

THE PARSEVAL AIRSHIP

BY CARL DIENSTBACH

When the "air balloon" was invented by the Montgolfiers and Charles, the belief was general that the most difficult part of the problem of human flight was then solved, and that it would require but slight additions to the inflated bag to make it a useful means of transportation. Hundreds of schemes and attempts were suggested to supply the "slight additions." How astonished one of these early naïf "improvers" would be if he could see his dream come true!

Perhaps the most practical airship of our day is the Parseval, which in truth may be called a gas bag with slight additions. The Parseval airship owes its great advantages precisely to the fact that its inventor did not aim at creating something essentially different from a balloon, that he intended to preserve every single good and practical feature of the time-honored "spherical," and that he strove for his comparatively modest goal with so much ingenuity.

A sight not altogether unfamiliar, would greet the eye of Parseval's eighteenth century admirer. First, he would be pleased to learn that the aircraft of his own day, after remaining exactly the same for over a century, had suddenly seen great technical improvement at the beginning of the twentieth century. The gas-retaining qualities, the strength and toughness, the lightness of the new double rubberized and biased balloon cloth would be a revelation to him. Without that fabric the new airship would never have come into existence. But what should otherwise appear really novel to him might only seem as if it were like a "touch" added here and there, but the "touch" of a master hand—comparable to the slight application of the brush, by which great painters are known to have turned a pupil's work into an everlasting masterpiece. Thus the fundamental change from the spherical balloon—the elongated gas bag—means in the Parseval an almost true "form of minimum resistance." This fact is due to the very propitious circumstances which favored the work of Major von Parseval.

It happened that the great German "Society for the Study of Motor Aeronautics" was founded at the initiative of the emperor at the exact date that his first experimental airship was tested. This organization counted among its members the most prominent financiers and the ablest scientists and engineers of the fatherland. Major von Parseval's work presently became the point around which its endeavors crystallized.

All its energies were soon concentrated on the improvement of his simple system, which was justly recognized to promise immediate success. After the model of Professor Zahn's aerodynamical laboratory in Washington, the society built a laboratory for aerodynamical research at Goettingen, and put Prof. Prandl of the Goettingen University in charge. In a big Zahn wind tunnel the best shape for the hull was developed on tin models, thus verifying the prediction of Prof. Woodward, president of the St. Louis International Aeronautical Conference, 1904, that the result of Prof. Zahn's and Prof. Nipher's work combined (the latter on the distribution of wind pressure on structures), both submitted to that conference, would result in a form of least resistance for the hull of an airship. Professor Prandl investigated the pressure by means of small holes bored along the whole surface of his models and communicating with many

interior compartments, which were alternately connected to pressure gages. He was thus enabled to draw accurate curves. The almost spherical front of the shape evolved by Prof. Prandl would seem most familiar to the man of the eighteenth century. The big fish-like steadying fins at its stern, so conspicuous by their simplicity, would be a surprise. These are indeed the principal contribution of the twentieth century to the old balloon. Invented by the late Col. Renard as early as 1884, they remained a secret up to 1902. The reason for the specially efficient use to which they were put by Major von Parseval is the fact

the "Drachen Ballon." The rounded, sausage-shaped steadying bag of the "Drachen Ballon," whose excessive drag prohibited its use as an airship, was first turned into three rectangular hollow "mattresses" stiffened by internal pressure and part of the balloon. The "Drachen Ballon's" ingenious suspension, flexible to prevent excessive rocking in the gusts, was easily turned into the famous Parseval airship suspension, which allows a "car on wheels" to roll ahead or back on steel ropes, with the air pressure against the gas bag.

