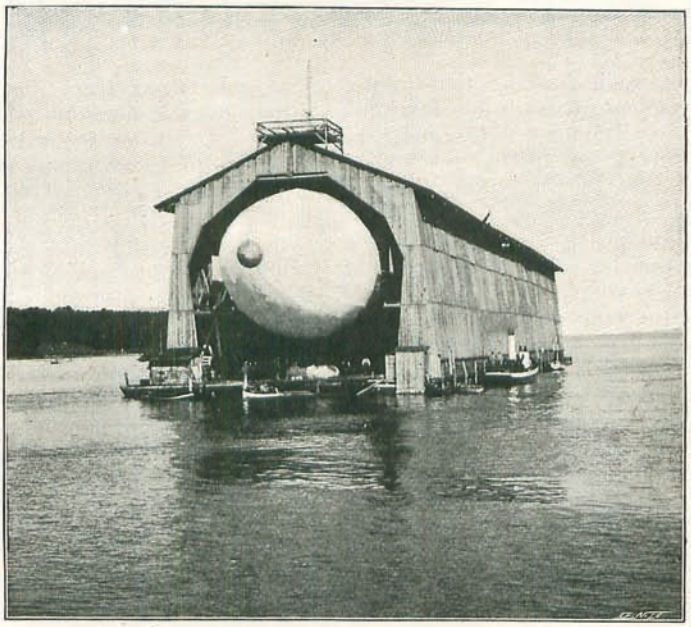
By Thomas E. Curtis.

Photos. by Alfred Wolf, Constanz. These are the only photographs authorized by Count Zeppelin.

WITH all these experiments going on we ought soon to be able to travel through the air. The celebrated flying-machine invented by Professor Langley, a few years ago, proved that flying-machines could fly; and the more recent experiments by Schwarz and Danilewsky have increased the belief that the era of aërial flight was near. The latest experiment, made only a month or two ago, by Count Zeppelin, on Lake Constance, with one of the most ingenious, expensive, and carefully-constructed balloons of modern times, was so successful in proving the rigidity and safety of an air-ship at a high altitude, that the complete submission of the air to the mechanism of man seems nearer than ever at hand. The interest of the whole scientific world in the experiment was deep, and an unwonted exhibition of interest by the ordinary public took place.

The balloon was constructed in a wooden shed on Lake Constance, at a little town called Manzell, near Friedrichshafen, and this curious pointed structure, with twenty-two big windows (eleven on each side) and its almost innumerable pontoons (on which the huge building floated), has for many months been an object of great attraction to those visiting the beautiful Swiss lake.

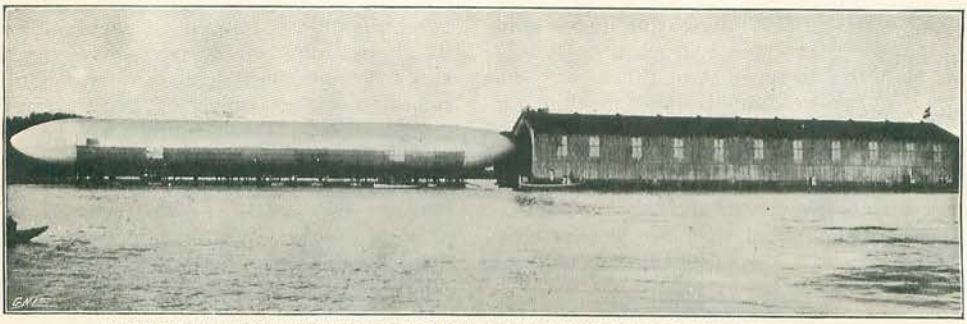
The illustration with which we open this article, while it does not show the pointed end, so constructed to diminish the resistance of the air, gives an admirable idea of the balloon-house. Four hundred and fifty feet long, seventy-eight broad, and sixty-six high, it is, indeed, a formidable object. The rear end, through which we are able to see part of the air-ship, is usually covered with a curtain, to ward off the curious; and the front end is given up to offices, store-rooms, and sleeping accommodation for such workmen as have to act as sentinels at night.



THE ZEPPELIN AIR-SHIP IN ITS FLOATING HOUSE ON LAKE CONSTANCE—SHOWING THE REAR END, WHICH IS CONICAL IN SHAPE.

