FEATHERED FLYING MACHINES.

BY W. E. IRISH.

Of the importance of the aeroplane as a factor in aerial navigation there can be no doubt. The aeroplane is vastly heavier than the air it displaces, but as weight is essential to all natural flying machines it is only reasonable to suppose weight will be necessary in any successful flying contrivance. Based on these simple lines, small and large gliding machines have been constructed and experimented with varying from 12 square inches of surface to 500 square feet and capable of carrying 1 ounce to 1,000 pounds.

Aerial navigation is the act of sailing from place to place through the air by means of mechanical contrivances, and in its study, as in the study of all other sciences, there must be a beginning and season of experiment, and the more simple, effective, and inexpensive the experimental apparatus, the better. I made my first models from wing feathers arranged to represent birds in their most simple form of flight, gliding and soaring, and I gleaned from experimenting with these, more practical information in one hour than otherwise obtainable by months of close study.

The chief difficulties to be overcome before the successful flight of man can be attained are leaving the earth and safely alighting where desired, and maintaining equilibrium.

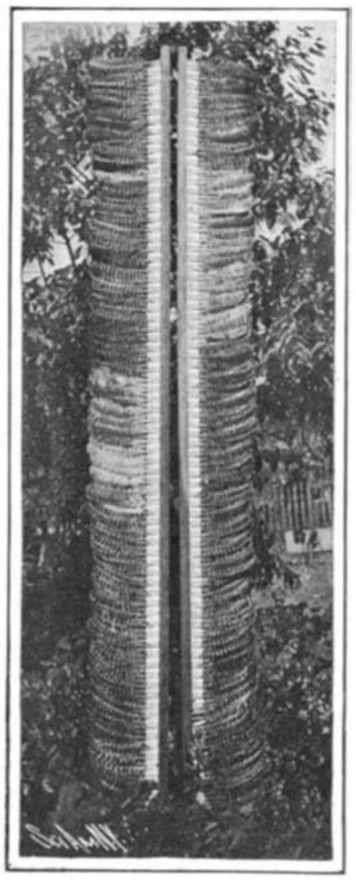
Feathers taken from the wings of birds have the ideal curvature for artificial supporting surfaces, whereas the tail feathers can be more advantageously employed in the rudder; and the germ of the truth that practical mechanical flying machines are possible may be found in a pair of wing feathers, which when properly arranged will not only glide long distances with, against, or across the wind, but actually soar into a wind having a slight upward trend. In their gliding descent with the wind their speed is accelerated until they often outrace the wind itself. It has been truly said, pluck the feathers from a bird, and it can no more fly than a man; properly arrange feathers on a man, and he should soar like a bird.

A very simple and fairly stable model can be made with a perfect pair of wing feathers, right and left, joined by cementing one quill within the other, which if let fall upside down will glide a far greater distance than any like model made of paper or other material. By burning a hole fore and aft, and passing a wire through the guides where they balance, and looping the wire ends, a very interesting model is formed, which when hooked on a short line, and whirled uniformly above and around the head by means of a rod, or held against a strong wind, will perform flight. When whirled around in one direction, the feathers may maintain their natural position in spite of their unstability; whirled in the other direction, they fly much better, but upside down. By fastening the line to the back instead of the front, the performance of the model will be quite different. Now remove the wire, enlarge the hole, and insert therein a straight tail feather; hitch the line on the projecting point of the quill, and whirl it as before, smoothly and with gradually-increasing speed, and note the change in its performance. Then try by turning the underside of feather up, and by replacing it with a screw.

Such models formed the basis of hundreds of others and thousands of tests, from which sufficient information was gleaned to warrant building my aeromobile. This machine, for two persons, although specially designed for flight, is intended to travel also on land or water, propelled by a gasoline motor of 10 horse-power, which can be connected to drive the wheels, the water screw, or the air propeller.

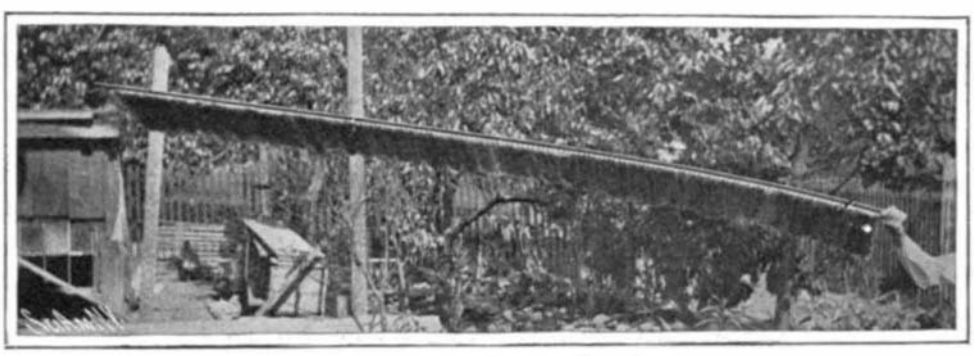
Small feather models, as shown in the figures, supporting canoes, boats, cars, etc., containing ballast, have been experimented with, driven by novel propellers actuated by the recoil of rubber bands, gasoline motors, and driven by air blasts and rocket charges. The propellers were sometimes placed forward, at other times at the rear, and again both fore and aft, the center of effort generally being in line with the center of gravity, and fore and aft axis immediately below the center of support. The effect of various rudders placed both fore and aft, and free and held in different positions, was also tried; glides without any mechanical means of propulsion have also been extensively experimented with by casting them from an elevation on the air, both indoors and out and against, across, and with the wind and hitched to an elastic line fastened on a fishing pole, the experimenter walking and running a straight course with them in every direction, also by whirling them around the head during calms and winds. During these experiments notes were taken. It should be remembered that a whirled model is unfavorably acted upon by the wind, which strikes it successively on every side. These models, patterned after animated creatures that fly and swim, make good air-current indicators, and show that form is not confined to very strict limitations, and experiments with them clear the mind of much befogging theory, and greatly aid those grappling with the subject, for they offer a means of practically testing every theory and mathematical deduction in a quick, inexpensive, and easy manner.

