hut. Gasparotto, finding himself friendless, as Herron and Singer were late in getting back from Suanetia, made the first attempt alone, reaching a height of 4900 m. by way of a difficult glacier beyond the Priud hut which, he tells me, is somewhat like our 'fixed bivouacs' in the Alps, without, however, their equipment. Bad weather drove him down again. Meeting with two Austrians, Slezak and Tomascek, he arranged to make the attempt with them. Thus on August 13, after overcoming many difficulties, he set foot on the second summit of Elbruz, the highest mountain in Europe: a 'first' ascent on ski.

I had been touring meanwhile, visiting the chief towns of Russia and highly interested in the many things I had seen and observed. On August 24 I got back to Milan and, on the Monday, the 26th, resumed my daily occupation; for the superiority of mountaineering over all other sports is that it never becomes, and, let us hope never will become, however mildly, a profession. It offers no scope for profit, only a means of obtaining perfect satisfaction.

[We wish to express our indebtedness to Count di Vallepiana for his interesting paper.—*Editor*, 'A.J.']

VARIOUS NOTES.

The South-East Face of Mont Maudit.

The bad weather of August 1929 disappointed a number of mountain lovers eager to make big ascents in the Alps, but fortunately an unusually long spell of fine weather was enjoyed almost at the end of the season. At the beginning of August my friend, Mr. F. S. Smythe, attempted to work out a new direct route up the Italian precipices of Mont Maudit, with Messrs. Parry and Harrison of the Scottish Mountaineering Club. They bivouacked at about 1000 ft. up the cliff, but, assailed by a heavy snowstorm during the night, were forced down to Courmayeur at daybreak. On the moraine on the E. side of the Brenva Glacier, Mr. Parry had the misfortune to hurt his knee so badly that he had to be carried down to Courmayeur. Two days later it was arranged that I should take the place of Parry, but owing to continuous bad weather, I was unlucky enough to be unable to make the trip in such congenial company. This intended expedition ended gloomily, and a disheartened party returned to England.

On my arrival again at Chamonix at the beginning of September, I heard that some Italians were after the same climb.[1] The weather

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[1] The first ascent was made on August 4, 1929, *A.J.* **41,** 403.—*Editor.*

had been splendid for days, and snow and ice conditions seemed so ideal that I got busy getting into training by traversing the Grépon and the Drus with an excellent Zermatt guide, Gottfried Perren, with whom I had frequently skied and climbed, after which we determined to try the Italian face of Mont Maudit together.

Saturday, September 14, witnessed our departure from the Requin Hut in glorious sunshine, whence we proceeded over the Géant Glacier to the Col de la Tour Ronde, intending to cut steps over that col down to the Brenva Glacier. Since August snow and ice conditions had changed for the worse, and the traverse of this col was out of the question. We then decided to go over the *Col Occidental* instead. This was also pretty bad; and we went farther N. to try the bergschrund; there a feeble ice bridge which, on being tested by Gottfried, collapsed as expected, but moving still farther N., we found a more or less secure bridge. Gottfried was now furiously cutting huge steps traversing the steep ice-slope of about 65° towards some rocks on our left. Meantime, I was getting uncomfortably cold in spite of the autumn sunshine. In due course the whole length of a 65-m. rope was stretched tight and the guide began to help me up. As we got higher, ice and snow conditions improved, and hard stamping on splendid snow kept me quite warm. Owing to our late departure and the bad conditions of the séracs above the Requin Hut, we did not reach the col until 2.30 P.M. Now the weather was changing rapidly; the tops of Mont Blanc and Mont Maudit had disappeared behind clouds, and we gave up all idea of descending right down to the Brenva Glacier. We followed the same way down as a month before, when Professor T. Graham Brown was with us investigating the Brenva face of Mont Blanc. As my guide generally cut the steps on our upward route, it was my job to cut them on the downward. It began to snow a little, and we gave up step-cutting when we had crossed the couloir, as the angle looked much more gentle and we thought it unnecessary. This is the best viewpoint of the S.E. face of Mont Maudit.

