It may not be amiss to mention here that the equations given by the Calculus of Variations may be either maxima or minima, or only "stationary" curves, and which of these they are can be only strictly investigated by the "excess function." In the present cases they are too complicated for this to be practicable. To satisfy myself that they here give true minima I calculated accurately the vertical fall in a short portion of a curve, and found it was less for the same increase of velocity than in a neighbouring curve. I

FIG. 7
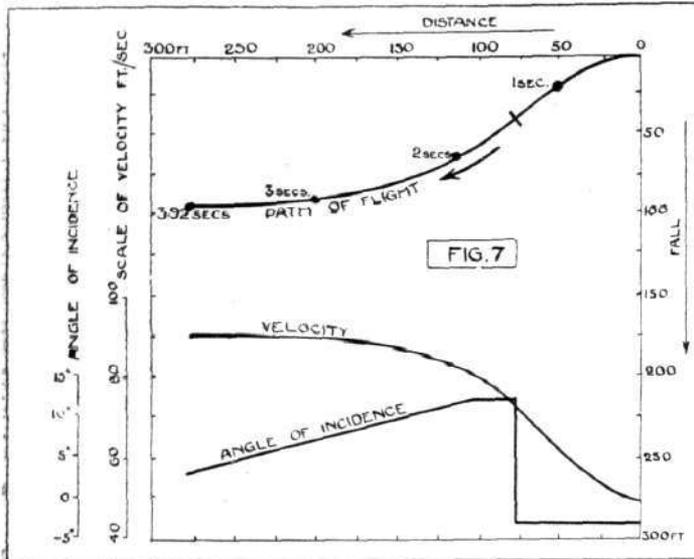
have therefore no doubt that it gives the true minimum. In the former case without the engine the result itself shows that it is a minimum.

It remained therefore to try and find a path, obeying the equations as far as possible without dipping below the final point. This has been approximately accomplished in the path shown in Fig. 7, which also shows the angle of incidence and the velocity at each point. On starting the dive, the angle of incidence (whatever

its initial value) is rapidly reduced to $-2°$ $30'$, so that I have assumed it to start at this value as in the case of Fig. 4. This is continued to the point marked by the cross line about $1·5$ secs. from the start. This portion of the curve obeys the equations exactly, but now to avoid the dipping curve of Fig. 6, I have performed the flattening out by another curve *which obeys the law for least fall but which is not the curve which belongs mathematically to the first portion.* I have selected the two curves as approximately giving the desired result. The first curve gives the best method of proceeding from the start to the point of junction, and the second curve the best method from that point to the end, but it does not follow that the total result is the very best, as by selecting a different point of junction, two others curves might have been found to give a slightly better result. I fancy, however, the curves chosen are very nearly the best.

In practice the change in the angle of incidence from $-2°$ $30'$ to $12\frac{1}{2}°$ could not take place instantaneously as has been assumed here, but must take a considerable fraction of a second. This will to a small extent affect the accuracy of the result.

The total vertical fall proves to be about 93 ft. The chief point of interest, however, is that during the flattening out, *the method of altering the angle of incidence is precisely the opposite to that when the engine is not running.* When the engine is not running, it is best to gradually increase the angle of incidence. When the engine is running the reverse procedure is indicated. As soon as the preliminary dive is accomplished, the elevator should be put up to give the maximum angle of incidence ($12\frac{1}{2}°$) at once, and then as the flattening proceeds should be eased off much more rapidly than when the engine was stopped. Examination of the equations seems to show that this does not depend on the precise formula, adopted for the thrust, but that it holds, roughly speaking, as long as the thrust is substantially greater than the constant part of the head resistance (Hv^2)

In this case the maximum wing forces occur shortly after the elevator is put hard up, and amount to about 326 lbs. drift wing force (which occurs about $\frac{1}{4}$ sec. after the elevator is put up), and about 3,053 lbs. lift wing force, which occurs about $\frac{1}{2}$ sec. later.

While the foregoing calculations strictly apply only to the aeroplane BE 2, and their tedious character renders it impracticable to perform them for other types, there can be little doubt that they may be taken as fairly typical of most modern aeroplanes, and I venture to hope that the results obtained may prove of some assistance to those engaged as pilots.

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BRITISH NOTES OF THE WEEK.

Flying over London.

BEARING date of September 22nd, 1913, the following notice was issued from the Home Office on Monday :—

AERIAL NAVIGATION ACT, 1911.

In pursuance of the power conferred on me by the Aerial Navigation Act, 1911, I hereby, for the purpose of protecting the public from danger, make the following order :—

I prohibit the navigation of aeroplanes over so much of the County of London as lies within a circle, the centre of which is Charing Cross and the circumference is described by a radius of four miles in length.

This prohibition shall not apply to aeroplanes exempted, for special reasons, by my Order.

(Signed) R. McKENNA,
One of His Majesty's Principal Secretaries of State.

Eight-Passenger World's Record at Hendon.

THE new Grahame-White five-seated char-à-banc at Hendon has already had its accommodation taxed to the limit, and on Monday last Louis Noel took it up with seven passengers beside himself, the combined weight of the live load being 81 stone. He was officially timed by Mr. Harold Perrin, secretary of the Royal Aero Club, to remain aloft for 17 mins. 25 secs., nearly three times as long as the previous record, 6 mins. for such a load. On the previous Thursday, the machine was taken up by Louis Noel with two mechanics as passengers, and in the course of a quarter of an hour's trip, the two mechanics walked out to the end of the planes, without affecting the stability of the machine at all.

The "Hermes" Coming South.

AFTER making a tour of inspection of the Naval air stations in the North, the parent ship of the Naval Wing of the R.F.C., commenced her journey south at the beginning of this week. On Monday evening she arrived off Blyth, where it is proposed to establish a station, in order to inspect the suggested sites and to make some test flights. The "Hermes" is due back at Sheerness on October

9th, and will call on her way down at Scarborough, Grimsby, Great Yarmouth, and Harwich.

Naval Station at Dundee.

TOWARDS the end of last week while the "Hermes" was at Dundee to enable the suggested locations for a naval station to be inspected, some very good flying was done by Lieut. Gaskell on one of the machines carried on board. On the 18th inst. a large number of members and officials at the Dundee Harbour Trust inspected the "Hermes," and took great interest in the repair work which was being done to one of the naval biplanes on board.

A Mishap at the Manœuvres.

ONE of the B.E. machines taking part in the manœuvres met with a serious mishap on Monday afternoon. Lieut. Chinery was bringing it back after a reconnaissance with Lieut. Playfair as passenger, and apparently, while making a spiral *vol plané* the machine side-slipped to the ground from a height of something over 100 ft. Assistance was quickly at hand, and the pilot was found standing just by the machine, but as he walked towards the approaching officers he fell and was picked up unconscious. He had sustained a broken arm and dislocated shoulder. Lieut. Playfair was still under the wrecked machine and was seriously injured. He was taken as soon as possible to the hospital at Rugby.

Southampton to Dover in a Sopwith.

OUT of the fog which obscured the south coast from Brighton to Dover on Saturday morning, Lieut. Spencer Grey arrived at Dover, having flown over from Southampton on a 50 h.p. Sopwith biplane in 75 minutes.

Col. Seely Flies Again.

QUITE a little excitement was caused at Hurley, about two miles from Marlow, on the afternoon of the 18th inst., by the arrival of three army aeroplanes, one of them hailing from Montrose. Col. Seely also arrived in a motor car and went for a trip on one of the machines—a Farman—piloted by Lieut. Stockford.