The British Gliding Association Journal

No. 1

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The
British Gliding Association Journal

No. 1 MARCH, 1930 Price 2/6

THE SECRETARY'S NOTES

As all members know, Air Vice-Marshal Sir Sefton Brancker, K.C.B., A.F.C., honoured the British Gliding Association by becoming its President, thus insuring its recognition as worthy of a place in aeronautics of the British Empire.

Although the British Gliding Association does not become an established body until the 27th March, it has been found possible to publish this first number of the journal.

The reprint of the lecture by Dr. Georgii before the Royal Aeronautical Society, which forms the greater part of this number, is full of just the information for which I am continually being asked by members and prospective members.

After the lecture, Mr. W. O. Manning, F.R.Ae.S., asked what load factors were fixed by the Rhön-Rossitten Geseilschaft for gliders and sail-planes. Replying, Dr. Georgii said that the load factor enforced by his society was 6 C.P.F., and that it was generally imposed as a sand loading test for privately built gliders.

For the less technicaliy-minded readers this means that the glider is supported in an inverted position and six times the weight of the glider and pilot (less the weight of the wings), is placed on the wings, frequently in the form of bags of sand. The glider must carry this weight without breaking, and when the load is removed there must be no signs that the planes have been loaded, no signs of bent or stretched parts.

This may seem a severe test, but it is regarded as the minimum to ensure safety.

In the record shown on page 19 it will be seen that a sail-plane flying in a cloud was carried downwards at a speed of 29½ feet per second (20 miles per hour vertically downwards), and immediately afterwards carried up at a speed of 36 feet per second (25 miles per hour upwards). This is sufficient indication that a glider must not be a flimsy construction.

On a power-driven aircraft this would be a " bad bump " (what the daily Press calls an air pocket).

It may be argued that the primary training glider does not soar high enough to get into these conditions, but Dr. Georgii said that the rough handling of these machines on the ground necessitated a similar load factor.

Mr. D. R. Pye, M.A., A.F.R.Ae.S., said that he welcomed the gliding movement because it enabled amateurs to experiment in aircraft. He mentioned the great progress in wireless telephony due to amateur experimenters and considered that aircraft would gain to a corresponding extent. The cost of experiments in power-driven aircraft is so great that only the government can afford to undertake them, but with gliders and sail-planes the cost is comparatively so low that many people can undertake experimental work.

It must not be thought that the load factors to be introduced by the British Gliding Association will hinder this work, it will have the contrary effect, because these regulations will only ensure that the gliders built by private experimenters will have adequate strength to obviate the wholely unnecessary

danger of a machine breaking in the air and the resulting loss of life. It will not impose any restrictions on aerodynamic design.

The Council of the British Gliding Association has received generous donations. The magnificent gift of £1,000 from the Rt. Hon. the Lord Wakefield of Hythe has assured that the Association will be able to proceed with definite work. Donations have been received from Mr. Henry Allen and Miss A. E. H. St. Leger Aldworth. Mr. Dagnall has presented the British Gliding Association with a German Zogling glider and two more gliders to be built to drawings in his works. He is also building a glider as a gift to the London Gliding Club. Mr. Dagnall's gifts will go a long way towards starting the gliding movement. The delay in delivery of German gliders seems to be at least six to eight weeks and the costs of freight and dues are high.

The thanks of the Association are also due to the Monospar Company and Mr. M. L. Bramson, A.C.G.I., M.R.Ae.S., for a free licence to use their valuable patents which will enable sail-planes to be made with lighter, stronger and more rigid wings.

Colonel Lamplugh, of the British Aviation Insurance Group Members of Lloyds, is preparing a scheme for third party insurance for gliders, and has very kindly given one year's free insurance policy to the Association for the first glider, pending the time that he can announce the insurance premiums.

Lord Wakefield of Hythe is giving the British Gliding Association a cup, to be competed for annually, as an inter-club trophy.. The rules and conditions will be announced after the Contest Committee has negotiated with the Royal Aero Club.

The Royal Aeronautical Society has given the greatest assistance to the Association in granting the use of its premises until such time as the Association could start its offices at 44a, Dover Street, W.1.

The Rhön-Rossitten Gesellschaft is subsidised by the German Government to promote gliding in Germany and to carry out aerodynamic research. With this subsidy the society is independent of membership or its one hundred affiliated clubs and six schools. The schools are separate profit-making organisations recognised by the Rhön-Rossitten Gesellschaft.

The British Gliding Association is dependent on its membership, donations, affiliated club fees (5 per cent. per annum on club subscription), and charges for technical work. Consequently it is important that members should make every effort to increase the membership of the Association and donations.

The British Gliding Association is giving assistance in the form of the loan of gliders or other apparatus to such clubs as are not able to make a start without such help, but at present the funds are not able to provide for as much assistance to the clubs as the Council would wish.

Co-operation is the essential factor in starting any organisation.

One of the chief points in which co-operation will prove of utmost use is in charting the air to provide safe and reliable routes for cross-country sail-planing. It is probable that flights of one hundred or more miles across country at an average speed of 25 m.p.h., measuring in a straight line, will be common within a couple of years.

The provisional Council of the Association is:—

President: Air Vice-Marshal Sir Sefton Brancker, K.C.B., A.F.C.

(b) (c) *Chairman*: D. E. Culver, Esq.
(c) J. R. Ashwell-Cooke, Esq., B.A.
(b) (c) The Viscount Carlow.
T. E. Lander, Esq.
(a) (d) C. H. Lowe-Wylde, Esq., A.R.Ae.S.
(a) (d) Captain C. H. Latimer Needham, M.Sc., F.R.Ae.S.
(d) R. G. Russell-Taylor, Esq.
(b) (c) W. E. Wroughton, Esq.
(b) (c) S. Whidborne, Esq.
R. F. Dagnall, Esq.

(a) Member of Technical Committee; (b) Finance Committee; (c) Executive Committee; (d) Contests Committee.

The Rules provide for twelve members of Council, and the present Council is standing for election. Nominations for Council members should be sent to the Hon. Secretary at once in order that ballot papers may be issued in time for the general meeting, of which seven days' notice must be given.

It will facilitate the business of the Inaugural Meeting if those members who have questions to ask will send them as soon as possible so that some of them may be dealt with in the Chairman's speech at the Inaugural Meeting.

Air Vice-Marshal Sir Sefton Brancker (if his official duties permit) will open the Inaugural Meeting with a short historical survey of gliding before the business of the meeting.

The meeting will be held on March 27th, 1930, at 6.30 p.m. in the Royal Society of Arts Hall, 18, John Street, Adelphi, Strand, W.C.2.

Ten affiliated clubs are in the process of formation or are making inquiries to ascertain if they will meet with sufficient support in their districts.

L. HOWARD-FLANDERS, A.F.R.Ae.S., M.I.Ae.E., A.M.I.Mech.E.,
Hon. Secretary.

TECHNICAL COMMITTEE NOTES

AIRWORTHINESS CERTIFICATES.—The British Gliding Association is taking a large share of the responsibility for the strength and airworthiness of British gliders, and it is the aim of the Association that gliding in this country shall be entirely free from structural failures in the air or accidents due to machines being flown when not in a fit airworthy condition.

To attain this the Association will do everything in its power to ensure that gliders are built to proper strength requirements, but at the same time it is hoped to keep gliding as free from restrictions as possible in order that the movement may progress rapidly and unhampered.

Certain essential regulations regarding the issue of certificates of airworthiness are being drawn up, to be submitted to the Air Ministry for approval, and it is hoped that builders of gliders will abide by these. It may remain possible for machines to be built and flown, within certain approved areas, without airworthiness certificates, but unless such machines are few and are operated without serious accidents then undoubtedly the Air Ministry will introduce regulations to prevent the recurrence of casualties.

LOAD FACTORS.—The strength called for should depend upon the conditions of loading that gliders may be subjected to and in this connection comparison is made with normal aeroplanes. Owing to the absence of an engine it is impossible for gliders to perform rapid manœuvres, but it must be remembered that, by diving from a fair height, considerable speed may be obtained sufficient to enable a glider to be looped or rolled, while spinning also could be done.

Such aerobatics may be rarely performed at first, but as much pleasure could obviously be derived from reasonable manœuvres it is quite certain that gliding aerobatics will soon take their place as part of the sport.

Apart from normal gliding and soaring, towed gliding may be done by towing the glider behind a power-driven aeroplane or motor car, but as these methods are attended with considerable danger and in many cases might set up stresses larger than the gliders had been designed to withstand, towed gliding is not encouraged by the Association and will not be recognised except under special circumstances.

Neglecting towed flight, it does not appear probable that greater loadings than about twice normal are likely to be experienced during the manœuvres mentioned and perhaps the worst case would occur in a quick pull-out from a nose dive, where considerable velocity had been attained by diving steeply from some height.

It would therefore seem that factors of about two-thirds of those generally

employed for the aerobatic category for normal aeroplanes would suffice for gliders. A further slight reduction could be made for gliding limited to straight flying, but as this would most likely apply only to school type gliders, where a little extra weight would be immaterial and the extra strength would be beneficial to withstand rough handling, it appears unnecessary to modify the aerobatic factors.

The final factors will be made known as soon as agreed and approved by the Air Ministry, and in the meantime designers will be fairly safe if they work to the above suggestions.

The Gliding Association is hoping to be empowered by the Air Ministry to issue certificates of airworthiness, and in the event of this it is anticipated that the charges will be considerably less than the standing Air Ministry charges.

The importance of first class workmanship cannot be over stressed, as poor material or inferior workmanship can be just as disastrous as an insufficient safety factor in the design, and in order to avoid this the Association is arranging for qualified inspectors to carry out inspections of gliders during construction. It may be mentioned that suitable material can generally be purchased from aircraft manufacturing companies.

Machines obtaining certificates of airworthiness will be known as " B.G.A. Approved Type Gliders " and will be allotted distinguishing letters, and it is hoped that in the interests of safety and for the satisfactory progress of the gliding movement all constructors and owners will apply for certificates.

It will be necessary for applicants for certificates to forward to the B.G.A., for each glider, a reasonable set of drawings showing the general arrangement and the lay-out of main planes and fuselage together with sections of spars, ribs, struts, longerons, etc., and the main dimensions of all fittings.

In conclusion it is recommended that those who are engaged in glider design should get in touch with the Association as early as possible, and any views or suggestions that might help with the framing of regulations or strength requirements would be greatly welcomed by the Committee.

GLIDING SITES.—Sites believed to be suitable for gliding and soaring will be inspected by the B.G.A. from time to time and will be approved if considered favourable.

C. H. LATIMER NEEDHAM,
Technical Advisory Committee.

CLUB REPORTS

Chairman: J. R. ASHWELL-COOKE.
Hon. Treasurer: S. O. BRADSHAW.
Hon. Secretary: L. HOWARD-FLANDERS.
Committee: Messrs. R. F. DAGNALL, T. JAMES, E. K. BLYTH, D. E. CULVER, E. J. STAMMERS, N. MELVILLE and W. GROVER.

Although the decision to form this club was only made during January, considerable progress has already been made. The British Gliding Association has generously loaned a Zoegling type glider to the club for six months, and Mr. R. F. Dagnall has presented a glider of a similar type to the club; this is being constructed in this country and is rapidly nearing completion. In view of the superiority of the communications on the south side of London, it was originally decided to commence operations there, but although several sites have been found, the Committee have been unable to come to a satisfactory agreement with the landowners concerned, and in view of the exceptionally favourable report by Dr. Georgii and Herr Stamer on the Dunstable Downs district as a suitable gliding ground, it has now been decided to commence operations there to avoid further delay. A full announcement as to the exact situation decided upon will be made shortly.

(Continued on page 25.)

TEN YEARS GLIDING AND SOARING IN GERMANY

BY

Professor Dr. WALTER GEORGII, of Darmstadt

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MR. CHAIRMAN, LADIES AND GENTLEMEN:—

Before passing to the subject of the paper may I ask your indulgence for my limited knowledge of English, which prevents my giving a free discourse, and constrains me to a set lecture. This I view with regret since this makes it difficult to impart to my words the lively and vivid feeling which a more formal picture of the importance and attractiveness of gliding flight may not give.

We are looking back on ten years of development and on an unbroken series of ten gliding competitions held at the Wasserkuppe in the Rhön, since 1920.

The organisation has not only maintained its range of activities all these years but has largely extended it, and in this way has given the best proof of its vitality and purpose.

In the first decade, now completed, successes have been achieved such as few foresaw, and the cause may be sought in the spirit of close co-operation with which the sportsman strove to avail himself of the flying possibilities opened up by the scientist.

This union of sport and science is in the true tradition of German gliding since its revival in 1920. At Frankfort in that year, Oskar Ursinus directed the "air-minded" members of the younger generation towards gliding as a substitute for power flight of which they were perforce deprived; but he had the progress of aeronautical science at least as much at heart as the interest of the sport. He desired to direct aeronautical investigation along a new path, and to free it from the restricted view that progress was bound up with power flight. Were it possible to develop gliders carrying appreciable loads, they would serve as prototypes for light aeroplanes, without losing sight of more general sporting possibilities. The evolution of the light sporting aeroplane from the glider was his technical objective. His sporting aim was to offer keen youngsters a chance of flying at no great financial outlay by giving their time freely to constructing gliders. In the course of their purely sporting activities they would develop a sound team spirit and would find a stimulus to technical and scientific work.

On his initiative the first gliding competition at the Wasserkuppe in the Rhön was held in August, 1920. In spite of initial difficulties a new gliding record of 2 minutes 22 seconds and 1,830 metres, was made by W. Klemperer, whose design first settled the type of construction suitable for gliders. It was a cantilever low-wing monoplane, in which great care was given to keep down resistance with its adverse effect on performance.

Klemperer's 1920 Glider

In the following year the same principle of keeping down body resistance was more fully applied by G. Madelung to his glider "Vampyr," the design of which has had a lasting influence. The "Vampyr" type prevails at the present time, and this is a measure of Madelung's contribution to glider design.

FIG. 1.
Sailing flight grounds and flying station on the Wasserkuppe in the Rhön.

FIG. 2.
Klemperer's sailing aircraft, 1920.

Since gliding flight depends on the use of slowly rising currents in the air, a practicable glider is chiefly characterised by a small vertical component of velocity, or rate of descent.

A small rate of descent may be obtained either by reducing the sum of the resistances or by reducing the wing loading. These two methods have been applied, and lead to two special types of glider, both of which find application for

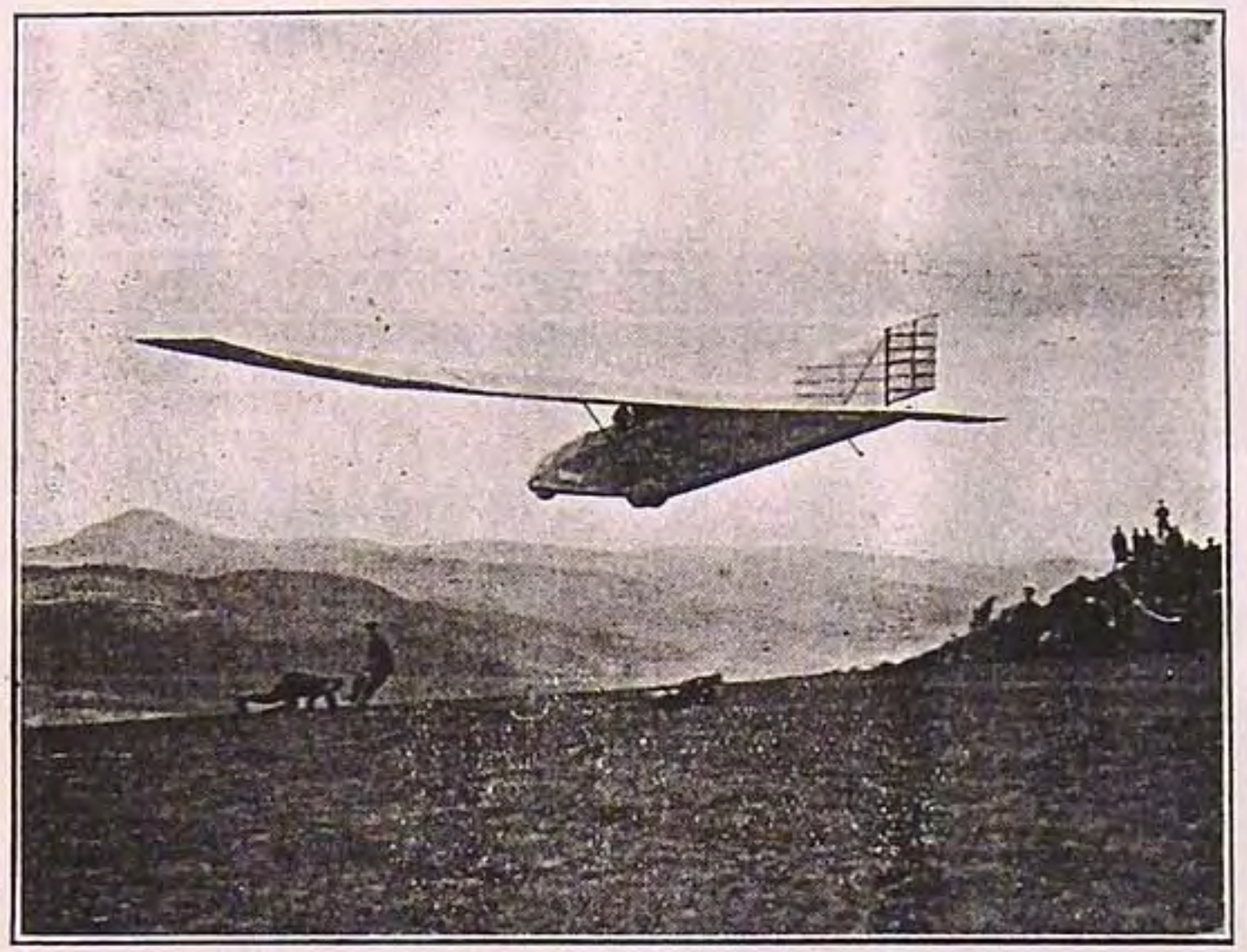

FIG. 3.
Vampyr gliding, 1921.

