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1. *Introduction and Summary.*—Suction slots on wings are of two kinds: those into which only the boundary layer is sucked away, and those which also receive a considerable portion of the free air outside the boundary layer.

The purpose of the former is to overcome a discontinuous drop in the velocity at the surface of the aerofoil and so obviate the need for extended regions of adverse pressure gradient where transition or separation may occur unpleasantly soon. This requires special design of the aerofoil (to have a discontinuity in velocity at some point or points) and conversely an aerofoil so designed essentially requires to have such slots at these points and nowhere else. Hitherto their position has generally been well to the rear of the aerofoil and the aim has been to make the velocity non-decreasing as far as the slots on both surfaces for as wide a range of C_L as possible.

The purpose of the second kind of suction slot is to eliminate large adverse pressure gradients occurring immediately behind it, by the action of sink effect. Such a slot could be placed anywhere on any wing, and would always have this effect. Naturally the most satisfactory position is near the summit of any large suction peak. These occur most frequently and with the greatest detriment near the leading edge at high lifts. Hence a slot suitably placed in the forward region may be expected to increase the maximum lift of some wings.

This report will study the use of slots near the leading edge; both when they act solely by sink effect, and when the ideas of the two foregoing paragraphs are combined and the same slots used for both purposes (obviously the most economical method). The following discussion is based on the theory of R. & M. 2112[1], of which at least § 1 should be read and the rest lightly skimmed before the reader goes any further.

2. *Slots as Sinks.*—A sink of strength $2\pi m$ on the boundary of the unit circle (at the point $e^{i\beta}$) possesses the complex potential

$$w(\zeta) = -m\{2\log(\zeta - e^{i\beta}) - \log\zeta\}\,. \qquad (1)$$

That this corresponds physically to a slot is seen from the fact that the flux through a small semi-circle in the fluid with $e^{i\beta}$ as centre is $2\pi m$, the change in the imaginary part of w as the semi-circle is traversed.

Combining it with the potential (1) of R. & M. 2112[1], we obtain

$$\frac{dw}{d\zeta} = e^{-i\alpha} - \frac{e^{i\alpha}}{\zeta^2} + \frac{i\varkappa}{\zeta} - m\left(\frac{2}{\zeta - e^{i\beta}} - \frac{1}{\zeta}\right). \qquad (2)$$

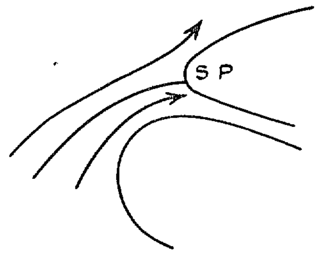
When $\zeta = e^{i\theta}$, this becomes

$$4ie^{-i\theta}\cos(\tfrac{1}{2}\theta - \alpha)\sin\tfrac{1}{2}\theta + mie^{-i\theta}\cot\tfrac{1}{2}(\theta - \beta)\,. \qquad (3)$$

But $|dz/d\zeta| = (2/q_0)\sin\theta$, by (4) of R. & M. 2112[1]. Hence the velocity in the aerofoil plane is

$$\left|\frac{dw}{dz}\right| = q_0\left(\frac{\cos(\tfrac{1}{2}\theta - \alpha)}{\cos\tfrac{1}{2}\theta} + \tfrac{1}{2}m\operatorname{cosec}\theta\cot\tfrac{1}{2}(\theta - \beta)\right). \qquad (4)$$

The parts due to incidence and sink effect are independent of one another.



As $\theta \to \beta$ the sink effect portion tends to infinity, and very close to β on one side or other (the $\theta < \beta$ side if $0 \leqslant \beta \leqslant \pi$ and $0 \leqslant \alpha$ for example) there is a stagnation point. This corresponds with the facts for a slot of finite width, as is illustrated in the adjoining sketch.

Expression (4) should give an accurate picture of the state of affairs past the stagnation point.

In all applications in this report $\beta = \pi$ has been taken, so that (4) becomes

$$q = q_0 \left(\frac{\cos(\frac{1}{2}\theta - \alpha)}{\cos \frac{1}{2}\theta} - \frac{1}{4} m \sec^2 \tfrac{1}{2}\theta \right) . \qquad (5)$$

A simple illustration is the following. In Appendix VI of R. & M. 2112[1] a low-drag aerofoil was designed with an exceptionally high " C_L range " (0·266) for its thickness (13 per cent.). For this good quality however it suffers with regard to maximum lift, as Fig. 1 shows, where the velocity over the forward portion is plotted at incidence 10 deg., $C_L = 1{\cdot}18$. Over this portion

$$q_0 = 1{\cdot}2034 \frac{\cos \frac{1}{2}\theta}{\cos(\frac{1}{2}\theta - 2{\cdot}29^\circ)} .$$

