

THE PARSEVAL DIRIGIBLE AIRSHIP.

BY DR. ALFRED GRADENWITZ.

The ability of steering motor-driven balloons imparts to the dirigible type a considerable military value. Endeavors have therefore been made in the German army to design a suitable type of dirigible balloon, the more so as the same problem has been recently solved with some satisfaction in the French army. The attempt derives additional importance from the fact that wireless telegraphy affords a means of communication between the airship and the commanding officers.

It may be said that whenever the propelling mechanism is disabled, the craft becomes a freely-moving balloon exposed to the caprices of the atmosphere. By reason of the great dimensions of the airship, a clever operator may even then be able, by utilizing the contrary winds that blow at different heights, to return to his starting point. The most valuable feature of a balloon as compared with other types of airship is the minimum of danger attending a landing. The main difficulty met with in designing a dirigible airship is the problem of wind currents. On account of these the proper speed of the balloon should be higher than the velocity of the wind. Whenever this is not the case, the balloon will in fact drift away. Modern racing automobiles are driven at such high speeds, despite their comparative lightness, that a solution of this problem is rendered possible. Still another difficulty is that of designing a balloon with sufficient rigidity and stiffness to deal with any propelling motor forces and to insure a sufficient stability *en route*. Without being of excessive weight the balloon body should be sufficiently rigid and solid. Moreover, the dirigible should be transportable also when empty, since it is not always possible in the case of unfavorable weather to prevent its drifting away and its collapse far from the station. The airship is therefore made up of several parts to be transported separately on carriages or railways. The rigidity *en route* is secured either by building a substantial framework into the balloon itself (in some cases even a sheet-metal cover is provided) or by utilizing the natural rigidity of the inflated balloon body. One of these alternatives has been chosen in the case of Count Zeppelin's airship, and the other in that of the Schwarz aluminium airship, which, not being transportable when deflated, are bound to be lost in the case of an unsuccessful landing. Moreover, because of the dead weight of the framework, large dimensions must be given to the gas-bag. The Rénard airship and its successors were designed much more happily, stiffening being secured by a long, detachable girder suspended below the gas-bag. A similar scheme has been adopted in the construction of the Lebaudy airship. The natural rigidity of the gas-bag in this instance is utilized to a far greater extent, the projecting portions of the gas-bag being supported by the internal excess pressure. The natural rigidity of the balloon body has been utilized to the highest extent in the Parseval airship, without subjecting the cover to higher strain than in the Lebaudy, the internal surplus pressure being 16 millimeters (0.629 inch) of water as against 20 millimeters (0.78 inch) in the Lebaudy.

Apart from the car, 6 meters (19.68 feet) in length, no provision is made for stiffening, the ease with which the airship may be transported

when deflated fully warranting this method of construction. No difficulty has been encountered in obtaining the necessary staunchness. The strength of the materials used is likewise quite sufficient. In fact, the experience gained in the case of captive balloons,

be alternately filled and discharged, for trimming the airship. The power required is supplied by the engine; it is not necessary to operate a sliding weight by hand as in the case of the Zeppelin airship.

In order to increase the rigidity of the airship, the car has been suspended far below the airship.

The propeller, 4.2 meters (13.77 feet) in diameter, is situated above the car as closely as possible to the latter, being thus better protected against damage in landing. It is made up of a central frame and four blades consisting of a loose fabric. These blades have been so charged with weights as to maintain their proper shape and tension, by reason of the centrifugal forces due to rotation.