On the Géant Glacier, before reaching the Col des Flambeaux on the way back to the Rifugio Torino, we were caught in a heavy hailstorm. At the hut the keeper told us that three Italians had made a new route up Mont Maudit,[2] but no details of their route could be obtained. We were told also that one of the Italian party was in hospital at Aosta for treatment of frost-bite in his fingers and toes.

On Sunday Gottfried dashed down to Courmayeur to attend church, returning in the extraordinarily quick time of $3\frac{1}{2}$ hrs., as he did not want to be seen by Fascisti! We discussed our route and worked out four different possible ways up our proposed face, but we agreed to begin on the right (E.) of the central couloir and finish up somewhere on the right of the summit ridge (a good way

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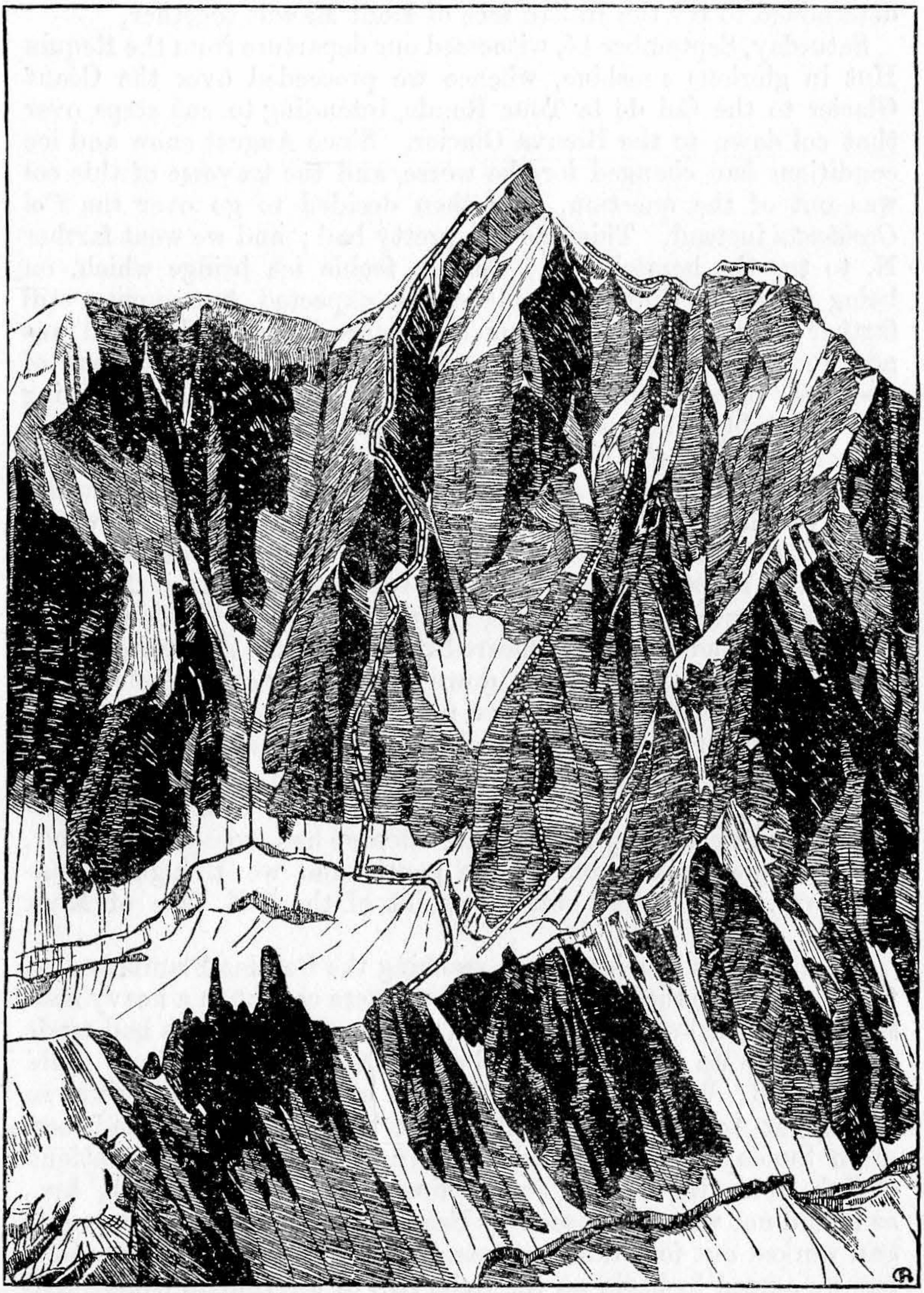
[2] *A.J.* **41,** 403.