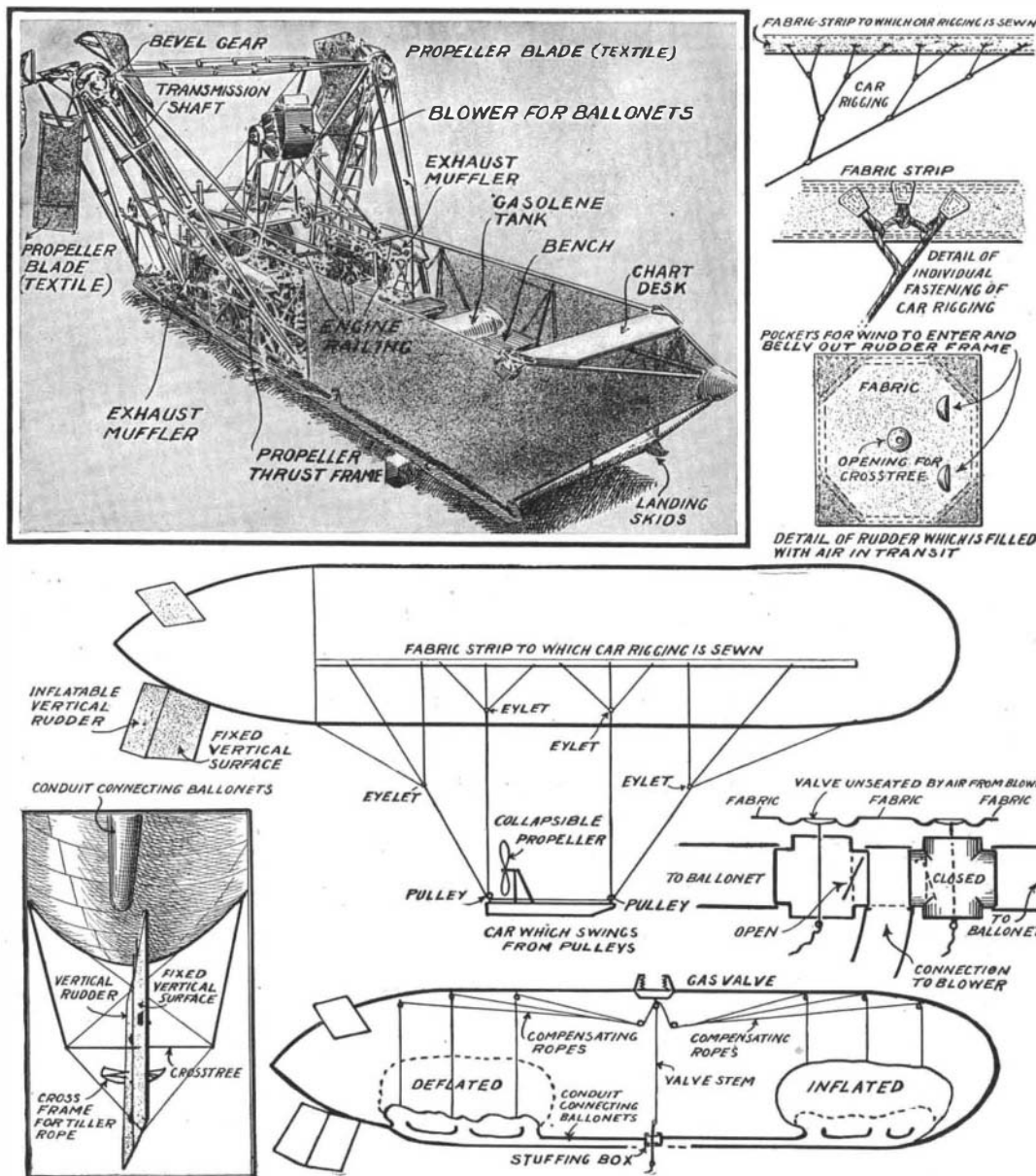
To these ingenious devices the Parseval airship owes its existence. Without them it would not be feasible to suspend the car low enough to distribute its weight sufficiently over the whole length of the bag to make it possible to dispense with any sort of a stiffening frame. The ship would pitch so violently that it could not be propelled. Still this very feature is a weak point of the "non-rigid" system. Its inventor personally remarked to the writer, when complimented on the truly beautiful appearance of the "rigging": "Its air resistance is something to be reckoned with." The great saving of weight it permits is thus partly offset. A Parseval has also most of the faults as well as the virtues of an ordinary balloon, while the purely rigid construction, as represented by Zeppelin, Schuette, and others, aims at turning the aerostat into a true "ship." Their goal is infinitely higher, and therefore fundamentally entitled to a more lenient criticism. The ample carrying power of a non-rigid airship makes indeed a large Parseval (type B) a thing of amazing solidity. For instance, the thinnest rope in the suspension has the thickness of a man's finger. The steel wire cables on which the car rolls have the same thickness. The car, detached, as to size and strength, looks almost exactly like a "freak" gasoline launch.

Its board floor, solid as a boat's deck, is 30 feet long and over 6 feet wide. The frame carrying the propellers is made of steel tubes as thick as a man's arm. The center of each propeller is about 12 feet above the floor of the car, and each is also slightly over 10 feet in diameter. The width of each of the four rectangular blades is slightly less than 2 feet. The non-rigid propellers, very inconspicuous when at rest, and directly attached to the car, also increase the resemblance of the Parseval to an ordinary balloon. Each propeller has a girder work hub of steel, skillfully designed to withstand all working stresses with a minimum of material, to which hub four cloth blades