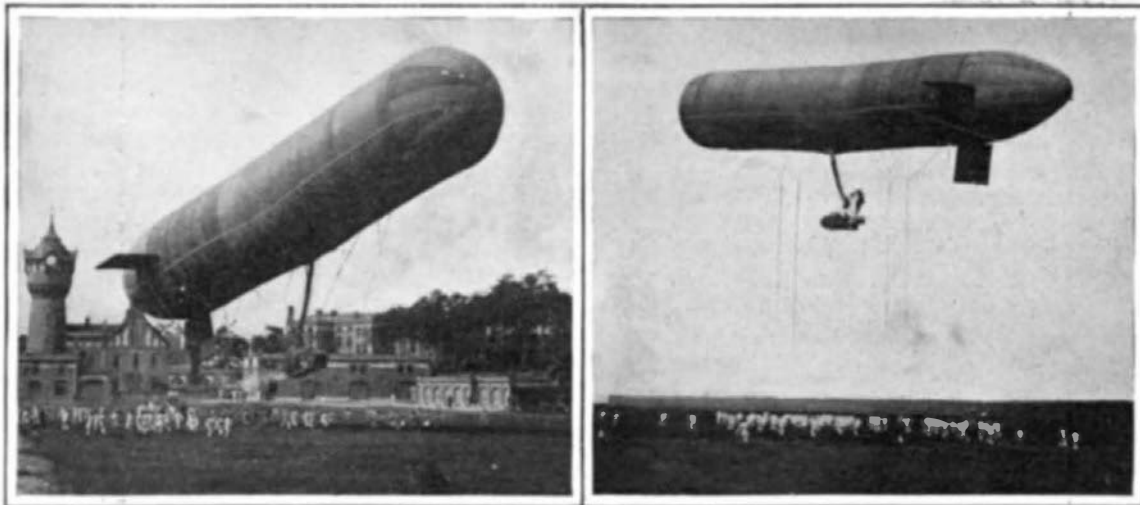
In order to prevent the balloon from being carried forward underneath, so as to cause the gas-bag to tilt upward, as the propeller is started, the car is not rigidly connected with the balloon, but is suspended so as to swing forward and backward in its central plane while maintaining its parallel position relatively to the gas-bag. As the propeller starts, the car is at first drawn forward before the balloon shares this motion, when the center of gravity being displaced in a forward direction, will compensate for the tilting action of the propeller.

Whenever the balloon is retarded by counter winds or accelerated by rear winds, this device will act in some similar way. Plunging and pitching are produced if the car is rigidly suspended. The car is free to swing without transmitting its movement to the gas-bag.

The motor transmits its power to the propeller through a double bevel gearing.

The dimensions of the balloon are: Length, 48 meters (157.48 feet); diameter, 8.57 meters (28.12 feet); capacity, 2,500 cubic meters (3,269.75 cubic yards).

Weights of the Balloon: Cover, 600 kilogrammes (1,322 pounds); car, 1,200 kilogrammes (2,645 pounds); gasoline, 200 kilogrammes (440 pounds); water, 100 kilogrammes (220 pounds); passengers, 300 kilogrammes (661 pounds); ballast, 460 kilogrammes (1,014 pounds); thrust of propeller, 280 to 300 kilogrammes (617 to 661 pounds); diameter of same, 4.2 meters (13.779 feet). The services of three men, viz., the aeronaut, pilot and machinist, respectively, are required to operate the craft, while two men will be sufficient after some practice. The aeronautical operation has been facilitated to a high extent by the considerable lifting or lowering forces produced, without detracting from the speed, by placing the gas-bag at a very small angle relatively to the horizontal line (up to about 5 deg.) and utilizing the aeroplane action on the upper and lower sides. The gas-bag may be thus displaced from its equilibrium by several hundred yards, and still kept far more easily at a given height than a freely-moving craft, thus insuring a considerable saving in ballast. Even if there be a consid-



Two Photographs Taken at a Recent Ascent of Major Von Parseval's Airship.

