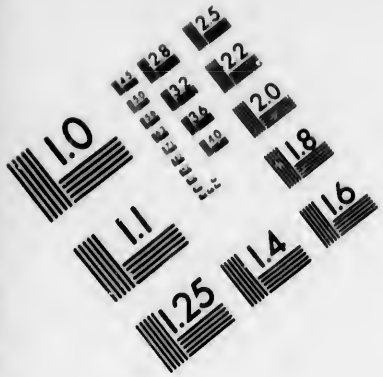

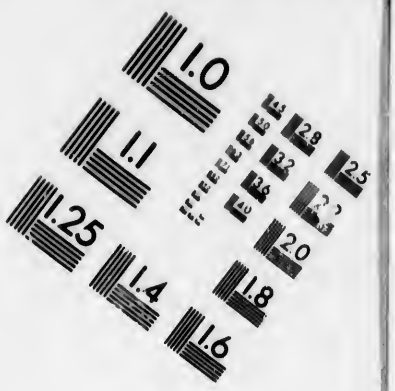

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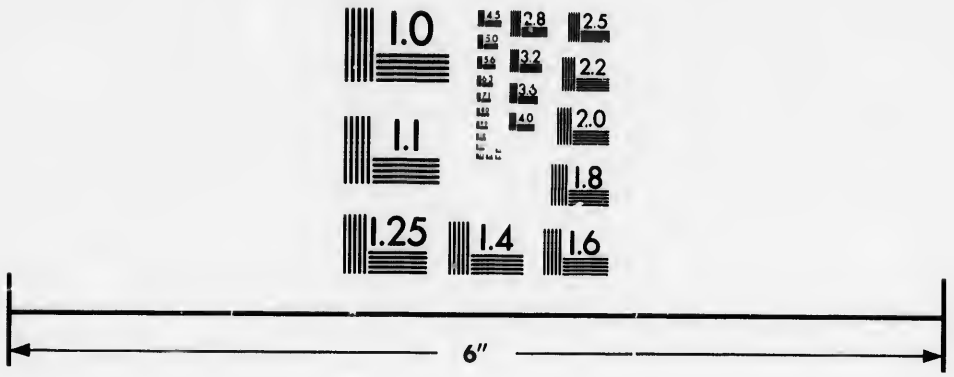

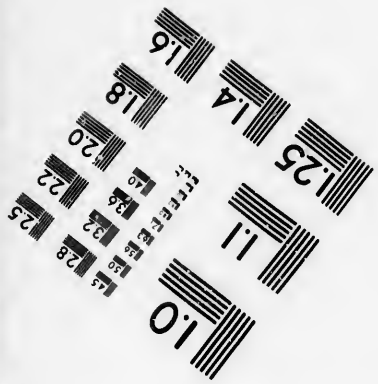

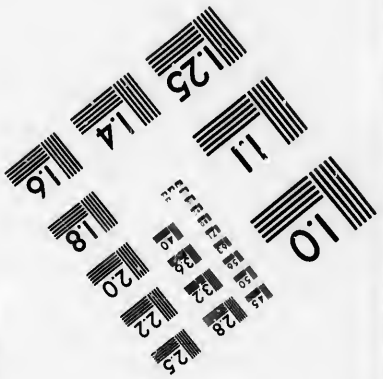

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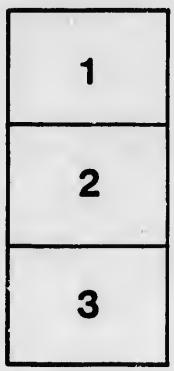

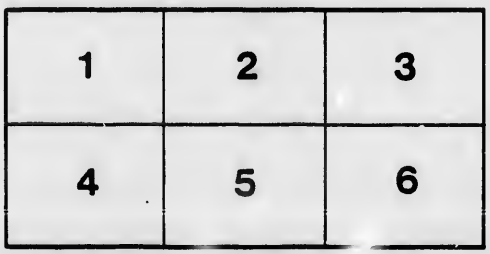

From THE CANADIAN ENGINEER, *November, 1897.*

THE NAVIGATION OF THE AIR.

Editor CANADIAN ENGINEER :

Balloons to date have always been symmetrical in cross section, or around on either vertical or horizontal axis of rotation. They have been spheres or spheroids, and when the latter, sometimes oblate, sometimes prolate, that is, elongated as the lemon, squat or flattened at the poles, as with the orange or the apple. They have also been made ovoid, as the egg, and even spindle like, as the weaver's shuttle; but always symmetrical in any and every section, perpendicular to the axial line.