There can be little doubt that this construction shed is one of the most perfect of its kind ever devised, and, incidentally, it shows the care and skill with which Count Zeppelin and his engineers prepared themselves against untoward delay and accident in the consummation of their great plan. If, for instance, we could row up to this

immense floating structure we should find it resting gracefully on ninety-five pontoons, and we could understand the advantage which such a shed, floating on the bosom



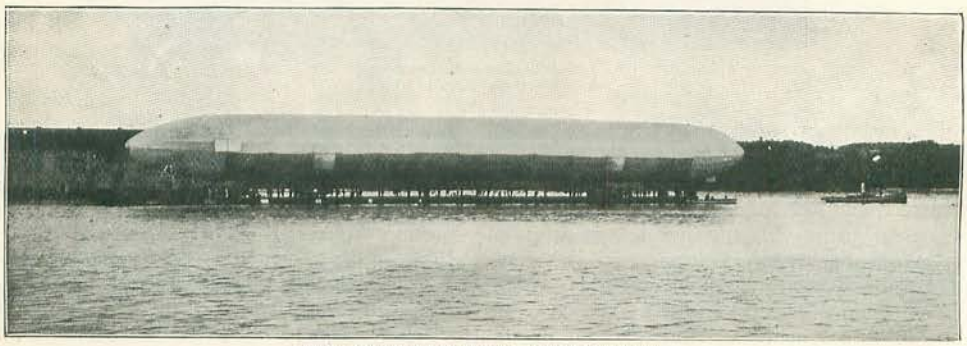
THE ZEPPELIN AIR-SHIP FLOATING ON PONTOONS AFTER HAVING BEEN DRAWN FROM THE SHED.

of an open lake, would have for the inventor in the experimental trials of his machine. No ground to fall upon, and nothing to run against! Again, by anchoring his shed at one point only the inventor allows it to turn, as on a pivot, with the wind, and thus gains the aid of the wind in getting his balloon out of the shed with the minimum of damage and the maximum of speed.

The cost of the construction of the building in which the balloon was housed alone exceeded 200,000 marks. The plans of the workshop were made by Herr Tafel, a well-known Stuttgart architect, and the construction of the balloon was intrusted to Herr Kaubler. The construction was carried out by seventy carpenters and thirty mechanics, and that the work was done well

the pontoons support the shed, and that the remainder support the balloon. In other words, the balloon, on its own supports, can be easily moved in and out of the shed. The exit, taking place, for reasons already given, in the direction of the wind, and assisted by it, is particularly safe, as the danger of pressure in the balloon against the sides of a shed—so common in sheds built on land—is avoided. It is reasonably certain that all experiments in air-ship construction will in future take place on water, owing to the success and ease with which the Zeppelin balloon has been taken in and out of its house on Lake Constance.

When the balloon is ready for an ascent it is pulled out of the shed on its own pontoons; and when its flight is over it is placed on the pontoon-floor and drawn into the shed. Each operation takes but a few minutes. Our second illustration, and several succeeding illustrations, gives an excellent idea of



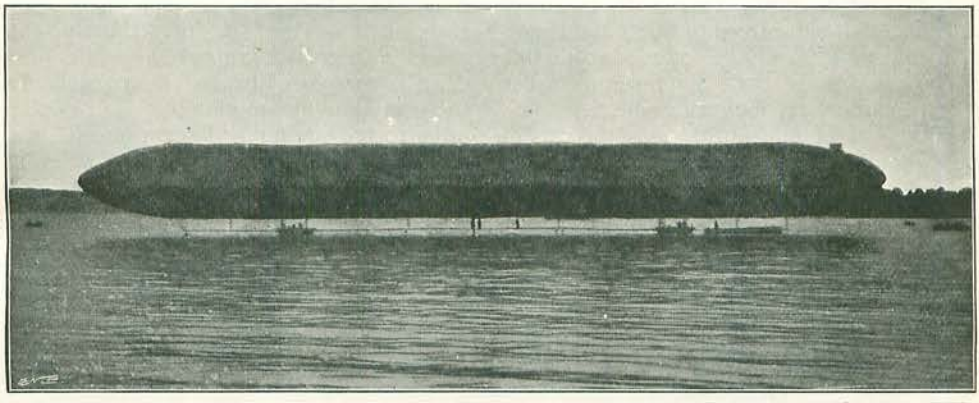
THE AIR-SHIP BEING TOWED UPON THE LAKE.

and carefully is shown by the fact that every separate piece of material used in the air-ship had been tested at least twice.