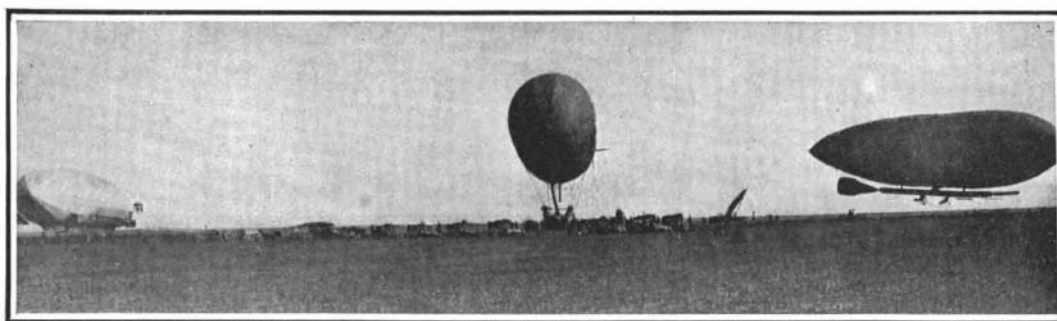
are fastened like so many flags. The blades are made of two strong wire ropes with cross pieces of steel, sewn into a double layer of heavy balloon fabric. Major von Parseval explained to the writer that by correctly proportioning the weight of different parts of the flexible blade to a given speed of revolution and a given pitch, any desired form of the blade could be obtained from centrifugal force acting against the pressure of propulsion. It has indeed been claimed that these blades are more efficient than solid ones. In the newest Parseval ships they are made semi-rigid—just stiff enough to preserve their shape when at rest—as a matter of convenience.

The Parseval power plant has been brought to such a state of reliability that it should furnish a fitting model for any kind of aircraft, especially flying ma-

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Diagrams showing the constructional details of the Parseval airship.



The Zeppelin.

The Parseval.

The Gross.

Three typical German airships.

THE ZEPPELIN AIRSHIP.

that he, in a way, had independently reinvented them. Even the rudder is so deftly hinged to these fins that it hardly shows. Yet it has an unusually efficient shape and position.

The resemblance of the Parseval to an ordinary spherical is due to the fact that it was evolved from a balloon. Parseval first developed an elongated captive balloon that could be operated in heavy winds. In co-operation with the late Capt. von Siegfeld, he did this so well that his so-called "Drachen Ballon" is to-day introduced into the military service of most powers. To his airship it is almost as closely related as a glider is to an aeroplane, or a towing barge to a steamer. It offered two formidable problems, steadying it in the wind, and properly suspending the car. To arrive at the nucleus of the Parseval airship nothing more was needed than to modify

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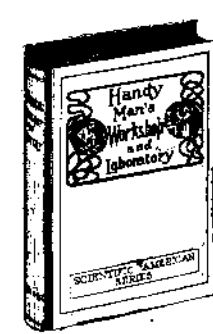
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THE PARSEVAL AIRSHIP.

(Continued from page 124.)

chines. There are, of course, two motors. To insure the highest possible economy when only one motor is running there is a coupling arrangement by which two propellers in tandem may be driven by either motor alone. The girder construction of the hubs has been fashioned into a mechanism that permits altering and even reversing the pitch of the propellers while they are running. This is done by a convenient hand wheel at the side of the car. The pitch is always adjusted to the most economical number of the motor's revolutions. With one motor driving both propellers the pitch is lowered until the propellers run quite as fast as with two motors.

The last reason for the striking resemblance of the Parseval airship to an ordinary balloon is the absence of any horizontal rudders. Steering up and down, i. e., tilting the keel, is effected by a principle similar to that which makes an ordinary balloon go down. Gas is removed from the end to be lowered. It is not lost, but merely transferred to the opposite end, whose lift is thus increased at the same rate that the buoyancy of the other end is diminished. This is done by means of two air ballonets (each with 1/8 of the cubic capacity of the gas space) in the opposite ends of the envelope, a powerful blower, driven by a double belt from each motor, and large distributing valves for the air blast. All this forms a specially substantial and conspicuous part of the machinery, and has been designed to stand rough usage. The blower is carried in the propeller frame, some 8 feet above the floor of the car. The vertical air hose leading to the bag is stiffened by strong wooden rings. The large distributing valves of aluminium are at the same time automatic safety valves. They are so attached to the envelope that any excessive gas pressure moves a plunger and allows the air to escape. The gas pressure is relieved in this manner as long as either ballonet contains any air. If both are completely emptied they automatically pull the maneuvering gas valve on top of the envelope open, an arrangement copied from the "Drachen Ballon." There is considerable mechanism inside the gas bag which has never been described. This was sketched for the writer by Major von Parseval himself. In order to keep a certain amount of control over the "convulsions" of the ballonets inside while they swell or collapse, a series of cords is fastened to their upper surface. They are united into one rope that runs over a pulley suspended above either ballonet from the inner "ceiling" of the gas bag. Thus the ballonets are made to swell and collapse more evenly. If excessive expansion of the gas by heat or height should ever squeeze all air out of the ballonets this rope, under tension, would exert a pull strong enough to open the gas valve on top. A single gas valve is thus made to serve as both a maneuvering and a safety valve. The valve stem is led through a stuffing box in the bottom of the bag. Two ripping panels and cords, one at either end, are provided, as in a spherical balloon. For the guidance of the pilot there are four pressure gages, one for each air ballonet and one for each end of the gas space. They register in centimeters of water, and consist of U tubes of glass filled with red liquid. The front end of the car is covered by a chart desk. A compass, designed by Prof. Marcuse, is suspended over the pilot's head, who reads the inverted dial from below. A small vertical steering wheel shaped like that of a ship is directly in front of the chart desk. The pressure gages mentioned are attached to the right "gunwale" of the car, and the lines controlling the distributing valves press down from above also on starboard. The compass may easily be taken down and with an iron tripod attached to "ship shape" brass fittings sunk into the car's board floor. This is done for nautical measurements of the sun's