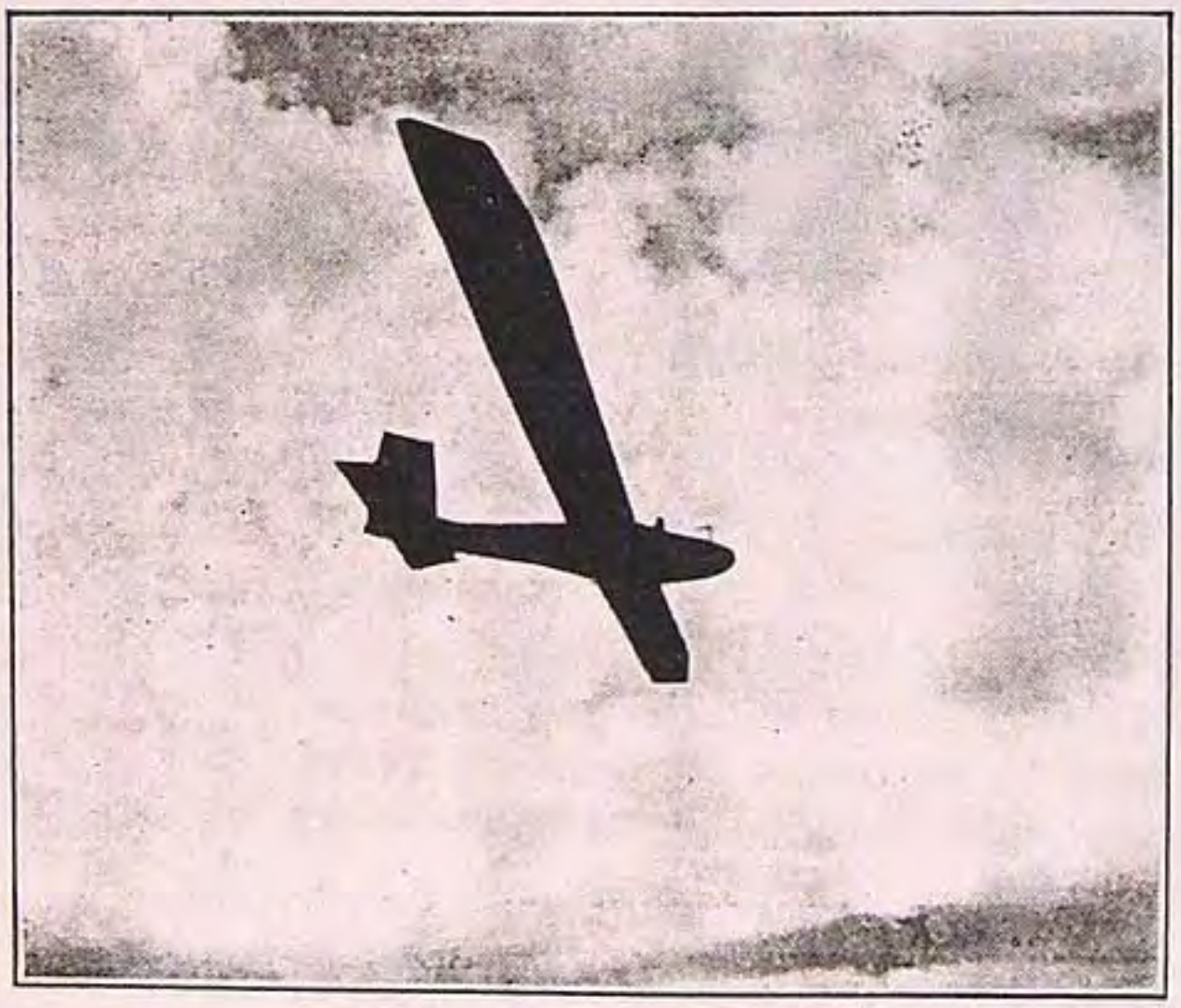

FIG. 4.
Sailing aircraft "Consul" of the Darmstadt Academic Flying Group, 1923.

special purposes. A large span and good aspect ratio are favourable to a small (induced) resistance, and further reduction of resistance is gained by a closed body, cantilever construction (no external bracing) and by dropping the starting carriage.

From the " Vampyr," the prototype of German high performance gliders, onwards, all these methods of reducing resistance have been so carefully studied and carried out that further fundamental improvements are scarcely to be expected.

The following photographs show the best known German high performance gliders from the " Vampyr " of 1921 to the " Wien " of 1929.

" Vampyr "—Academical Flying Club of Hanover, 1921 (Fig. 3).
" Consul "—Academical Flying Club of Darmstadt, 1923 (Fig. 4).
" München " Academical Flying Club of Munich, 1928 (Fig. 5).
" Wien "—R. Kronfeld. Built by A. Lippisch, 1929 (Fig. 6).

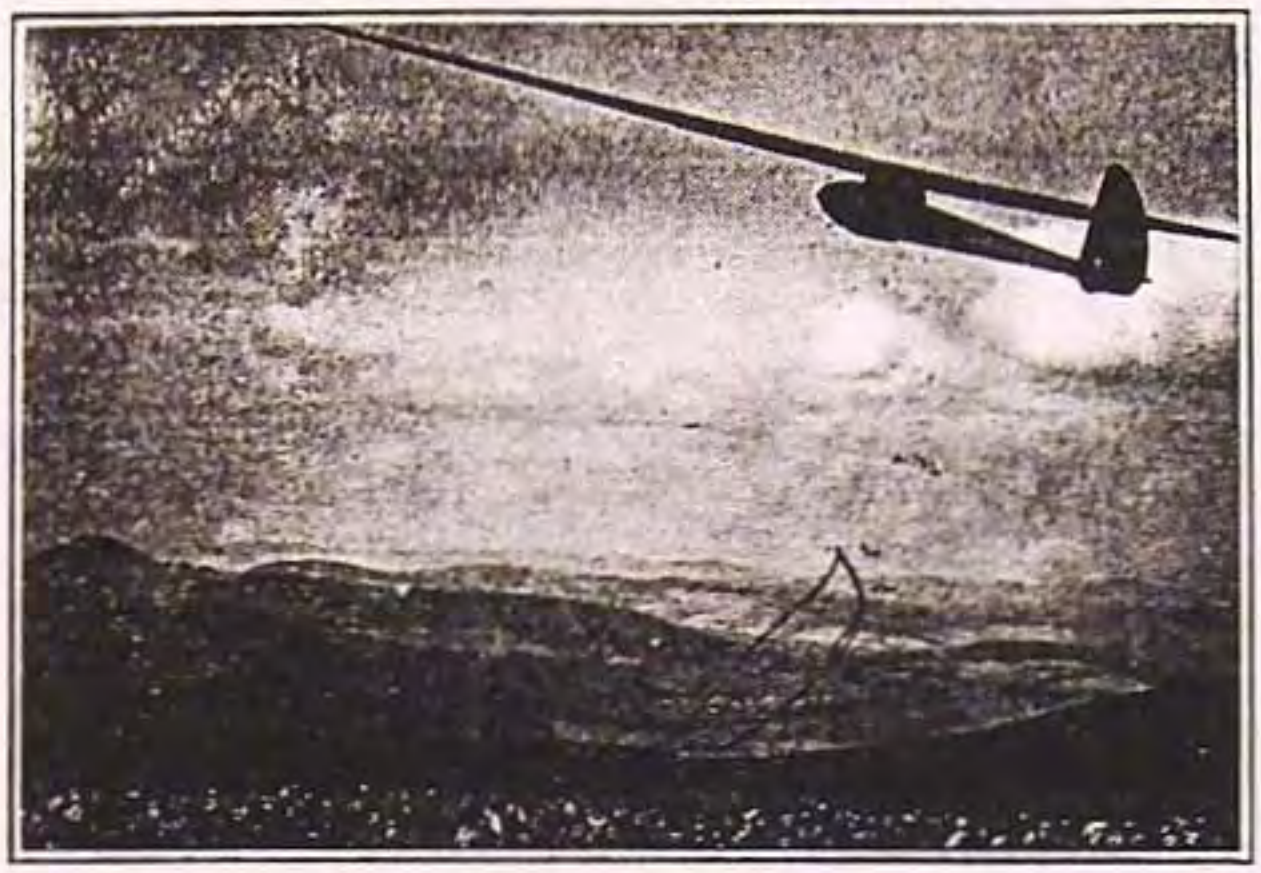

FIG. 5.
Sailing aircraft " München " of the Munich University Flying Group, 1928.

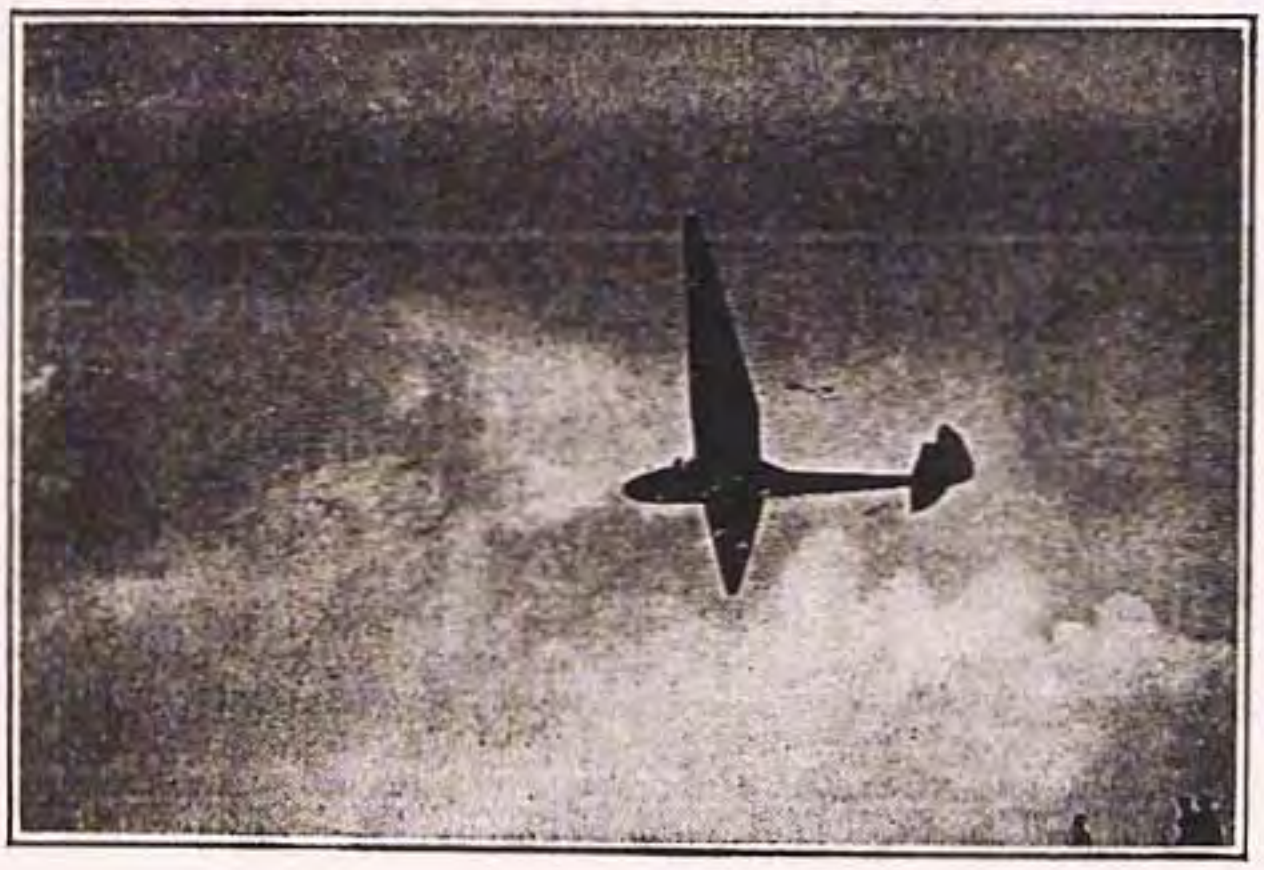

FIG. 6.
Sailing aircraft " Wien," R. Kronfeld's aircraft, constructed by A. Lippisch, 1929.

On the " Wien," Kronfeld carried out his great duration flights, covering distances up to 150 km.

In designing for low head resistance the structural weight is increased to a restricted degree, and the structural methods, illustrated above, produce medium heavy gliders with a margin of strength for high performance and for flying in gusty weather. The additional weight gives the greater air speed required for

progress against strong winds and for passing rapidly through unfavourable belts of down wind.

The glider of low resistance and considerable structural weight is the best all round for long cross-country glides by virtue of its slow descent and high air speed.

Another method of reducing the rate of descent, by reducing the wing loading, is widely applied to glider design but quite unsuitable for high performance. It produces a very special type of low air speed, poor gliding angle, light structural weight and simple form.

The Djalvar—" Anamma " (" Devil take it ") is of this type and its main characteristics are: braced monoplane wings, simple girder, tail hook, and boat-shaped cockpit below the wings. Fig. 7 shows a standard glider of this type.

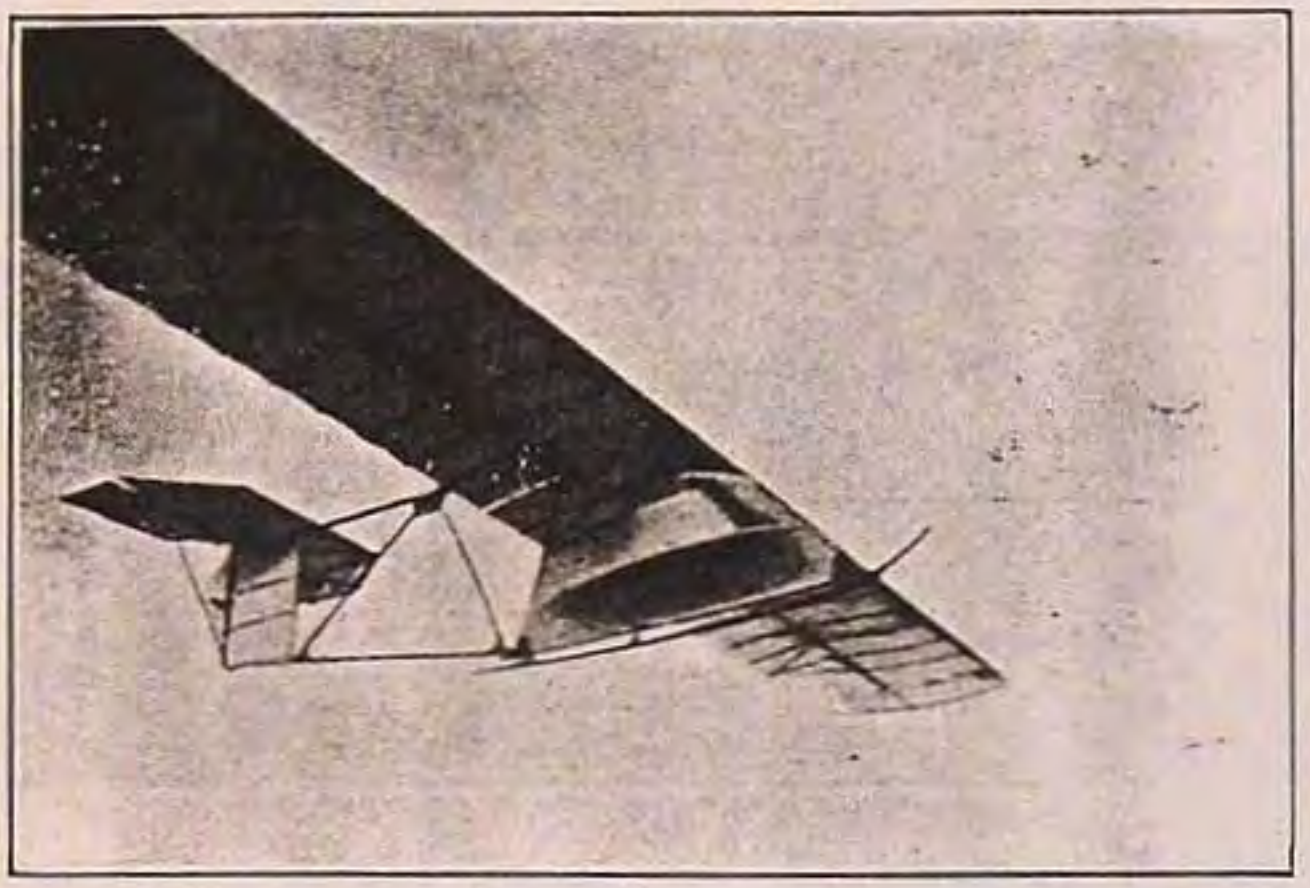

FIG. 7.
Djalvar anamma.

