Up Rope!

NEWS OF THE WASHINGTON ROCK CLIMBERS

Vol. 6, No. 9 November 23, 1949

Schedule

POTOMAC ROCK CLIMBING MOVIES
By Dick Leonard
Friday, December 9, at 8:00 P.M.
Sterling Hendrick's home
1118 Dale Drive, Silver Spring, Md.

The Annual Meeting of the Rock Climbing Club will be held at the Hendricks' this year as last. The meeting will comprise a movie, and a business session. The movie is a record of Dick Leonard's visits to the Washington area during the War, and includes, we hear, climbing on Donald's Ducks, Leonard's Lunacy, and other local climbs. At the business meeting we'll elect new officers for the coming year.

To reach Sterling's home by car, follow Georgia Avenue to Silver Spring and turn right on Colesville Pike (U.S. Route 29). At Dale Drive, just before Mrs. K's Tea House, turn left. The house is about 0.3 miles from the turn. The junction of Dale Drive and Colesville Pike may be reached by either the Z4 or Z6 buses, which start from Georgia and Alaska. Sterling's phone is SHepherd 4603. (And if you can get to the Editor's house by 7:30, you rate a Nash ride. Please let her know!)

Ups and Downs

Andy Kauffman	Ray Moore	John Meenehan	Ted Schad
Betty Kauffman	Suzy Moore	J. Sterling King	Gaby Rosenberger
Jane Showacre	Patsy Moore	Jack Wilson	Sy Zweigoron
George Kamm	Mike Moore	Lowell Bennett	Don Hubbard
Peg Keister	Arnold Wexler	Tony Soler	Norman Goldstein
Roger Foster	Eleanor Tatge	Art Lembeck	Chris Scoredos

A big turnout at the Hot Shoppe proceeded to Carderock for practice climbing. Ambitiously the Spiderwalk was the first item on the program, after which the group spread out along the cliffs and spent a long and glorious day heroically maneuvering the numerous intricate byways customarily employed by rock climbers to get from the bottom to the top in lieu of the trail. (This was Sunday, Nov. 6, 1949.)

On Saturday, November 12, 1949 Donald Hubbard, Peg Keister, and Mr. and Mrs. John Buck and family of three climbed at the Bull Run Mountains.

Sunday, November 13, the party leaving the Hot Shoppe comprised Don Hubbard and Tony Soler. They started the day's climbing at Eagle Rock on the Virginia side of the Potomac, then on to Boucher Rock, where Tony made a climb that only Don, Steve Yurenka, and Arnold had done before, and that many years ago. They had lunch on the rocks in the water, and spent the afternoon walking down Difficult Run in a light rain, locating a site for an aerial traverse for Don's younger protegees.

From what we can gather, a considerable proportion of the Washington Rock Climbers spent this Sunday underground. Ted Schad, John Meenehan, Nancy Rogers and Jack Wilson joined Bill Stephenson and Miles Grimm on a caving expedition to Patton's Cave, Gap Mills, West Virginia, which they found wet and muddy but full of wonderful-ly intricate dripstone formations, and Laurel Creek Cave, Greenville, West Virginia, report-ed as "awfully big!" Lowell Bennett and Tom Culverwell are reported as cavers this week also, with Leo Scott, in the vicinity of Lewisburg, West Va. They visited three sink holes, Pierce's Mill Cave where they engaged in rubber boating, and a very large cave from which limestone had been quarried.