Scientists generally seek the solution of difficult problems by carefully studying nature's works, and I have tried to follow their example by building machines patterned after such pre-eminent sources as the condor, which in a few minutes of leisurely flight will sweep for many miles over mountains, rivers, and forests without any perceptible movement of its wings. Nature in dealing with the problem of flight furnishes wings and weight. Without the weight there could be no gliding and soaring, as any creature lighter than air would helplessly drift on the wind.

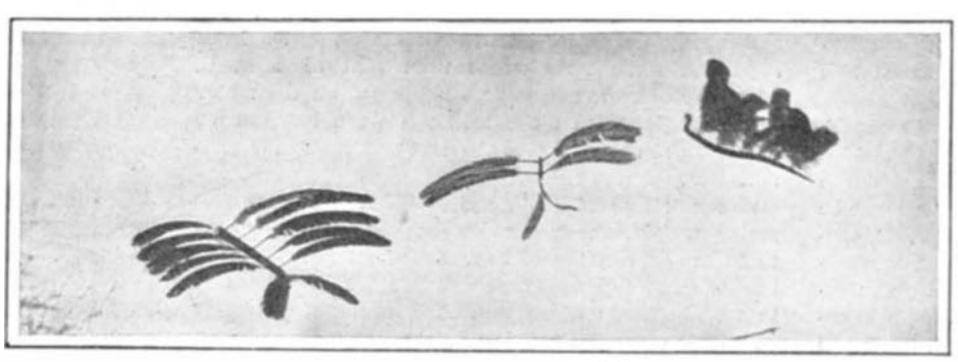


A Pair of 12-Foot Wings Provided with Feathers.

A Pair of Irish 1 and 4 Impulse Motors with 12-Foot Linen Wings.



A Wind-Supported 12-Foot Wing.



Feathered Aeroplanes in Flight.

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Spectra of the Electric Arc at High Tension.

In a paper read before the Société de Physique, M. de Kowalski gives an account of his experiments upon the spectra of the electric arc at high tension. The first researches were made upon the electric arc which was formed between metallic electrodes at high tension, and the author shows that his experiments agree with the theory of M. Stark. According to this, the electric arc commences to form at the moment when the temperature of the surface of the cathode is high enough to produce a sort of evaporation of the metal of the cathode. We may then expect that in the neighborhood of the cathode, the aspect of the luminous spectrum of the arc influenced by the metallic vapors will be different from the spectrum around the anode. It was also of interest to study the influence of the strength of the current upon the appearance of the spectra. Some new experiments were made in this direction. Not having direct-current dynamos of high enough tension, the author employs an induction coil for this purpose. In order to obtain an arc which will form between metallic poles with the anode and cathode well defined, the current from the induction coil must be dissymmetric to a certain degree, but this is easy to carry out by using a suitable current-interrupter. The turbine form with mercury jet is the best for this experiment. He used one which is made by the Allgemeine Company of Berlin. By its use we can employ high currents and can also measure the number of breaks per minute with precision. Photographs of the spectra were obtained by using a spectrograph with quartz lens and a Cornu prism. The experiment was disposed as follows: At a distance of about one inch from the spectrograph slit was placed the arc apparatus with its electrodes in cadmium or zinc. The poles were connected with the secondary circuit of the induction coil, with 0.6 inch distance between the electrodes. Thus he obtains an arc discharge at some 20 breaks per second with 6 amperes current in the primary circuit. A check spectrum is formed by putting a set of 0.003 microfarad condensers in parallel with the arc apparatus. The discharge is then changed to an oscillatory spark discharge. The spectrum of this latter is well enough known owing to the researches of M. Hemsalech, and it can be used as a comparison. The results which were thus obtained confirmed the suppositions of the author. The photographs show at first a band spectrum, the bands being due to nitrous vapors which are formed in the arc. But on the side of the cathode at the top we notice a set of strong broken lines which are due to the metal forming the cathode. These lines appear to belong exclusively to the cathode, and this is verified by reversing the current. They appear then at the bottom of the plate. The length of these lines depends on the strength of current in the arc. By increasing the current, certain lines traverse the whole top part of the spectrum, becoming wider on the side of the cathode. The study of the position of these broken or partial lines gives some interesting results. In the case of cadmium we observe the following lines: 5086, 4800, 4678, 3610, 3613, 3404, 3261, 3466, 3467. For zinc we have another series. We find that these lines are the same that M. de Watteville found in his remarkable work on plane spectra. They are identical with the characteristic lines of the spectra of metals evaporated in the cone of the plane. The line 3282 which is very weak in the flame spectrum of zinc appears very sharp in our spectra. All the facts clearly show the existence of metallic vapors in the region of the cathode and in a condition and a temperature analogous to those which are found in the cone of a gas flame.

Rose Powder.—As a base, as is ordinarily done in preparations of this nature, take 200 parts of powdered iris root, add to this 600 parts of rose petals, 100 parts of sandalwood, as many of patchouli, and only three parts of oil of geranium, and finally add two parts of true rose oil.