Djalvar—Anamma

It has a good duration performance in light winds but a restricted range on account of its slow air speed. In the school type the aerodynamical qualities are sacrificed to more robust construction, simplified for ease of repair; the cockpit is not covered so that the pilot may fall clear in a smash, and restricted gliding and soaring powers are desirable for training purposes. The best known of this derived type is the " Zögling," shown in Fig. 8.

Zögling School Glider. Rhön Rossitter Gesell: 1926

Once the principles of successful soaring were recognised results soon followed.

In 1922, Hentzen and Martens, both students, carried out the first soaring flights, lasting over an hour, on the " Vampyr." Hentzen's record flight of three hours ten minutes, attaining an altitude of 350m., made the activities at the Wasserkuppe world-famous.

It elucidated the problem of soaring flight by using the energy in the air's motion. In accordance with the laws of motion soaring is possible in an ascending current of air, and in a horizontal air current of variable velocity.

When the rate of ascent of the air current equals or exceeds the rate of descent of the glider " static soaring " is possible. When the horizontal wind is variable, the pilot gains height as the velocity increases and loses height as the velocity decreases. As the air forces are proportional to the square of the air

speed, it is possible in principle to obtain a net gain. If the net rate of gain equals or exceeds the rate of descent this " dynamic flight " becomes possible. It is quite probable that some dynamic gain was obtained in the earlier flights, but not by any systematic use of the wind fluctuations.

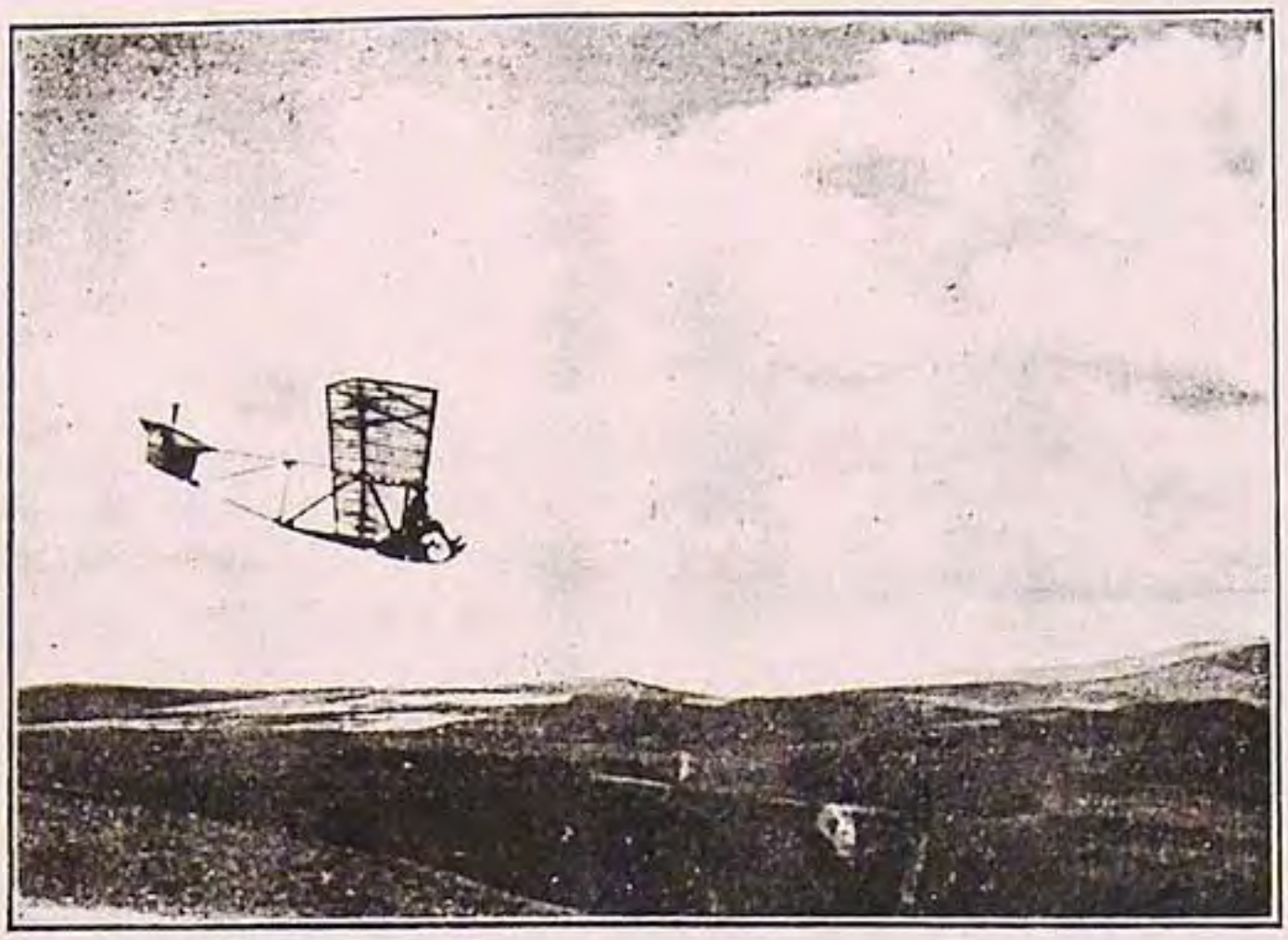

FIG. 8.
Instructional glider " Zögling " of the Rhön-Rossitten Co., 1926.

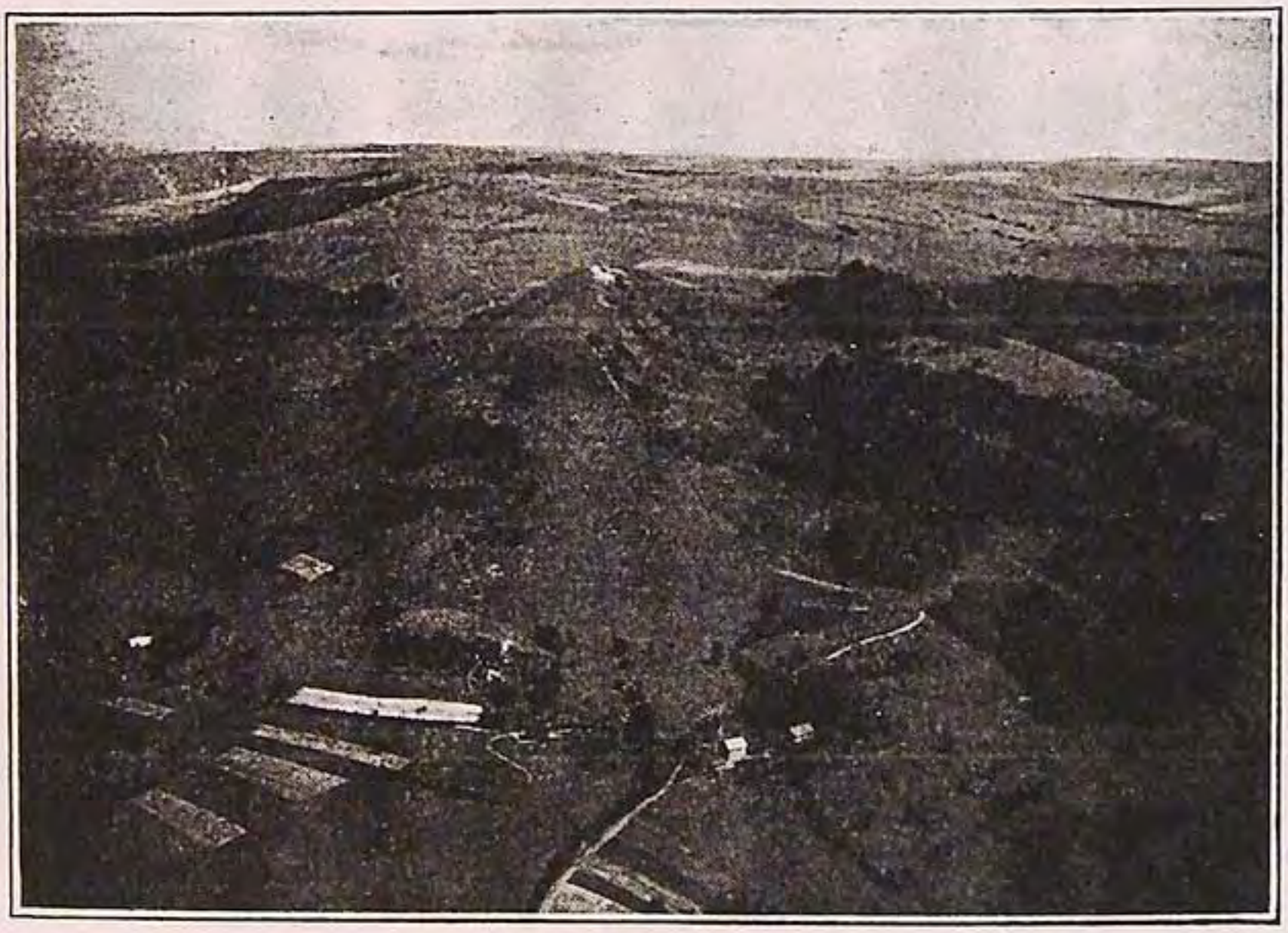

FIG. 9.
Western declivity of the Wasserkuppe, Rhön.
(Main sailing-flight declivity.)

The extensive efforts made from 1921 to 1923 to connect pulsating dynamical effects with the performance of man-carrying gliders did more harm than good to the development and reputation of soaring, the possibilities of which, apart from any such effects, have been fully shown by the subsequent years.

To revert to static soaring, local rising currents are produced by every irregularity of the earth's surface—knolls, dunes, woods, the waves of the sea—and may be utilised for soaring flight.

The following photographs show well-known soaring grounds:—

The Wasserkuppe in the Rhön (Figs. 1 and 9).

The French soaring grounds at Vauville (Fig. 13).

The soaring grounds at Rossitten on the Kurisch lagoon (at the mouth of the Memel in East Prussia) (Fig. 10).

The following table shows a number of duration records.

	Wasserkuppe			Rossitten.		
Year	1922.	1928.	1929.	1924.	1925.	1929.
Pilot	Heutzen.	Kronfeld.	Neininger.	Schulz.	Schulz.	Dinort.
Duration	3h. 10m.	7h. 24m.	8h. 24m.	8h. 24m.	14h. 7m.	14h. 43m.

Fig. 10.
Gliding ground at Rossitten from the Nehrung.

It is seen that the records at the Wasserkuppe have dropped far behind those at Rossitten. Such flights are a useful stimulus to the sport but do not much help further developments of soaring. For this reason cross-country flights have been preferred at the Wasserkuppe as eminently serviceable for research work, and by this means alone new regions of favourable rising winds have been delimited, and the practice of soaring has been made less dependent on time and place. The performance has been steadily improved and a high aeronautical and scientific standard of instruction in the methods of soaring has been attained. The following table shows the progress made since 1922.

Cross Country Soaring Flights

Year	Pilot	Distance in km.	District
1922	Martens	9·5	Wasserkuppe
1923	Botsch	19	,,
1925	Nehring	21	,,
1927	Nehring	52	,,
1928	Schulz	62	Rossitten
1929	Nehring	72·3	Odenwald
1929	Kronfeld	100	Teutoburger Wald

The technique of cross-country soaring flights is best shown by plotting the course on a contour map, with barogram readings of the heights attained, and other information supplied by the pilot. The two charts selected show the masterly flights of Nehring and Hirth, from the starting point round a fixed mark and back.

Soaring flight by Nehring round the Heidelstein on the "Darmstadt," August, 1927, is shown in Fig. 11.

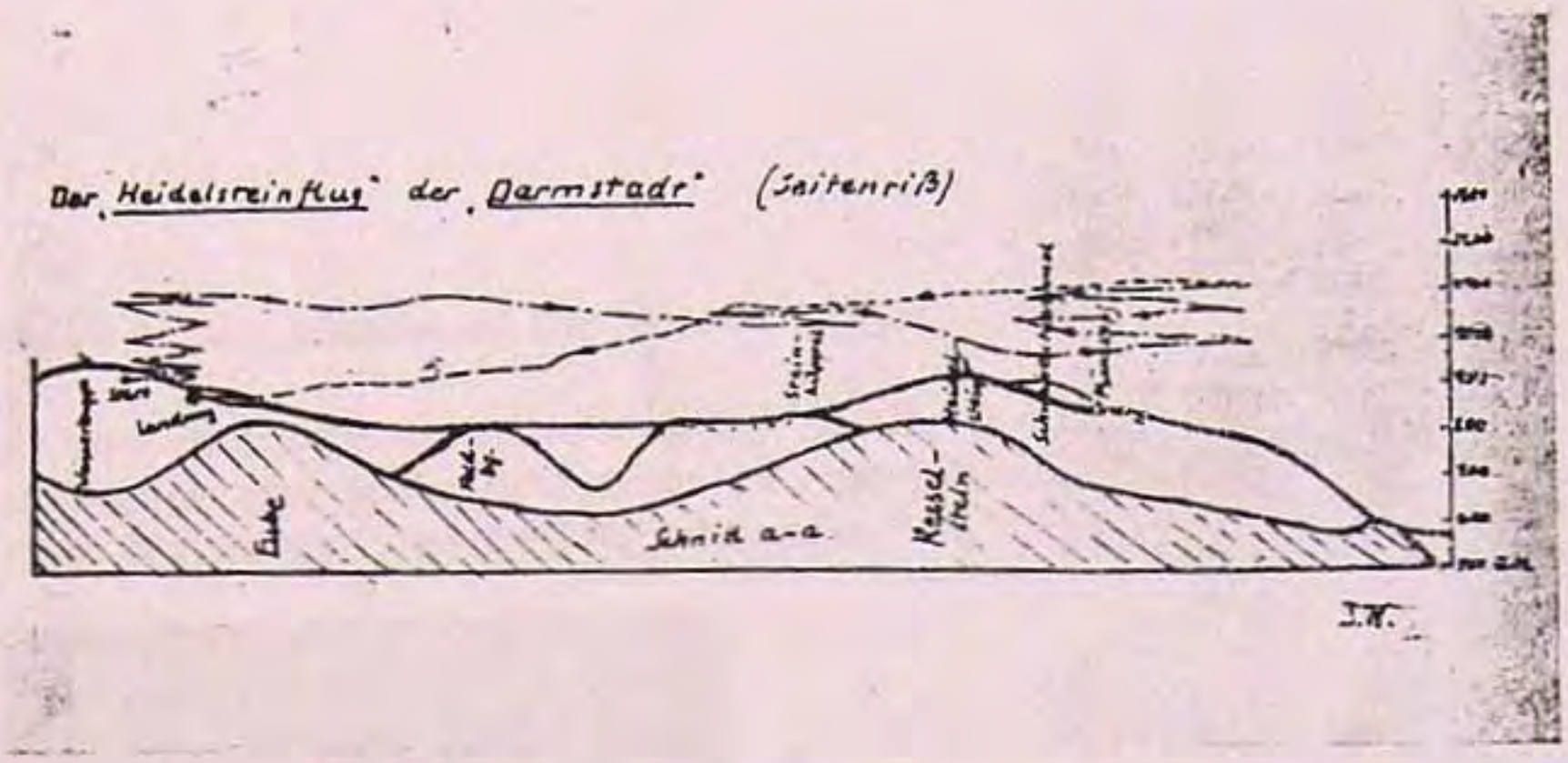

FIG. 11.
Heidelstein flight by Nehring on the sailing aircraft "Darmstadt," August, 1927.