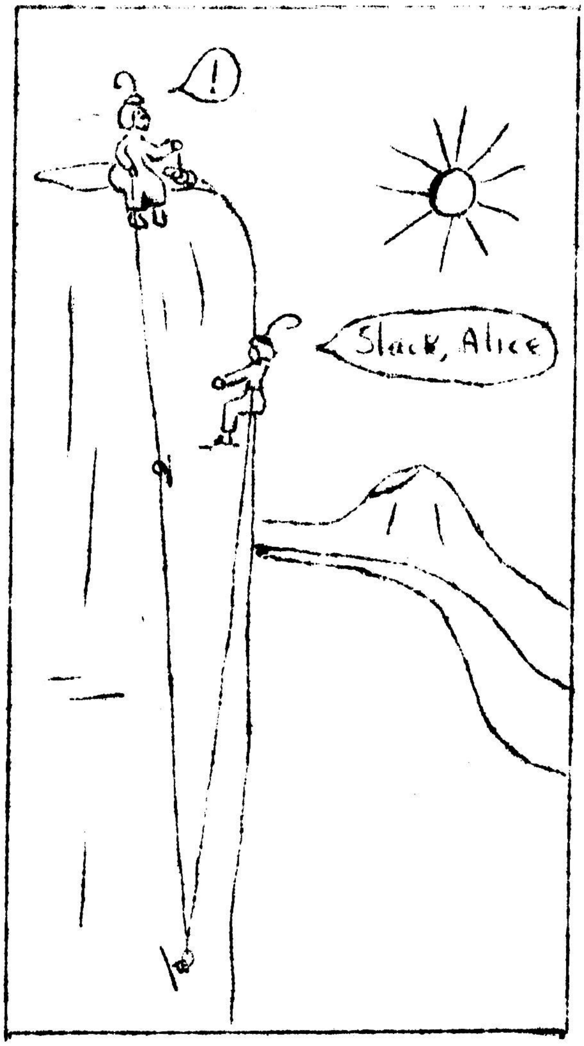
STUDIES IN WHITE
No. 11

Four Square Inches Of
UP ROPE Paper

Your Editor was caving too. She spent a bright, colorful Sun-day driving across the Texas plains from El Paso to Carlsbad Caverns with a friend, includ-ing three dark hours on an underground tour, and a wonderful trip back to El Paso, facing a gorgeous red sunset which reached its peak in bathing the rock El Capitan, the highest point in Texas, in a rosy glow.

Jan Conn	Marion Harvey	Jack Reed	Peg Keister
Herb Conn	Mrs. Harvey	Jill Reed	John Buck
Andy Kauffman	Norman Goldstein	Joe Reed	Mrs. Buck
Betty Kauffman	Chris Scoredos	John Reed	3 little Bucks
Art Lembeck	Tony Soler	Ted Schad	Eleanor Tatge

On Sunday, November 27, Carderock, Maryland was again the scene of activities. The highlights of the day were probably Marion's as-cent of Sterling's Crack, a session on Herbie's Horror--long and ear-nest but unproductive--and a revisiting of the Jam Box, which remains high and unreachable on its shelf in spite of Herbie's sweet tooth, which carried him the farthest up.



Inside Corner

Herbie and Jannie Conn are wintering in Washington this year. Having dug the foundation for their new home in South Dakota, they've come East to await the spring to continue building. Jobs are promised to all who would like to help.

Dolores Alley is now the proud possessor of a shiny blue Chevrolet sedan. From now on the Alleys travel in style and save on shoe leather.

From Mrs. Leo Dawson we hear that Hope and Robert Seebold were married Thursday, November 17, at 7:00 P.M. at the Congress Heights Methodist Church. The wedding was a simple family affair. The bride wore a suit of spring green and a wreath of flowers in her hair. The Seebolds are at home in their apartment at 39 Galveston Place S.E., Washington 20, D.C.

A FEW TECHNICAL NOTES on ROCK CLIMBING

by Paul Bradt

Climbers of rocks are to such an extent technically minded that it is thought a few arm-chair deductions on climbing might be of interest to them.

For this purpose use will be made of vectors which are the arrow shaped lines used by engineers to represent forces. For the uninitiated let me give a simple example. Fig. 1 represents a climber standing in the mud. Arrows w and w', which we shall call vectors, represent the forces to be considered. The direction of the vector w indicates the direction of the downward force due to his weight. Its length, at the scale of one inch equals 100 lbs., indicates that the magnitude of this force thrusting him downward into the mud is 160 lbs. The upwardly directed vector w' represents the upward supporting force of earth under his feet. The smile represents satisfaction with the realization that w' is equal to w, and oppositely directed, and he has ceased to sink.