Hence

$$q_{10^\circ} = 1{\cdot}2034 \frac{\cos(\frac{1}{2}\theta - 10^\circ)}{\cos(\frac{1}{2}\theta - 2{\cdot}29^\circ)} ,$$

which is the expression plotted and possesses a very steep decline from the leading edge, which is the point of maximum suction at this incidence. But, if we insert a suction slot at the leading edge and utilise the sink effect it produces, the velocity at incidence 10 deg. becomes

$$1{\cdot}2034 \left\{ \frac{\cos(\frac{1}{2}\theta - 10^\circ)}{\cos(\frac{1}{2}\theta - 2{\cdot}29^\circ)} - \tfrac{1}{4} m \sec \tfrac{1}{2}\theta \sec(\tfrac{1}{2}\theta - 2{\cdot}29^\circ) \right\} . \qquad (6)$$

This is plotted for $m = 0{\cdot}04$ as a dotted line in Fig. 1, and the maximum adverse gradient is seen to be very moderate, so that with this amount of suction the maximum C_L of the aerofoil must be $\geqslant 1{\cdot}18$. The strength of the sink is $2\pi \,.\, 0{\cdot}04$. But the chord of the aerofoil is 3·689, so that reduced with respect to this it is $2\pi \,.\, 0{\cdot}04/3{\cdot}689 = 0{\cdot}0681$. It would be produced by sucking 10 times the velocity at infinity through a slot of width 0·00681 chords. This would be possible (without choking) only at very low speeds : but the highest lifts are often only required at low speeds.

Another application is to wings for flight faster than sound. These have to be designed (*see* R. & M. 1929[2]) very thin indeed and with very sharp leading edges. A good shape is the symmetrical biconvex, of thickness ratio 4 to 7 per cent. But this is not at all a favourable shape at low speeds : it has a low maximum lift and, even at moderate lifts, a high drag due to breakaway at the front on the upper surface.

An aerofoil of approximately this shape is given by the equation

$$\chi = \begin{Bmatrix} -\gamma \cos\theta \ (0 < \theta < \pi) \\ +\gamma \cos\theta \ (-\pi < \theta < 0) \end{Bmatrix} . \qquad (7)$$

This gives $\log q_0$, the conjugate of χ, as

$$-\frac{2\gamma}{\pi} \cos\theta \log \left| \cot \tfrac{1}{2}\theta \right| .$$

The method of R. & M. 2112[1] can be carried through to give the aerofoil shape. For $\gamma = 6$ deg. the ordinates and abscissae are given in Table 1, below, with the velocity distributions over the forward part at incidences 0, 5 and 10 deg. ($C_L = 0, 0 \cdot 57$ and $1 \cdot 13$). The sink effect for $2\pi m = 0 \cdot 1$ is also shown, and by inspection we find that this, removed from $q_{5°}$, gives a conservative pressure gradient ; but that three times as much must be subtracted from $q_{10°}$ to give the same effect.

TABLE 1

θ (deg.)	X	Y	q_0	$q_{5°}$	$q_{10°}$	$\frac{0 \cdot 1}{8\pi} q_0 \sec^2 \frac{1}{2}\theta$
180	0	0	0	∞	∞	∞
170	0·0088	0·0009	0·911	1·815	2·705	0·477
160	0·0335	0·0034	0·959	1·429	1·889	0·127
150	0·0724	0·0071	0·991	1·310	1·618	0·059
140	0·1238	0·0115	1·015	1·255	1·484	0·035
130	0·1858	0·0161	1·035	1·224	1·405	0·023
120	0·2565	0·0204	1·048	1·203	1·348	0·017
110	0·3340	0·0238	1·061	1·189	1·307	0·013
100	0·4159	0·0260	1·067	1·174	1·272	0·010
90	0·5000	0·0268	1·069	1·158	1·239	0·008

The shape and velocity distributions are plotted in Fig. 2. Reduced with respect to the chord the strength is $0 \cdot 1/3 \cdot 864 = 0 \cdot 02588$, which corresponds to a flow of 10 times the velocity at infinity through a slot of width $0 \cdot 0026$ chords. The higher value (three times this) is therefore practically unattainable. But we can expect the maximum lift to be at least higher by use of suction, and, more important, the range of C_L without stalling drag will be very much greater.

But the most important application of leading-edge suction will be to cambered aerofoils with a discontinuity in velocity at the slot independent of the quantity sucked away. These are considered in the next section.

3. *Wings with Discontinuous Velocity at the Leading Edge.*—In R. & M. 2112[1], Appendix VIII, a symmetrical aerofoil with two leading-edge slots (for boundary-layer suction) was designed, and the shape and velocity distribution shown in Fig. 7. But it is undesirable to use two slots where one might serve and it is wasteful to construct an aerofoil which, in addition to a large maximum lift, possesses a minimum lift of equal magnitude and opposite sign which could never be used. Both these arguments point to the need for making aerofoils of this type cambered.