Soaring flight by Hirth round the Schweinsberg on the "Lore," July, 1929, is shown in Fig. 12.

In the flight round the Heidelstein, Nehring first soared over the south slope of the Wasserkuppe until he had gained 150m. height above the starting point. He then flew parallel to the ridge and at right angles to the prevailing wind to Münzkopf, where he used the strong up-current to reach his maximum height at 260m., which was sufficient to reach the Heidelstein and return to the starting point.

FIG. 12.
Schweinsberg flight by Hirth on the sailing aircraft "Lore," July, 1929.

Hirth's flight was more difficult and more instructive. He started from the west slope of the Wasserkuppe, and maintained himself there until he had gained 400m. in height, and then carried out his cross-country flight to the immediate neighbourhood of the Schweinsberg without serious difficulty. On the return flight he found that he had lost height badly and was 200m. below the starting point. He was twice forced to turn back and soar over valleys with up-winds in order to regain sufficient height to regain the western slope, over which he

cruised until he was high enough to land on the plateau of the Wasserkuppe at the prescribed point.

In this admirable exhibition of the methods of cross-country work, it is seen that the pilot leaves the original region and seeks new areas of rising wind, leaving nothing to chance, but laying his course beforehand, according to the

FIG. 13.
French sailing-flight grounds near Vauville.

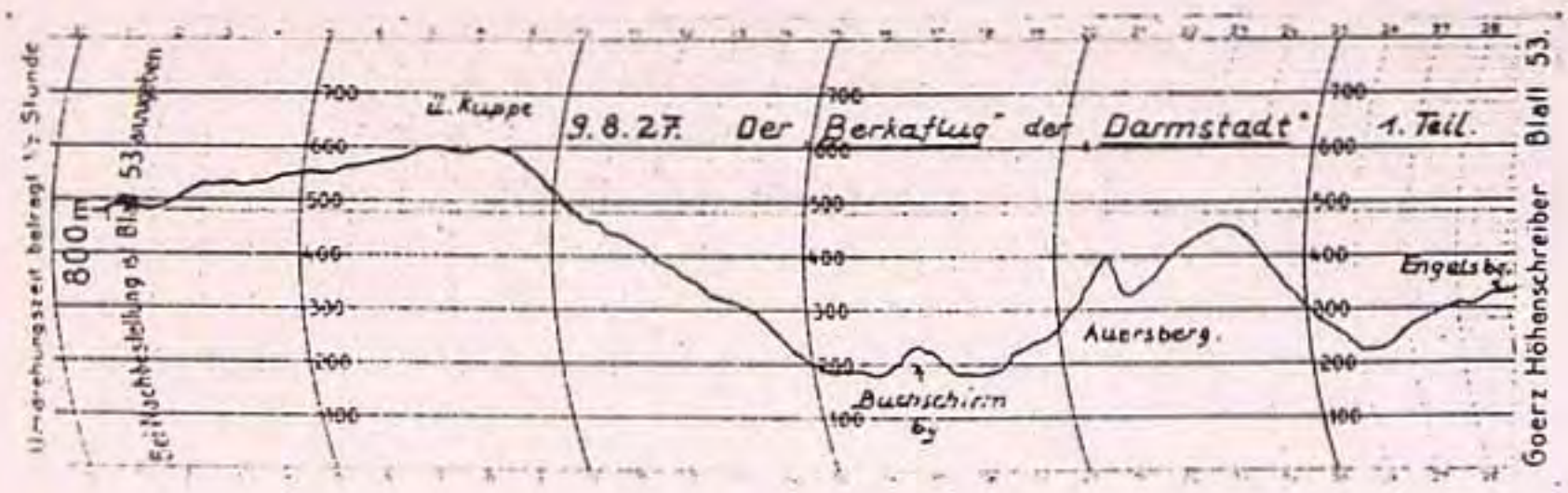

FIG. 14.
Barogram of the flight by Nehring to Berka, August, 1927.

wind prevailing and to the lie of the land. It is characteristic of such flights that the best course is not in general the shortest distance, but may involve long detours in reaching up-wind areas, and lengthy soaring over a particular point in gaining sufficient height. Briefly, the pilot must fly on sound topographical and meteoro-

logical information, if he is to reach his goal. Cross-country flights will be achieved over wide regions by flying from slope to slope, from hill to hill, and finally, from range to range. The satisfaction of skilfully adapting soaring flight to the configuration of wind currents and landscape is enhanced if need be by the sporting excitement and by the real value to flying.

Nehring's 1927 flight is another instructive example of cross-country work in which a whole range was transversed by passing from hill to hill. There was no straightforward continuous region of upwinds available. Local areas of rising wind had to be sought out on slopes facing the general direction of the wind, and wide belts of downwind lying between them had to be crossed. The masterly

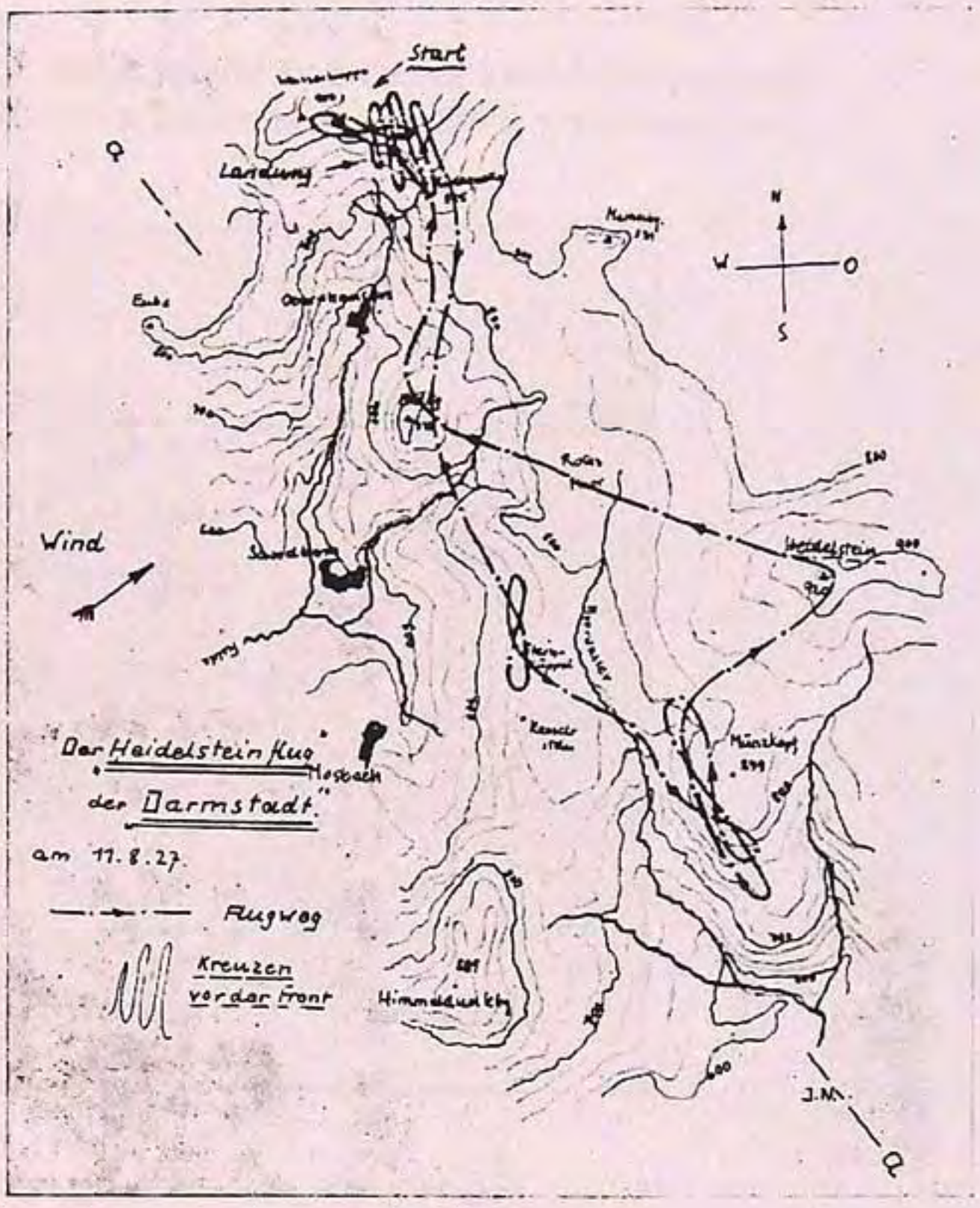

FIG. 15.
Heidelstein flight by Nehring on the sailing aircraft "Darmstadt," August, 1927.
Plan of the course of flight.

fashion in which Nehring carried out these successive stages is shown by Figs 15 and 16.

A barogram of Nehring's 53 km. flight to Berka, August, 1927, is shown in Fig. 17 and a plan and height contour of the same flight in Fig. 14.

The ups and downs of the barogram correspond to the up and down wind regions which were met. The plan of the course shows very well the flying tactics adopted in circling over hills which produced rising winds, long enough to gain extra height for the next stage of the flight.

Kronfeld's 100 km. flight in Spring, 1929, over the Teutoburgerwald was achieved by these same tactics, and supports the view that a sound knowledge

of the flow of the wind round hill ranges, hills, knolls and dunes enables a soaring pilot, competent in his art, to achieve remarkable cross-country performances, over hill and dale.

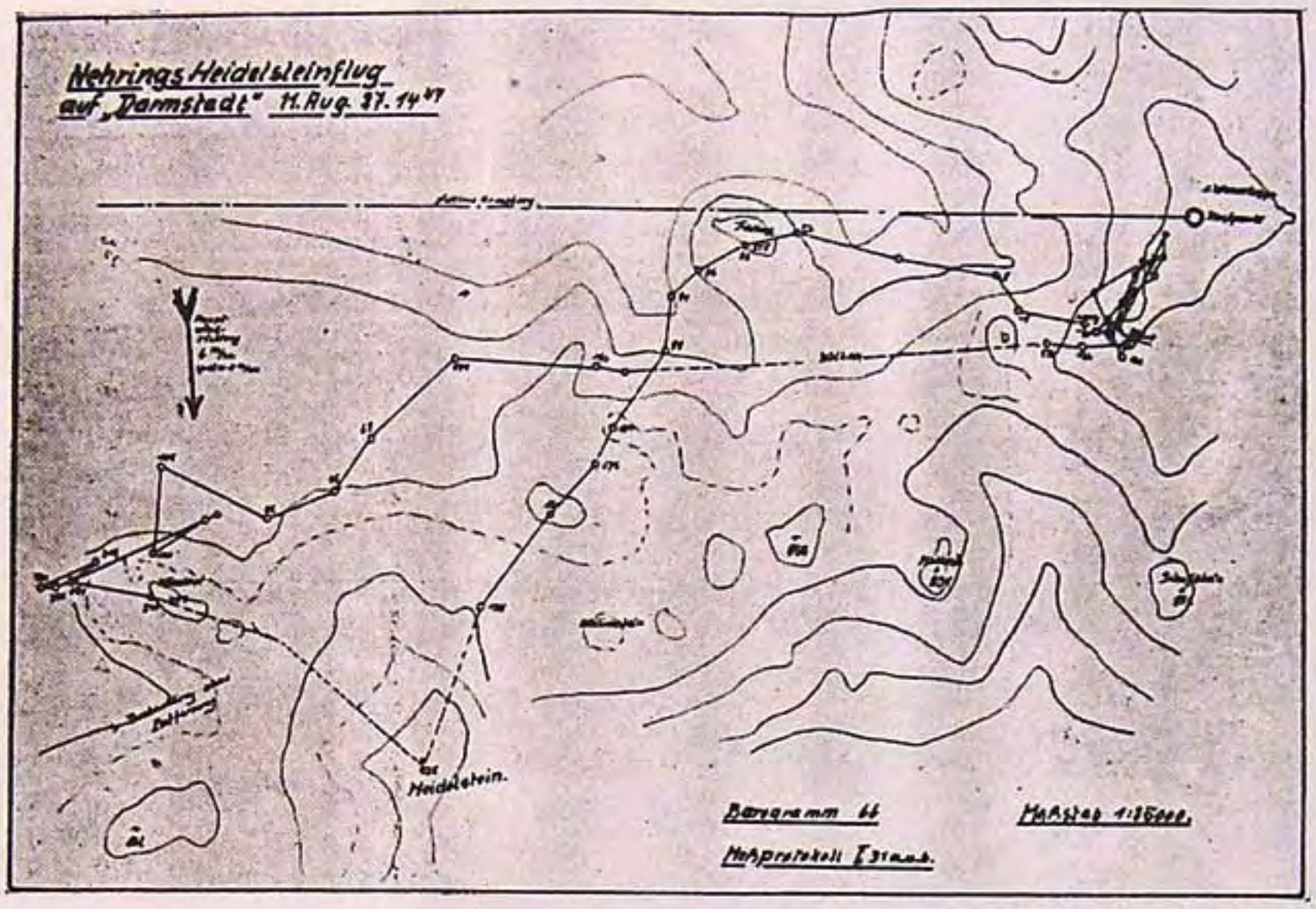

FIG. 16.
Heidelstein flight by Nehring on the sailing aircraft "Darmstadt," August, 1927.
Course of flight according to trigonometrical measurement.

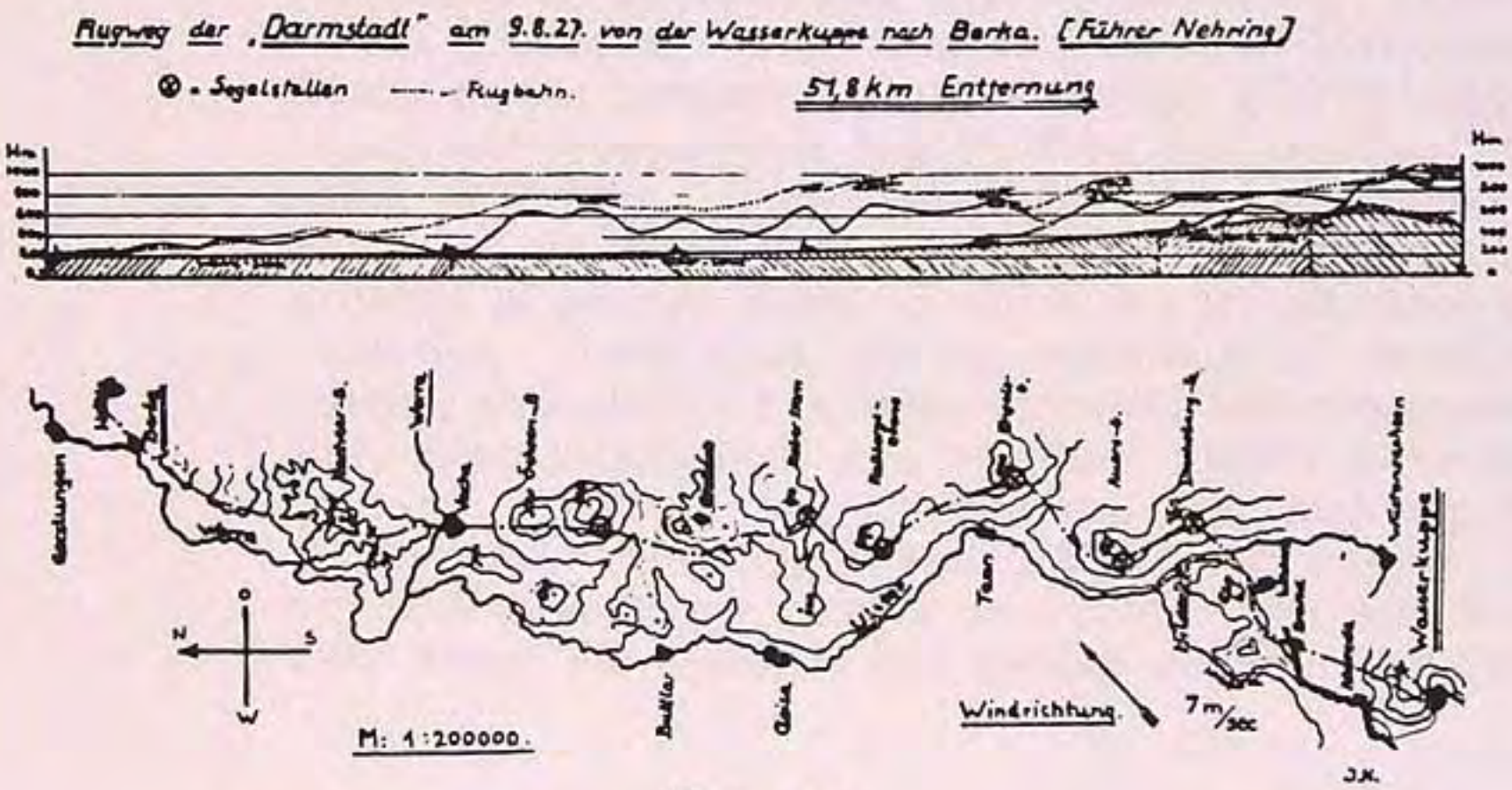

FIG. 17.
Vertical section and plan of the course of the flight by Nehring to Buka.
Distance flown 53 kilos., August, 1927.