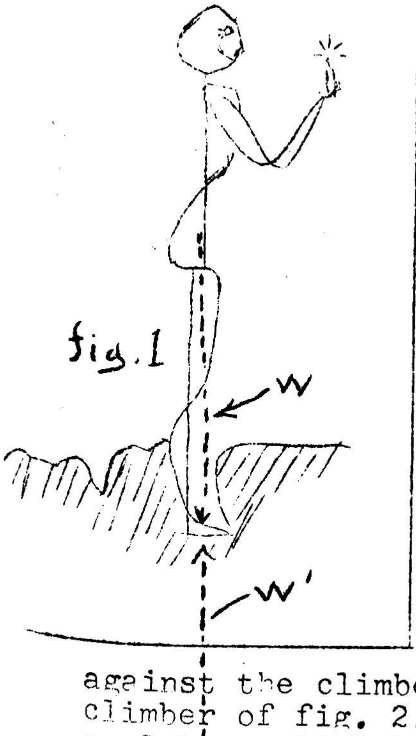


fig. 1

Forces have a way of occuring in pairs. In fact whenever a climber presses against a rock in a given direction, the rock presses just as hard in exactly the opposite direction against the climber. This was not realized by the ignorant climber of fig. 2. While standing on a slab at slightly less than the critical angle he became worried, and to steady himself, he leaned against the wall with a force f. The resulting thrust f' of the rock upon his hand necessarily caused him to slide down the slab. He was pushed from his footing just as truely as if someone else had done it.

Toward reducing our resemblance to this chap let's consider the forces operating when a man stands on a sloping rock. He exerts only one force, his weight, represented by the vector w, but for purposes of analysis it can be resolved into two vectors, p and s, as shown in fig. 3. The vector p indicates the amount of pressure (in this case 100 lb.) pressing his shoes against the rock. The vector s is the force (90 lb.) tending to cause his shoes to slip down the rock face.

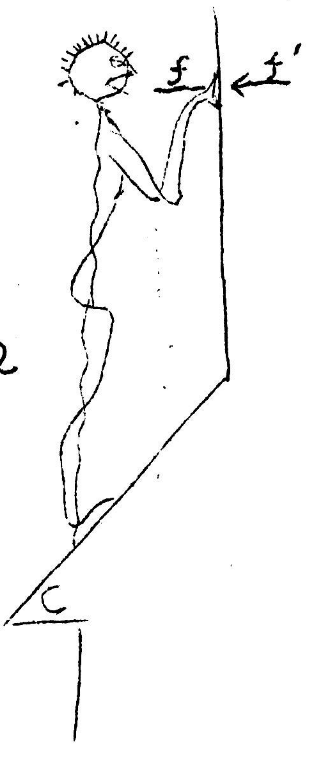


fig. 2

Whether this slippage occurs or not depends upon the rock texture and the climber's shoe soles.* It is seen that s/p equals H/D, the slope of the rock. So long as the rock isn't too steep the pressure p is sufficient to prevent slippage due to s. At the critical slope, c, these two forces are just balanced. Steeper than that, this pressure isn't enough to hold s.

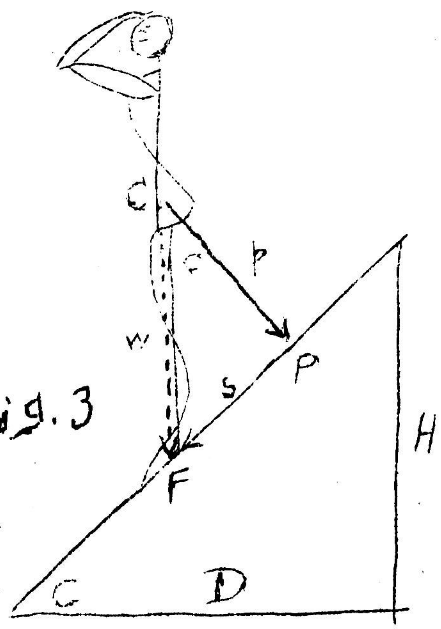


fig.3

The condition just referred to is shown in fig.4, wherein the angle of the rock, q, is greater than the critical angle, c. To find the force needed to prevent a climber slipping under these conditions, resolve the weight vector w, as in fig.3 into a perpendicular, p, and a slippage force vector, PF, Also draw the critical angle, c, from p to intersect the slippage vector at R. The vector PR is the slippage force that can be held by the pressure p. The rest of the slippage force, RF (about 30 lbs. as drawn) is the amount that must be held, as by the pull F'R' of the rope, or by a handhold, to prevent him sliding down the slope.

