BLUE RIDGE MOUNTAIN RESCUE GROUP

"Basic Ascending"--Keith Conover

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Practical

--Assemble 2-knot rig

--Do 1 ascent each with 2-knot rig, using:
Prusiks
Hedden knot in webbing
Jumars
Gibbs

--Rig and tighten Tyrolean; everyone goes across, and litter is sent across.

--Optional ascent with Jumar rig or 3-cam rig.

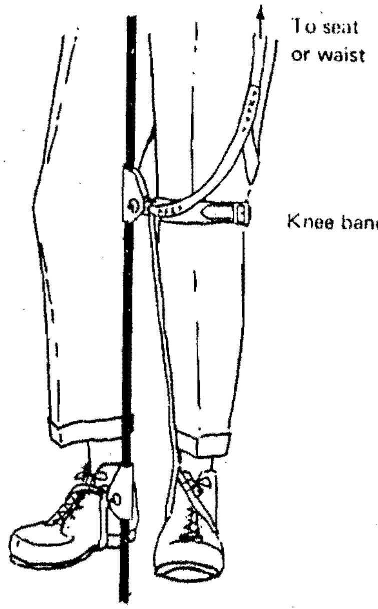


Fig. 62. The Ropewalker. The body weight is transferred to the cam ascenders with endless nylon loops from the instep of each foot. An elastic strap and nylon safety sling support the upper cam ascender against the knee. From Gibbs and Doll (1969).

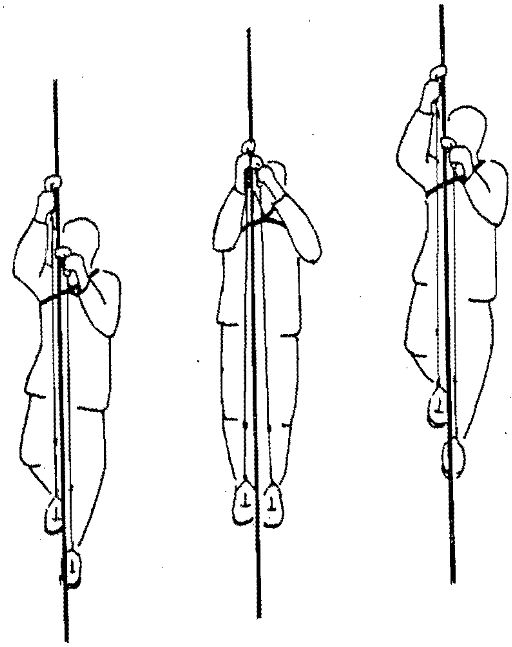


Fig. 57. The Jumar System.

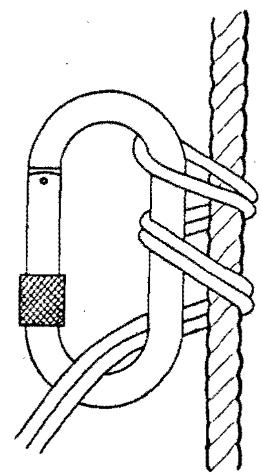


Fig. 20. Bachmann knot.

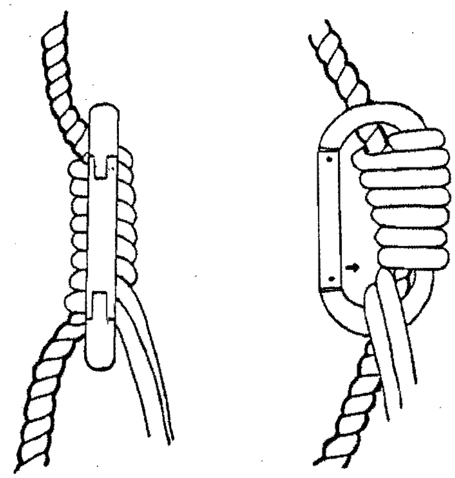


Fig. 21. An alternate way of orienting the Bachmann knot.

A climber soloing up *Cave Route* on Gordale Scar secured himself by hanging an 11mm kernmantel rope down the face from two pegs and attaching himself to the rope by means of a loop with a Prusik knot. He fell (for reasons unknown, apparently while moving an etrier to another position) but his Prusik failed and he fell to the foot of the crag where he was killed.

On examination of the rope afterwards it was found that a short piece of the Prusik line was fused through and to the rope at a point where the sheath had been rucked after slipping over the core. The Prusik loop had been of nylon or perlon kernmantel line of 4mm diameter, which has a breaking load when new of about 200kgf.

It is evident that the Prusik knot slipped down the rope for some distance before it failed and that friction-generated heat contributed to the failure of the loop. Calculations based on the mass of material in a Prusik knot of 4mm line and known specific heat of nylon or perlon show that failure due to melting is inevitable in such a situation *if the climber falls only one foot and any slip at all takes place between the Prusik and the standing rope.*

It is tempting, therefore, to assume that the Prusik might have held if it had been fully tightened on the rope beforehand, but it is very doubtful whether any Prusik of 4mm line could have withstood this fall no matter how tightly it was pulled. Tests have shown that such a Prusik fails at about 230kgf, and this force could only be expected to hold a falling climber if the working length of 11mm rope is many times the height of the climber. Indeed, the nearer the climber approached to the peg securing the fixed rope the more certain it was that the Prusik would fail.