We cannot remain content to restrict soaring to hilly country but must strive to bring within its scope the regions of the air above flat lands. The sailing flight of birds, indeed, shows that upwinds exist over plains, and are probably adaptable to soaring man-flight.

Research on soaring was initiated just at the beginning of the serious crisis of 1924 and 1925.

Soaring gliders had not been involved in the restrictions imposed on power aircraft, but were adversely affected by the revival of interest in the sporting possibilities left open to light aeroplanes, when the worst restrictions were removed.

After the record duration soaring flights of 1922 England, France, Italy and Russia had held soaring competitions, but interest had soon passed back to the light aeroplane. Even in Germany soaring came to be regarded as a mere makeshift for power gliding. Only when this erroneous view had been disproved, and soaring shown to have its own individual scope, did the crisis pass.

The Rhön Rossitten Gesellschaft was founded in these difficult times, with the purpose of supporting gliding schools, of holding competitions to give publicity, of improving performance, and of stimulating gliding activities generally. A special research department was established at the Wasserkuppe for advancing technical and scientific knowledge of the problems involved, and the management was placed in the hands of the present author in 1926.

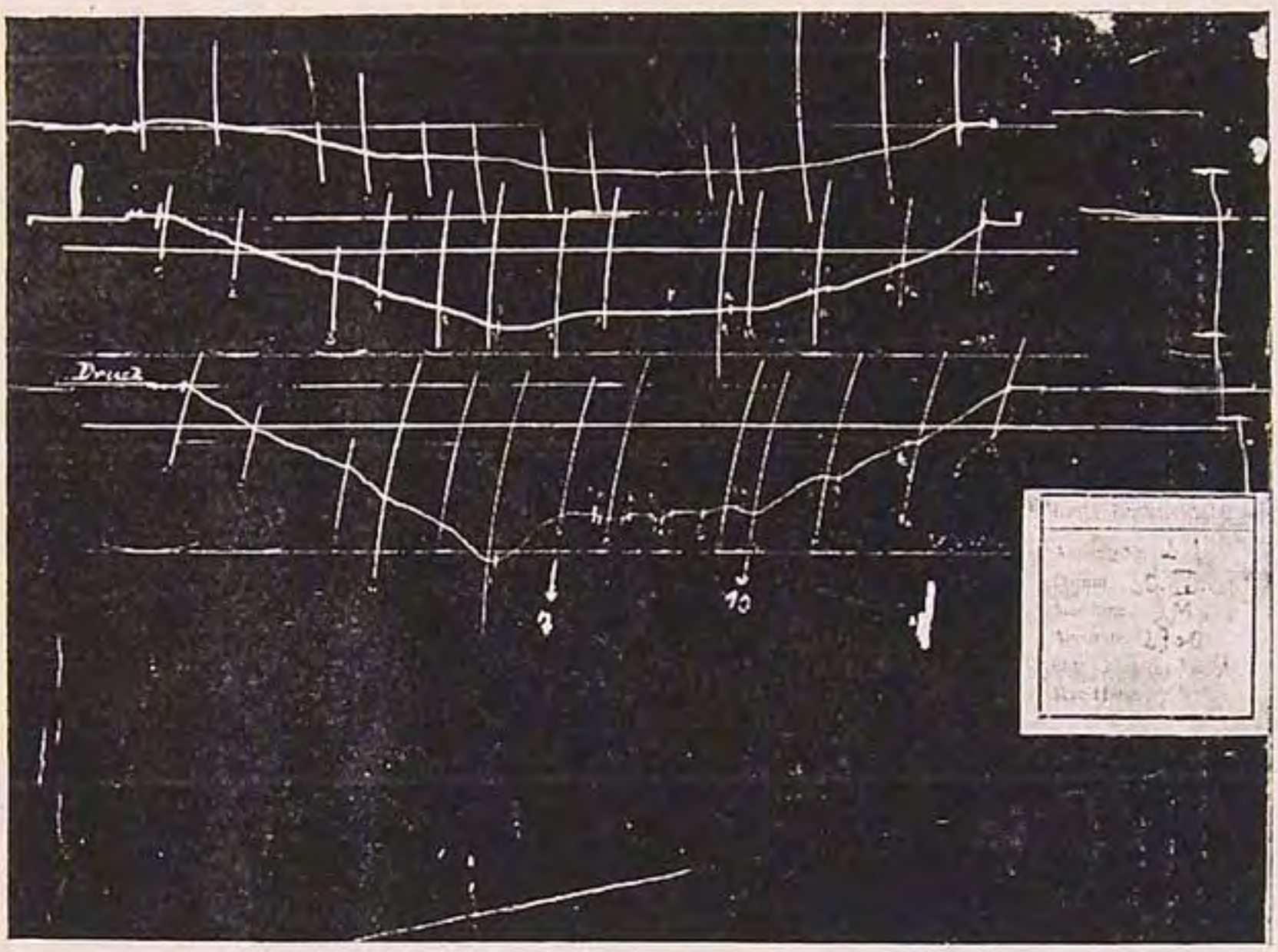

FIG. 18.
Meteorogram of the survey flight of the 30th April, 1928.

The Rhön Rossitten Gesellschaft may be regarded as the centre of the gliding movement in Germany and in other countries. Teams were sent to the meetings in the Crimea at Asiago and at Vauville. Instructors were sent to the United States on the formation of the American gliding school at Cape Cod. A French educational commission has received full training, and this has stimulated the sport in France. Technical advice has been given to Hungary, Holland and Belgium. In these ways the Society has made its contribution to the common problem of soaring flight to which in turn all other nations can contribute their activities. Since 1926, having overcome the crisis of 1924-25, the practice of soaring and gliding has made vigorous and continuous progress. Glider schools have been established, and standard gliders have been distributed along with working drawings and instructions for building them. These include the "Zögling," "Prufling" and "Professor" types. The number of airminded youngsters and their interest in gliding have been increased by these measures, and, above all, research has opened out new possibilities and has contradicted

the prevailing belief that soaring depends entirely on the use of rising current over hill slopes.

The investigations of rising currents in the free atmosphere carried out in the last few years at Darmstadt and at the Wasserkuppe have shown that soaring under cumulus clouds and near cold fronts is practicable, both entirely new conditions.

It has long been known that cumulus clouds are associated with rising currents of air, but few measurements were available. Research was directed to the determination of these currents in the Spring of 1928 from measurements of the vertical rate of a power plane gliding beneath a cumulus cloud with its airscrew stopped. Repeated glides of as long as 10 minutes without loss of height were obtained.

Fig. 18 shows a meteorogram of experimental flight, April 30th, 1928.

On Fig. 18 it is seen that there was no loss of height from point 7 to point 10 of the barogram, which implies a rising current of 2 m./sec.

Fig. 19 shows a chart of experimental flight measurements in a rising current, July 12th, 1928.

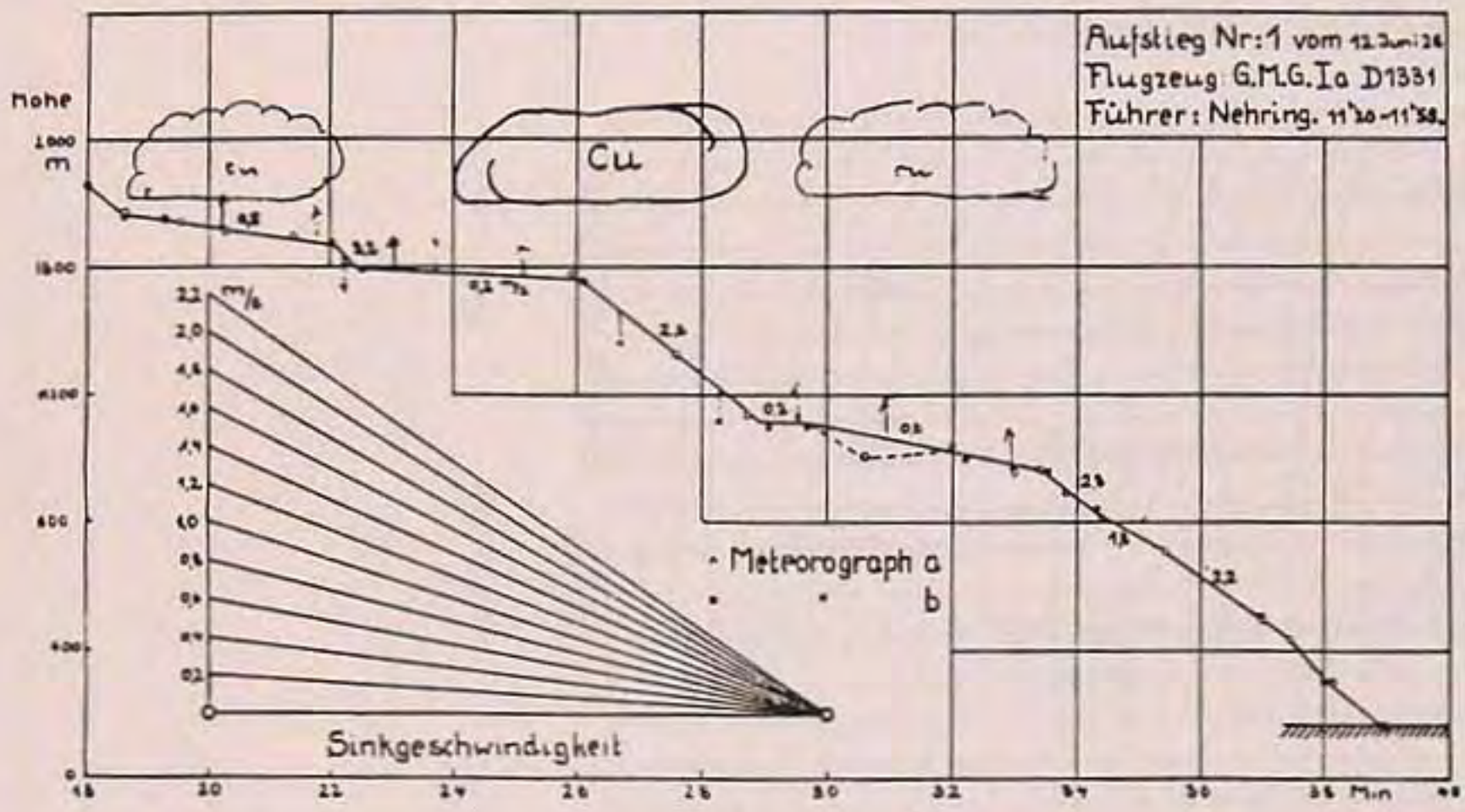

FIG. 19.
Testing of a wind-borne survey flight of the 12th July, 1928.

Fig. 19 shows the observed descent of the aeroplane gliding. From this is subtracted the known rate of descent in still air, about 1.9 m./sec. The difference measures the vertical motion of the air.

From time 20 min. to time 28 min. there is a rising current of from 1 m./sec. to 2 m./sec., and from 28 min. to 30 min. of 2 m./sec. to 5 m./sec. These are hign values and give excellent conditions for soaring in gliders, which have rates of descent as low as 0.7 m./sec.

Fig. 20 shows a chart of rising current measurements before a line squall, June 26th, 1929.

A " cold front " produced a line squall of moderate intensity, and the aeroplane, with airscrew stopped, maintained itself without loss of height for 15 min. From these results it was inferred that a soaring glider starting from the Wasserkuppe could reach the region of rising currents under a cumulus cloud or the front of an approaching squall, and this was successfully accomplished.

Fig. 21 shows a barogram of soaring flight by the " Darmstadt," August 10th, 1928.

The barogram shows clearly the vigorous effect of the rising current under a cloud in comparison with that produced by a hill barrier.

The " Darmstradt " maintained itself over the west slope of the Wasserkuppe at 100 m. above the starting point. In 20 min. the boundary of the up current below an approaching cloud was reached, and the glider was quickly carried up to a height of 400 m.

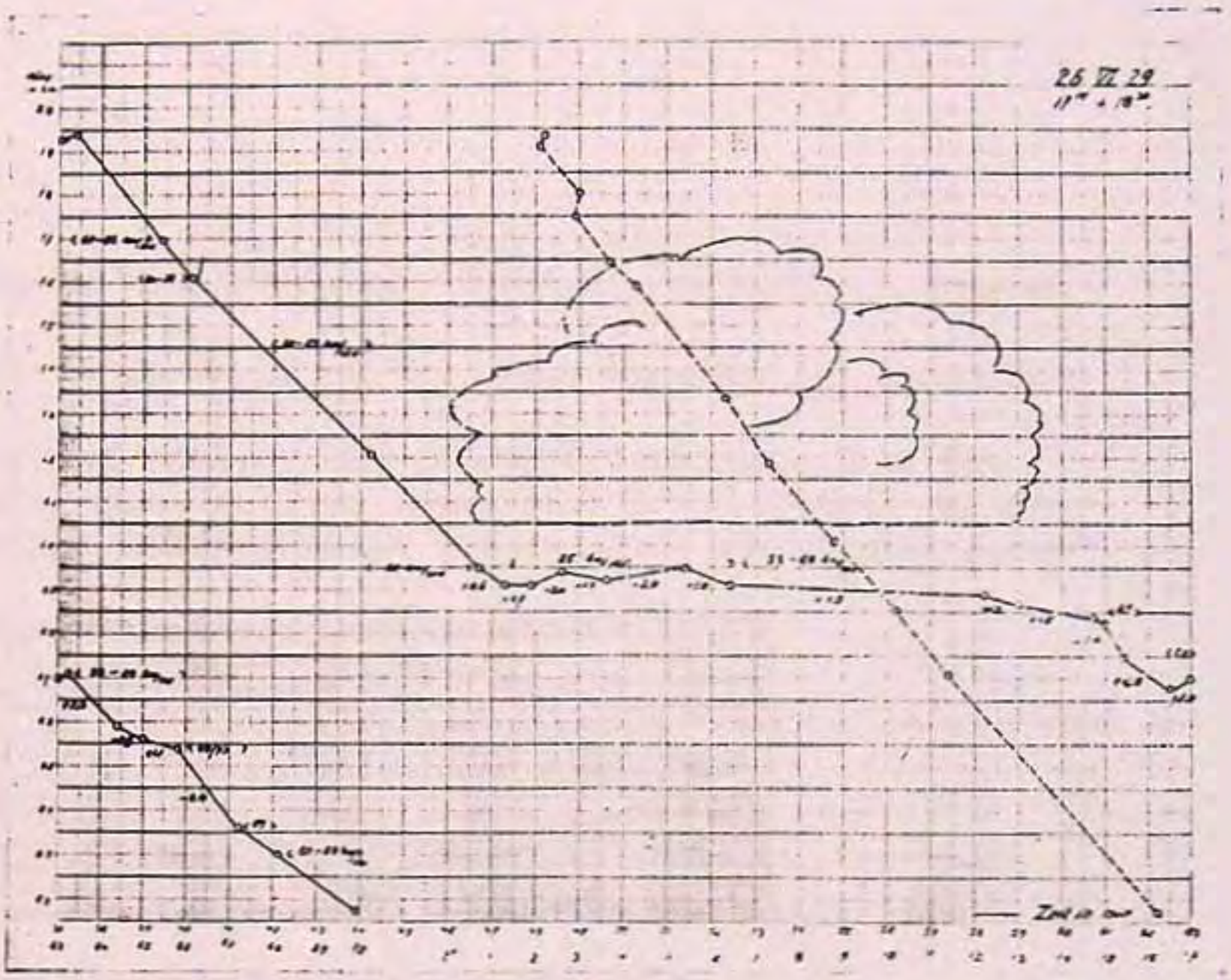

FIG. 20.
Testing of a wind-borne survey flight in the face of a squall on the 26th June, 1929.