It also seems clear that the greatest advantage will be obtained if the discontinuity at the slot is as large as possible ; in fact if for positive incidence the lower surface velocity at the slot is infinite (in the mathematics at any rate) and the upper surface velocity quite low. Finally we want, over as large a range of C_L as possible, no large adverse velocity gradients. These considerations led the following distribution to be chosen :—

$$\log q_0 = \left\{ \begin{array}{ll} \log \cos \frac{1}{2}\theta & (0 < \theta < \pi) \\ - \log \cos (\frac{1}{2}\theta - \alpha) & (2\alpha < \theta < \pi) \\ + k + a\,(1 - \cos \theta) & (0 < \theta < \pi) \\ + k + b\,(1 - \cos \theta) & (-\pi < \theta < 0) \end{array} \right\} \quad \ldots \quad (8)$$

At incidence α on the upper surface the velocity sidles down at a fairly even pace along the whole chord, while at zero incidence the same is true (at a slower pace) for the lower surface. For all positive incidences the velocity rises from its stagnation point on the lower surface to an infinite value just before the slot.

To obtain the shape we need the conjugate of (8) and in particular the integral

$$f(\theta, \alpha) = \frac{1}{2\pi}\int_0^{\pi} \log\cos\tfrac{1}{2}t \,.\, \cot\tfrac{1}{2}(\theta - t)\,.\,dt$$
$$- \frac{1}{2\pi}\int_{2\alpha}^{\pi} \log\cos(\tfrac{1}{2}t - \alpha)\,.\,\cot\tfrac{1}{2}(\theta - t)\,.\,dt\,. \quad \ldots \quad \ldots \quad (9)$$

Now it can be shown that

$$\frac{\partial f}{\partial \theta} = \frac{1}{2\pi}\Big[\alpha - \tan\tfrac{1}{2}\theta\,(\log\tan\tfrac{1}{2}\theta + \log\sin\alpha)$$
$$- \tan(\tfrac{1}{2}\theta - \alpha)\Big\{\log\cos\tfrac{1}{2}\theta - \log\sin\alpha - \log\sin(\tfrac{1}{2}\theta - \alpha)\Big\}\Big]. \quad \ldots \quad (10)$$

Hence, if we assume $f(0, \alpha) = 0$, as we may, since an arbitrary constant present in χ does not matter, we can integrate (10) numerically to obtain $f(\theta, \alpha)$. The result for $\alpha = 10$, 15 and 20 deg. is given in Table 2, below.

TABLE 2

θ (deg.)	$\frac{180}{\pi} f(\theta, 10°)$ (deg.)	$\frac{180}{\pi} f(\theta, 15°)$ (deg.)	$\frac{180}{\pi} f(\theta, 20°)$ (deg.)
180	$-\infty$	$-\infty$	$-\infty$
170	14·10	10·21	6·27
160	16·62	16·92	16·83
150	15·57	17·59	18·87
140	14·34	17·02	18·99
130	13·12	16·09	18·44
120	12·00	15·08	17·62
110	10·96	14·05	16·66
100	10·01	13·03	15·65
90	9·10	12·02	14·58
80	8·24	11·02	13·48
70	7·40	9·99	12·31
60	6·56	8·94	11·07
50	5·71	7·83	9·70
40	4·83	6·64	8·13
30	3·87	5·25	6·19
20	2·76	3·54	4·09
10	1·38	1·71	1·96
0	0	0	0
− 10	− 1·18	− 1·41	− 1·63
− 20	− 2·08	− 2·64	− 3·06
− 30	− 2·99	− 3·79	− 4·40
− 40	− 3·86	− 4·88	− 5·70
− 50	− 4·73	− 5·92	− 6·99
− 60	− 5·61	− 7·09	− 8·30
− 70	− 6·53	− 8·22	− 9·67
− 80	− 7·52	− 9·51	− 11·11
− 90	− 8·60	− 10·83	− 12·70
− 100	− 9·81	− 12·39	− 14·46
− 110	− 11·21	− 14·11	− 16·50
− 120	− 12·89	− 16·25	− 18·92
− 130	− 15·00	− 18·83	− 21·94
− 140	− 17·80	− 22·34	− 25·92
− 150	− 21·87	− 27·30	− 31·62
− 160	− 28·67	− 35·59	− 40·98
− 170	− 44·47	− 53·91	− 62·11
− 180	$-\infty$	$-\infty$	$-\infty$

The χ corresponding to (8) is then

$$f(\theta, \alpha) + \frac{a - b}{\pi} (1 - \cos \theta) \log \tan \tfrac{1}{2}\theta - \tfrac{1}{2}(a + b) \sin \theta \, . \quad .. \quad .. \quad (11)$$