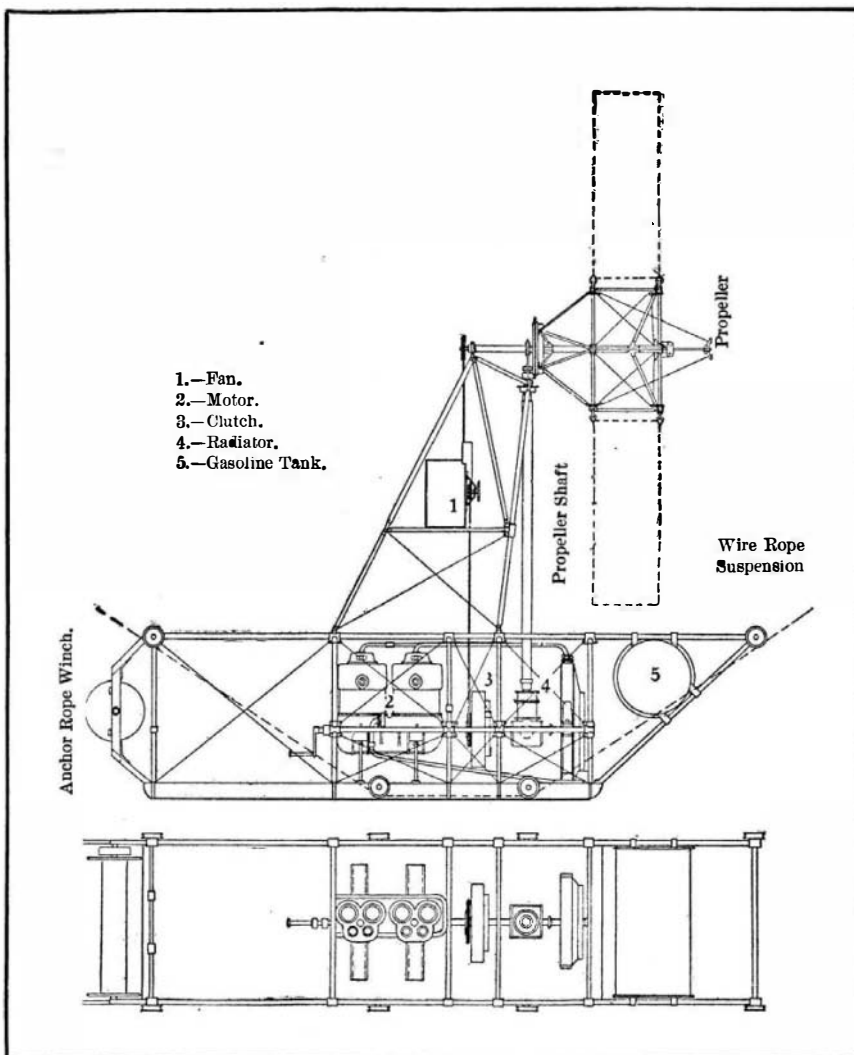
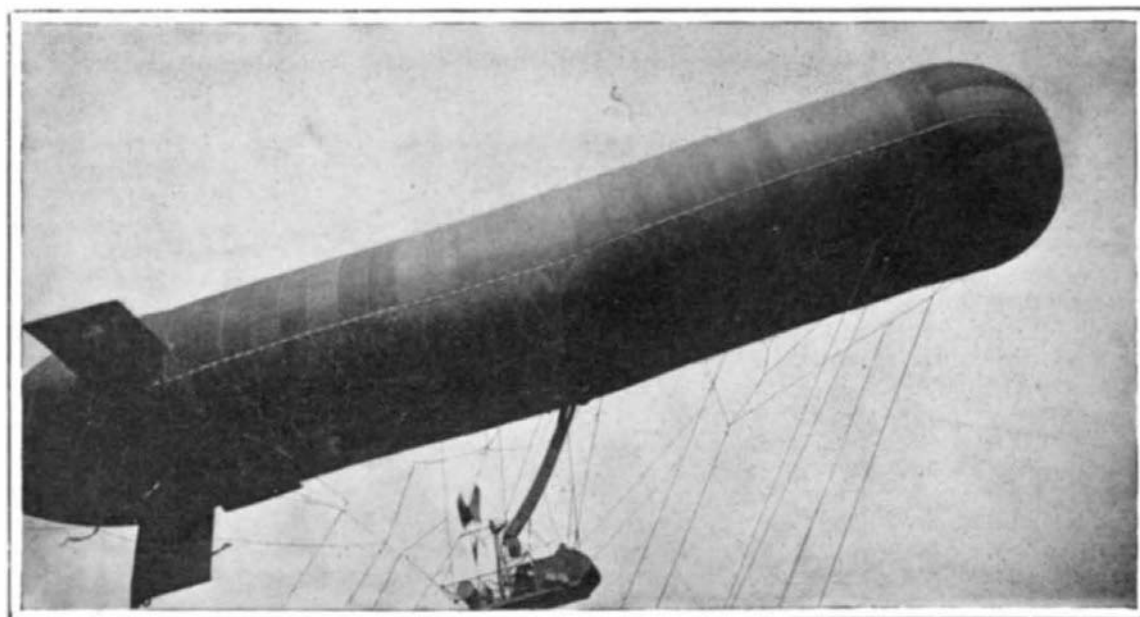


Diagram of the Car.

which must withstand much greater forces in the wind than have ever been produced by aeronautic motors, fully warrants the fulfillment of both conditions. In order to prevent any oscillations, the cylindrical gas-



A Near View of the Airship.
THE PARSEVAL DIRIGIBLE AIRSHIP.

erable excess in weight, the craft will be fit for operation as long as the driving mechanism is operative and there is a sufficient supply of fuel.