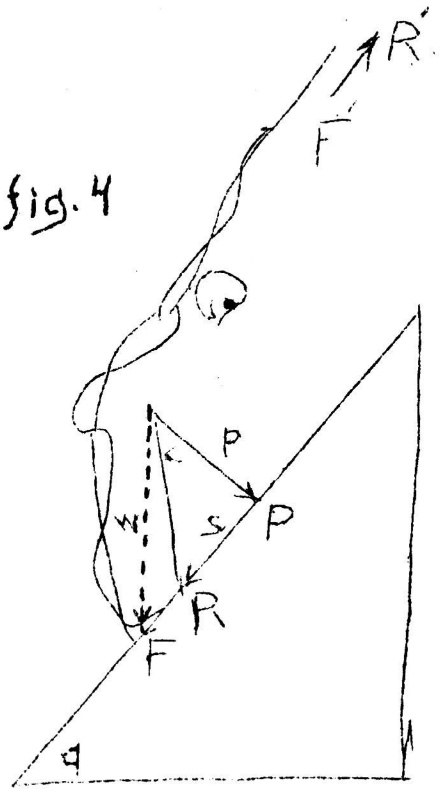


fig.4

But a word of caution concerning handholds is in order. In critical conditions the placing of a hand on the rock may be just the wrong thing to do.

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*This was emphasized in my earlier Up Rope paper "Some technical aspects of rock climbing" April 30, 1948 The notation and values of critical angles are from this earlier paper. My stenciling of that paper was very poor but a legible copy was published in The Iowa Climber Vol. 2 No.2 p82 ff. by The Iowa Mountaineers Inc. State University of Iowa, Iowa City, Iowa.

