This excellent little volume consists of an extensive glossary of aeronautical terms and appliances. The terms have been selected with care so that there is little redundancy. The entries include, in their proper place, detailed descriptions, with diagrams, of the principal dirigibles, aeroplanes and aerial motors.

Die Berliner Flugwoche. By Jos. Hofmann (M. Aer. Soc.). (Berlin, 1909: L. Simion).

A brief review of the Berlin Aviation Week (September 26—October 3) and of its lessons, in which the author criticises the sharp corners of the course (one of which had an angle of 60° and was productive of several mishaps) and from which he concludes the necessity of cutting down the preliminary run of an aeroplane on the ground by reducing the normal angle of incidence of the foils.

CORRESPONDENCE

THE BALL AND ROD EXPERIMENT

To the Editors of the *Aëronautical Journal.*

Sirs,—Cases are unfortunately not rare in which a natural phenomenon of unimpeachable respectability, so to speak, is utilised as a means of deceiving the public. The subject of this communication was so used not long ago by an enterprising gentleman who claimed to be able to influence matter, without actually touching it, by mental action. One of his feats was to blow upon a captive celluloid ball and make it advance *towards* him, *against* the current of air impinging upon it. This phenomenon is perfectly genuine and can be demonstrated by anyone who "knows how." It is, however, sufficiently startling at first sight to the uninitiated to endow the demonstrator with an entirely fictitious reputation for magical powers; the more so that attempts to imitate the feat would probably fail ignominiously from lack of knowledge of the underlying principle. An explanation of this is proffered below.

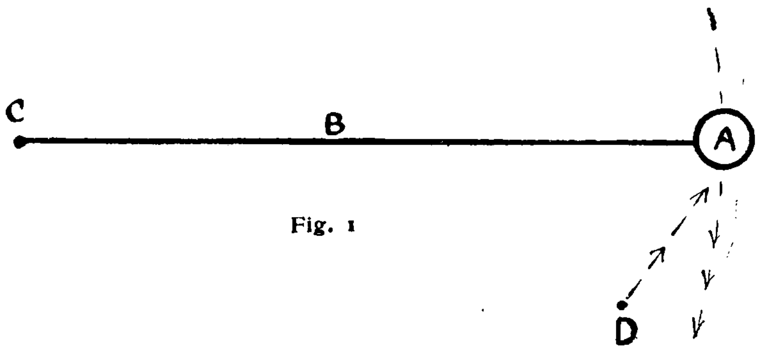

Fig. 1

The diagram (fig. 1) shows in plan the necessary apparatus. The ball A is supported by a rod B which is supported in its turn at axis C, round which it is free to swing in a horizontal plane. The demonstrator causes the ball to travel towards him by blowing on it from point D.

In order to appreciate why the ball so behaves it is necessary to consider what happens when a fluid stream issuing from an orifice encounters a sphere. It will simplify matters to consider its behaviour on meeting a cylinder (to which form the centre section of a sphere approximates) which we may imagine as extending an infinite distance either side of the plane of the paper; the whole fluid disturbance can then be indicated in plan. It should be noted that no attempt has been made, in the diagrams herewith, to represent the eddies and vortices which are at present in the actual fluid stream, both before and after meeting the obstacle, as they are not relevant to the explanation. The stream dealt with is not larger than the cylinder in cross section, as the power of diversion of the latter extends of course only to the region immediately adjacent to it.

If the fluid stream (shown at A, figs. 2-4) meets the cylinder (shown sectionally at B) "dead-on," fig. 2 represents what occurs. The original stream divides into two equal streams, which pass on either side of the obstacle, leaving its surface at, or just after, passing its maximum girth, and, skirting the dead-water region, join again on the far side. The resultant stream, being made up of two converging equal streams, takes the line bisecting the angle of convergence—that is, the same straight line as the original.

When the stream meets the cylinder "off-centre" a different result ensues. The original stream now divides into two unequal streams, the smaller of which, if the cylinder is struck sufficiently off-centre, is so much diverted from its path that it does not rejoin the rest of the stream. The larger stream shows the usual inclination to "hang on to" and follow the surface

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of the obstacle, and is also diverted in the same direction as the smaller stream. The consequence is that the original stream is diverted from its path as shown, somewhat exaggerated, in fig. 3.