The Parseval airship has a radius of action of ten hours, which period may, however, be lengthened considerably, if the ballast consists entirely of gasoline.

The speed is placed at 45 kilometers per hour (27.9 miles), thus insuring a range of 225 kilometers (139 miles) in the case of a ten hours' operation in calm air. A few hours are required to get the craft into working order. A large two-horse wagon is sufficient to transport the airship when deflated.

Ship Elevators.

In a paper read before the Austrian Engineers' and Architects' Society, and reported in the official organ, the *Zeitschrift des Oesterreichischen Ingenieur und Architekten Vereines*, Dr. A. Riedler—speaking more particularly of the competition for designs for the projected ship lift at Preran—pointed out that the results of such competitions can never possess any widespread applicability, owing to the preponderance of local conditions influencing the design in every case. The two essential considerations, however, in the mechanical part are reliability in working and reasonable prime cost, and to these may be added as subordinate, though important, conditions, simplicity, ease of supervision, and accessibility and interchangeability of parts. So far as the engineering part of these projects is concerned, it cannot be determined beforehand with the same degree of accuracy as is possible with the machinery, but is largely dependent on subordinate circumstances, all foundations and underground construction being influenced by the nature of the ground. Nevertheless, it is possible to fix as a standard for underground construction a limit that will be seldom reached in practice, and thereby insure absolute reliability in working, by reducing the pressure, set up on the site by the structural work, to the natural pressure. This ideal cannot be realized in the case of lifts where concentric loads, deep foundations, high supporting walls, etc., are in question, at least not without great expense. On the other hand, in the case of inclined plane lifts, this broad condition can be easily fulfilled by adopting a suitable form of construction, the reliability of working being far greater than is attainable in engineering works as a rule.

The inclined plane system is also the only one that can be constructed at a low cost, but it is essential that only a single and sufficiently high speed should be used, and that the dry-haulage method should be adopted in order to save the weight of the water trough. All the plans hitherto proposed for affording an elastic support to ships when out of the water are based on an erroneous idea, and calculated to defeat their own purpose, the only reliable way being to recognize the fact that all ships undergo deformation when loaded and afloat, and to adapt the supports to the actual form of the vessel and then fix them in a perfectly rigid manner. The hydraulic press forms the best method of carrying out this idea in practice, a number of such presses being so arranged on a truck that they can be applied to vessels of different build, and the press heads covered with a ring of hemp, which is forced against the hull by a pressure of two and one-half atmospheres, the pressure at the contact surface being about one-tenth atmosphere. Then, as the truck is drawn out of the water, the weight of the ship gradually acts on the rings, and the press valves must be closed. If the presses are mounted six feet apart, the pressure in each cylinder will not exceed forty atmospheres. Each press must be operated independently, so far as closing the valves is concerned, in order that the weight may be distributed uniformly; otherwise there is the danger of bending the hull plates where the internal pressure is low, and no guarantee that the more heavily loaded parts will not bulge to a dangerous extent. No difficulty will be encountered in packing the press plungers quite tightly, leather being a perfectly reliable material.

In distributing the pressure, the plan recommended is to mount every eight presses in two double rows on a separate truck, all the trucks being attached to a through girder. Wheels running in ball bearings are indispensable, the frictional resistance being only about one-third that of roller or plain bearings. The tractive force is preferably applied by rack and pinion, the strains being less than those in the ordinary mountain railway of this type and the movement freer from jolting. Low speed electro-motors would furnish the motive power, two pairs of cogwheels being sufficient for the reducing gear. Springs on the truck wheels are not essential, the hull and track being sufficiently elastic to take up the slight irregularities in the rails, joints, etc.; and in this system no duplication of the lifting plant is necessary, since the rate of haulage can be increased to 10 feet per second, owing to the low dead weight and absence of the ship.

