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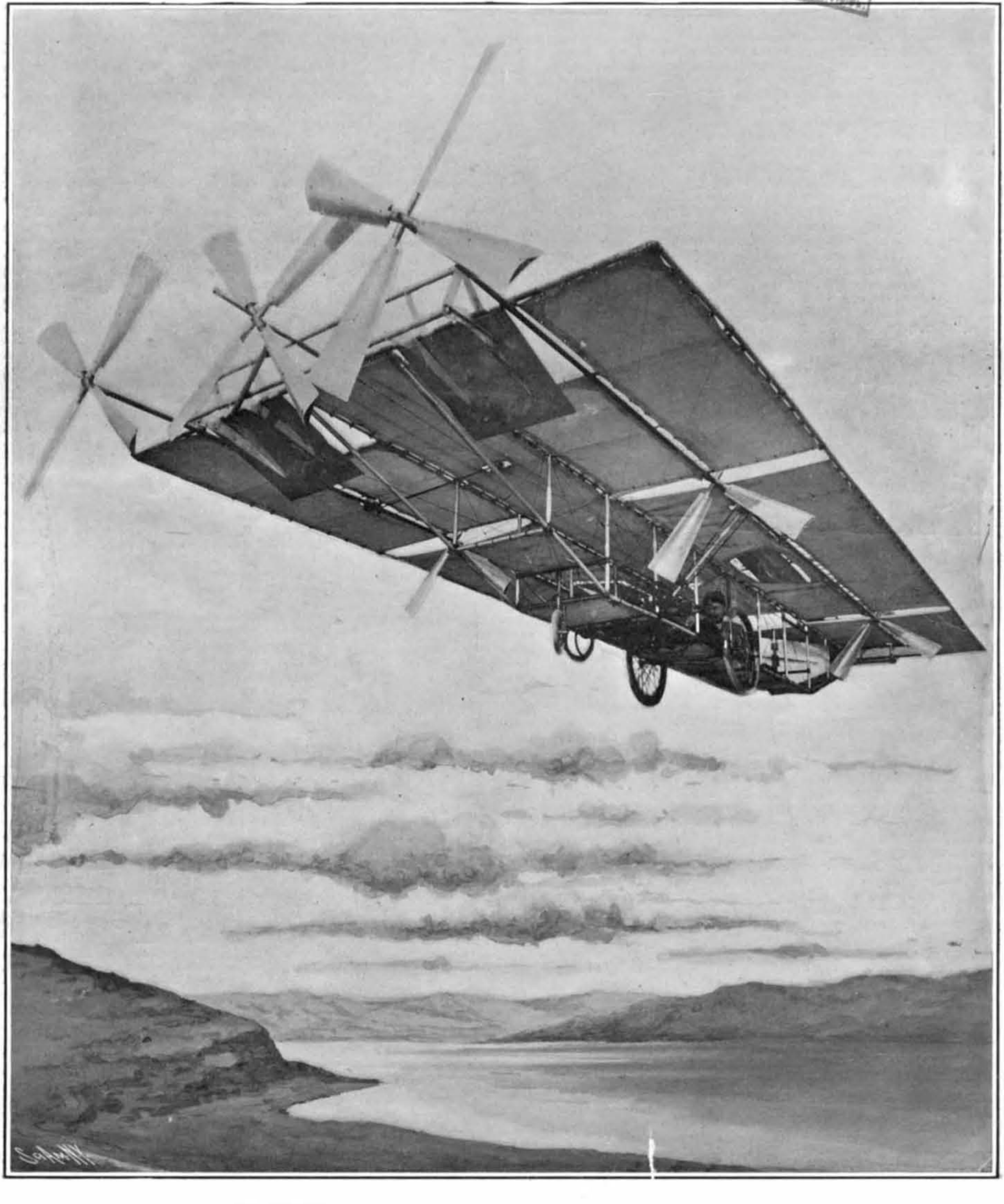
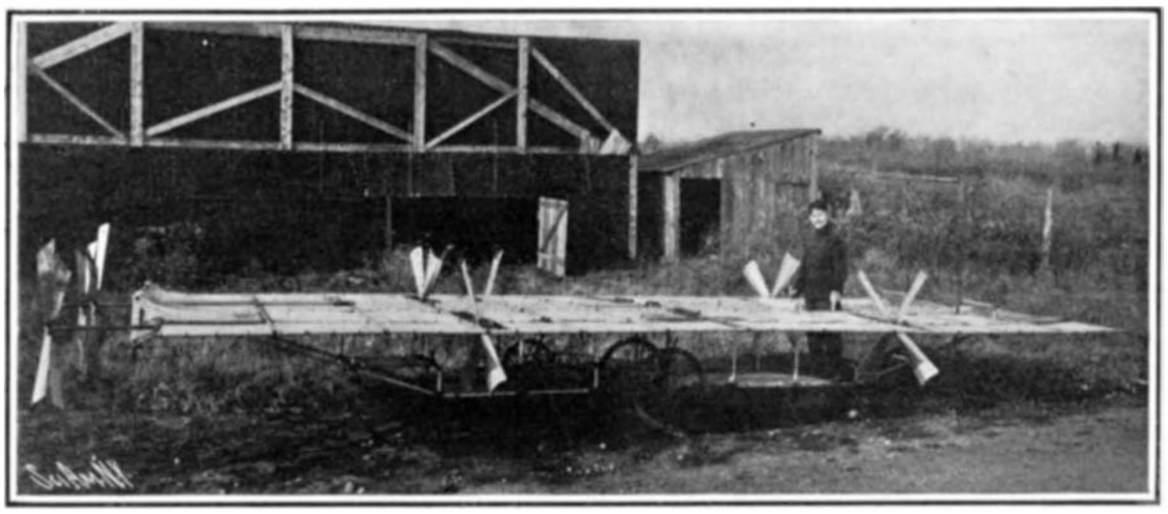