The " conditions (7) " of R. & M. 2112[1] are

$$\left.\begin{aligned} \tfrac{1}{2}\pi - \sin 2\alpha \log \sin \alpha - (\tfrac{1}{2}\pi - \alpha) \cos 2\alpha - \tfrac{1}{2} \sin 2\alpha - \tfrac{1}{2}\pi a - \tfrac{1}{2}\pi b = 0 \\ - \sin^2 \alpha \, (1 + 2 \log \sin \alpha) - (\tfrac{1}{2}\pi - \alpha) \sin 2\alpha + 2a - 2b = 0 \\ \int_0^{2\alpha} \log \sin \tfrac{1}{2}\theta - d\theta + 2k\pi + a\pi + b\pi = 0 \end{aligned}\right\} . \quad .. \quad (12)$$

For $\alpha = 10$ deg. these give $a = 0{\cdot}3190$, $b = 0{\cdot}1180$, $k = -\,0{\cdot}0659$. In Table 3

$$\tfrac{1}{2}\, e^k \frac{dx}{d\theta} = e^k \, q_0^{-1} \sin \theta \cos \chi$$

and

$$\tfrac{1}{2}\, e^k \frac{dy}{d\theta} = e^k \, q_0^{-1} \sin \theta \sin \chi$$

are tabulated. Both become zero at $\theta = -\pi$, since q_0 is finite there ; but at $\theta = +\pi$ they are indeterminate, since $\sin \theta / q_0$ tends to a finite limit and χ to infinity. We integrate starting from the trailing edge, and go all the way to the leading edge on the lower surface, but stop short (owing to the indeterminacy) on the upper surface at $\theta = 170$ deg. The value at 180 deg. is of course that at $-$ 180 deg. The leading edge being (x_1, y_1), we reduce, translate and rotate by the formulae

$$X = 1 - \frac{xx_1 + yy_1}{x_1^2 + y_1^2} \, , \qquad Y = \frac{yx_1 - yx_1}{x_1^2 + y_1^2} \, , \quad .. \quad .. \quad .. \quad .. \quad (13)$$

to make the chord the line joining $X = 0$, $Y = 0$ to $X = 1$, $Y = 0$. The velocity-distributions at incidence 0, 5, 10 and 15 deg. are then calculated. The true chord is found to be $3{\cdot}792$, so these correspond to C_L's of 0, $0{\cdot}578$, $1{\cdot}151$ and $1{\cdot}715$.

To obtain the sink effect due to sucking away four times the velocity at infinity through a slot of width $0{\cdot}004$ chords, we must have $2\pi m = 0{\cdot}016 \, . \, 3{\cdot}792$, so that $\tfrac{1}{4}m = 0{\cdot}002414$. The expression

$$0{\cdot}002414 \; q_0 \sec^2 \tfrac{1}{2}\theta$$

is shown in the last column.

In Fig. 3 the shape and velocity-distributions are shown, with the sink effect put in (for $C_L = 1{\cdot}715$ only) as a dotted line, and a second dotted line indicating sink effect due to twice as much suction. The results are encouraging.