to the E. of Smythe's planned route). We knew it would be very hard going at the beginning and end of the rocks, but in the middle, once we had gained the small ridge, it appeared to become



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MONT MAUDIT, S.E. FACE.

'Chabod' route (left), 'Kagami' route (right).

easier. The great peaks were free from clouds; the barometer kept steadily high.

At 3.10 on Monday morning, September 16, we left the hut under a clear starlit sky. The silence between us showed the impressiveness of our task. The big steps we had cut on the Col Occidental [de la Tour Ronde] were covered with new snow, but they only needed clearing. Rock-climbing in the dark with a lantern is not pleasant. When we had gained the col, light began to show in the east; hurrying across the couloir on the Brenva Glacier side, I cut small steps down to the glacier itself. We proceeded to the foot of our red granite face some 4000 ft. high, and there hunted for an ice or snow bridge over the huge continuous bergschrund: but there was none. Finally, we decided to jump over the gap, which was at least 9 ft. wide and very deep. Neither of us liked the look of it, and we tossed up for the first jump. I won and Gottfried prepared for the leap, while I stood ready to hold him in case he slipped; we also lowered a second rope down on the chance that it might help him to clamber out if he fell into the chasm. Gottfried got over, and, after sending the sacks across and enlarging the landing-place, my turn came. It was the biggest jump I have ever made over a crevasse, and had not the landing been a little below the take-off we would never have got over successfully.

Looking up from the Brenva Glacier at the height of 3500 m. (the foot of Mont Maudit), the rocks on the left (W.) side of the central couloir appeared much easier than those on the right (E.), but I was glad we were not on the left side, as from where we stood we could see the true angle of the nasty buttress. We began our climb straight away, as it was now after 7 A.M. and small stones were falling continuously in the couloir. Had we begun on the other side, the traverse of the couloir to the sheltered rib might have been impossible. The stones whizzed through the air on our left, but happily we were in absolute safety. We began climbing slowly on firm granite; in a way it was too smooth and gave us a lot of difficulty, so Gottfried accordingly changed into *Kletterschuhe*.

On this ascent one has to be prepared to face hard climbing on awkward rock almost all the way, but the face is safe from the danger of falling stones.

At the beginning of our ascent the best route lay to the W. towards the central couloir, as the E. couloir was much too precipitous. After 800 ft. of climbing we came to an *impasse*; an overhanging crag above and smooth slabs to either side. We *descended* a rope's length, finding a hand-traverse to the left for about 30 ft., then up again, following an almost vertical chimney with sufficient room to wedge a knee. We had already struck three chimneys where we had to go up without our sacks and haul them up afterwards, but this step was the toughest proposition of all, surpassing anything on the Petit Dru, as the rocks were icy in

parts and provided with only tiny hand- and foot-holds. I gave Gottfried a shoulder, but after one attempt he came down for a rest before making a fresh start. Tea and biscuits reinvigorated us. I suggested fixing a piton in the rock, but Gottfried sportingly wished to have another try without it. This time he went a little higher, but after a while I heard a sudden loud shout from above: 'My fingers don't shut or open!' I guessed what he meant by it and made the rope very secure. He told me afterwards that it was the first time his fingers had been affected with cramp when climbing. He fortunately wedged his knees and was able to support the weight of his body. Soon he started again and in a few seconds was up. The sacks (and myself) were then pulled up. We had now reached the commencement of the intended rib, and we could perceive the right-hand or E. couloir where water melting from a corniche above was pouring down. As we expected, the climb on the rib was not too difficult, as the rocks were excellent, and I took the lead in order to give Gottfried a rest. We occasionally struck snow patches, and Gottfried changed his *Kletterschuhe* to ordinary boots, thus affording me much relief as I had to carry them!