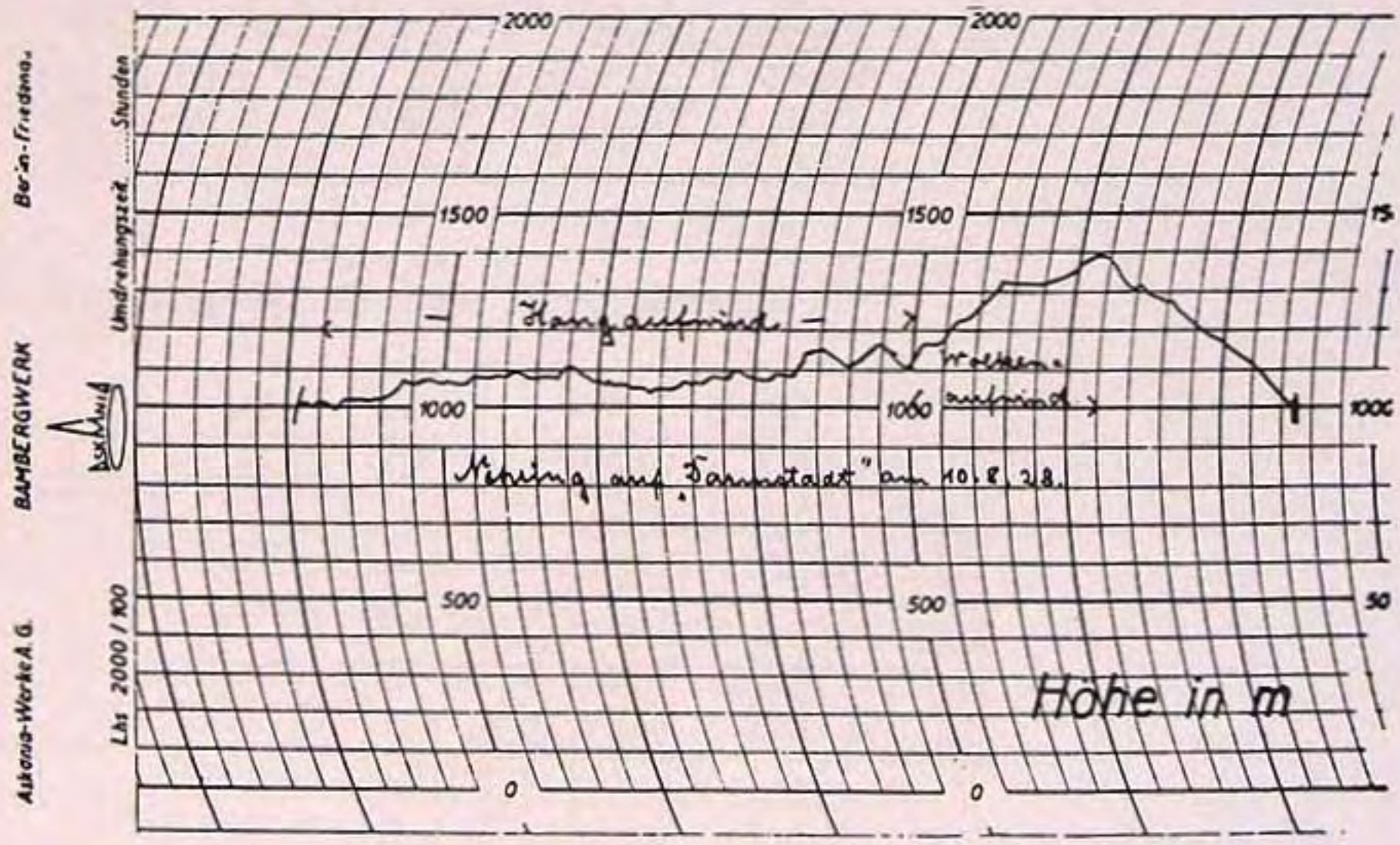

FIG. 21.
Sailing flight barogram of the aeroplane " Darmstadt " of the 10th August, 1928.

Fig. 22 shows a record of Kronfeld's flight at the Himmeldankberg, August, 1928.

The plan of the course is shown in full line under the cloud, in dotted line outside their influence.

Kronfeld started from the western slope of the Wasserkuppe, and flew at once towards an approaching cumulus cloud, which he followed towards the east with continual gain of height, reaching finally 470 m. above the starting point.

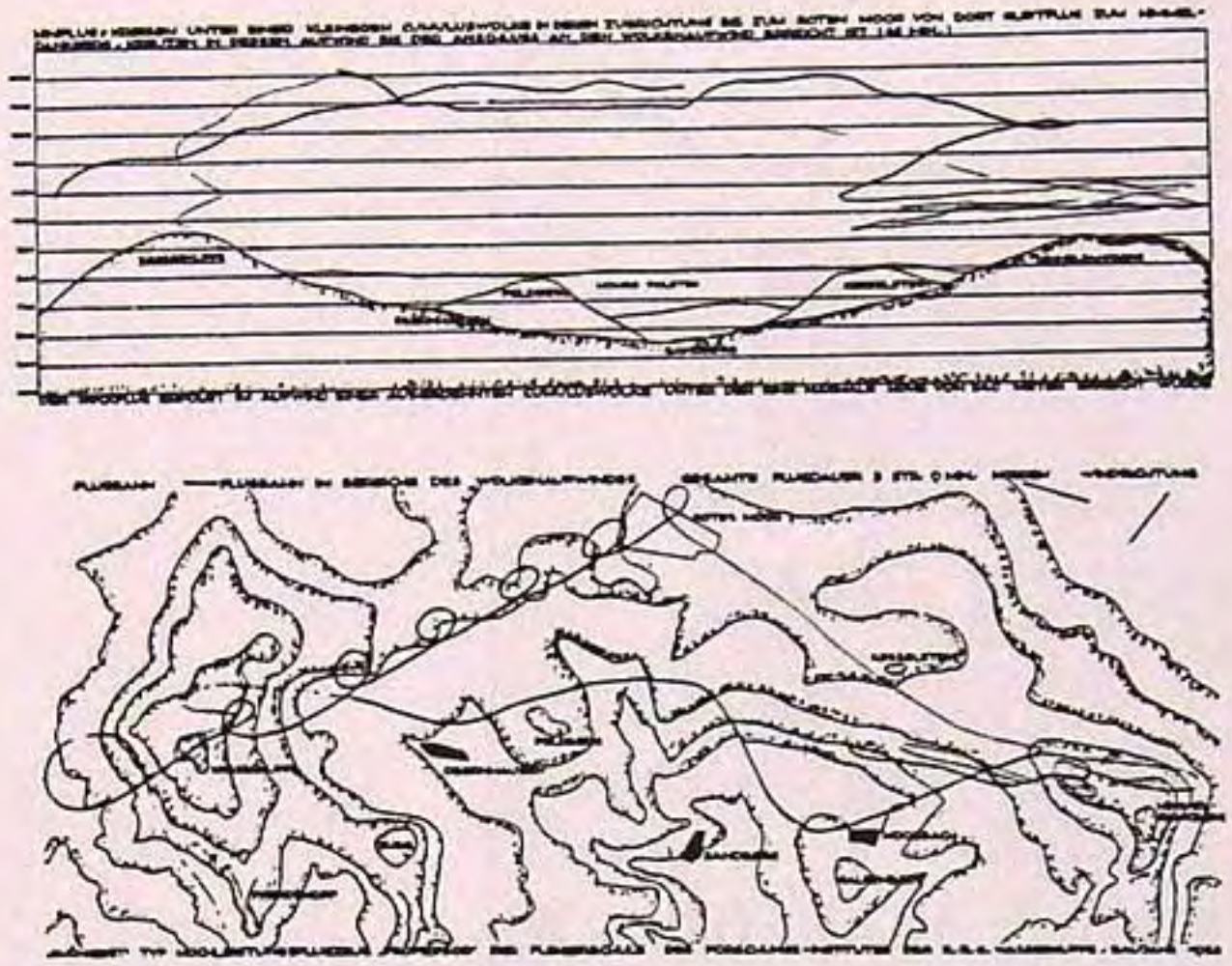

FIG. 22.
The Himmeldankberg flight by R. Kronfeld.

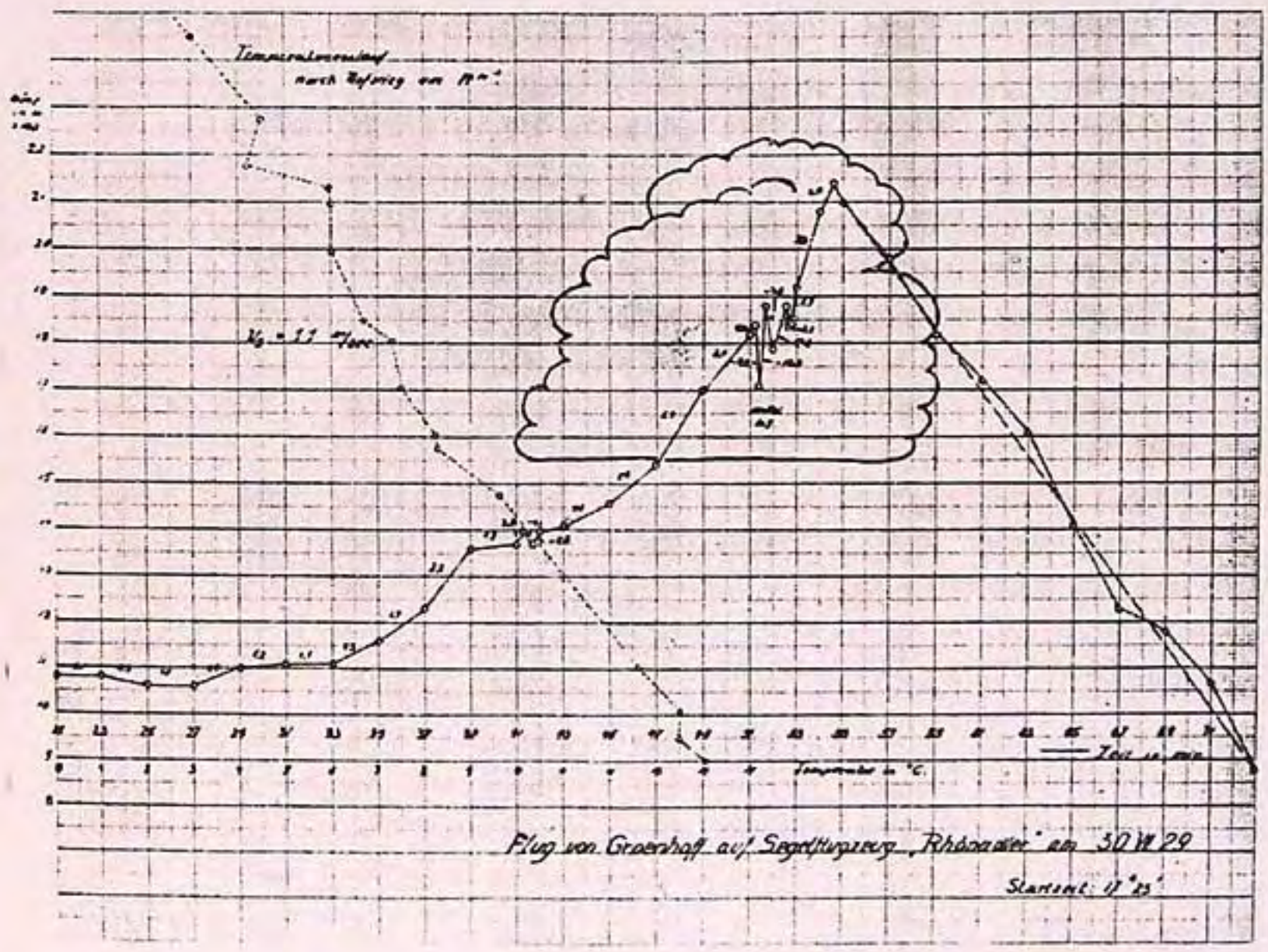

FIG. 23.
Barograph curve of the flight by Groenhoff with a passenger on the 30th July, 1929.

The cloud began to dissipate and the up current became ineffective, so that Kronfeld left it and flew with considerable loss of height to the Himmeldankberg as pre-arranged, and there soared for some time in the up currents. On the approach of another cumulus cloud Kronfeld used it to gain considerable height, and then flying always from cloud to cloud he reached the Wasserkuppe at his maximum height of 540 m. above the starting point.

These details illustrate the difference between hill and cloud flying, between flying from hill to hill over a course, which must be adjusted to the contours of the ground, and flying from cloud to cloud over hill and plain, when the ground is ignored and the pilot scans the cloud formations and adjusts his course to their motion.

Fig. 23 shows a barogram of Groenhoff's flight with a passenger on the two-seater "Rhonadler," July 30th, 1929.

FIG. 24.
The 150 kilometre flight by Kronfeld from the Wasserkuppe to Bayreuth, August, 1929.

The next flight shows the extended performance obtained by flying into the cloud instead of soaring below it. Groenhoff started from the west slope of the Wasserkuppe and soared over it for a short time, then flew under a cumulus cloud and rose through it almost to its summit, reaching a maximum height of 1,250 m. above the starting point, and covering a course of 33.3 km., both figures being records for soaring flight with a passenger.

The rate of descent of the glider in still air was 1.1 m./sec., from which the vigour of the up winds may be inferred.

Severe vertical gusts were met with in the cloud. At 1,800 m. the glider was driven down 140 m. in a few seconds and immediately after it was carried up 170 m. Two more such gusts followed after. The chart shows a down current of 9 m./sec. and an up current of 10 m./sec.

On the same day and under the same weather conditions Kronfeld made his great cross-country flight of 150 km.

Fig. 24 shows Kronfeld's soaring flight from the Wasserkuppe to Bayreuth (150 km.).

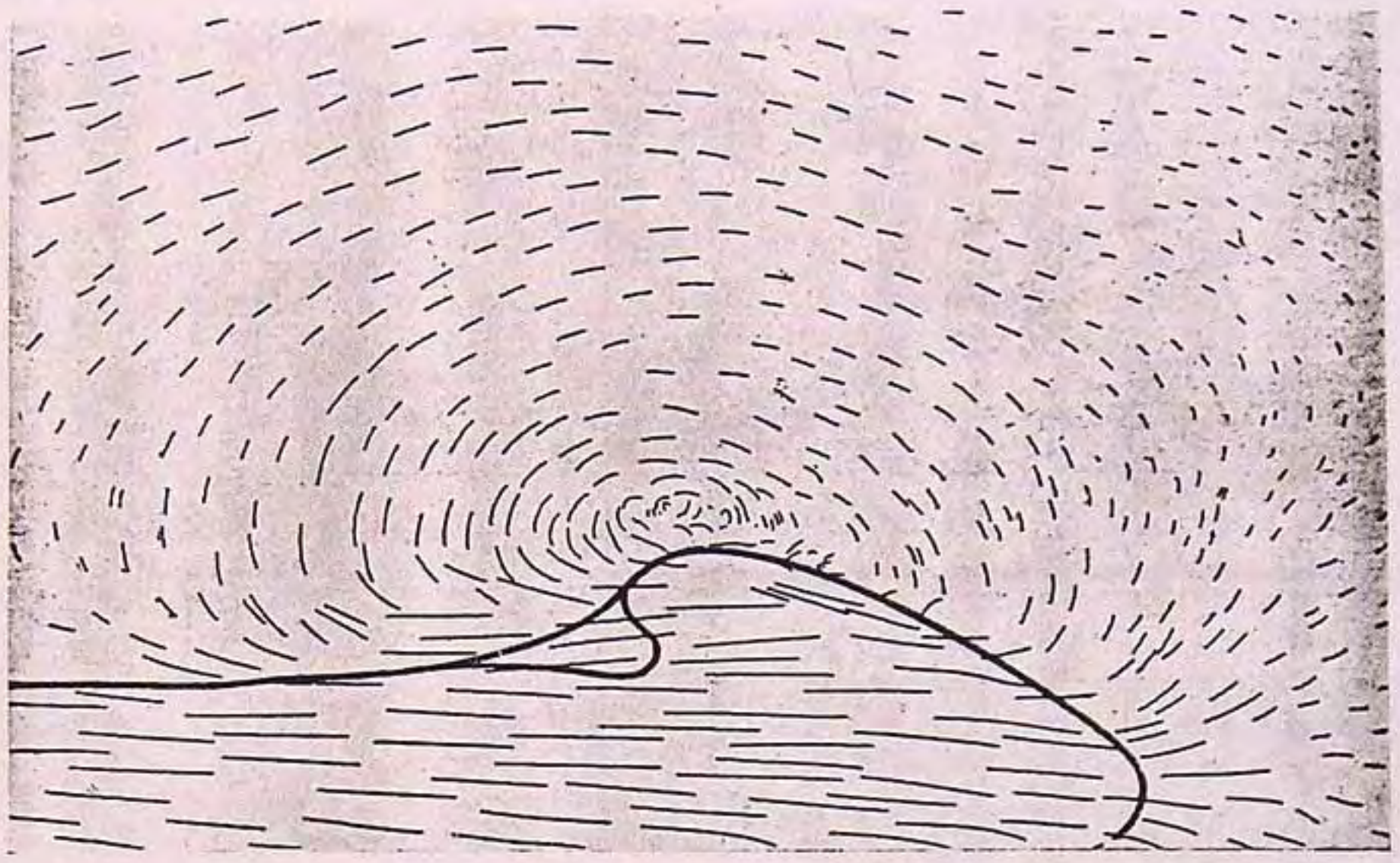

FIG. 25.
Movement of the air on the entrance of cold masses of air into warmer masses, according to W. Schmidt.

