known (*e.g.* Lanchester, "Aerodynamics," § 80). If the bounding surface meets the plane boundary OP at O, and O is the origin, then $dw/dz=0$ when $z=0$, whence we easily have $a=b\sqrt{3}$ in the above expression.

Now substitute $z=\sqrt{z'}$, and the solution is obtained of a *continuous* motion round the straight edge past O, with a single vortex in the dead water in the wake of the edge (Fig. 2).

Making the substitution, we now write

$$w=A\left(\sqrt{z'}+2ib\log\frac{\sqrt{z'}-(\sqrt{3}+i)b}{\sqrt{z'}-(\sqrt{3}-i)b}\right),$$

where A is a constant, and we find that when $z'=0$, $dw/dz'=-A\sqrt{\tfrac{3}{4}}b$.

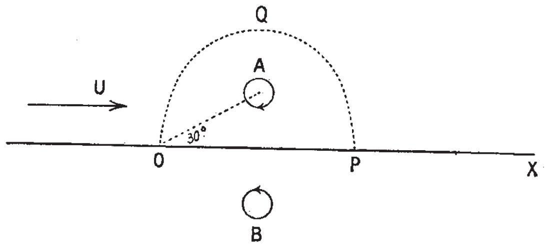


FIG. 1.

The velocity is thus finite where the stream leaves the plate.

With $z'=z^{\frac{3}{2}}$ we get a streaming motion round a rectangular corner with a single vortex in the dead water (Fig. 3), and similarly with $z'=z^n$, where $1<n<2$, we get a streaming motion past a projecting corner with re-entrant angle $n.180°$ (Fig. 4). But here comes the difficulty, *if it is a difficulty.*

Except in the above case of $n=2$, the velocity vanishes at the origin, and, further, the stream line bounding the dead water makes equal angles with the two parts of the fixed boundary; thus, for the right angle of Fig. 3, the boundary of the dead water starts from the origin at an angle of 135° with the two walls, and the dead water projects forward into the stream.

But is it not the fact that when a stream flows through the arches of a bridge, the dead water *does* project into the current, the circulating fluid pushing the stream into the

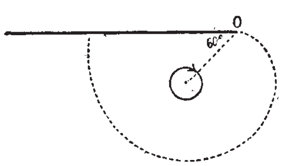


FIG. 2.

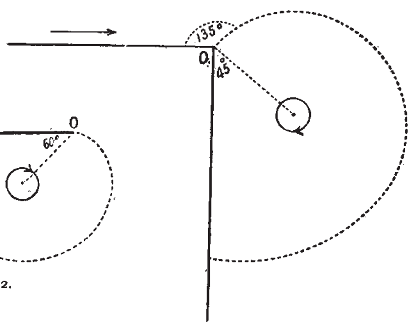


FIG 3.

centre and narrowing it? I believe I have seen something of this very kind.

As regards the velocity being zero, the same would occur in the hydrodynamical problem representing the motion of two streams meeting at an angle, the velocity vanishing at the projecting angle of the boundary.

If, finally, we apply Schwarz and Christoffel's transformation to our original figure, we can obtain various solutions representing continuous motions past projecting obstacles, maintained by a fixed vortex in the dead water behind them. For example, taking

$$\frac{dz'}{dz}=C\frac{z}{(z-c)^{\frac{1}{2}}(z+c)^{\frac{1}{2}}},$$

or (say),

$$z'=\sqrt{(z^2-c^2)},$$

we get the solution for a broad stream with a pier projecting at right angles to the straight bank, or a current impinging perpendicularly on a lamina, with a couple of vortices situated in the dead water behind it. Moreover, if $c<2a$, the whole of the back of the plate will be in the dead water (Fig. 5), while if $c>2a$ the current will flow round and on to the plate, leaving dead water only near the edges (Fig. 6).

The whole point which I wish to emphasise is that hydrodynamical solutions can be obtained of cases of eddy formation in the wake of a projecting obstacle by taking Fig. 1 and the corresponding formula, and transforming by the usual methods of conformal representation, *transforming the point O of Fig. 1 into the projecting or re-entrant angle.* No other point can be so transformed without making the velocity infinite, except P. We should then have the vortices in front of the obstacle, and this would certainly give a solution of the hydrodynamical equations, but it is difficult to see how vortices would get to the right points, and uncertain whether they would be stable there.