TABLE 3

θ (deg.)	$\frac{1}{2}\,e^{\kappa}\,\frac{dx}{d\theta}$	$\frac{1}{2}\,e^{\kappa}\,\frac{dy}{d\theta}$	$\frac{27}{\pi}\,e^{\kappa}x$	$\frac{27}{\pi}\,e^{\kappa}y$	X	Y	q_0	$q_{5°}$	$q_{10°}$	$q_{15°}$	$0\cdot002414\ q_o \sec^2 \frac{1}{2}\theta$
180	—	—	30·507	−0·791	0	0	0	0·891	1·772	2·641	∞
170	0·2379	0·1354	29·897	−0·582	0·0202	0·0063	0·594	1·183	1·763	2·330	0·188
160	0·3297	0·1515	29·049	−0·142	0·0483	0·0200	0·882	1·315	1·738	2·148	0·070
150	0·4274	0·1415	27·913	+0·301	0·0859	0·0336	1·039	1·374	1·698	2·008	0·038
140	0·5216	0·1189	26·489	0·694	0·1329	0·0452	1·125	1·390	1·644	1·887	0·024
130	0·6096	0·0871	24·789	1·005	0·1888	0·0540	1·165	1·378	1·581	1·772	0·017
120	0·6880	0·0503	22·841	1·212	0·2528	0·0591	1·175	1·348	1·511	1·662	0·012
110	0·7549	+0·0125	20·673	1·306	0·3239	0·0603	1·165	1·306	1·436	1·556	0·008
100	0·8069	−0·0221	18·326	1·290	0·4008	0·0578	1·142	1·257	1·361	1·456	0·005
90	0·8405	−0·0502	15·850	1·180	0·4818	0·0521	1·112	1·204	1·288	1·361	—
80	0·8527	−0·0689	13·304	0·998	0·5650	0·0440	1·079	1·154	1·220	1·277	—
70	0·8393	−0·0768	10·759	0·777	0·6482	0·0346	1·044	1·103	1·155	1·197	—
60	0·7977	−0·0738	8·297	0·548	0·7287	0·0250	1·012	1·059	1·099	1·129	—
50	0·7259	−0·0618	6·003	0·343	0·8037	0·0163	0·985	1·021	1·050	1·070	—
40	0·6235	−0·0446	3·972	0·183	0·8700	0·0094	0·963	0·990	1·009	1·021	—
30	0·4934	−0·0261	2·290	0·077	0·9251	0·0045	0·948	0·966	0·977	0·981	—
20	0·3405	−0·0113	1·034	0·022	0·9661	0·0016	0·939	0·950	0·954	0·950	—
10	0·1735	−0·0028	0·261	+0·003	0·9915	0·0003	0·937	0·941	0·937	0·927	—
0	0	0	0	0	1	0	0·936	0·932	0·922	0·904	—
−10	0·1733	−0·0027	0·261	−0·003	0·9915	0·0001	0·938	0·928	0·910	0·885	—
−20	0·3394	−0·0108	1·033	−0·022	0·9661	+0·0002	0·942	0·924	0·899	0·867	—
−30	0·4917	−0·0226	2·284	−0·071	0·9251	−0·0004	0·951	0·926	0·893	0·853	—
−40	0·6242	−0·0362	3·963	−0·159	0·8700	−0·0018	0·962	0·928	0·887	0·839	—
−50	0·7327	−0·0494	6·005	−0·288	0·8030	−0·0043	0·977	0·933	0·883	0·826	—
−60	0·8143	−0·0600	8·332	−0·453	0·7267	−0·0078	0·992	0·939	0·878	0·810	—
−70	0·8670	−0·0663	10·862	−0·643	0·6436	−0·0118	1·013	0·947	0·874	0·795	—
−80	0·8909	−0·0667	13·505	−0·845	0·5569	−0·0162	1·034	0·953	0·866	0·773	—
−90	0·8868	−0·0607	16·179	−1·037	0·4691	−0·0202	1·054	0·958	0·855	0·745	—
−100	0·8561	−0·0491	18·800	−1·203	0·3831	−0·0234	1·075	0·959	0·836	0·707	0·005
−110	0·8016	−0·0323	21·292	−1·327	0·3014	−0·0254	1·096	0·955	0·808	0·654	0·008
−120	0·7255	−0·0123	23·588	−1·394	0·2261	−0·0256	1·117	0·944	0·764	0·578	0·012
−130	0·6311	+0·0090	25·626	−1·399	0·1594	−0·0241	1·137	0·920	0·696	0·467	0·017
−140	0·5212	0·0292	27·359	−1·341	0·1027	−0·0207	1·154	0·873	0·586	0·294	0·025
−150	0·3986	0·0461	28·741	−1·227	0·0575	−0·0158	1·167	0·783	0·393	0	0·041
−160	0·2661	0·0568	29·740	−1·071	0·0249	−0·0098	1·176	0·591	0	0·591	0·093
−170	0·1250	0·0571	30·329	−0·897	0·0058	−0·0036	1·183	0	1·183	2·357	0·376
−180	0	0	30·507	−0·791	0	0	1·185	∞	∞	∞	∞

Innumerable variations on the velocity-distribution (8) can be made. In Fig. 4 the result of modifying the lower surface for low drag is shown. We take

$$\log q_0 = \left\{ \begin{array}{ll} \log \cos \frac{1}{2}\theta & (0 \leqslant \theta \leqslant \pi) \\ -\log \cos (\frac{1}{2}\theta - \alpha) & (2\alpha \leqslant \theta \leqslant \pi) \\ +\, a - b \cos \theta + \varkappa & (0 \leqslant \theta \leqslant \pi) \\ +\, \varkappa & (\pi \leqslant \theta \leqslant 2\pi - \beta) \\ +\, a - b + \varkappa & (-\beta \leqslant \theta \leqslant 0) \end{array} \right\} \quad \ldots \quad (14)$$

This has a slot at $-\beta$, on the lower surface, where the boundary layer is sucked away, as well as the fundamental leading-edge slot. Choosing $\alpha = 20$ deg., $\beta = 40$ deg., we obtain, by methods exactly similar to those used before, an aerofoil 13 per cent. thick, whose properties are shown in Fig. 4.

Again, in Fig. 5 is shown the result of a more determined effort to combine high maximum lift, low drag and relatively low thickness. By taking

$$\log q_0 = \left\{ \begin{array}{ll} \log \cos \tfrac{1}{2}\theta & (0 \leqslant \theta \leqslant \pi) \\ -\log \cos (\tfrac{1}{2}\theta - \alpha) & (2\alpha \leqslant \theta \leqslant \pi) \\ + k + a - \tfrac{1}{4} \cos \Theta & (\tfrac{1}{2}\pi \leqslant \theta \leqslant \pi) \\ + k + a\,(1 - \cos \theta) & (0 \leqslant \theta \leqslant \tfrac{1}{2}\pi) \\ + k + b & (\pi \leqslant \theta \leqslant \tfrac{3}{2}\pi) \\ + k + b\,(1 - \cos \theta) & (\tfrac{3}{2}\pi \leqslant \theta \leqslant 2\pi) \end{array} \right\} ,$$

the adverse velocity gradient is kept down over the forward part of the aerofoil, and at low C_L's there is a favourable one up to $0 \cdot 5$ chord on the lower surface and $0 \cdot 35$ chord on the upper surface. The aerofoil is found to be only $14 \cdot 2$ per cent. thick: yet the velocity-distribution with sink effect at $C_L = 2 \cdot 95$ augurs a maximum lift not far from this.

