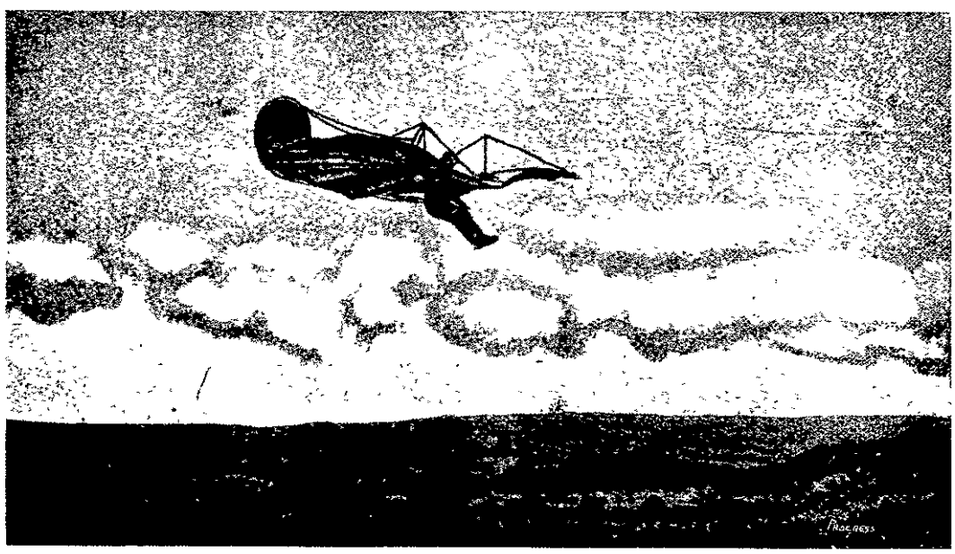
pounds. In the centre was an aperture for the experimenter's body, and the apparatus was held in position by his arms. On running down a hill (with the machine firmly grasped) against the wind, the latter acquired a vertical component, which soon carried the apparatus up into the air and propelled it against the wind. These experiments persevered with soon attracted the attention of all Europe, and many were the disciples of the daring aeronaut. Having been moderately successful in calm, Lilienthal determined to try what he could do towards compelling strong winds to do his bidding, carrying him in any direction he chose. At first he practised in moderately rough weather, and was often obliged to perform the most fantastic feats of contortion to preserve his life. Then he substituted for one large frame-work two smaller ones, placed parallel one above the other—an idea on which the brothers Wright improved later on—and he obtained some remarkable results. For instance, a wind of some six miles an hour carried him from the top of a hill without any starting run downwards, against itself almost horizontally. Sometimes indeed he found himself at a standstill in the air at a higher altitude than that from which he had started. Here is an interesting human document in this connection, the utterance of a man on the point of solving, as he thought, the problem of soaring in circles like the larger birds of prey. "I feel very certain that if I leaned a little to one side and described a circle and further partook of the motion of the lifting air around me, I should sustain my position. I have made up my mind by means either of a stronger wind, or by flapping the wings to get higher and further away from the hills, so that, sailing round in circles, I can follow the strong uplifting currents." It was soon after making these observations that the end came, as above mentioned.



LILIENTHAL FLYING.

THE BROTHERS WRIGHT.

They studied the flying-problem in their native town of Dayton, Ohio, faithfully following the methods of Lilienthal. They divided the problem into three essential parts: stability, control and propulsion, and practice. Of the three, they gave the place of first importance to practice, and they spent five years in practising to find out something about stability. At the end of that time they had corrected the working tables compiled by Lilienthal out of his experience, and they had succeeded in embarking on machines of larger construction by far than any one had dared to think of before. After careful experiments they had altered the curvature of their plane, and found a perceptible diminution of the eccentricities of the centre of pressure. The main problem of stability consists, they point out, in reconciling (bringing together, and keeping together) the centres of gravity and pressure. They found, as all find who trust to the support of the air, that between these two there seems to be a boundless incompatibility of temper, which prevents their remaining together for a single instant, to the great injury often of the operator whose business it is to reconcile them. Happily for themselves, they managed to avoid that injury, while they made surprising and useful discoveries. They constructed their aeroplanes with two decks instead of one, thus securing "the advantage of the system of the modern truss bridge", they added a smaller surface placed a short distance in front, and a tail slightly mobile vertically. Lastly they curved the surfaces of their planes, following the principles of Lilienthal and improving on his curves after very careful experiment long continued. By these methods they secured for their machines (gliding) a greater stability than had ever been experienced before. Their curvatures were all in front like the curvatures of the front upper surfaces of the flying wings of birds. Their machines were in the end, of 308 sq. ft. of area, with curves of 1 in 12, the dimensions being 22 ft., by 14 by 6. Our illustration shows one of these gliding through the air with one of the brothers riding in a horizontal position. They are described as very clever mechanics, and they have designed and themselves made everything they use.