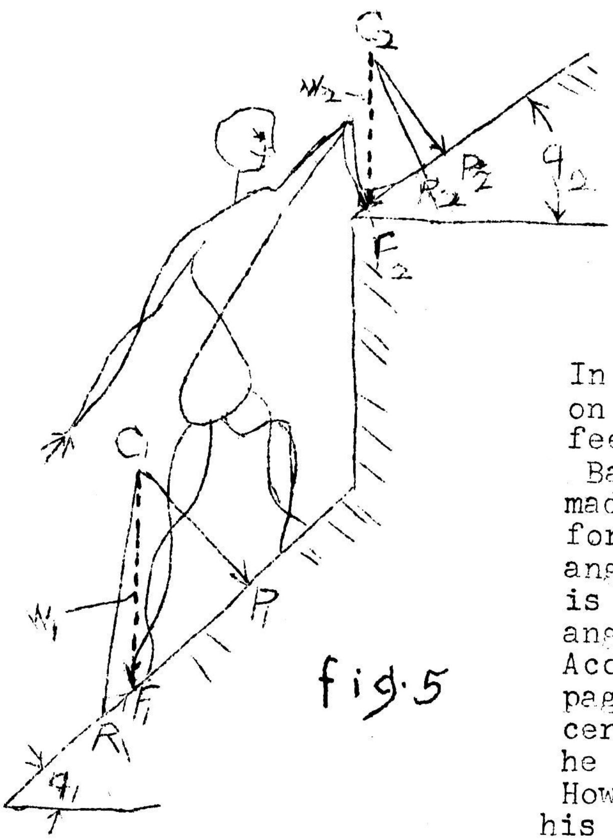


fig.5

The climber had been standing on a smooth quartz slab at F_1, fig. 5, when he noticed a leveler band at shoulder height. Leaning gently in that direction and carefully pressing straight down with his gloved hand, he was able to take much of his weight off of his feet. At the instant he slipped, the forces were as shown in fig.5. In that figure the weight w_2 taken on his hand, and w_1 that on his feet, added together equal his weight. Based on these two vectors, I have made a construction similar to fig.4 for both hand and feet. The critical angle $P_1C_1R_1$ for rubber on such rock is greater than the angle q_1 (equals angle $P_1C_1F_1$) of his footing. Accordingly his feet resisted slippage with a force R_1F_1 and he certainly wouldn't have slipped if he hadn't touched his hand to the rock. However he had dry cotton gloves on his hands and their critical angle $P_2C_2R_2$ was considerably less than the angle q_2 (equals $P_2C_2F_2$)of the handhold. The excess slippage force R_2F_2 on his hand exceeded the holding friction R_1F_1 of his feet and caused his descent. The principles of this incident should be given at least fleeting consideration before touching the wall with any part of the body having less holding power than one's shoes.

A climber ordinarily doesn't reach up and get a hold on a rope as shown in fig. 4. The same pull F'R' could have been obtained from a handhold on the rock if one is avainable. In the center of fig.6 a climber is holding himself by applying that pull to a handhold. The handhold has to yield or pull upward on him with the requisite force F'R'. The thrust of the legs, CR',added vectorially to the pull of his hands, R'F', equals the weight vedtor w, indicating that his position is stable.

However it is rather difficult to exert the force F'R' parallel with the rock face. The climber above him is pulling on his handhold in the direction of his arm at FR". This is the easiest direction to pull. Moreover, he doesn't have to pull as hard.

Because he pulls up somewhat more on the rock with his hands, he necessarily bears down on it more with his feet as indicated with the longer arrow CR". The resulting greater pressure p gives his shoes the greater holding force P"R". Again the leg thrust CR" plus the arm pull R"F" equals the weight w.

The upper climbers of fig.6 have placed their legs at the critical angle c from the perpendicular p to the rock face. The lowest figure is that of a novice occupying a position in which novices are often photographed. Rather than place the feet low, where he fears they may start slipping, they are placed higher toward the hands. This brings the leg thrust in the direction CR"'. The much greater thrust shown by this vector is necessary in order that the vector triangle with w can be closed by a pull R"' F"' in the direction of the arms. Ordinarily the legs don't so much feel this extra thrust but the tremendous pull R"' F"' of the hands is unnecessarily tiring on the fingers and likely to pull off the handhold.