(Continued on page 134.)

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(Continued from page 133.)

position. There is, of course, in addition to the usual barograph, barometer, statorscope of the spherical balloon, also an air bubble to indicate the "tilt." The frame of the car is made of steel tubes and T girders, covered with wire netting and heavy canvas. A large cylindrical gasoline tank in a cloth casing serves as a back to an elegant bench upholstered in red leather, running across the car, and dividing it into a "bridge" and "engine room." This bench accommodates six passengers. For the pilot and his aides there are camp chairs. The spacious engine room, with the smart iron railing around the motors, differs in no sense from that of a boat, even as to its minute cleanliness. The motors are of the six-cylinder type, each good for 120 horsepower maximum. They were selected after a competition and have never given trouble. The radiators, arranged like an inverted V, close the car in the rear. They are of aluminium, very imposing, each about five feet square, but quite light. Cooling is effected by powerful blowers set in a casting. These spread the blast evenly over the whole radiating surface. The motors are cranked with the throttle almost closed and the propellers are thrown in by clutches.

The rigging is as elaborate and picturesque as that of a clipper ship. It was found that anything could be attached directly to the gas bag, to reinforcing "patches," which doubled and trebled the thickness of the cloth. There is an "equatorial belt" carrying the suspension, and there are many other "patches," some of them shaped like a star, to hold a single rod. The stabilizing fins are now made of steel frames covered with cloth on both sides. The "air mattress" idea has been dropped, but the cloth is still kept from fluttering by allowing the wind to catch in a "mouth" and blow between the two layers. The tiller rope ends in a steel band that fits around a large semi-circular pulley fastened to the rudder. This insures precise action. The stabilizing planes are held in place by a very simple and strong arrangement of rods and stays fastened to the envelope as described above. The suspension branches back with innumerable "crows' feet" (the original ones made of three loops of rope each, sewn to the equatorial belt) from many short hemp ropes into fewer and fewer wire ropes. Everything is flexible. All loops are lined with fittings of aluminium or steel, allowing the ropes to slide with little friction and preventing excessive wear and tear. The car, with four grooved wheels, rolls on two strong inclined cables of twisted steel wires, into which most of the branch ropes finally consolidate. But at the same time it swings like a pendulum with parallel motion from six vertical ropes.

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At Frankfort in 1909, during the International Aeronautic Exposition, where the ship ascended, one of these dragging ropes coiled around a man's legs and raised him into the air like a feather, although the balloon had no surplus lift. Thus the lifting power of the propellers and the tilted hull was forcibly shown. The ship was always actually heavier than the air when it left the ground in a slanting direction. Coming down was harder than going up. The consumption of fuel lightens the ship, and it is considered "unsportsmanlike" to let out gas. The low center of gravity, in spite of the flexible suspension, prevents a tilt as sharp as that of the Zeppelin III, which swoops down like a hawk. The "Parseval III" must "screw itself down" in many spirals. On one occasion, in bright sun-

(Concluded on page 135.)

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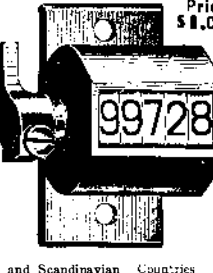


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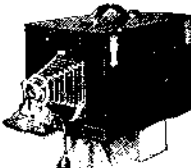
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(Concluded from page 134.)

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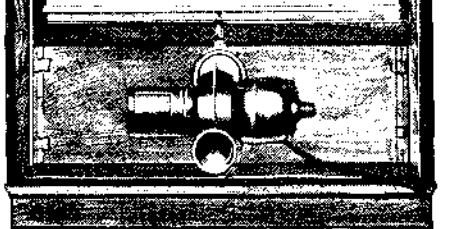
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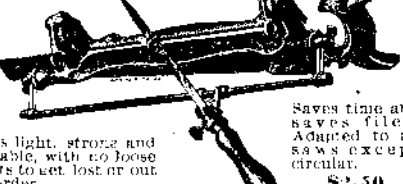
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