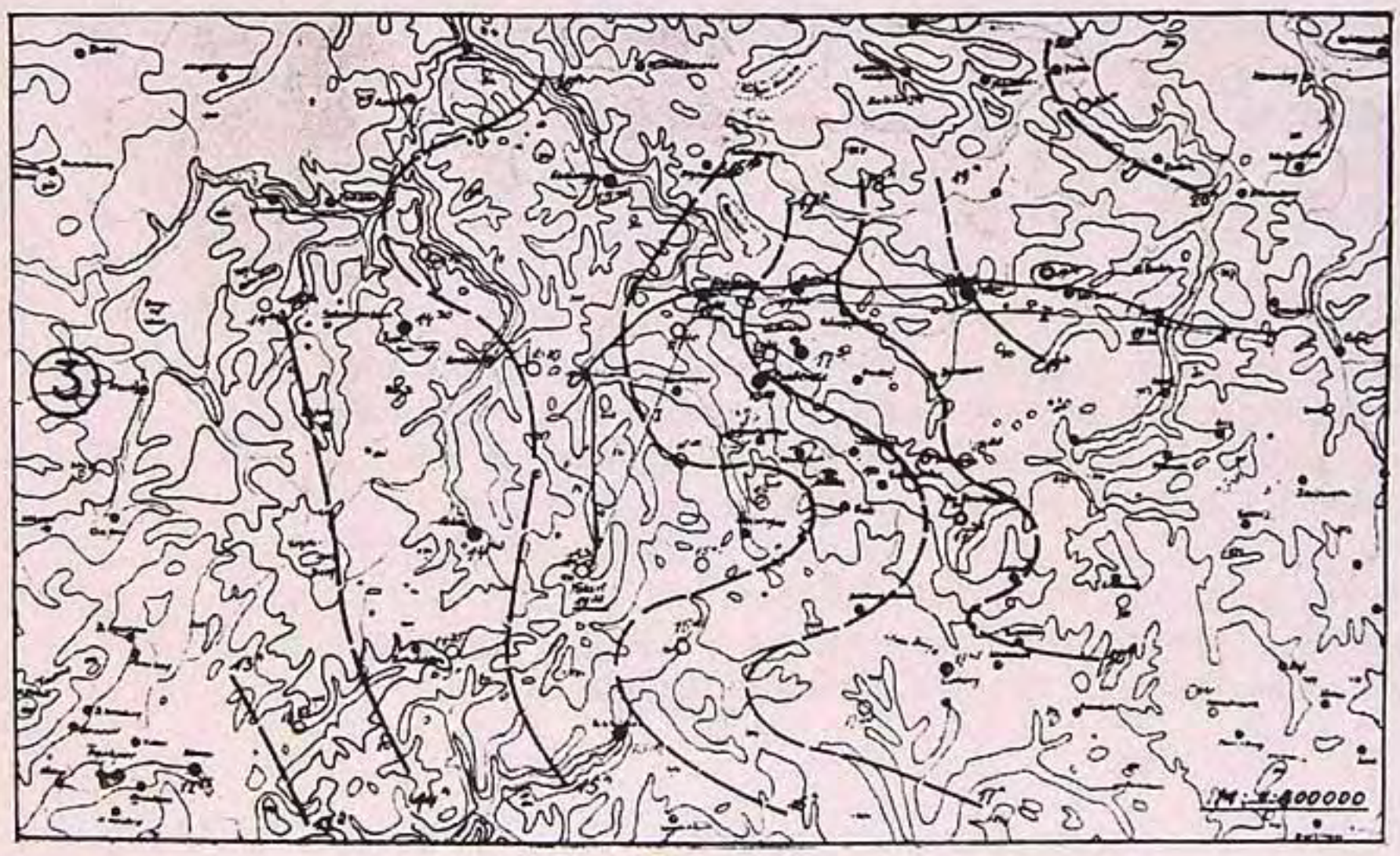

FIG. 26.
Route sailing-flight by Kronfeld of 143 kilometres in the face of a storm.
(3) *Movement of the face of the storm and horizontal path of flight.*

Immediately after the start Kronfeld flew under a cumulus cloud and was carried up continuously to a height 2,150 m. above the starting point.

The up current given by the measurements was 5 m./sec.

After leaving the cloud height was slowly lost in passing over flat country. In two hours the Thuringenwald was reached, and the flight was continued for 4 hours in the rising currents from the ridges. Finally a landing was made at the Fichtelgebirge 150 km. from the Wasserkuppe.

This masterly flight is a fine example of the art of soaring, and illustrates the manner of utilising the various means available. In particular a record height in this manner was gained in the up current of a cumulus cloud formation sufficient to cross flat and hilly country alike, independently of the consideration of the surface.

The most important result is the ease with which great heights can be reached in the up currents of cumulus cloud formations. The second part of the flight gives fresh evidence of the value of the older established method of flying in the up currents from hills.

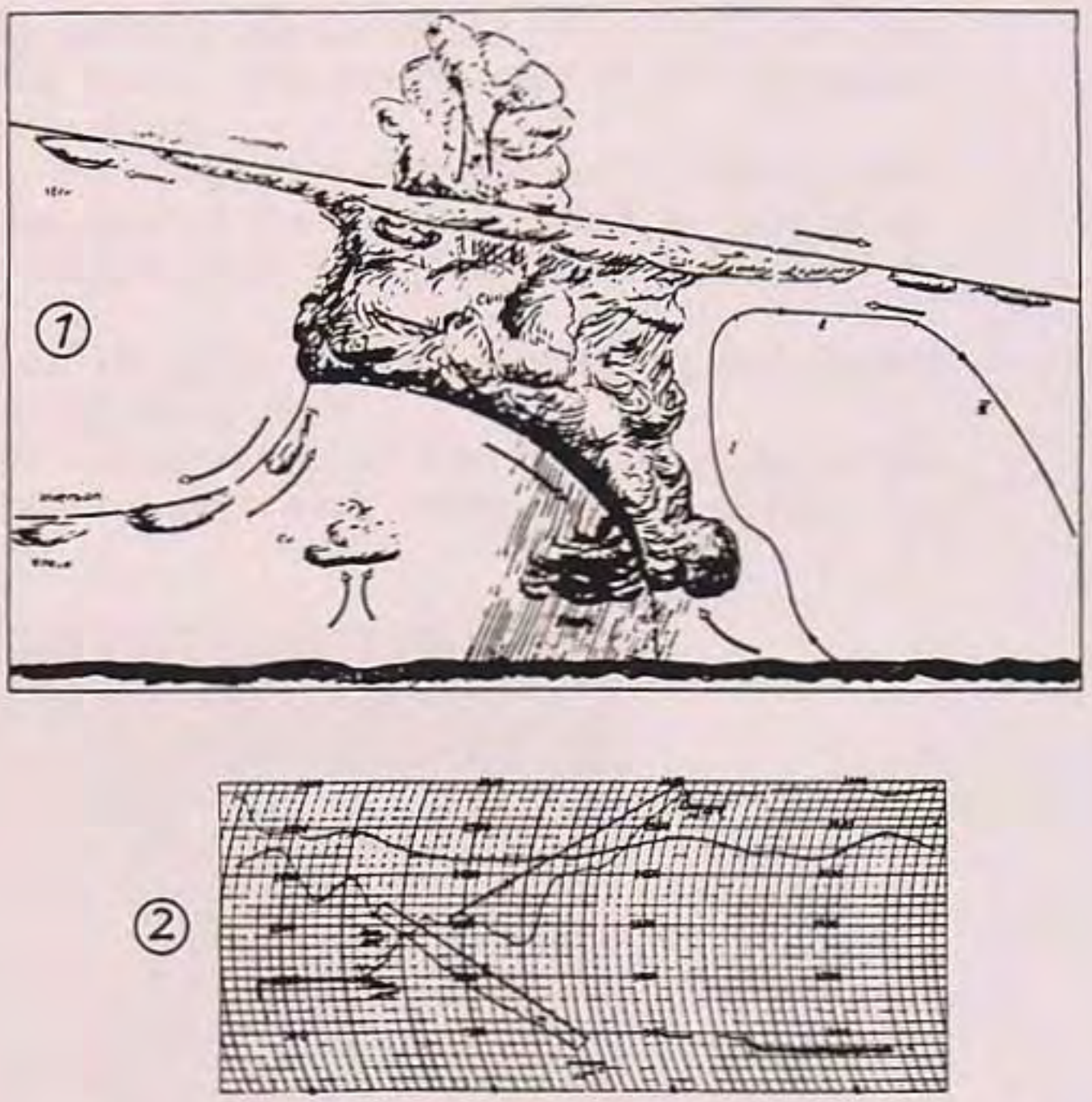

FIG. 27.
Route sailing-flight by Kronfeld of 143 kilometres in the face of a storm.
(1) *Representation of the face of the storm and the path of flight before it.*
(2) *Barogram of the flight.*

A more recent development of cloud flying is the use of up currents at the cold air fronts of line squalls, of which measurements with an engined aeroplane have been referred to. In this type of atmospheric disturbance masses of warm air are pushed up by the inrush of cold air along the surface of the earth.

Fig. 25 shows motion of the air caused by cold air flowing in under warm air (W. Schmidt).

In Fig. 25 the lines of flow show the local direction of the wind. In front of the line squall the air rises almost vertically and offers the best soaring region.

Fig. 26 shows Kronfeld's flight in front of a line squall (143 km.).

Fig. 27 shows the region of up-currents before the cold front, the barogram of the flight and the time changes in the line squall along the course.

Kronfeld started at the moment when the wind was freshening, just before the passage of the line squall, and by utilising the rising currents before the cold front rose 2,000 m. above the starting point. The middle part of the barogram shows that he then maintained steady flight.

The meteorological records determine the motion of the storm accurately, and in conjunction with the pilot's account lead to the conclusion that he flew about 2 km. before the front of the squall, rising or falling slightly as he was nearer or farther.

After turning away from the front the glider rapidly lost height and landed 143 km. from the Wasserkuppe after 4½ hours flight.

The knowledge gained as to the configuration of line squalls, leads to the conclusion that there is no danger if the pilot keep some distance before the advancing front.

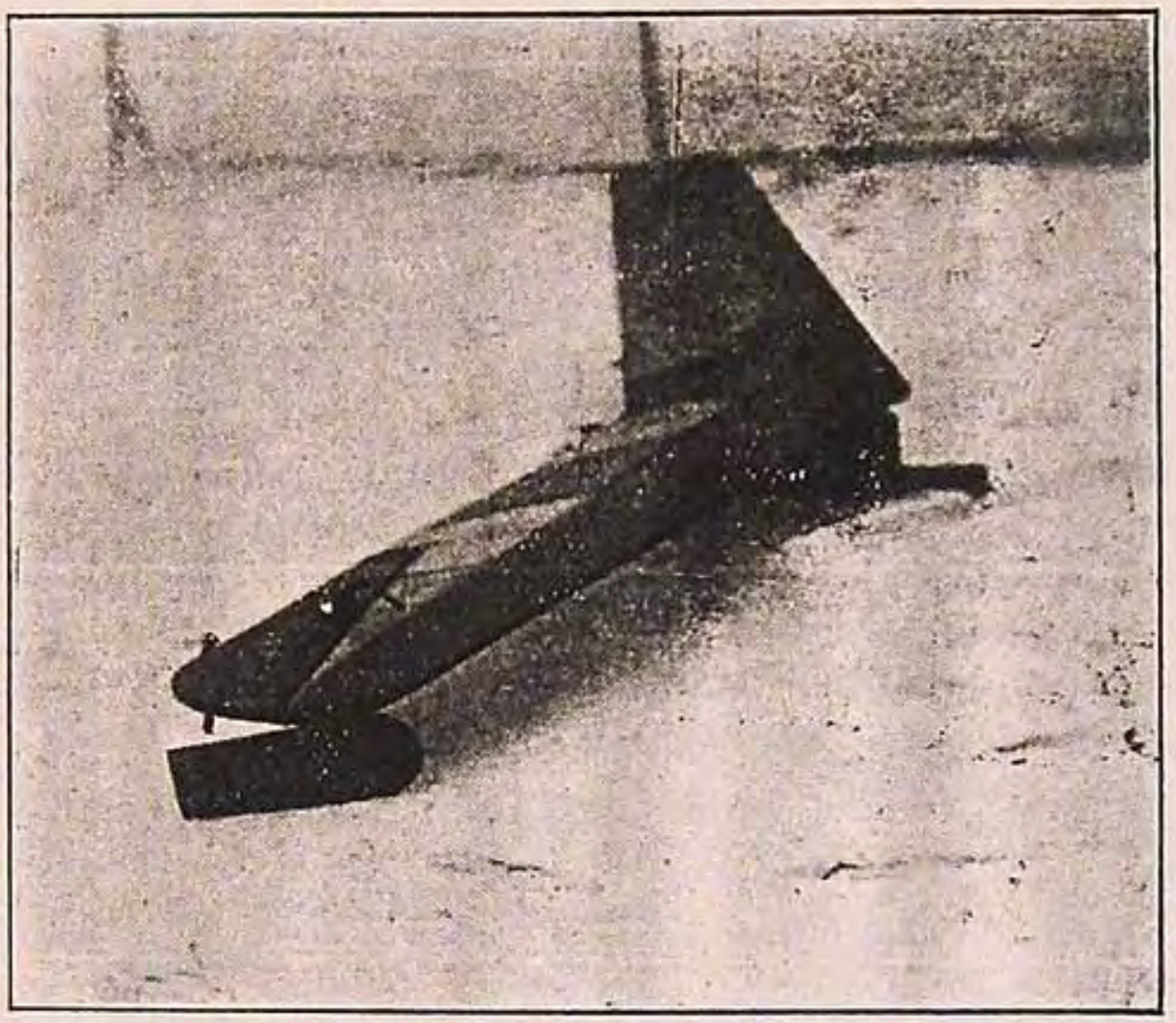

Fig. 28.
Tailless aeroplane "Storch" as a model.

It appears from recent investigations at the Research Institute of the Rhön-Rossitten Gesellschaft that heights of 4,000 m. to 4,500 m. above the starting point may well be attained, in comparison with the existing record of 2150, and that the cross-country record of 150 km. may be increased in like proportion.

Systematic experiments have been carried out by the Society with gliders towed by power aeroplanes and released at a sufficent height to reach regions of up-currents and to continue independent cloud flying.

The Prospects of Soaring Flying

The performances recorded above show that flying without engine power, by using the energy of rising currents in the atmosphere is already established. We cannot, indeed, expect it to meet the requirements of air transport, but its value as a sport cannot be questioned, and as such is on a high level in its demand for physical fitness, skill, quick decision and courage, and in addition a serious study of the scientific and technical problems involved.

Especially, soaring flight has had a beneficial effect on the design of light aeroplanes which now give performances with low engine power which were possible formerly with powerful engines.

The soaring glider with an auxiliary engine is unsatisfactory both as a glider and as a power aeroplane, and this line of development has been given up in Germany except for special research work.