A word or two more about the shed and we may leave it, with the balloon. If we examine closely we discover that part only of the floor upon which the balloon rests before flight. It also affords us our first real view of the huge cigar-like structure that has so recently flown itself into world-wide fame. Conical at both ends, in order that resistance to the air may be lessened, and cylindrical

in shape, it measures 390ft. in length, and has a diameter of about 39ft. It looks, even at a close view, like a single balloon ; but, in reality, it consists of seventeen small balloons, because it is divided into seventeen sections, each gas-tight, like the water-tight compartments on board a steamship. The gases) has been proved to last for two or three weeks.

The exterior of the balloon is made of pegamoid, which protects it both from sun and rain. The total capacity of the interior balloons is about 12,000 cubic yards of hydrogen gas ; and, lest any of our readers

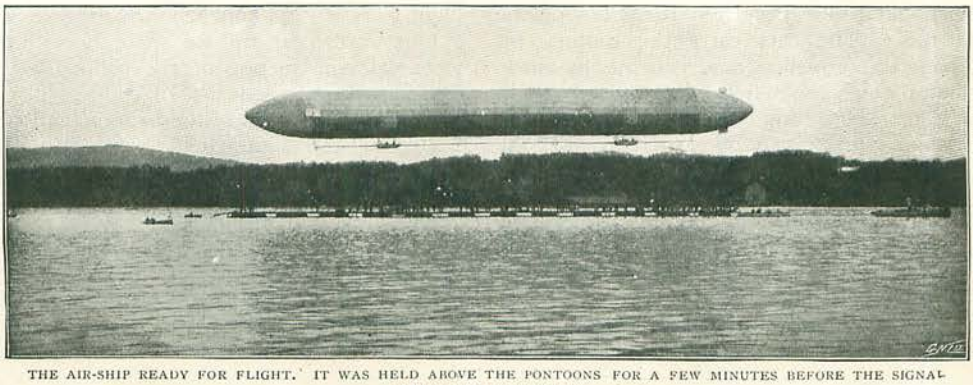


THE AIR-SHIP READY FOR THE ASCENT. THIS PHOTOGRAPH SHOWS THE CARS OF THE BALLOON IN WHICH THE MOTORS AND PASSENGERS ARE CARRIED.

interior is a massive framework of aluminium rods, stretching from one end of the balloon to the other, and held in place by seventeen polygonal rings, arranged 24ft. apart. Each ring is supported by aluminium wires, and the whole interior, looked at from one end, appears as if a lot of bicycle wheels had been placed side by side. The whole series of seventeen sections is covered with a tough and light network of ramie.

Each section, as we have said, is a balloon in itself, and each section is covered with a light silk texture, which, by virtue of an india-rubber coating, is, in the general sense of the word, gas-tight. So tight, indeed, has each balloon been made, that one filling of hydrogen (the lightest and most volatile of should bankrupt himself by attempting to construct a Zeppelin balloon, we may as well add that each filling costs in the neighbourhood of £500. When the balloon is ready to be filled, the hydrogen gas, in 2,200 iron bottles, is brought alongside the balloon-shed on pontoons, each containing 130 bottles, and all connected with each other, thus forming a single reservoir, which in turn is connected with the balloon by a distributing pipe. It takes five hours to fill the whole balloon.

It is one thing to build a balloon and another thing to make it go. It is still another thing to be able to control its flight, steering it this way and that, with the wind and against it. Hundreds of inventors, including the lamented Darius Green, have failed