Mathematical Note.—The spiral at the leading edge in the aerofoils of this section is not the usual logarithmic (or " equiangular ") spiral $\chi = A \log s$, but one of the form $\chi = A (\log s)^2$. This is due to the infinite jump in $\log q_0$ there.

Conclusions.—Though nothing can be laid down for certain without experimental evidence, all the indications of theory are that leading-edge suction has a part to play in the development of high-speed aircraft. The aerofoil of Fig. 3 is to be tested in the National Physical Laboratory 4 ft. tunnel, and one similar to that of Fig. 2 in the 13 ft. × 9 ft. one, and this will greatly increase our information.

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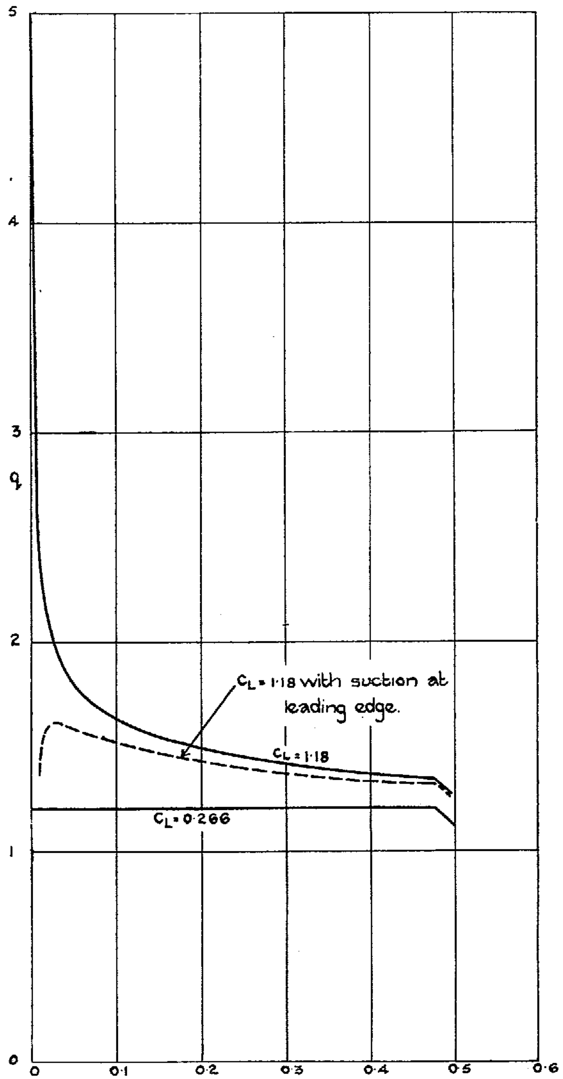

FIG. 1. The Aerofoil of R. & M. 2112[1],
FIG. 5. Velocities over Forward Portion.
Thickness 13 per cent.

