REPORT ON TENSILE TESTS made on two samples of Climbing Ropes sent by Sydney Spencer, Esq., Hon. Secretary, Alpine Club, 23 Savile Row, W. 1, for whom the tests were made.

Two samples of rope were submitted, of which the distinguishing marks, approximate descriptions and weights (estimated from a length of about 30 feet) are as follows :—

N.P.L. Eng. Dept. Test mark.	Sender's marks.	Approximate description.	Estimated weight per 100 feet length in lbs.
EZF 1	'Frost's rope'	3 stranded left-handed cotton[1] rope	4·63
EZF 2	'Beale's rope'	3 stranded right-handed white manilla	5·61

Method of test and preparation of specimens.

The end of each specimen was spliced carefully round a thimble of large diameter, so that the free length between the end of the splices was about 5′ 2″. A steel bar, passing through each thimble, was attached to each straining head of the tensile testing machine. It is accepted that the breaking strength and energy absorbed value depends, to some extent, on the rate of straining. For this reason, an absolutely uniform rate of straining was adopted throughout the tests, the actual chosen rate being low, and equal to 0·6 inches per minute.

An initial load of 0·01 tons (22·4 lbs.) was applied to each specimen ; a gauge length of exactly 5 feet was then marked off. Straining of the specimen was then commenced, the value of the extension being read off at each increment of load equal to 0·02 tons, until the specimen fractured. From these readings, load-elongation diagrams were made from which the area under each curve (equal to the energy required to fracture) was estimated.

The results obtained are given in Table 1 (p. 326).

The load-elongation diagrams obtained from the four samples, EZF 1A, EZF 1B, EZF 2C, and EZF 2D are reproduced in the accompanying print C.26/556.

With regard to the tests on samples of Beale's rope, it will be seen from Table 1 that one sample, EZF 2D, gave a much lower value than the other sample EZF 2C. There is no doubt that it is a genuine value, as this sample broke in the *middle* of the test

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[1] This is incorrect : the rope is made of 'Italian' hemp ; see p. 326. —*Editor*.

portion. However, it was decided to find the breaking strengths of two other samples, and samples EZF 2A and EZF 2B were

TABLE 1.

Sender's marks.	N.P.L. test marks.	Breaking load. tons.	Breaking load. lbs.	Extension at fracture measured on a length of 5 feet. inches.	Energy to fracture. inch. tons.	Energy to fracture. ft. lbs.	Remarks.
'Frost's rope.'	EZF 1A	0·96	2150	5·56	1·87	349	Broke just clear of splice
	EZF 1B	0·88	1970	5·24	1·56	291	,, ,,
'Beale's rope.'	EZF 2A	0·99	2215	—	—	—	,, ,,
	EZF 2B	1·00	2240	—	—	—	,, ,,
	EZF 2C	1·06	2375	9·55	3·07	573	,, ,,
	EZF 2D	0·86	1925	9·24	2·58	482	Broke at centre of test length

broken. These gave results a little lower than EZF 2C. The variability in the strength of Beale's rope should be noted.

As shown in Table 1 and the load-elongation diagrams, the samples of Frost's rope gave results which are in extremely good agreement.

C. JAKEMAN.
p.p. Director.

The results of these tests having been forwarded to British Ropes Ltd. (Frost) and Mr. Arthur Beale, we publish the reply of the former and regret that owing to its highly controversial tone we are unable to print that of the latter.

September 7, 1931.

With reference to the report on the tests of Beale's rope and ours, which will appear in the ALPINE JOURNAL, we have now had the opportunity of looking carefully into the comparative tests.

We would draw attention to the fact that our rope is described as cotton rope, whereas it is in fact 'Italian' hemp rope.

In looking at the tests the first thing that is observed is that no size is stated, and this of course rather upsets the comparison, as it is obvious from the fact that Beale's rope weighs heavier than ours that theirs is a larger size.[2] The only way to strike a correct comparison in the absence of size is to work the breaking strain to a

[2] As a matter of fact, the 'size' of both ropes is practically the same; the Frost rope is lighter than Beale's.—*Editor*.

pound per pound per fathom weight basis. By this method we arrive at the fact that our rope gives 7440 pounds per pound per fathom weight against Beale's 6520 pounds per pound per fathom weight. These figures are arrived at by using the average of the various tests and clearly show that on an equal size our rope is vastly superior, from a breaking strain point of view at all events.