THE GILLESPIE AEROPLANE AS IT WOULD APPEAR WHEN SOARING.—[See page 501.]

THE GILLESPIE AEROPLANE.

BY CHARLES B. HAYWARD.

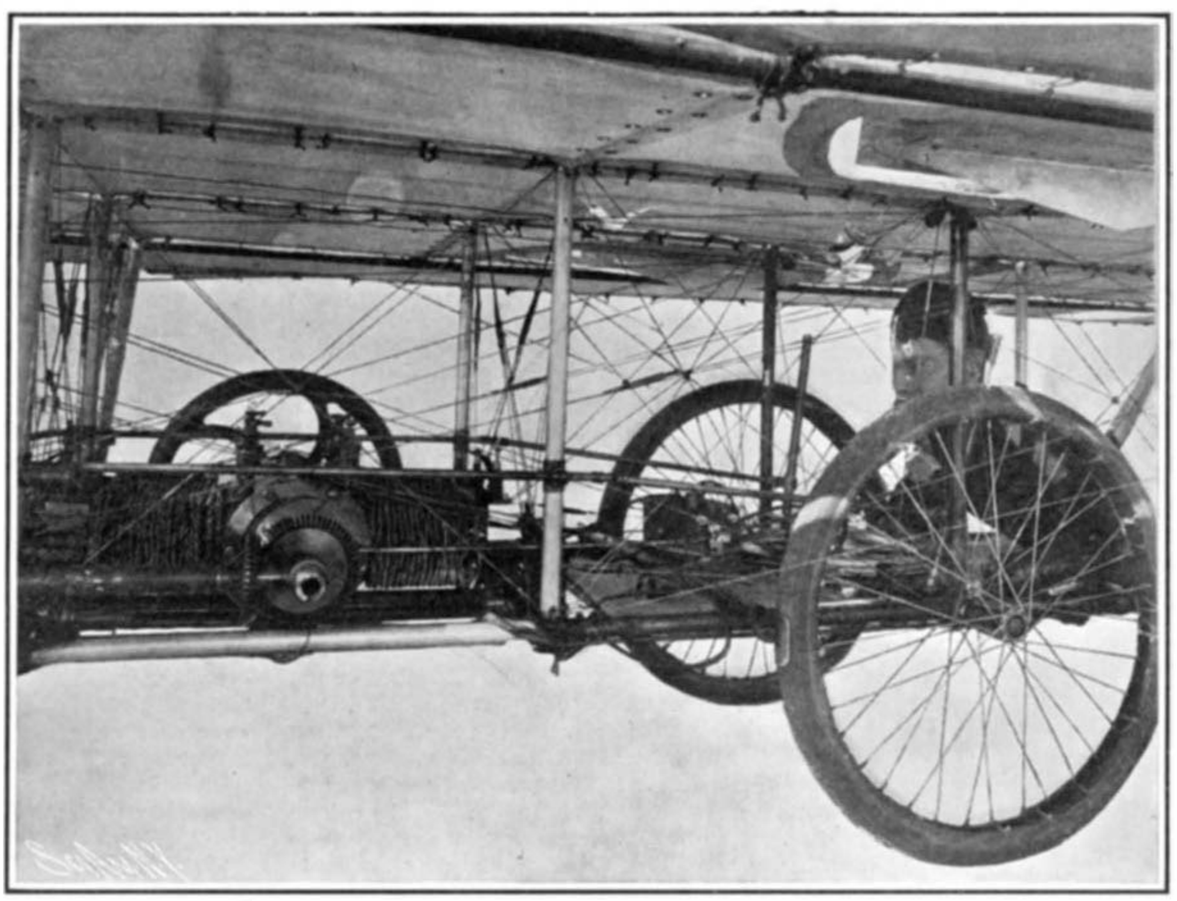
Aeronauts may well be divided into two general classes, although there are many subdivisions of each which might be deemed to be of sufficient importance to be classified individually. Of the two sharply divergent schools under which all others may be brought for the sake of convenience, the first may well be said to consist of those followers of Montgolfier who still pin their faith to the balloon, but in the present state of the art have made dirigibility their aim. The other general class comprises that army of investigators who have discarded the lifting power of gas and depend solely upon plane surfaces and mechanical propulsion for this. There are so many subdivisions of this last class that it would be hopeless to attempt to enumerate them, but probably they can all be brought under two heads—the followers of the fixed aeroplane idea moved by propellers or something similar, and those in which the movement of the planes themselves is relied upon to produce this, as do the wings of the bird in nature. Experiments in both fields date back for more than half a century, and it is not at all unlikely that attempts have preceded this by many years, but have gone unrecorded. How to impart sufficient speed to the apparatus to overcome the wind pressure is the problem presented in both instances, and its solution is in either case attended with difficulties that appear well-nigh insurmountable.



The Aeroplane Ready to Start.