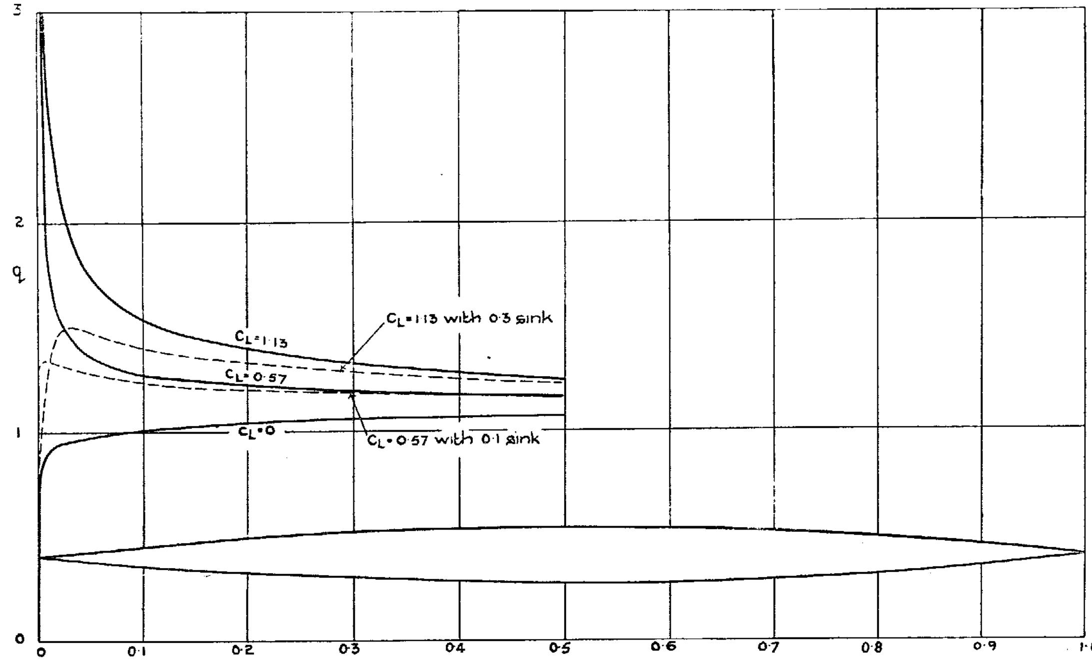

FIG. 2. Supersonic Aerofoil, Thickness 5·4 per cent.

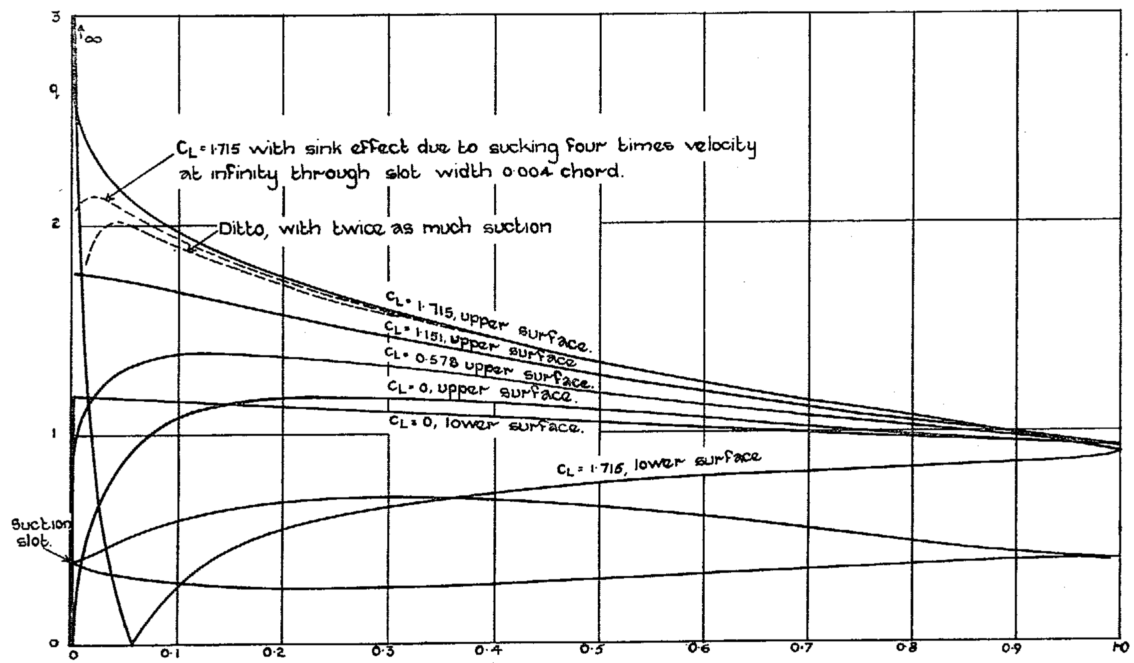

FIG. 3.—Thin Aerofoil with High Maximum Lift, Thickness 8·6 per cent.