I have seen nothing like these solutions, yet it is hard to imagine that anything so simple can have escaped attention in a well-worn subject like hydrodynamics, especially as the

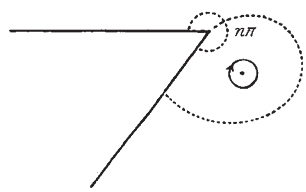


FIG. 4.

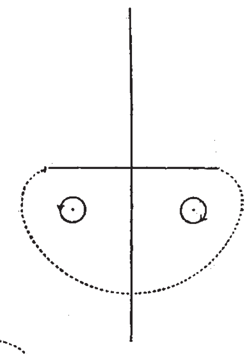


FIG. 5.

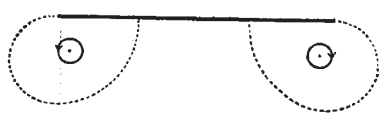


FIG. 6.

motions bear a strong resemblance to certain observed phenomena. If it should transpire that these problems have been solved before, it seems desirable that attention should be directed to them in view of the importance which such problems have assumed in connection with aërial and other navigation.

G. H. BRYAN.

THE NEW COMET (1910*a*).

IN those places where there has been a clear horizon at sunset during the past week, the new comet has provided a striking spectacle for thousands of observers. The observations made at the established observatories will have to be reduced and discussed, and some time will elapse before they are generally available, so at present we have only the meagre details of telegraphic summaries.

From these we learn that excellent photographs have been obtained at Oxford, Cambridge, Dublin, Stonyhurst, and other observatories, including the Harvard, Yerkes, and Lick institutions. Numerous observers have recorded changes in the appearance of the comet, and it will be interesting to see if these are shown on the photographs.

The elements and ephemeris issued from Kiel are evidently considerably in error; according to Prof. Turner, the error was 3° in declination on January 26, and was increasing 40′ daily. On that day the comet's position was determined at 5.35 p.m. by Dr. Rambaut, at the Radcliffe Observatory, as R.A.=21h. 20m. 40s., dec.=2° 17′ S.; according to the ephemeris, it should have been approximately 21h. 26.9m., 0° 52.5′ N. According to Mr. Crommelin, speaking at the British Astronomical Association, the perihelion distance given in the elements, viz. nearly 4,000,000 miles, is probably much too small. Prof. Kobold has calculated the following elements and ephemeris from observations made on January 18, 20, and 23:—

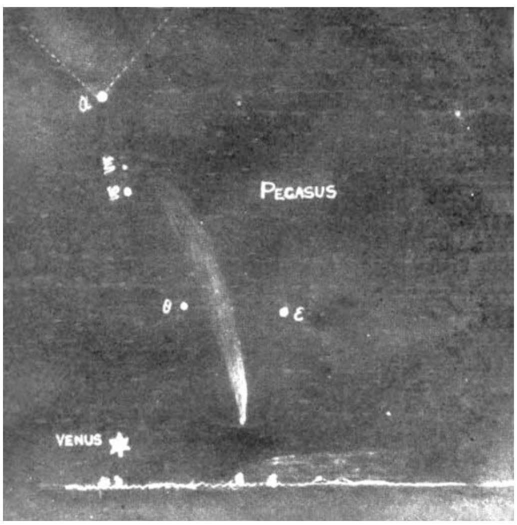
Elements.

T = 1910, January 17·07 G.M.T.
$\omega = 311^\circ\ 53'$
$\Omega = 83^\circ\ 50'$
$i = 138^\circ\ 25'$
Perihelion dist. = 0·109

Ephemeris 5 p.m. *G.M.T.*

1910			R.A. h. m.		Decl. °
February 1	...	...	21 38·5	...	+ 3 20
,, 5	...	...	21 47·0	...	+ 5 50
,, 9	...	...	21 53·9	...	+ 7 48
,, 13	...	...	21 59·8	...	+ 9 25
,, 17	...	...	22 5·2	...	+10 52

The spectrum of the comet has been observed a number of times at Cambridge, and found to consist of a bright yellow line in a continuous spectrum, thus far confirming the Lick observation. To the *Times* Sir Robert Ball reported this line as being due to sodium or helium, and stated, on January 26, that it was growing fainter. In a subsequent interview Mr. Hinks is reported to have said that Prof. Newall's observations showed that the spectrum of the comet's tail was purely monochromatic, the one line being due to sodium or helium, probably the latter. It will be remembered that Copeland and Lohse observed bright yellow lines in the spectrum of the great comet of 1882, but they were confirmed by Thollon and Gouy in ascribing them to the sodium, D, lines; further, they found them displaced towards the red sufficiently to give a measure of the comet's velocity of recession which agreed fairly well with the velocity determined geometrically. Should the presence of helium in the spectra of comets which have small perihelion distances be established, it might throw more light on Prof. Newall's suggestion that possibly the cyanogen spectrum so frequently observed is produced in the medium through which the comet is travelling; but the observation of cometary spectra is a delicate one, and not until the details of the observations have been thoroughly discussed by those who made them may any semblance of a definite conclusion be arrived at.