As a further comment we should like to draw attention to the fact that the elongation of our rope compared with Beale's when a load of 0·2 tons has been placed on the ropes is much less, and in our opinion this is of some importance, as it would tend to prove that Beale's rope is of a more spongy nature than ours.

With regard to the breaking strains of our ropes, which are given as 0·96 tons and 0·88 tons respectively, we are at a loss to understand how such a low breaking strain has been obtained, since in order to check this breaking strain we have to-day taken two tests from our $1\frac{1}{4}''$ circ. Alpine rope, taken at random from our stock, and these have given a breaking strain of 27 cwt. and $26\frac{1}{4}$ cwt. respectively, or, taking the average of these two and converting them to the pound to pound per fathom weight method mentioned above, the figure of 11,307 pounds per pound per fathom weight is obtained.

We do not understand one of the tables in the test, viz. the 'Energy to fracture,' and we should very much like to have this explained.

We think it only fair that we should draw your attention to the above, since, in view of the purpose for which Alpine ropes are used, the respective breaking strains are of very great importance, and the user should be in a position to know exactly what may be expected from similar size ropes made by different manufacturers.

We should be happy to give you any further information you may require.

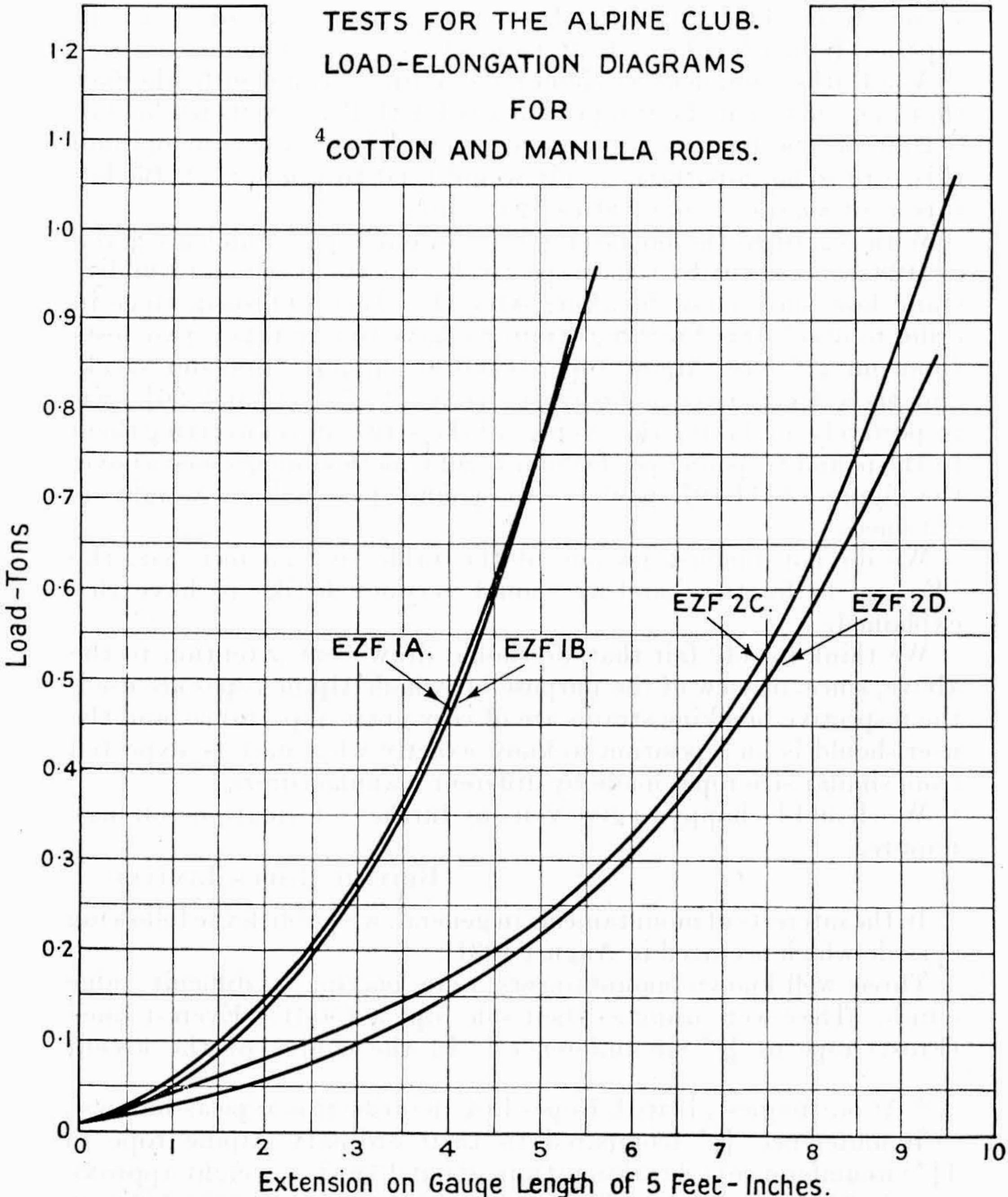
British Ropes Limited.

