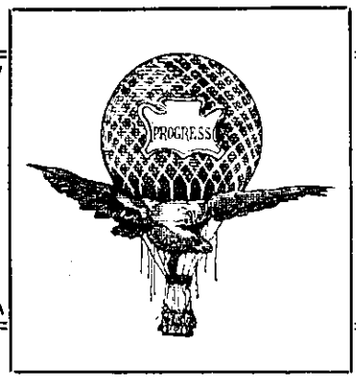

The Mastery of the Air

A Record of the Achievements of Science in the Realm of Aerial Navigation

Aviation.

(By Peter Ellis.)

Flying.

Suppose a machine weighs 100lbs., and we wish to raise it vertically in the air 100 feet in one minute by means of a screw propeller (I do not say this is practicable, only assume it), the propeller having a helical pitch of one foot, we would require to revolve the propeller 100 times and the thrust would be 100lbs., assuming, of course, that there were no slip. Now, if instead of rising vertically we go up an incline of 1 in 50 with the horizontal, with a propeller of the same pitch, we would require to revolve it 5000 times, with a thrust of 20lbs., 10,000 foot lbs. of work being done in either case, the speed in the first instance being a 100 feet per minute and in the latter 5000ft., or nearly 60 miles per hour.

To revolve a propeller at the slow speed of 100 revs. per min., with the heavy thrust of 100lbs., would mean a very heavy, slow-moving motor (or a fast motor geared down with reducing gear), and the heavy thrust would require a very strong propeller, which would also be heavy as a natural sequence, the whole thing being preposterous. On the other hand, a propeller revolving at the high speed of 5000 revs. per min. with a light thrust (2lbs.) makes it easy to apply a light motor, light shaft, and light propeller. Of course atmospheric and frictional resistance is neglected in the discussion, in order to make this explanation clear, and to show the absurdity of attempting to fly *vertically* and the ease and practicability of flying in a nearly horizontal direction, rising gradually to the desired height.

Force and Motion.

When a block of wood lies on a table, the Savants tell us that it presses on the table, and the surface of the table reacts on the block. Now, suppose we smear the surface of the table with cement, and place the block upon it so that the block unites with the table, what has become of these contrary forces? We have not altered the position of the block, only interposed a thin layer of cement to exclude the air, where the under surface of the block meets the upper surface of the table. If it be contended that the forces are still acting, then since the block and the table have become one mass, these forces must be acting not only at the joint where the cement is, but above and below it, everywhere, from the top of the block to the bottom of the table legs, and even right down to the centre of the earth. Beginning at the centre of the earth, we follow the material from that point upwards until we reach the top of the block, we find the density of the material greatest at the earth's centre, diminishing as we go upward (that is, if the density of the material decreases proportionately all the way, as it seems to do). Take the foundation blocks of a building. Are they pressed upon, and more dense by reason of the superincumbent weight, weight meaning the pull of gravitation (of course, if there were no gravitation, there would be no weight). Now we cannot draw a horizontal line, or fix on a point, anywhere between the centre of the earth and the top of a building, and say here, at this line only, or at this point only, there is a downward pressure and an upward pressure; the fact seems to be that these upward and downward pressures are everywhere, vertically throughout the mass. The mass or masses being considered as strata of different materials, but the meeting surface of the different strata do not locate the contrary forces we have been considering. Relying on the "Atomic theory" (which, anyhow, is a convenient one for our purpose), does it not appear that the opposite forces exist throughout every mass of material in all directions, and by this principle are able to exist as masses. The atoms must hold together, and also be kept asunder, in different densities in order to form masses. The whole matter, then, resolves itself into a question of varying densities, dependent on position. A castiron column, for instance, lying horizontally, will have the density of its ends equal, but if raised on end, the lower end will become denser than the upper. Another curious fact seems to appear, and that is, that the force or forces in connection with atoms, only really act, when they are in motion, for after the respective densities have adjusted themselves, and the contrary forces balance each other, they mutually destroy each other and have no real existence. Will the pursuit of this study give a clue to the mystery of what is heat and electricity? It seems to open the door in that direction. May not electric energy be simply the disturbing of balanced forces, and so causing motion, *i.e.*, a state of unbalance. In a word, is not electricity simply motion born of disturbance and working again towards a balance?

When a ball is projected vertically in the air by considerable force, it reaches a point where it ceases to rise, and is for an instant in a neutral position, *i.e.*, having no weight, neither going up or down. Now if, at this critical moment another force is applied to cause the ball to move rapidly in a horizontal direction (tending upwards) the ball will have little time to descend, and will nearly maintain its height and weightlessness as long as the horizontal force acting upon it is sufficient and continuous. Gravity, like every other force, requires time to act, but the rapid horizontal motion of the body in this case does not give it full opportunity. Of course there can be no real force apart from motion. This shows that the art of flying through the air is a much simpler matter than is ordinarily supposed.

Alighting with Planeless Flying Machines.

Since there are no planes to depend on for supporting the machine, a constant horizontal motion is necessary, the propellers being kept constantly going. Twin motors, capable of being coupled, or working independently, are needed for safety.

When it is desired to alight on a particular spot, the machine would be steered in a wide, sweeping circle around it, and the speed of the propellers lowered so that gravity may gradually draw the machine to earth in a helical or spiral course of considerable length.

The Belmont (New York) Meeting.

This meeting was marred by the dispute over Moisant's win in the flight around the Liberty Statue. His death at Los Angeles gives a melancholy interest to the event. We glean the following regarding the matter from the American press:—

"The prince of the power of the air seems to have been alive to his opportunity to sow dissension among the airmen. At any rate, a Satanic sequel to the international aviation meet at Belmont Park, Long Island, has been a crop of protests and charges which threatens civil war in the Aero Club of America, and moves one paragrapher to remark that birds in their little nests agree better than birdmen competing for prizes. Let no one after this say that the aeroplane is not destined to be an instrument of warfare,' exclaims the New York *World*, which notes that ever since the Belmont Park meet, 'rival forces of flying men have been ranged in hostile array at banquet tables and about hotel lobbies.'

On October 30, which had been officially announced as the last day of the meet, three contestants, representing France, England, and the United States, flew in a race from the aviation grounds around the Statute of Liberty in New York Harbour and back, a prize of £2000 to go to the airman making the best time. This race was won for the United States by John B. Moisant. There the incident would have ended had not the committee in charge of the meet extended its original programme