This effect is akin to that obtained from a round-backed blade. The portion of the cylinder or ball which does the diverting of the major portion of the stream is the off side, away from the axis C (fig. 1). If we cut off a section of this we have a round-backed blade, the action of which on the air is represented in fig. 4. As is well known, this shape of blade gives a decided reaction in the direction towards which the rounded face is pointing, even when the flat side is in direct alignment with the fluid stream impinging on the blade. As the flat side can in this case have no effect upon the fluid, the reaction is due to the diversion of the stream passing along the rounded face, to the contour of which it conforms, the resultant stream taking a line governed by the angle of convergence and relative size of the two streams into which the blade divide

FIG. 2

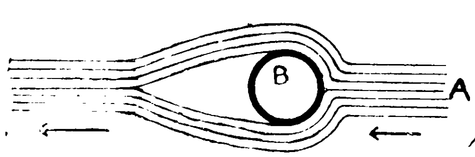


FIG. 3.

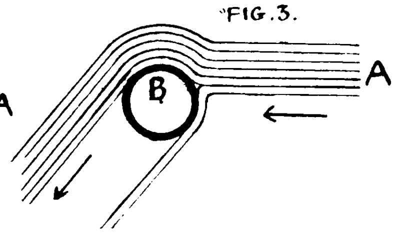
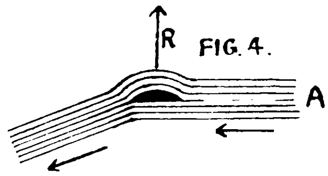


FIG. 4.



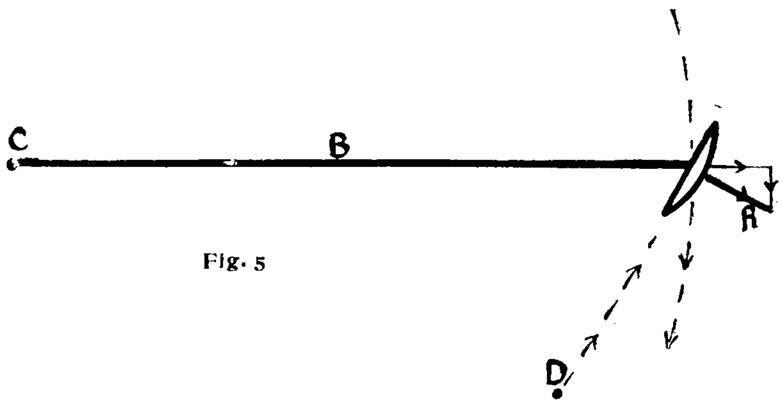


Fig. 5

the original stream. The reaction can be represented by a line R at right angles to the flat face (this is approximately correct), and we now have the clue to the behaviour of the ball.

If we were to blow on the ball "off-centre" from a position about axis C (fig. 1), the reaction R would obviously be at right angles to the pull of the supporting bar, and the ball would be given a strong impulse round the axis. On the other hand, blowing from a point at right angles to the supporting bar would lead to the reaction R being balanced by the pull of the bar. We have simply then to move so far towards axis C as will lead to a portion of reaction R being *un*-balanced by the supporting bar to ensure that the ball will come towards us. Fig. 5 (in which a round-backed blade is shown for clearness) shows this condition fulfilled.

BERTRAM G. COOPER

April 15, 1910

MAN FLIGHT

SIRS,—In answer to your letter, I beg to state that I delivered a lecture lately in the "Verein Deutscher Flütechnikie" about the further development of aviation.

My conclusions are based on the results of the measurements of the resistance of the air made by my deceased brother and myself, and published in "Der Vogelflug" (newly published by myself at R. Oldenbourg's Verlag, München). These measurements are exactly uniform with the results of correctly built modern flying machines, which I could prove by mathematical calculation. Regarding this statement, I claim that our further discoveries, published in the same book, are also reliable; especially I referred to the wonderful increase of the resistance of the air by beating wings, in opposition of the effect of the screw. I proved this by an experiment shown in the lecture hall. This stated a multiplication of the air pressure of seven times more than the general calculation otherwise shows. Based on this fact, I am able to prove that man can fly with his own force without a motor, as only one-third h.p. is required when a wind of at least six metres per second or more is blowing. I stated further that the question of equilibrium has to be solved before it is possible to make experiments, and that my special attention at present is occupied to construct a combination of special formed wings, which keep the equilibrium in the ever changing wind.

GUSTAV LILIENTHAL