The lifting power of hydrogen is so small compared with its volume that in order to provide sufficient latitude to cover the weight of motive power, crew and accessories, the size of the envelope must be increased until the area it presents makes the factor of wind pressure absolutely prohibitive. In order to combat the latter at all a horse-power entirely out of proportion with the weight of its generator is imperative and the available capacity of the latter is restricted within closely defined limits by the small surplus to be devoted to this purpose after the lifting power of the balloon itself and the crew has been deducted, and this in turn determines the possible speed. That this is closely restricted is evident, for the resistance grows as the square, and the horse-power required as the cube, of the speed.

The principle of the dirigible balloon has been pretty well evolved, but the maximum attained with this type has been a speed of 18 miles an hour—Count Zeppelin's balloon—and a distance of five or six miles. On the other hand, a balloon has made a sustained flight of twelve hundred miles, with the wind. Thus the only practical advance over first principles has been found in the dirigible balloon, but while the latter has the advantage of providing independent flotation its many disadvantages are apparent, and at best, though it may serve useful ends in war or exploration, it is a costly toy with which few but governments can afford to experiment.



View Showing the 20-Horse-Power Motor and Position of Operator.

THE GILLESPIE AEROPLANE.

There is an element that must perforce be lacking in every attempt of man to imitate the flight of the bird and that is the spark of life—the nerve center that man has never succeeded in endowing any of his creations with. Many of the attempts to reproduce the bird's flight have been crude and fanciful, although they are of some value to science. On the whole there is no difficulty in merely simulating the movement of a bird's wings nor in reproducing the surfaces its wings present to the air.