The plant for discharging the ship into the high

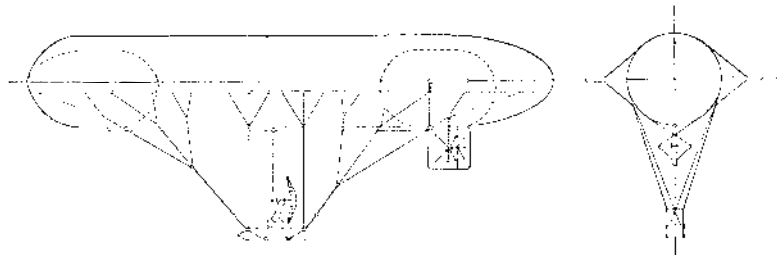
level water may be greatly simplified by providing a turntable (turning through an angle of 16 deg.) of the same gradient as the rest of the track, so that the train of trucks and their load can be run down into the water without change of gradient, only the direction of movement being reversed. The turntable can be operated by a couple of electro-motors at opposite sides. This arrangement dispenses with the necessity for any protecting wall at the high level, and no extensive masonry is required anywhere, the pressure on the site being no greater than the natural pressure.

Official Meteorological Summary, New York, N. Y. October, 1906.

Atmospheric pressure: Highest, 30.59; date, 13th; lowest, 29.36; date, 6th; mean, 30.06. Temperature: Highest, 74; date, 9th; lowest, 37; date, 12th; mean of warmest day, 66; date, 5th; mean of coldest day, 43; date, 11th; mean of maximum for the month, 61.8; mean of minimum, 50.4; absolute mean, 56.1; normal is 55.5; average daily excess compared with mean of 36 years, +0.6. Warmest mean temperature for October, 61 in 1900; coldest mean, 50 in 1876. Absolute maximum and minimum for this month for 36 years, 88 and 31. Precipitation, 4.30; greatest in 24 hours, 1.21; date, 19th and 20th; average for this month for 36 years, 3.70; excess, +0.60; greatest precipitation, 11.55, in 1903; least, 0.58, in 1879. Snow: Trace. Wind: Prevailing direction N.E.; total movement, 10,490 miles; average hourly velocity, 14.1 miles; maximum velocity, 58 miles per hour. Weather: Clear days, 5; partly cloudy, 10; cloudy, 16. Thunderstorms: Date, 9th. Frost: Date, 11th, 12th, 13th. Fog: Dense, date, 20th.

Automobile Omnibus Lines in Paris.

The first of the automobile omnibus lines commenced running in Paris not long ago. Experiments had been made for a long time past, and the public became accustomed to seeing the omnibuses pass along the streets, but the system was not put in actual operation until the first week in June, when the line known as the Montmartre—St. Germain des Près was started, and the eleven automobiles were used to replace eighteen



Side and Bow Elevations of the Parseval Airship.

of the old form of omnibuses requiring 194 horses in all. The time which is needed to make the trip across town, which was about 45 minutes, is now reduced to 25 minutes. These cars have been furnished by the well-known automobile firm the Société Brillé, after a sharp competition between many of the leading firms. The Omnibus Company of Paris has now ordered as many as 90 new cars, which are to be used upon six lines in the city to replace the horse vehicles. These lines will be put in service from month to month so that they will all be in operation at the end of this year. It is proposed to start up soon the second line, running from the city hall to the Neuilly gate. All the cars are built after the general lines of the company's standard double-decked omnibus.

A Bricklaying Feat.

In the erection of the House of Representatives office building, adjacent to the United States Capitol at Washington, an interesting fact has developed in connection with the brick masonry work. The first brick was laid at the site on the afternoon of July 5, 1905, and on July 3, 1906, there had been laid in the walls 11,000,000 bricks. This is believed to be the greatest number of brick laid on any building in one year in the United States, and probably in the world. One of the causes conducing to this record-breaking feat was the remarkably "open" winter of 1905-06. In those winter months the work continued almost without interruption from either snow or cold, and not more than twelve or fifteen days were lost during the entire winter by reason of weather conditions.