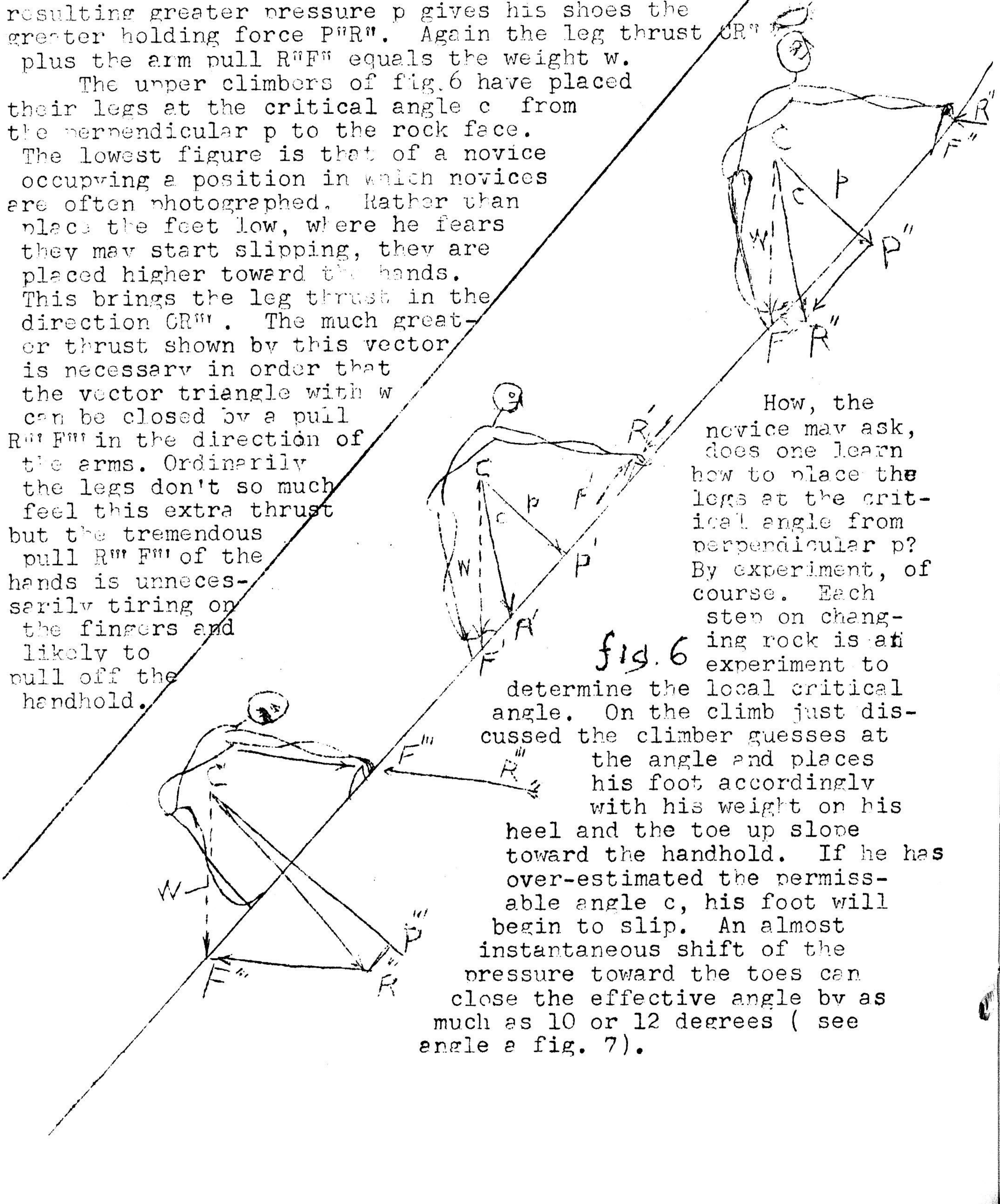


fig. 6

How, the novice may ask, does one learn how to place the legs at the critical angle from perpendicular p? By experiment, of course. Each step on changing rock is an experiment to determine the local critical angle. On the climb just discussed the climber guesses at the angle and places his foot accordingly with his weight on his heel and the toe up slope toward the handhold. If he has over-estimated the permissable angle c, his foot will begin to slip. An almost instantaneous shift of the pressure toward the toes can close the effective angle by as much as 10 or 12 degrees (see angle a fig. 7).

If his judgement has not erred more than this, the shift will stop the slippage. With this latitude available for experiment, one can experiment freely and arrive at a pretty fair judgement of critical angles for one's footwear. One gains no friction by placing the toe up slope; only a safety margin if the handhold is that way. Even that isn't gained if the rock is dished somewhat.