When man steps on the "yellow peril" in the shape of a banana skin and is threatened with a sudden loss of his center of gravity, a subconscious effort flashed from his nerve center pulls him up, and in the majority of instances saves his loss of dignity if nothing more. It is the same with the bird; violent gusts of wind from every direction strike it on all sides in its flight, but this same subconsciousness with which all beings of a sufficiently high order are endowed suffices to save it from being capsized in the air or blown against obstructions in its path. Whatever it may be termed, intuition, instinct, or an unknown quantity, it is this unconscious effort made in far less time than it would be possible to accomplish any voluntary movement that preserves the center of gravity.

If illustration were needed that this is the *sine qua non* without which the true flying machine is a practical impossibility, it is only necessary to revert to the many fatalities that have ended man's attempts to fly in various instances. Every aeronaut who has reached the stage of making practical experiments in aviation has had to recognize that provision for shifting the angle of incidence and for preserving the equilibrium is a matter of paramount importance—indeed, a condition precedent to any extended flight.

"Upset in the air" tersely explains the deaths of Lilienthal and Pilcher, who demonstrated a great deal in their numerous gliding experiments, but nothing so conclusively as the fact that until there can be some means of automatically preserving the equilibrium—some nerve connection from the wings of the aeroplane to the nerve center exemplified by its operator—no amount of skill or dexterity on the part of the latter can suffice to save him in the end. Even the birds are at times suddenly "up-ended" in battling against the gale, and their recovery is due solely to this force of unconscious cerebration that does the right thing at the right moment without conscious effort. But should the bird actually meet with disaster in the shape of capsizing, the chances of recovery before striking the ground are so great that the latter seldom if ever occurs. In the case of the aeronaut recovery is out of the question.

Probably the chief reason why more has not been accomplished with the aeroplane lies in the fact that such meager opportunities to study it in action have been presented. "Defective equilibrium" epitomizes the failure of practically every attempt at flight with a true flying machine since experiments have been made along this line. Shifting the weight of the operator to vary the angle of incidence and numerous devices to shift the planes, the addition of side planes, tails and similar devices to accomplish the same object—all theoretically correct—have been found to fail when put to the test. It is the claim of G. Curtis Gillespie, of New York, who has made a close study of the subject along this particular line for a number of years, that in his flying machine principles are embodied that permit of the operator's becoming imbued with a sensitiveness to the movements of the aeroplane when in flight that, with a little experience, the closest approach ever made to this same subconsciousness of the bird will be attainable.

The effective area of the Gillespie aeroplane is approximately 240 square feet, and the designer, while being perfectly familiar with the great advantages of the curved plane, is confident that with the great amount of power developed by the seven aluminium propellers, each of which is slightly over three feet in diameter, the form of plane used in this machine is not only very much more difficult to "up-end" when in flight, but is likewise not so easily capsized laterally, this being a fatal defect in many of the extremely light machines with curved planes. This small plane is moreover more easily handled than an extremely wide convex plane or several of them, as usually adopted.

The dimensions of the machine are 24 feet over all with a beam of 10 feet, the plane being of light duck, its surface being cut into at each end to provide for aluminium movable planes in order to vary the angle of incidence. In order to do this, they are connected by light wire cables with an aluminium wheel directly in front of the operator, and this is his sole duty while in the air, upon this fact being based his ability to emulate the subconsciousness of the bird in flight.

The body is suspended from the plane by means of a trussed frame of light aluminium tubing reinforced by piano wire which also serves the purpose of stiffening the wind-bearing surface and preventing any deflection under pressure.

The motive power consists of an air-cooled gasoline engine having six cylinders, opposed three to three in a horizontal plane with cranks set at an angle of 60 degrees. The machine's total weight is 150 pounds, the cylinders having a bore of 3¼ by a stroke of 3½ inches, and at 2,000 revolutions per minute it develops 20 horse-power, or an effective horse-power for every 6.15 pounds of metal.

With this power each of the propellers has shown an effective pull on a scale of 7 pounds and a fraction, or for the total number approximately 50 pounds, so that at maximum speed a lifting power of some 2,400 pounds is commanded. Complete with operator the total weight is 450 pounds.

In an article on "Guns for the Defense of the Outer Harbor," Capt. James F. Howard, United States Artillery Corps, states that of the large-caliber guns already mounted in partial completion of the project of coast defense as determined by the "Endicott Board," 93 are 12-inch, 119 are 10-inch, and 93 are 8-inch.