Water-proof glue is manufactured of gum shellac three parts and India-rubber one part by weight, these constituents being dissolved in separate vessels in ether, free from alcohol, subject to a gentle heat. When thoroughly dissolved, the two solutions are mixed, and kept for some time in a vessel tightly sealed. This glue resists the action of water, both hot and cold, as well as most acids and alkalis. If the glue is thinned by the admixture of ether, and applied as a varnish to leather along the seams where this has been sewn together, it renders the joint or seam water-tight, and almost impossible to separate.

THE STORY OF THE DISCOVERY OF THE FIRST ANILINE DYE.

BY SIR WILLIAM HENRY PERKIN.

My father was a builder. In early childhood I began to think about the choice of an occupation, and as I took an interest in everything that went on about me, I thought I should probably follow in my father's footsteps, and I busied myself with practical carpentry at every possible opportunity. I remember also that I took a lively interest in the applications of the lever, the screw, and the wedge, of which I occasionally saw practical examples. The reading of some descriptions of steam engines and the like awakened an interest in machine construction, and I spent much time in making drawings and wooden models. I was also very much interested in painting, and even had, for a short time, the foolish idea that I should like to become an artist. I believe that the practical knowledge of mechanics which I thus acquired in early youth has exerted a lasting influence upon me, and I never lost the appreciation of its value.

Shortly before my thirteenth birthday something occurred which was destined to determine my final choice of an occupation. A young friend who had a cabinet of chemical apparatus showed me some experiments of a very elementary sort, including the crystallization of soda and alum, and these experiments seemed to me so wonderful (and indeed every formation of crystals appears wonderful to me to this day) that I saw that chemistry was something far higher than anything that I had yet met with, and my ambition to become a chemist was awakened. I thought that I should be happy if I were apprenticed to an apothecary, for I could make experiments at odd times; but circumstances intervened which led to a still better result. Until that time I had attended a private school in the neighborhood, but I now left it and, at the age of thirteen, entered the City of London School. In this public school lectures on chemistry and physics were given, very strangely, during the noon recess. It was the only school in the country in which these subjects were taught. I had not been there long before the teacher, Thomas Hall, B.A., observed my great interest in the lectures, and permitted me to assist in preparing the lecture experiments. This raised me to the highest pitch of enthusiasm. I often went without my luncheon in order to find time for my work in the dreadful place that in that school was called "the laboratory."

Hall had heard a few lectures by Dr. Hofmann, and had worked with him for a short time in the Royal College of Chemistry in Oxford Street. When I was fifteen years old he had several conversations with my father, and the result was that I went to Dr. Hofmann, to study chemistry under his direction. (I am afraid that my father, although he said nothing, was displeased at the time, for I know that in accordance with his wish I should have become an architect.) I soon finished my course of qualitative and quantitative analysis, and took up research work. Strangely enough, the first subject that Dr. Hofmann selected for me was anthracene. The raw material was obtained from Mr. Cliff (the manager of Bethel's tar works). Unfortunately, Laurent had assigned to this hydrocarbon an erroneous formula ($C_{15}H_{12}$), and although I had prepared and analyzed anthrachinone (Laurent's anthracenone) and other derivatives, the figures I obtained would not fit any possible derivative of $C_{15}H_{12}$. Notwithstanding this, the experience thus acquired and the material and derived products obtained all became useful to me when I began to work on alizarine many years afterward. Dr. Hofmann next gave me as a subject the action of cyanogen chloride upon naphthylamine, and after I had purified naphthaline and made from it nitronaphthaline and then naphthylamine—operations which one had to do for one's self in those days—the remaining part of the investigation was soon finished, though it was not published until some time afterward. I was now about seventeen years old, and became an assistant in Dr. Hofmann's experimental laboratory. Before I go on I must here give expression to my profound feeling of indebtedness and gratitude to Dr. Hofmann for his brilliant method of teaching, for his stimulating enthusiasm in scientific investigation, and for the interest which he took in me during my studies.

I now come to the period connected with "mauve." As Dr. Hofmann's assistant I was occupied all day with his researches (which at that time were concerned chiefly with the phosphor bases). I therefore carried on my own work in the evening and at other spare times at home in my scantily furnished laboratory, and there it was that, in the Easter vacation of 1856, when I was just eighteen years old, I discovered "mauve." As is known, I was led thereto by an attempt to produce quinine artificially from allyltoluidine, which caused me to study next the oxidation of aniline. Now, when in experimenting with the dye-stuff thus obtained I found that it was a very stable