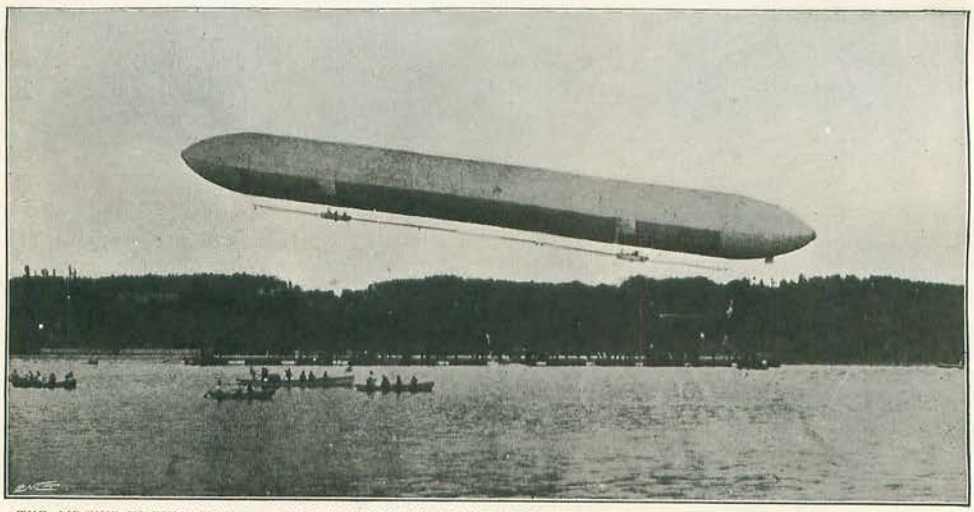


THE AIR-SHIP READY FOR FLIGHT. IT WAS HELD ABOVE THE PONTOONS FOR A FEW MINUTES BEFORE THE SIGNAL WAS GIVEN TO LET GO.

because of their methods of steering and propulsion, or the absence of each. But it is in these very respects that Count Zeppelin may well be said to have been successful. More, however, of that anon. Suffice to say here that the propulsion of the great balloon under consideration is effected by four screws made of aluminium, all working as do the propellers of a ship. Two of these screws are situated about a third of the total length from the bow, and the other two a like distance from the stern. Each screw makes over a thousand revolutions a minute.

In several of our illustrations the cars of the balloon are plainly shown. These also are made of aluminium—indeed, every part of the air-ship is made of the lightest possible material—and are attached to the inner framework by rods and wires. The cars are about 5ft. broad and 3ft. deep, and are situated each under a pair of screws, which may be noted projecting from the sides of the balloon. The cars carry the motors for driving the propellers, and benzine, by virtue of not requiring such heavy machinery to use it with, has been chosen for the motive power. Enough benzine may be carried to work the balloon for ten successive hours. It may be added that the cars of the balloon are connected, as shown in our photographs, by a narrow passage-way, made of aluminium wires and plates, which are firmly connected with the balloon above.

One very noteworthy feature of this latest air-ship is the sliding weight—made of lead and weighing 300 kilos—by means of which the balloon is raised or lowered at the bow or stern. In our illustrations on the last four pages of this article — particularly on page 313—we may observe the balloon at a decided angle in the sky. This shows the work of the sliding weight. It was secured in the centre of the dragging-cable, the ends of which were fastened fore and aft. As the dragging-cable was about 328ft. long, with a slack of about 75½ft., the stability of the vessel was greatly improved. The heavy, deep-hanging weight acted as a regulator of the pendulum-like motion of the air-ship. In order to provide for a descent into the water the sliding weight is inclosed in a water-tight box filled with air, which causes the box to float when it touches the water. The value of this piece of mechanism was proved, as is hereafter shown, when the first experiment in flight was made, although an unfortunate accident occurred to it, which brought the flight to an abrupt conclusion.



THE AIR-SHIP IN FULL FLIGHT. BY COMPARING THIS ILLUSTRATION WITH THAT ON THE NEXT PAGE IT WILL BE SEEN HOW THE OPERATION OF THE SLIDING WEIGHT TILTED THE BALLOON WITHOUT DESTROYING ITS EQUILIBRIUM.

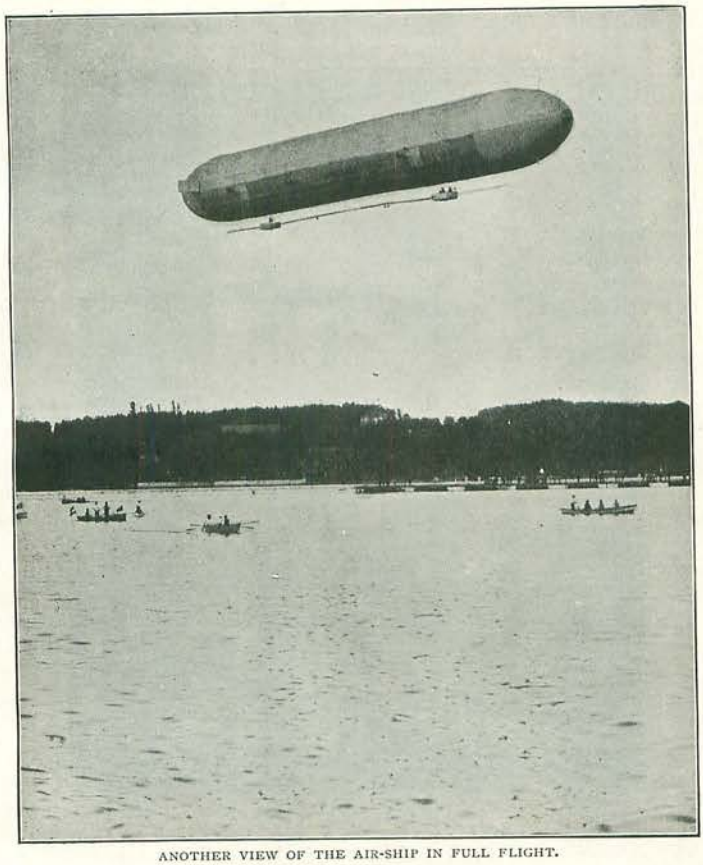
One word more and we are done with the technical construction of the balloon. The steering apparatus consists of rudders placed at the bow and stern of the balloon, and controlled by wires attached to the two cars. Each rudder is made of cloth with a framework of aluminium.