From stability and practice they proceeded to power, and they designed a method of applying a gasoline engine. Then they constructed their machine. No pictures were ever taken of it and the brothers have only given a general description. They state that they do not intend to take part in any trials for prizes, their plan being to deal with some powerful government to buy the machine. The following are the particulars supplied. Length fore and aft 20 ft.; width of wings from tip to tip 40 ft.; weight 700 lbs; two aerial screws, one behind the wings for direction, the other under the machine for suspension (this coincides with Jules Verne's idea); the gasoline engine, of 16 brake h.p., capable of driving the screws at 1200 revolutions a minute, four cylinders with four-inch stroke. There was a track for ascension, carrying a single rail eight inches above the ground. On December 17th 1904 the machine was put on the track. It was moved along the rail by the motor, and after running for about 40 ft. ascended into the air and flew a little over half a mile by actual measurement, being steered round the paddock in which it was constructed. The speed maintained was between 30 and 35 miles per hour. These facts were verified by the testimony of several persons who witnessed the flight. The trip ended unexpectedly, by the machine striking against a sand hummock, but no damage was done.

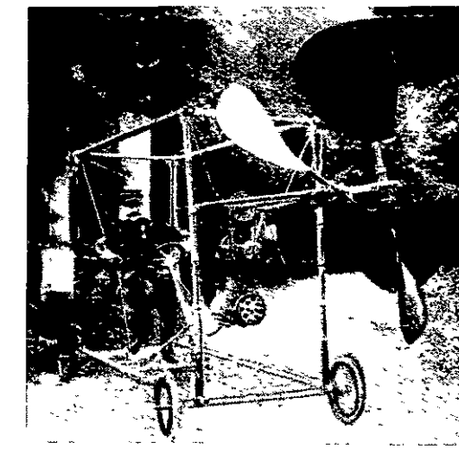
ARCHDEACON.

Of the school of the Wrights. He constructed an aeroplane in 1905, which he raised by means of an automobile of 60 h.p., but something went wrong with the rudder immediately after the start and the machine came to grief. This inventor has done great service with a new form of propeller.

PAULHAN-PEYRET.

This machine—an aeroplane after the example

WRIGHT'S GLIDER



CAPT. FERBER'S AIR-PROPELLER DRIVEN VOITURETTE.

of Langley's—was the most conspicuous machine of all those tried at the Concourse of Aeroplanes in Paris in the year 1905. They were of all sorts and conditions, and as they were all tried in-doors (in the Machinery Hall left by the International Exposition) they all lacked the only condition that counts in experiment, the condition of experiment in the open. They were all in the model stage, which is a further element of unreliability, and all were started from a launching tower expressly constructed. The Paulhan-Peyret was in appearance suggestive to a certain extent of the aeroplane of Hargraves. It had a front plane for a rudder after the manner of the Wrights, and it behaved under shelter in the best manner.

GILLESPIE.

This inventor is at the head of a school of aviation which has adopted as a leading principle the idea that no contrivance for equilibrium that is not automatic can be relied on for a moment. Consequently, he constructed a machine the chief characteristic of which is that the wings and planes of which it is composed are all connected by wires with the central point, where sits the aeronaut, whose chief function it is to adjust the angle of incidence according to the varying circumstances of the moment. The machine is like a great flat aeroplane—all box kite and truss arrangements being discarded—driven by a motor of 20 h.p. It measures 24 feet by 10, and it is claimed for it that it is not easily capsized, provided the adjustment machinery is worked sufficiently smartly to make it in practice as the automatic action of birds. The official verdict was that it would be hard to either capsize or up-end. No satisfactory trial, at least not in public, has yet been attempted.

MONTGOMERY,

The machine of Montgomery of Santa Clara College—after which it was named—and his collaborator, Professor Bell, of the same institution—not to be confounded with Dr. Graham Bell, the friend of Langley—but for all that a proficient in the principles of aeronautics, which he has studied with great success—this aeroplane is not a flying-machine but a glider. It was raised 2000 ft. in 1905 by a balloon and at that altitude cut off, descending to the earth with great deliberation and success, if the phrase may be permitted in relation to an inanimate object. In the descent, which took some twenty minutes, the machine was under the control perfectly of the aeronaut, who went up with it and did the severing of the connection, and made it manœuvre on the way down. The official verdict was that it had demonstrated the solution on perfect lines of the problem of stability. But as the inventor had still to devise for it the power of continuous flight and the faculty of raising itself from the ground to fly, there was clearly much to be desired before this machine could be regarded as perfect. For preservation of the equilibrium Montgomery relies exclusively on the rudder.

CAPTAIN FERBER.

This distinguished aeronaut of the French military service followed the lead of Langley and the Wrights. In 1905 he tried an aeroplane of his own construction. But as soon as he let go for a flight unaided something went wrong promptly and the machine came to earth and was broken to pieces. He has summed up the proposals of the time for enabling airships to raise themselves from the ground for flight. Said he "Every aviator has been confronted by this problem of starting. Lilienthal built himself an artificial hill 15 metres high, Pilcher suggested a kite cord; Langley used a catapult, Eiffel proposed to stretch an inclined wire from the first story of his tower; Goupil a circular railway; Bazin has patented