Thus there has never been an attempt, as with flying machines, to imitate in a balloon the shape of a bird on the wing; and yet there should be, there must be, to be successful in directing them, as man has become in propelling vessels through the water by building them in imitation of the fish. Nor will flying machines ever prove a success until some closer imitation has been arrived at than heretofore, of the winged denizens of the air. These have been supplied with machines which have to perform the double duty, not only of propulsion through the air, but of ministering the while to their buoyancy.

This necessity must be eliminated, and can be, in flying machines, by having a space inclosing structure, approaching in point of weight to that of a more or less perfect vacuum, by inflation, as is usual, by a lighter gas than air, as hydrogen—some fourteen times lighter, bulk for bulk, than air—and this requiring less place or bulk to do the needful, or with the heavier coal gas, by increasing size of air buoy. Thus, as it is, the balloon is buoyant, but without the proper shape to render it possible to direct its motion, while the sky-flyer is deficient in the opposite sense of having the power of direction without the buoyancy.

Now then, let us try to conciliate or combine the two requirements or desiderata: for as there is so to say but one kind or shape of fish or vessel to navigate the sea, there can also be but one kind of vessel to navigate the air; and the balloon and flying machine as now distinct from one another, must be blended (except for mere ascensional, observational, or meteorological purposes, where the balloon as now made may suit the purpose) into one and the same structure, and as closely as possible approximating to the figure of a bird on the wing.

This may be done by building the balloon or sky-flyer more or less crescent-like, or in the shape of a crescent in its cross section or that perpendicular to its axis of direction. The bird gains buoyancy by plying its wings, spreading them concavely to the air, as a swimmer does with the hollow of his feet and hands against the water which he leaves behind him, and preparatory to another stroke, lengthens out his feet and hands to their minimum cross section to draw (the feet) or thrust (the hands) forward for a renewal of the action; the same again as to propel the boat, the blade of the oar is held flat against the water, and then turned edgeways, pending the interval required for another stroke; or again, the same as with the paddles of a steamer, as soon as they have done their duty in and through the water, they are made to turn edgeways before leaving it, to prevent back-water. This must be done, or no success will be forthcoming. The bird must be imitated, both in its shape and in its motion. Watch it then carefully, look at it from beneath when you get a chance of doing so. We have already seen how it ascends by the ply of its wings. Now it has attained its height, and soars aloft, no more by the motion of its wings or by moving them, but by spreading them, and it spreads the feathers of its tail, till they reach and underlap them, and then you have the surest parachute. The bird, though, must move or soar as it is called, but it does so bodily, or as a whole, now acting as the kite or as the aeroplane, which the slightest motion keeps afloat, either by its own advance in perfectly still air, or by the motion of the air in the contrary direction, when the kite, or bird, or aeroplane, moves against the wind or breeze; and similarly does and must the cyclist move when soaring, so to say, on his wheel, or at a standstill or slow motion, by curving slightly to one side, then the other, to retain his vertical position in space.

But there is another cause which helps the bird to soar on air, and which I do not remember as yet to have seen noticed, any more than does the centrifugal action of floating ice or other objects, such as the remains of the "Jeannette" or other wreckage, appear to have ever been taken into the calculation, or in any way considered as a factor in the computation as well as circum-polar currents, etc., in Arctic navigation.

This is the very heat generated by the bird's body, and we all know how immensely hot a bird feels when you hold him from beneath. This heat then imparts itself by radiation and conduction both, to the air contained in the concavity between its wings, it heats this air and thus rarefies it and makes it lighter, with the tendency, if not to further lift the bird in space, at any rate, to keep it there or on the wing, and prevent its tendency to fall, which it would do, or at any rate, descend, as with an ordinary non heat-generating parachute.

And this soaring of the bird, the bird of prey especially, is due to its meat or flesh-devouring propensities, and of fatty and oily substances creative in the blood of vast amounts of carbon, which, when brought into contact with the oxygen of the air in the bird's act of active respiration, sets fire, so to say, to the interior, with the effect alluded to of thus maintaining its not otherwise-to-be-explained faculty of keeping almost indefinitely on the soar.