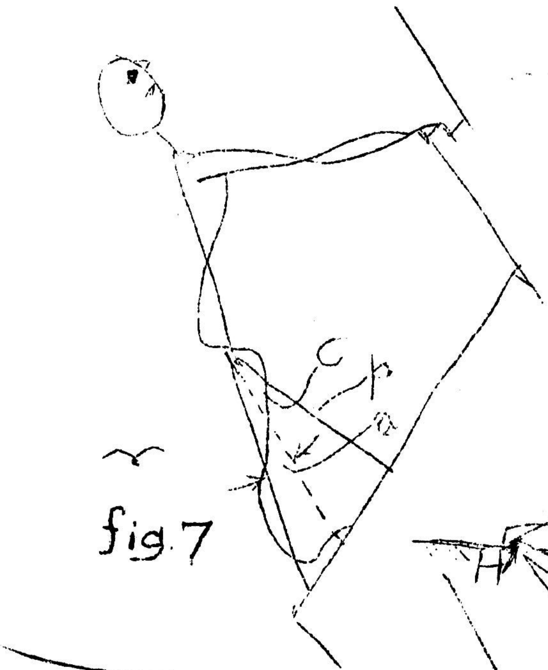


fig. 7

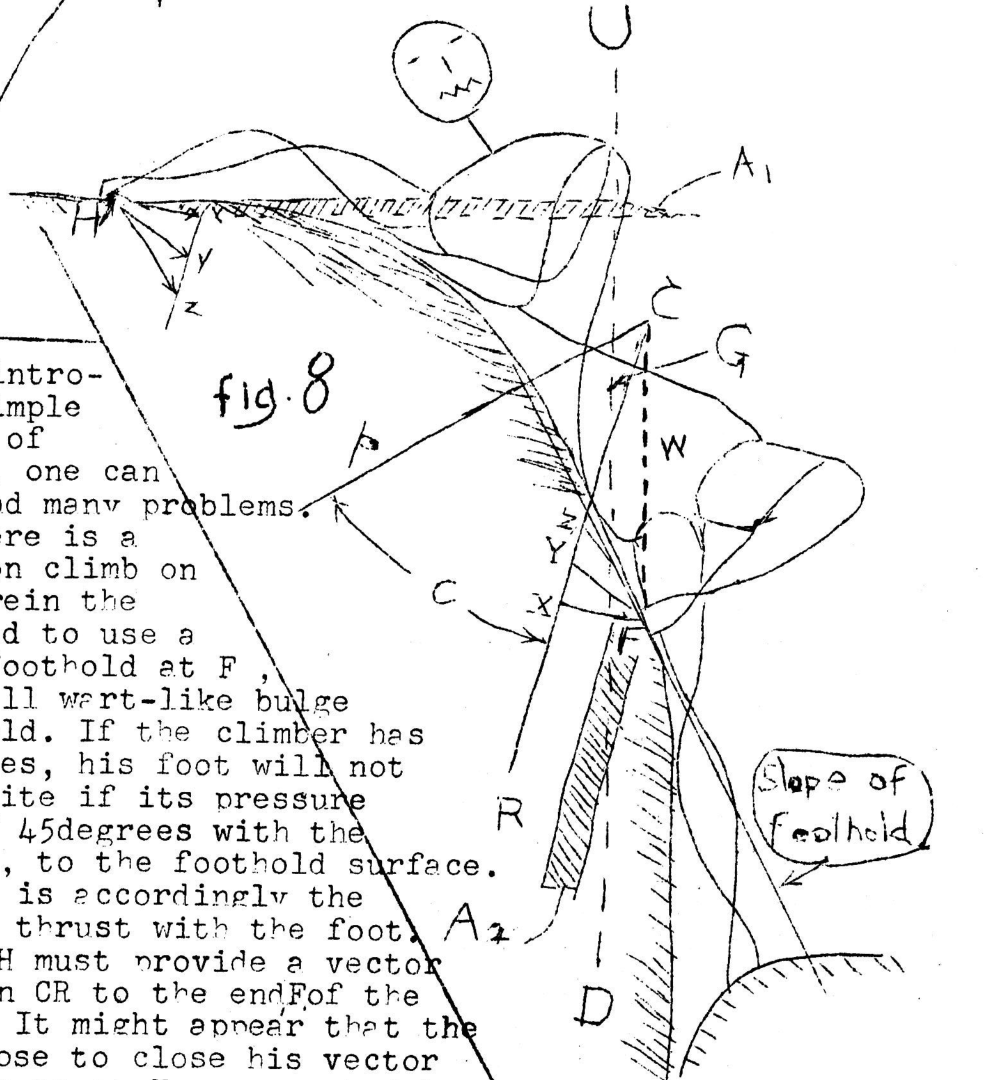
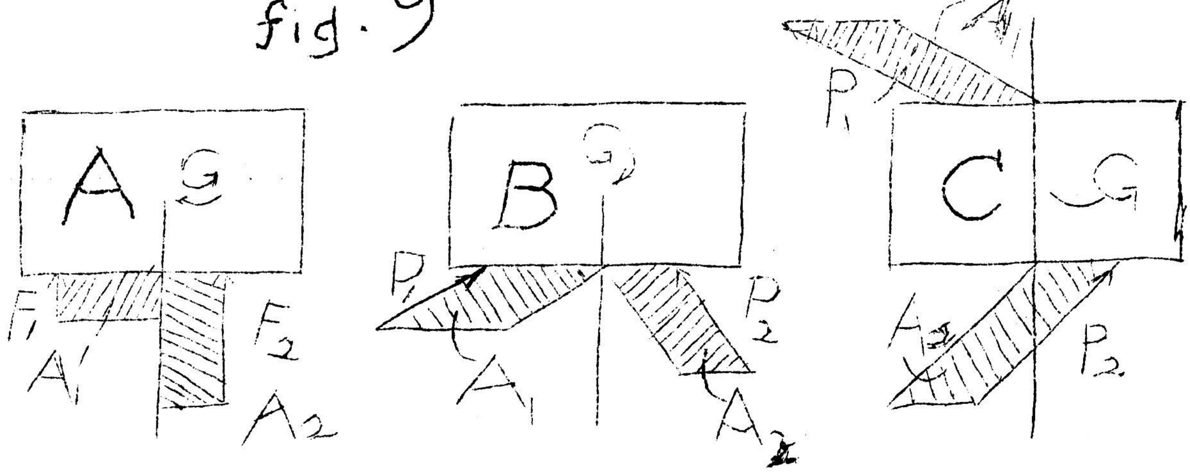