By noon we had reached the end of the rib and were just below a huge square tower of smooth-faced rock. To continue straight up was impossible, and we surveyed the prospect while making a short halt. We had previously picked out this obstacle from the Rifugio Torino through a powerful telescope and thought we could detect a possible chimney on its right, but it was hidden behind the corner, and the job was to locate it. After a short rest and erecting a cairn (about the fifth we had built), we *descended* a chimney leading down to our right-hand or E. couloir by means of an 180-ft. spare rope. A traverse along the face still to our right leading into the couloir took us fortunately to the right spot. Here was the chimney we expected, but it was clogged with ice. For the fourth time Gottfried climbed on to my shoulders. (Later, at the corniche, I had to act as footstool for Gottfried for a few minutes before the overhanging snow could be hacked away.) Looking up from the top of the chimney a corniche of enormous size led right along the sky-line, a most impressive sight. Taking turns, we began cutting steps in hard ice, zigzagging up to the base of the corniche where we struck better snow under the overhang. Right or left we wandered along the wall trying to find a spot, whence we might gain the snowfield above. On our right there was no accessible place in sight, so we had to go round to our left, coming across projecting ice half-way up on the wall. Gottfried conquered the icy step by standing on my shoulders.

By 2.15 P.M. our difficulties were over, but had it not been for the skill and energy of Gottfried Perren the attempt would have ended in failure. On the upper ridge we had hoped to take our first good rest, but it was not to be, as bad weather was coming up over the Gran Paradiso. We raced up to the summit, arriving

there at 3.20, and thence descended straight down to the Col du Midi without going round the Col du Mont Maudit. The crevasses were very open beyond the Cabane du Midi, and heavy hail was encountered thenceforward.

Snow fell throughout the following day.

T. Y. Kagami.

[Mr. Kagami's route lies far to the E. of that accomplished by Signori Cretier, Binel, and Chabod, some six weeks earlier.—*Editor.*]

A Note on the Watch-Type of Aneroid and its Use.

This note is written in the hope that it may be of use to Alpine parties carrying an aneroid, usually of the watch-type, to indicate weather changes and the heights attained. Its use for the latter purpose does not seem at present to be entirely successful, and aneroid heights are always regarded with grave suspicion. Whymper, describing his experience of two aneroids in the Andes, relates that 'the index of one instrument became immovable and the other was afflicted with a quivering action which set observation at defiance.' Since that time advances have been made in the design of these instruments, and within the last fifteen years the errors likely to occur have been closely studied. The causes of the most important errors, avoidable and unavoidable, are described below, and some idea is given of their magnitude.

The aneroid barometer has two distinct functions to perform. It must first determine the atmospheric pressure and then give a height reading corresponding to the pressure.

Its accuracy in determining the first of these quantities is much lower than that of a mercury barometer. It should therefore be adjusted against a mercury barometer on every possible occasion. An aneroid is called 'compensated' if it is designed to give a reading at sea-level independent of the temperature. It does not follow that the reading at low pressures will be unaffected by the temperature. A simple test is to see if the reading is altered by the warmth of the hand.

More important is the error known as 'creep.' If an aneroid is subjected to a low pressure its pressure reading will not remain steady at the same pressure, but will show a further gradual fall, which may continue for days before ceasing. As an example of this variation with time, the reading of an aneroid subjected to a change of pressure from 30 to 22 ins. of mercury fell $\frac{1}{20}$-in. in the first 2 hrs. and a further $\frac{1}{20}$-in. in the next 18 hrs. If the pressure be restored to its initial value, the aneroid will at first read low. 'Creep' will then occur in the opposite direction, and the reading will slowly rise to its original value.