The Government lent its aid in a manner worthy of emulation by Governments which are less up to date. When, for instance, the inventor discovered that by allowing his building to float freely about on the lake he was hampering himself with considerable difficulties, the naval dockyards at Kiel

came to his support with the loan of four gigantic anchors, by which the floating workshop could be fastened. The Kaiser was interested in the air-ship throughout its construction, and only the inventor and his immediate colleagues will ever know how much the Imperial aid and interest stimulated them in their endeavours.

The 30th of June last witnessed a tremendous gathering of scientific men and others on the shores of Lake Constance, who had come from far and wide to attend the experimental trials of the Zeppelin balloon. Experts from various countries were present, and the Kaiser, always keenly interested in the problems of aëronauters, was represented by several Germans of wide experience. It was a day when the fate of an old man of seventy was to be decided—a man who, with exceeding enthusiasm in his hobby, had put £20,000 into the construction of a flying-machine that had not yet taken its first flight into the air.

The Balloon Company, which had been formed with a capital of £40,000, half of which was contributed by Count Zeppelin, chartered a steamer on that day and carried the experts to the scene of the trials. A delay in filling the balloon occurred and the trial was postponed. The following day the trial was delayed by a stiff wind, but in the evening the balloon was drawn from the shed, ballasted and balanced, and was sent up a few feet into the air in order that its propelling power might be tested. Night then intervened, and the real trial was again postponed.



ANOTHER VIEW OF THE AIR-SHIP IN FULL FLIGHT.

The next day, July 2nd, proclaimed the success of the aërial monster over which so many months of mental and mechanical labour had been spent. There was a touch of romance about it too, for it was not until sundown that the trial trip began, and it was then that the gray-headed inventor, courageous and confident of the success of his plans, ventured on a voyage in an untried ship into the darkening night. A light wind prevailed. Punctually at half-past seven the balloon was

taken from the shed, and, held in position by several ropes, was allowed to rise about 75ft. At eight o'clock it was released, and with Count Zeppelin, and four assistants in the two cars, began slowly to ascend.

Zeppelin himself, as we have said, is a man of seventy, who for many years has devoted his whole time and energy to the study of aërial navigation. It has been said that the Schwarz balloon, which was described in this Magazine in March, 1898, gave him the idea of the present air-ship; and those who have read that article will note many points of similarity in the two pieces of mechanism. Schwarz died prematurely, and his idea had to be carried to fruition by his friends. The balloon, for this reason, was, as time proved, a failure; but Count Zeppelin, noting the great ingenuity of its construction, decided to improve it, upon the lines of its lamented inventor. The Count lives in the fine castle of Ebersberg, near Constance, and he looks back on a distinguished career in the Franco-German War. He made an extremely daring ride at one time through the outposts of the enemy, and it is said that the desirability of having some quicker and safer means of scouting than that in use appealed to him strongly, and suggested at once an aërial machine. He consulted and took the advice of various authorities in aërial navigation, both of his own country and abroad, and finally succeeded in floating, at Stuttgart, the company already mentioned, which has so successfully built the balloon.

THE AIR-SHIP AT A HIGH ALTITUDE.