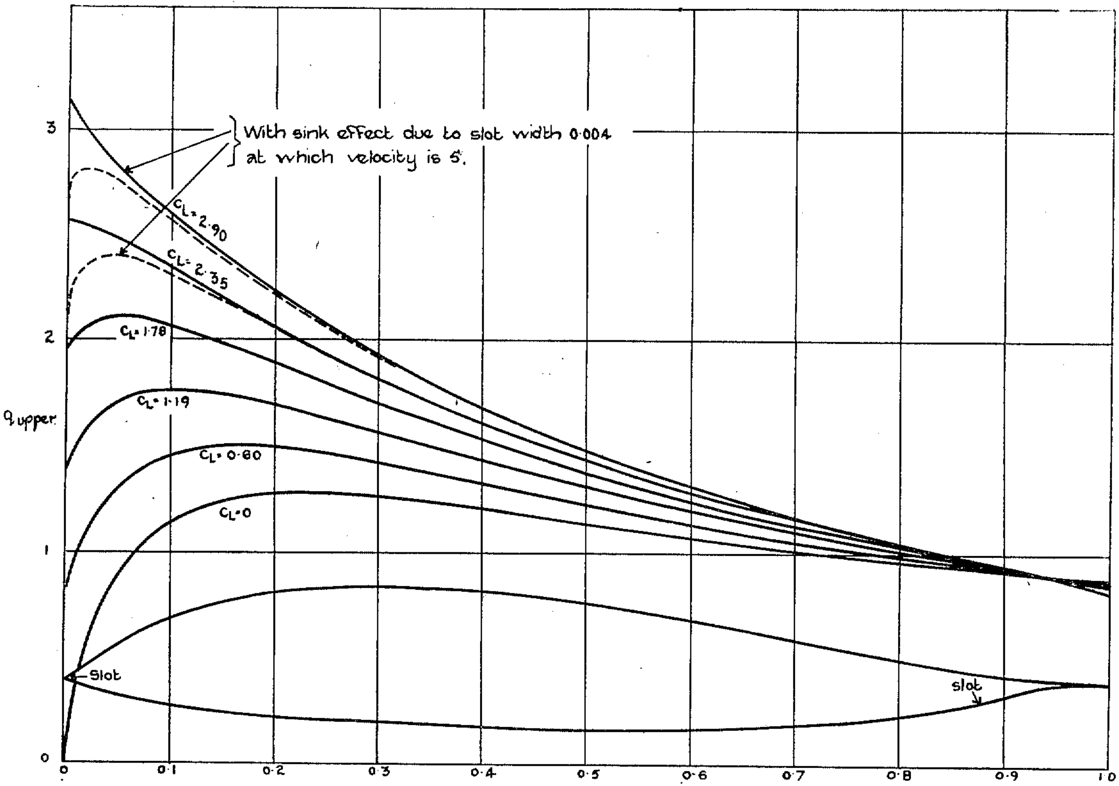

FIG. 4. Thickness 13 per cent. Upper Surface Velocities Shown; Lower Surface Flat up to Slot at $C_L = 0$.

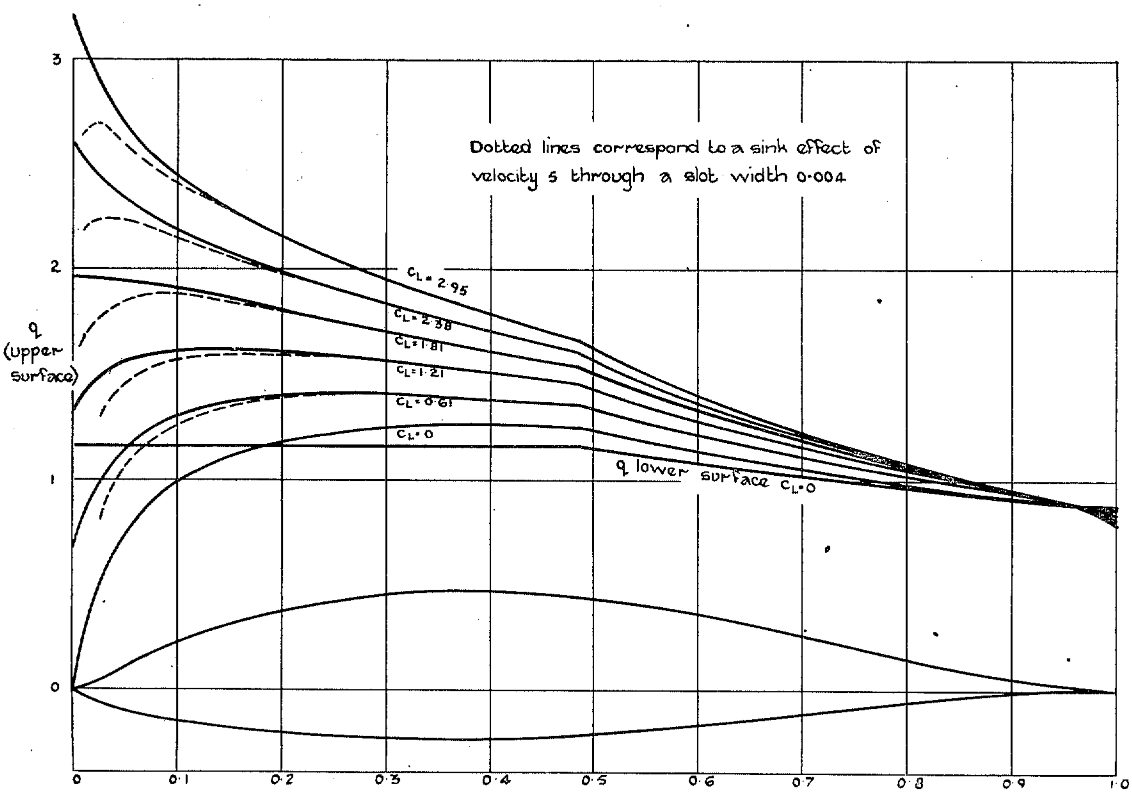

FIG. 5. Thickness 14·2 per cent.

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