View of the New Comet on January 29 (W. E. Rolston).

Prof. Dreyer reports (the *Times*, January 27) that observations made with the 10-inch refractor at Armagh on January 21 and 24 showed a fan-shaped jet on the side of the comet's head turned towards the sun. The matter issuing from the fan, and turning back on both sides to form the tail, was distinctly broader south-east of the nucleus than west of it.

Observations at the London observatories have been greatly interfered with by the smoke and haze at the horizon and by clouds. On January 25 the comet was "glimpsed" at Greenwich, and its position was determined the following day.

Successful photographs were obtained on January 28 and 30, and show, in addition to the two main streamers, a much fainter tail which makes a considerable angle with the main tail and gives the comet an appearance similar to that of the great southern comet of 1901.

At the Solar Physics Observatory, South Kensington, Dr. Lockyer saw the comet on Friday evening, January 28, just before 6 p.m., but there was not time to determine its position exactly before clouds again interfered.

Visual observations made at South Harrow on January 29 by Mr. Rolston showed the comet as a magnificent object with a curved tail extending nearly to ξ Pegasi, that is to say, about 20°. The rough sketch reproduced herewith shows the relative position and extension at 6.20 p.m.

Mr. F. C. Constable, of Wick Court, near Bristol, directs attention to a projection extending from the base of the double tail on the side nearer to Venus. In a rough sketch, made at 6.20 p.m. on January 30, he shows this projection as a short, bushy tail inclined some 20° to the axis of the main tail.

Father Cortie states (*Times*, January 29) that on January 26 the comet was seen at Stonyhurst from 5.40 to 7 p.m.; the nucleus was as bright as a first-magnitude star, and the tail could be traced to a distance of 10°. Observed with the 15-inch refractor, the region near the head showed a deep, wide, dark segment running down the tail, recalling to mind the drawings of Donati's comet made by Bond and Pape.

Two photographs taken with the 6-inch Dallmeyer portrait lens show a cloud of particles to the east of the main tail, bounded by a ray making an angle of about 30° with the main axis; presumably this is the projection also observed by Mr. Constable.

On the Stonyhurst photographs the tail can be traced to a distance of 4°, and has the appearance of being a hollow cone, the two bright wings of the tail being the sides of the cone in projection. A glimpse at the spectrum with a small McClean direct-vision spectroscope showed that it was continuous, with a decided brightening in the green, presumably due to a hydrocarbon band; the colour of the comet was decidedly yellowish.

A number of observations are recorded in No. 4385 of the *Astronomische Nachrichten*. M. Gonnessiat, Algiers, suggests that between January 19 and 20 the brightness decreased two magnitudes, and other observers record the rapid decrease. On January 23 Prof. Kobold found the nucleus to be of the third magnitude and the length of the tail to be 15°. From the *Times* (January 31) we learn that, presumably on January 28 or 29, Prof. Nijland, Utrecht, saw a tail 30° long, strongly convex towards the west, and reaching a few degrees to the left from α Pegasi. On Saturday Prof. Turner recorded a faint tail 15° or 20° long. Mdlle. de Robeck, of Inistioge, Kilkenny, reports that the comet was well seen at that place on the four nights succeeding January 22, and provided a fine spectacle just after sunset; she likens it to an egret's plume, which stood out with remarkable clearness against the golden-red background of the sunset sky.

A *Times* correspondent, writing from Malvern, directs attention to a remarkable glare which he saw, on January 30, extending from the concave, or southern, side of the tail well up into the square of Pegasus. This lateral extension through an angle of nearly 80° set with the stars.

THE MESSINA EARTHQUAKE AND THE ACCOMPANYING SEA-WAVES.

A SUMMARY of Dr. M. Baratta's preliminary report on the Messina earthquake has been given recently in NATURE (December 16, 1909, p. 203). Since then two other memoirs have appeared, one a preliminary report by Prof. Omori (Bulletin of the Imperial Earthquake Investigation Committee, vol. iii., No. 2, Tokyo), and the other a detailed account by Prof. G. Platania of the accompanying sea-waves (*Boll. della Soc. Sism. Ital.*, vol. xiii.).