The best account of the short and exciting trip of the Zeppelin balloon has been given by Captain-Lieutenant D. von Bethge, steamship inspector of Friedrichshafen, who may briefly be quoted: "It was an exciting moment," he writes, "when the first command to let go the cables sounded from the raft, and the air-ship, which, up till then, had been held by the hands of the firemen, labourers, and soldiers, rose slowly into the air, and suddenly, at the height of 25 mètres (82ft.), was released and soared upwards. At first the vessel descended somewhat before the light easterly breeze which was blowing; but when the engines began to work it steamed *against* the wind, then turned to right and left, and afterwards travelled with the wind, turning occasionally hither and thither until it reached Immenstaad." The distance travelled was about 3¼ miles.

In the early part of the trip an accident to the steering mechanism occurred. A winch broke and hindered the further use of the running weight, which, as has already been mentioned, was provided in order that the bow or stern might be lowered or raised, and the horizontal position regained. Notwithstanding the accident, Lieutenant Bethge goes on to say, "it was still possible to turn the balloon to the left against the wind, but as it was impossible, owing to the broken cable, to turn to the right, Count Zeppelin decided to descend." The descent took place seventeen minutes after the ascent.

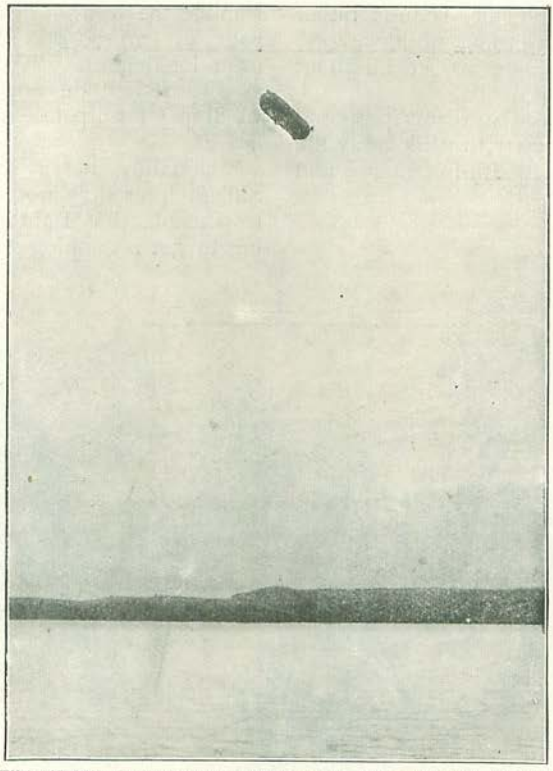
Count Zeppelin has written an account of the trial trip which is of special interest, as it comes from one with a full knowledge of all the details. "The task," he says, "of bringing down the air-ship took place without a hitch. In spite of a rapid and considerable escape of gas, followed by but a small sacrifice of ballast, the descent took place so gently that

a descent on to hard ground would seem devoid of danger."

The accident to the running weight made it necessary to avert the imminent danger of capsizing by stopping and going astern with the screws. "Henceforth," he adds, "the whole voyage consisted of alternately going ahead, and then astern, with the screws, so as to prevent excessive inclination. A further reason for this alternate motion arose from the circumstance that the air-ship, which at first obeyed her helm well to starboard, ran more and more to the left, owing, apparently, to a curve to larboard, due to the drag of the running weight. For this reason also, in order to avoid being driven on over the land, it was necessary to go astern with the screws whenever the stern pointed towards the lake."

It seems from all accounts that the floating capacity and the great lateral stability of the Zeppelin air-ship have been conclusively proved. The ship floated smoothly in a horizontal position. It also obeyed its rudder up to the moment when the steering cable broke. Moreover, as Count Zeppelin himself says, "it has been proved that there is no danger of fire in connection with the use of the air-ship in ordinary conditions."

The rigidity of the balloon—important in view of its great length—has also been established. It is unfortunate that no exact statement of speed was obtainable owing to the accident, although the reports of several experts stationed at different points, now, at the moment of writing, being made out, may give an approximate idea of that speed. Bethge estimates that the rapidity of flight before the wind towards Immenstaad was about nine mètres (29ft.) per second, from which figure the trifling wind-velocity has to be deducted. It is enough, however, to say that a dirigible balloon, which can maintain a state of equilibrium, and descend with perfect safety to its passengers, has become an established fact. Future experiments, which the fortune and enthusiasm of Count Zeppelin will enable him to carry out, will doubtless bring the Zeppelin balloon to a gratifying perfection.



THE AIR-SHIP SLOWLY DESCENDING, AFTER THE ACCIDENT, TO THE BOSOM OF THE LAKE, ON WHICH IT LIGHTED WITHOUT DANGER TO THE OCCUPANTS.