fig. 8

With this introduction to the simple vector analysis of climbing forces, one can better understand many problems. For example, There is a short instruction climb on Old Rag Mt. wherein the climber is forced to use a nearly vertical foothold at F, fig. 8, and a small wart-like bulge at H as a handhold. If the climber has rubber soled shoes, his foot will not slip on the granite if its pressure makes an angle of 45degrees with the perpendicular, p, to the foothold surface. The direction CR is accordingly the best direction to thrust with the foot. The hand pull on H must provide a vector from some point on CR to the endFof the weight vector w. It might appear that the climber could choose to close his vector triangle by pressure at H represented by vectors HX, HY, HZ, or some other such force. However those who have tried this climb realize that it isn't that simple.

We shall leave our climber struggling while we consider a box of sand, fig. 9A, resting on the edges of two parallel angle-iron bars. To figure how much weight rests on either bar, fig. 9



we consider the bars' positions relative to the central spot G called the center of gravity of the box. Of course the two upward forces F_1 and F_2 of these bars must add together to equal the weight of the box. But there is another condition to be met, for which we drop a vertical line from the center of gravity G. The forces F_1 and F_2 must have lengths such as will make area A_1 equal area A_2, where the A's are the areas of the parallelograms contained between the F's and the vertical line.

This condition is quite general. In fig. 9B we see it applied to a box balanced on sloping props having oblique pushes P_1 and P_2. In fig. 9C the box is supported by prop P_2 and pull chain P_1. Again A_1 equals A_2.

The forces applied to the box of fig. 9C are analogous to those applied to the climber of fig. 8. The forces he applies are their opposing counterparts. Accordingly we locate the center of gravity of the climber in the position shown; draw the vertical line UD through G; and drop perpendiculars from the points of application of the forces onto the line UD. Now by measuring the perpendicular distances of H and F from UD and the length of the weight vector w, one can solve the two equations:

Downward pressure of hand + downward thrust of foot = w .

Downward pressure of hand × distance of hand from UD = downward thrust of foot × distance of foot from UD. Taking the measurements mentioned from fig.8 we find that the downward pressure of the hand is 10 lbs. and of the foot is 140 lbs. Accordingly, Pull HX is the only possible hand pressure. The others require too much downward force. The corresponding foot pressure is CX. Due to the poor handhold at H it would be to the climber's advantage to get his center of gravity closer to the rock, and accordingly closer to his hand. This would allow him to pull more in the direction HY,--a direction in which the hold H is better suited to serve.

Clearly one could apply such analyses to varied and more complex situations but I think it is time to stop. The fundamental principles have been illustrated. Besides, consideration of these analyses occurred to me while trying to tell beginners how to make the step of Fig. 8, but the explaination of <u>why</u> was a little more than I could handle on the spot.