In the interests of mountaineers in general, we publish the following episode which occurred in August 1931 :

Three well-known mountaineers were making a difficult ridge climb. They were using as their sole rope a 150 ft. 'Everest line' (Frost) rope of $\frac{15}{16}''$ circumference.[3] In the course of the ascent

[3] At our request, British Ropes Ltd. describe this rope as follows : 'Circumference $\frac{15}{16}''$ (compared to their ordinary Alpine rope of $1\frac{1}{4}''$ circumference) ; breaking strain about 13 cwt. ; weight approximately 3 lbs. per 100 ft. The corresponding figures for the $1\frac{1}{4}''$ rope would be about 27 cwt. and 5 lbs.'

The $\frac{15}{16}''$ rope (or line) was at first used on the 1922 Everest expedition as a spare rope to be attached by pitons to the steep ice slopes leading to the N. Col. It proved so strong and satisfactory that it was employed as a climbing-rope in the latter stages of the assault.—*Editor*.



[4] Should read 'Italian hemp.'—*Editor.*

the last man, owing to extraneous causes, slipped and fell. The party was ascending diagonally at the time, over difficult rocks and ice, and below the actual crest of the ridge. As a result of the fall of the last man, the second man was pulled off and both he and the third man were swung into space. We give the concluding episode in the leader's own words: '*Twice* indeed the rope held in spite of the double fall into space. I will add that its thinness in this case proved an unexpected advantage as, owing to this fact, it slipped gradually through my fingers, causing it to act as a brake instead of giving me a violent shock which would doubtless have pulled me off as well. It is due to the light rope that my companions were saved, when we were all so nearly killed. The rope held *most admirably*.'

We may add that the said rope was in its *second* season, but had not suffered from being used on difficult rocks.

We shall not, of course, be suspected of favouring the light 'line' at the expense of the far stronger, Frost or Beale, ordinary Alpine rope.

Wide Angle Stereoscopic Photography as a means of Prospecting Mountains from a Distance.

Some years ago it occurred to the writer that the principles of aerial stereoscopic photography might be applied to surveying distant or inaccessible mountain faces.

It is well known how flat an ordinary landscape appears from an aeroplane a few thousand feet above it, and similarly survey by direct aerial photography fails completely to show the contours of the land which is photographed. A well-recognized method of overcoming this deficiency is to take from the aeroplane two photographs of every strip of country, these photographs being taken from the same height, and at a considerable distance apart. They are then set up in a suitable binocular viewing apparatus, and the country viewed stands up in greatly exaggerated relief, so that the contours can be quite accurately sketched in by hand.

Precisely the same principles may be applied to obtain a picture of the form of a distant mountain, with the detail of its relief exaggerated to any required degree.

The appearance of a mountain face seen with the naked eye or telescope from afar is notoriously featureless in its deceptive flatness, for the distance of human eyes apart is so small that no conception of solid form or depths can be obtained at greater distances than a quarter of a mile or so. To get within so close a distance of a large mountain in order to prospect a possible route up it, is usually inconvenient, and requires such proximity to the lower parts of the face that all true impression is lost of the proportions of the top of the intended route.