The Research Institute of the Society has recently established a new and important system of aerodynamical tests of new aircraft types. In the first place free flights by large models of three to four metres span are carried out at small cost. When all that can be learned from the models has been recorded,

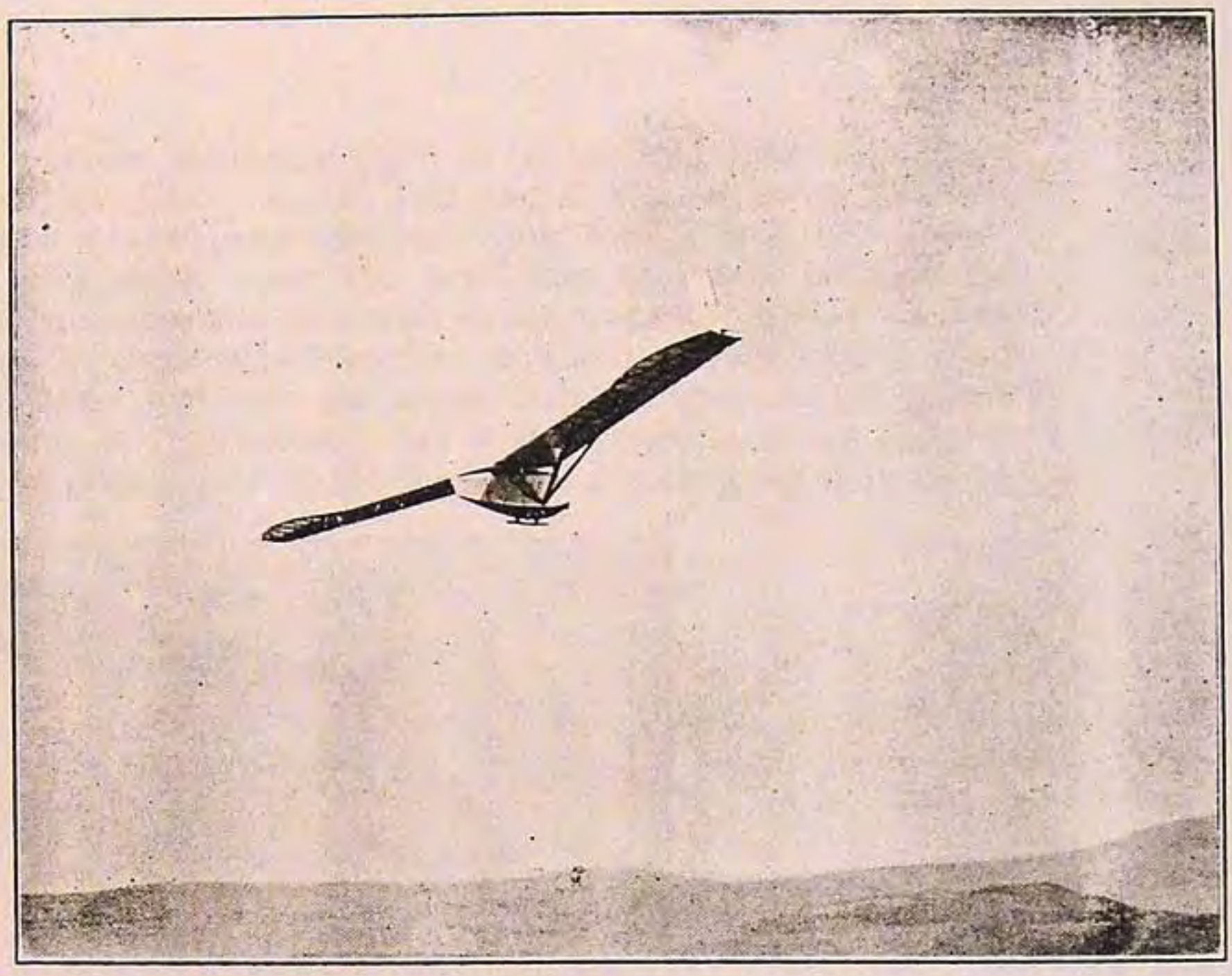

FIG. 29.
The tailless aeroplane " Storch " as a sailing aircraft.

gliders of similar aerodynamical form are built and tested by a pilot in different flying altitudes. Finally, an engine is fitted and ordinary flying tests are carried out. In this way the successive steps in the development of a new type are carried, with minimum of cost and danger, to a point where the design of the full-sized aeroplane offers no serious uncertainties.

The tailless " Storch " (Stork) was developed on these lines.

Fig. 28 shows the " Stork " in model size.
Fig. 29 ,, ,, in glider size.
Fig. 30 ,, ,, as a light aeroplane.

Fitted with an 8 h.p. engine it attained a speed of 125 km./hr., and attracted much attention at the Tempelhof Flying Ground by its speed, manœuvring and great stability, and gave impressive evidence in favour of this method of designing. The question remains whether gliding is a sound basis for piloting a power aeroplane. Opinion is divided, but it may be taken that gliding is a sound basis for further training, and soon tests the balance, touch and eye. But a pupil who has mastered every branch of gliding still requires comprehensive further training when he goes on to power aeroplane piloting. Of far more importance than the preliminary training in hand and eye, is the extension of piloting experience to the special lore of the currents of the air,

gathered in far richer measure during a flight of a hundred kilometres from hill to hill and from cloud to cloud, than in year-long flying on power aircraft. Such experiences will give a new generation of flying men a body of weather wisdom by which they may safely meet and even turn to useful purpose the atmospheric disturbances so frequently met with in air transport to-day. Pilots of this school will imitate the exploits of Kronfeld, and so far from fearing wind and weather will master them and ride the storm front in their flights across the land. The true meaning of " air sense " lies in this conquest of the variable atmosphere by the soaring pilot. Just as the master of a great liner must serve

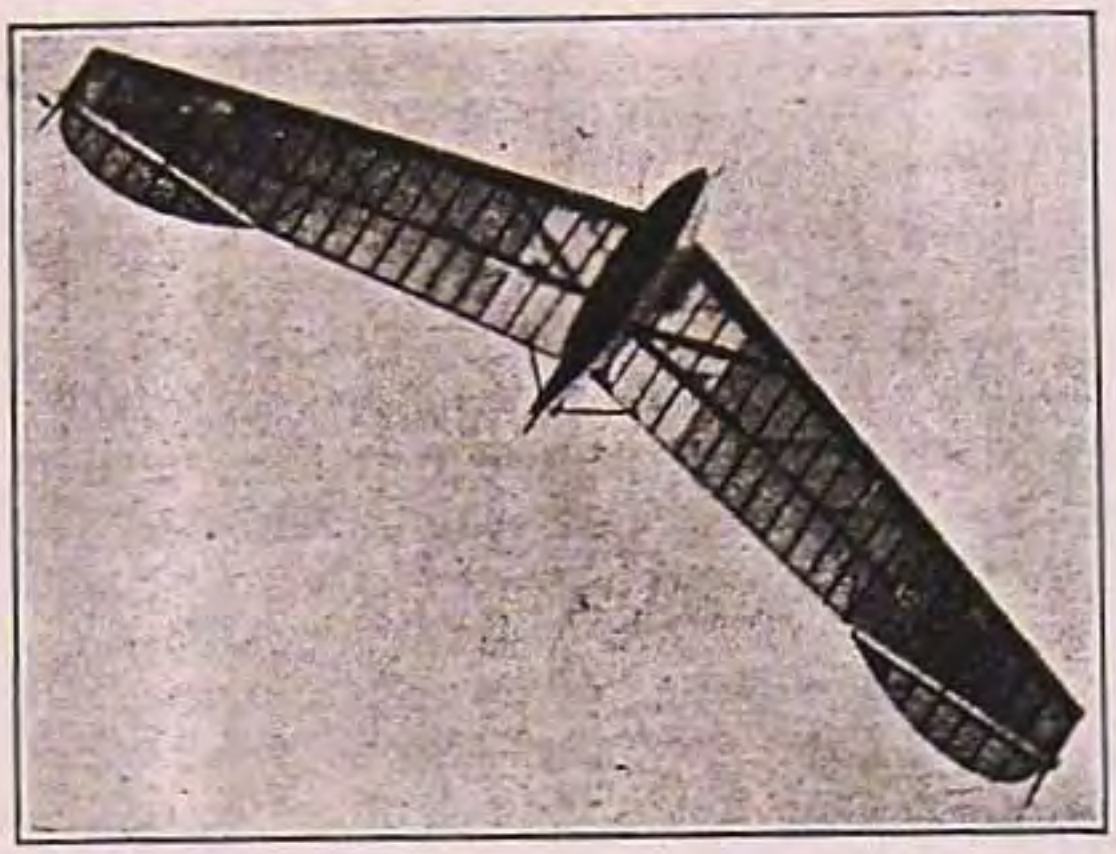

FIG. 30.
Tailless aeroplane " Storch " with 8 h.p. D.K.W. engine.

an apprenticeship in sail craft to learn the secret of sea and wind, so should the air transport pilot practise soaring flights to gain wider knowledge of air currents, to avoid their dangers and adapt them to his service.

In confirmation of this view, pilots with soaring experience have shown their special worth in the difficult Lufthansa service across the Alps.

It has not been possible within the limits of this paper to describe more fully the growth of soaring flight, its present activities, its new problems and its future scope. I would call in aid all civilised nations, and particularly your own, in advancing its achievements to a higher level and opening to its activities all regions of the earth, temperate and tropical.

May I conclude with the hope that the unusual combination of scientific and sporting interest will bring you to join us, in friendly rivalry, in opening the regions of the air to man by means of soaring flight.

CLUB REPORTS—*continued from page 4.*

The first general meeting of the club was held in London on February 20th and the provisional Committee was unanimously confirmed in office, and at the request of the Chairman two additional members were appointed. The Chairman (Mr. J. R. Ashwell-Cooke) then gave a brief account of the Committee's activities to date, and outlined the proposed policy of the club as drawn up by the provisional Committee. This was unanimously approved and a number of additional suggestions were made, which are at present under consideration. The meeting was then adjourned.

The subscription to the club is one guinea, with half a guinea entrance fee, and intending members should apply without delay to the Hon. Sec., L. Howard-Flanders, 44a, Dover Street, W.1. It is hoped to commence gliding before April.

THE FLYING SCHOOL AT THE WASSERKUPPE

BY

FRITZ STAMER

The site of the Flying School was selected on a gentle eastward slope about midway between the southern slope of the "Wasserkuppe" and the western slope of the "Weltensegler," a ridge running at right angles to the former, the slopes of which are most used for training glides. The hangar, 60m. by 12m., was built of timber, with a cantilever roof requiring few supports and with drop doors at each end. The pupils are boarded at the school for convenience and for better supervision and direction of their spare time activities. It was also necessary to provide workshops and offices, and quarters for the mechanics and instructors and for the head of the school. A single building, also 60m. by 12m., adjacent to the hangar contains living quarters below, and a workshop above; a long central passage leads to a hall, on the south side, off which are the quarters of the Director of Research and of the Head of the School, and the kitchen premises; on the north side a woodworking shop equipped with a combined plane and shaping machine, a combined circular saw milling and slotting machine, and a hand saw. On both sides of the passage are pupils' rooms, each equipped with four beds and four cupboards, etc., and accommodating four pupils. From 25 to 30 pupils can be boarded normally, but in recent years the average has been 40 to 45, the additional pupils being boarded in an annexe not far from the school buildings. Off the passage there are also reading and writing rooms and a wind channel room for experiment and instruction. On the south side are a few guest rooms, and instructors' and mechanics' quarters. Two covered passages connect quarters and hangar, and off these passages are sick bay, bath room, large washing room and laundry. Above the machinery is a materials store. The rest of the upper floor is occupied by the school workshop lit by a long skylight. It has benches for 12 to 15 mechanics, a lathe, drill, and welding plant for metal working, and wood working equipment. Electric lighting and power is installed. This building, like the hangar, is entirely built of timber, with double boards and sandstone filling, and with untarred papier maché roof. The central heating plant and coal store are in the cellar under part of the residential building. Water is pumped electrically from a small well, sunk in the hillside, into tanks in the school building. Common meals are taken in the dining hall, and instruction is given in the large lecture hall, both in Ursinus House. Lectures are given by the instructors and by Heads of Sections in the Research Department. The sheds in the neighbouring "flying camp" have also been taken over.

The beginners' course includes pupils holding only the A certificate for glider pilots. Pupils who have passed the B glider test or who hold full pilots' certificates are classed as advanced.

In a session of seven months from 200 to 250 pupils pass through the course, and fifteen gliders of five different types are in constant use:—

6 of Zögling type for beginners.
3 of Prüfling type for soaring practice.
2 of Hangwind for soaring in light winds.
2 of Canossa two-seaters for soaring.
2 of Professor type for high performance soaring flights.

—

15 total.

In the past year out of 269 pupils 139 passed the A test, 121 the B test, and 30 the C test. A course lasts for four weeks and concludes with the B test for pupils of moderate skill. Approved pupils then take the advanced course of four weeks' further training for the C test and for all types.

Methods of Training

Solo piloting only is taught in all German gliding schools. The instructor explains the conditions of steady flight and the effects of the controls, warns the pupil against common mistakes such as stalling and abrupt movements of the controls, and advises him to hold the control firmly centred and without movement during the first glide. The glider in use for this stage was designed from years of experience with a special view to avoidance of accidents, and cannot soar. It is towed over level ground for a short distance and is released when it reaches a limited height. In this way the pupil practises hops without much danger, even in a stalled landing, until he ceases to make false movements and can hold a steady glide. Solo instruction makes the pupil rely on himself from the beginning, while the presence of the instructor might give a false impression of competence. As the initial hops just clear the ground by a few centimetres the instructor, from the ground, can observe the pupil closely and estimate his progress accurately.

Instruction with dual control has been carried out with success, especially in clubs with a small number of pupils, for which it has certain advantages. But the greater complication of the dual control glider, and the greater calls on the instructor's time, prevent its adoption in schools. When a more suitable two-seater design has been evolved, dual control may become more important. At present a two-seater glider with low wing loading and a good gliding angle must have an undesirably large span and inertia.

In the Wasserkuppe district the best slopes for gliding practice face from S.E. by S. to N.W., while the prevailing winds are westerly. The slopes facing N. and E. are also good, so that the general lie of the ground is almost ideal.

For training and practice grounds there should be no ground obstructions within the gliding range, as beginners may lose direction or height at any moment, and the ground should have a fairly soft surface such as loose sand, moss, or slightly marshy soil, to mitigate bad landings.

For soaring flight by experts good starting and landing places within the range of flight are the only local ground requirements, and general suitability is judged by the prevalence of rising winds over a considerable area, such as a fairly long ridge, along which the pilot can soar to and fro without frequent turns, which are tiring and lose height. A horse-shoe ridge facing the wind and catching it as in a funnel sets up strong rising currents and offers good turning points at the ends.

To return to the early stages of training, there should be a choice of courses offering progressive difficulties. A slope with an angle equal to the gliding angle enables the pupil to glide for a hundred metres or more while a false manœuvre forces him to alight before his glider has time to assume a dangerous position. (In general, of course, flying near the ground is not specially safe).

As the pupil satisfies the instructor he is taken by slow stages further up the slope until he is able to pass the A test—a flight of at least 30 seconds in a given direction to a fixed landing point. From half-way up the slope he is able to practise turns, and proceeds by further stages until he gains the necessary confidence and skill to take from the higher slope the B test—a flight of at least 60 seconds, with right and left turns round given marks, to a fixed landing point. Twenty or thirty flights on the Zögling type are sufficient for the A and B tests. Towards the end of the four weeks' course the pupil is transferred to the " Prufling " and " Hangwind."

Pilots in the advanced class have usually had preliminary training at a flying school, and begin at once on high performance machines, making long flat figures of eight turns in a region of rising wind, and developing thereby the soaring sense. After a further twenty or thirty flights—forty or fifty flights in all—the pupil takes the C test, which requires a flight of at least five minutes with continuous gain of height, altitudes of 200m. to 300m. above the starting point being not uncommon. The course is concluded by instruction on a high performance glider in which the C test is again passed.

There are, each year, one or two courses in long distance flights and in cloud flying for pilots holding the C certificate.

Starting.—The method of starting evolved by years of experience is as follows :—A rubber cable is passed through the ring hooked on to a hook attached to the glider. Two members of the starting party hold the ends of the cable and others hold the tail of the glider. The former walk forward till the slack is taken in. On a signal they run until the length is doubled, where, on a second signal, the tail is released, the glider slides forward, and gains speed till flying speed is reached. At the same time the tension in the cable decreases to nothing, the ring drops from the hook, and the glider is in free flight.

The flight is timed from the instant that the ring drops. The start resembles, closely, the start of an engined aeroplane against a wind.

Instruments.—No instruments are fitted to gliders for elementary instruction, and the pupils thereby develop an air sense. On long distance soaring flights, a light compass is essential to determine the direction of path and wind. The air speed is determined by pitot tube, the scale being calibrated in metres/sec. High performance machines carry a sensitive barograph, giving the change in height to the nearest metre. Sealed barographs are carried in competition flights and in attempts on records. In research flights pressure gauges and inclinometers are fitted, and meteorographs are carried for recording air conditions. The course includes lectures, and in unfavourable weather the pupils assist in the workshops in building and repairing gliders, which gives them experience in design and construction.

Objects.—The objects of the school are to give sporting facilities to keen young men at small cost, and thus to promote formation of private gliding and soaring clubs in Germany, to give training during vacation to academic aviation groups formed of students of aeronautics, and to give theoretical and practical experience to professional pilots of engined aeroplanes.

THE CHOICE OF A GLIDING SITE

The ideal type of gliding hill is of horse-shoe shape with the centre facing south-west. There should be as little in the way of trees, roads, hedges, or rocks, as possible. The height of the hill need not be more than about 100 feet, but it should open on to a plain. The gradient may be 1 in 6 or 1 in 8. Very steep gradients are inadvisable except for highly efficient pilots. If the hill is in such formation that a little work could also be done on the easterly side, it is an advantage, enabling school work to be carried out on those rare occasions in which the wind is in that direction.

The minimum dimensions of the gliding ground should be $\frac{1}{4}$-mile long and 200 yards wide, free from obstructions, if instruction for class " A " and class " B " certificates is to be undertaken.

It appears that the expert sail pilot will take his machine out (in Germany) in winds up to 70 m.p.h., and that this new type of craft is more easily navigated in bad weather than is the power-driven aircraft, in fact it rides on the wings of the storm.—L.H.F.