Again as in the so-called ball-cock mystery, of which I was the first to explain the apparent parndox; buoyancy, or additional or increased buoyancy might be obtained under a parachute or flying machine of the kind, by causing a jet of steam from a boiler of the propeller, if such were used to give motion to the flyer, or a jet of gas of any kind, or of atmospheric air, to issue from a reservoir of compressed gas or air, or from an air or gas compressor worked by the engine, and either by electricity or any other motive power, to issue from a conical nozzle with a ball near its apex, or from the conic space between two concentric cones, and at such an angle as required to cause the funnel-like jet to pass out in contact with the circular periphery or outer and lower edge of a conical or concave roof or ceiling to the flyer, which (the jet) as in the case of the similarly shaped water nozzle, would, by the mere effect of its friction on the air contained beneath the parachute-like covering, roof or awning, suck the air from the space enclosed between the awning and the funnelled jet of gas or air in a way to form a vacuum or partial vacuum within; and again, in this way be productive of the buoyancy required to float the flyer, and allow of applying the power of its motor or the balance of such power, as the case might be, to the propulsion of the bird-like structure through or into space.

But better still, let the buoyancy be provided for in advance of starting, by making the structure a balloon or space-enclosing one, and let the car and motor be held beneath the balloon in the concavity between its horns, already spoken of, by building it as said, of crescent-shape in its cross section. Its weight might be borne by rods or ties from horn to horn, or it might be suspended to the under or concave side of the aerostat or to suit its height to all requirements, its head might rise air-tight, of course, into the very balloon itself, and he there maintained in shape by suitable light steel ribbing.

Now on either side the car and perpendicular thereto, or symmetrically and at whatever angle, there might go forth axles of motion, and these axles might either pass beneath or through the pendant horns of the crescent, coupled thereto if passing beneath them, or if passing through them, would do so through fixed tubes concentric in direction with that of the axles, and with joints at either end made impermeable to the space-filling medium of the air-ship. Then to the ends of these axles, projecting as required beyond the tubes, would be attached such paddle-wheels or motor-blades as required to propel the ship through space; and by making the axles separate or capable of separate action, the one from the other, both would be made to revolve or work at the same velocity for straight motion or motion ahead in a vertical plane, or one of them to work slower than the other when starting on a tack, or the one backward and the other forward for speedy rotation of the vessel or a change in direction, end to end. And if the tail-end of the aerostat were provided with a rudder, this could be easily worked from the platform of the car by an endless chain or rope passing through sheaves and pulleys attached to the bottom or concave side of the imitative bird, or again a screw or helix, or a pair of them (twin screws) could be as easily handled from the car.

I have as yet said nothing of the balloon in longitudinal section, nor of its plan or shape as viewed from above or below; but from what I have said about a bird-like structure, it will have been inferred that the rear end of the airship should be like a lobster's tail, and the whole bag of gas fan-like in plan, while its head or nucleus should, except for its concavity beneath, be like that of Newton's great comet of 1680, Halley's comet of 1835, the six-tailed (feather-like) comet of 1744, that of 1811, and even those of by-gone ages, as of A.D. 1000 (supposed to be Halley's, of 1835), are described in the annals of the time as exhibiting a tail in the form of a scythe, as if their mighty flight through space (at a million miles or more an hour when under perihelion influence) as if concavity of the tail while traversing ethereal space, were akin to that formed by birds traversing atmospheric space, or that their heating of the ether in their concave surface had something to do with an ethereal vacuum supporting them in space.

But I had better keep out of ether and get back into air, with the concluding remark that such a shape of balloon cross-section would, in case of collapse or of a rapid coming down, in case of a burst or rent in its enclosing skin, cause it to fall on its horns, which, being made of certain amplitude or thickness and lower rounded edges, as I should have said before, would act as buffers on land and water to deaden the fall or force of impact. The balloon, it is likely, should be ribbed, and all its ribbing and impelling machinery be made again in imitation of the bird, of light steel tubing (birds' bones being hollow), thus affording increased strength with less material, and as such ribbing would, even in case of a burst and escape of gas, maintain the shape and keep the enclosing material in position, this would be highly conducive to the prevention of accidents, since even without the gas within it, the outspread cotton, cloth, or silk, or of whatever material the coverings were made up, would be sure to stay the velocity of descent and effectively prevent casualties, and here again we take our cue from the bird; for though when, after soaring it perceives its prey, it swoops or shoots down like an arrow, closing its wings and the feathers of its tail the while, but when near the earth it spreads them again to break its own fall, which otherwise would prove as fatal to it as that of a man not armed with a parachute for the purpose of retardation.

Quebec, October 25th. C. BAILLAIRGE, C.E.