This error can be minimized by keeping the instrument, when not in use, in an air-tight tin, in which the pressure has been raised to 30 ins. of mercury by means of a bicycle pump. In the Watkin aneroid the same effect is produced by a device which relieves the diaphragm of the forces on it.

In a good instrument the mechanical errors due to friction and backlash are very small; though when reading the instrument it should always be held in the same position and lightly tapped.

The Paulin aneroid[1] avoids some of the errors mentioned above, but at present it is not made in a pocket size.

The problem of interpreting the pressure readings must now be considered.

The height scales of English-made aneroids are usually graduated from a formula which assumes that the sea-level pressure is 29·9 ins. of mercury and that the atmospheric temperature is constant at 50° F.

An error is caused by adjusting the height scale to changing sea-level pressures. This error increases steadily with height, and amounts to over 1000 ft. at 15,000 ft. if the sea-level pressure alters $1\frac{1}{2}$ ins. from its standard value. This error can be avoided at the cost of a small complication by fixing the zero of the height scale opposite the pressure reading 29·9 ins. The difference of level of two points is then the difference of height indicated on the height scale. For example, suppose at a hut of known height 10,240 ft. the aneroid adjusted as above gives a reading 10,790 ft. If in the course of an expedition the aneroid indicates 15,770 ft., the true height will be [15,770 ft. — (10,790 ft. — 10,240 ft.)] = 15,220 ft.

A closer approximation to the height attained can be found if the aneroid height be read on return to the hut or other point whose height is known. By taking a mean of the two readings the variation of the sea-level barometer during the day can be allowed for.

Equally serious is the error due to the fact that the atmospheric temperature has not a constant value of 50° F. If temperature observations are made during the expedition and calculations afterwards carried out, the correction for this error can be determined, but the process is far too lengthy and troublesome to be practicable for the ordinary party.

This difficulty is, of course, just as troublesome in aviation. As a result of a great number of observations of air temperatures at different heights, the International Commission for Air Navigation has recently adopted an 'International Standard Atmosphere.' This is to be taken as a basis when computing formulae for the graduation of aircraft altimeters. This atmosphere is assumed to have the following properties. At sea-level the temperature is

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[1] *A.J.* **40,** 360–2.

59° F. and the barometer height, reduced to 32° F., is 29·9 ins. The air temperature decreases uniformly with height at the rate of 3·57° F. per 1000 ft.

These relations do not apply precisely to the British Isles, where the mean annual ground temperature is about 48° F., but they represent with fair accuracy average conditions over the whole world. They are much superior to the isothermal assumption of 50° F. At 15,000 ft. the difference between the formulae amounts to over 500 ft. It is greatly to be hoped that instrument makers will at once adopt this standard atmosphere.

A. M. Binnie.

Fuller information will be found in the following :—

E. Whymper. 'How to use the Aneroid Barometer.' John Murray, London, 1891.

Sir Richard Glazebrook. 'Dictionary of Applied Physics,' vol. iii ; articles entitled 'Atmosphere, Physics of the' ; 'Air, Investigation of the Upper' ; 'Barometers and Manometers.' Macmillan & Co., London, 1923.

A. R. Hinks. 'Maps and Survey.' Cambridge University Press.

International Commission for Air Navigation, Official Bulletin No. 7, 1924.

IN MEMORIAM.

GEORGE FORREST BROWNE.

(1833–1930.)

By the death on June 1 of the Right Rev. George Forrest Browne, D.D., etc., sometime Bishop of Stepney, and later of Bristol, at the age of 96, the Alpine Club has lost its oldest and one of its most gifted members. His was a remarkable personality, and his long life was one full of valued and varied service to University, Church, and State. He was a born organizer, of great distinction as an antiquary, and a historian, in the latter case doing invaluable work in impressing upon the English people the true *origines* of the National Church.

He was born on December 4, 1833, under the shadow of the strong and splendid walls of York Minster, with which famous cathedral he was closely connected on the side of both his parents. In addition, he was educated at the ancient school of St. Peter's, York, with which are also associated the names of a number of our most distinguished members—Charles Hudson, Tempest Anderson, Clifford