A Prusik knot of thicker line would have been stronger but not by enough to load the fixed rope sufficiently to absorb the falling climber's kinetic energy, while the risk of slipping and consequent heating and weakening of the knot would be increased.

The forces involved in holding a falling climber are likely to be so large that anything in the nature of a weak link between the climber and his rope should be avoided. The Prusik knot, even if perfectly formed, is much too weak to give reliable protection to a falling climber; its tendency to slip if not fully tightened is a further hazard.

—W. H. Ward
British Mountaineering Council

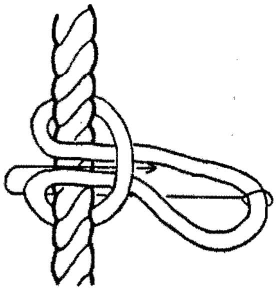


Fig. 1. Start a prusik knot with a ring hitch.

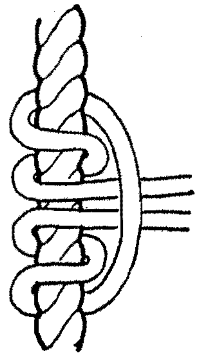


Fig. 2. Tuck the sling through the knot a second time to give four coils.

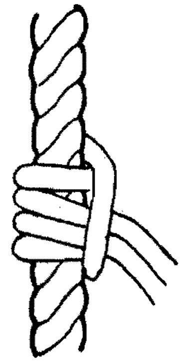


Fig. 3. The finished knot when pulled tight. This is a right-handed knot.

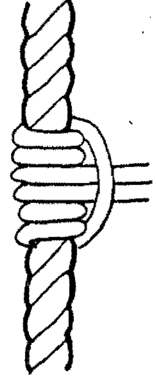


Fig. 4. 6-coil prusik knot.

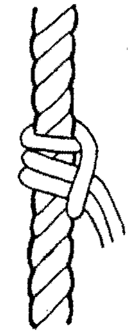


Fig. 5. 3-coil prusik knot.

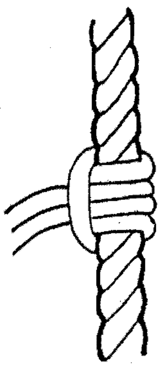


Fig. 6. Left-handed prusik knot on right-handed rope.

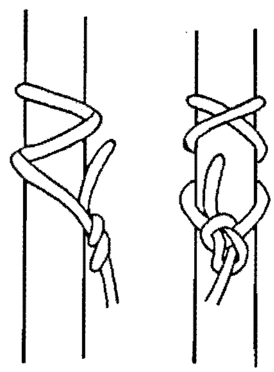


Fig. 7. French prusik knot.

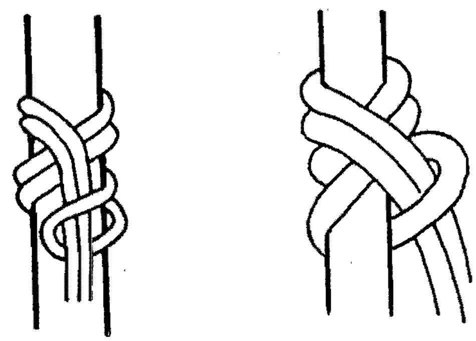


Fig. 8. Hedden Knot. Two views of Hedden knot. The two knots are tied in an identical manner with different size slings.

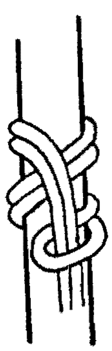


Fig. 9. Hedden knot with twist.

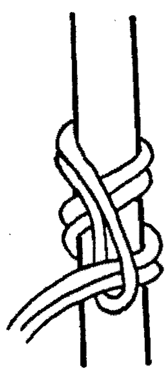


Fig. 10. Upside-down Hedden knot.

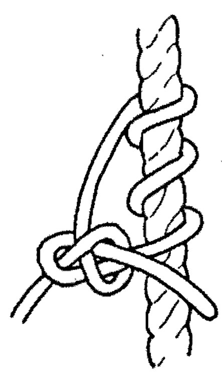


Fig. 13. Helical knot.

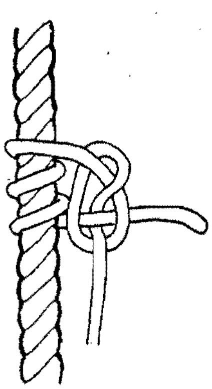


Fig. 14. One way of finishing and sizing helical knot.

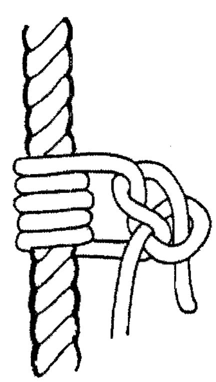


Fig. 15. The finishing knot used by Penbertby and Mitchell (not a bowline).

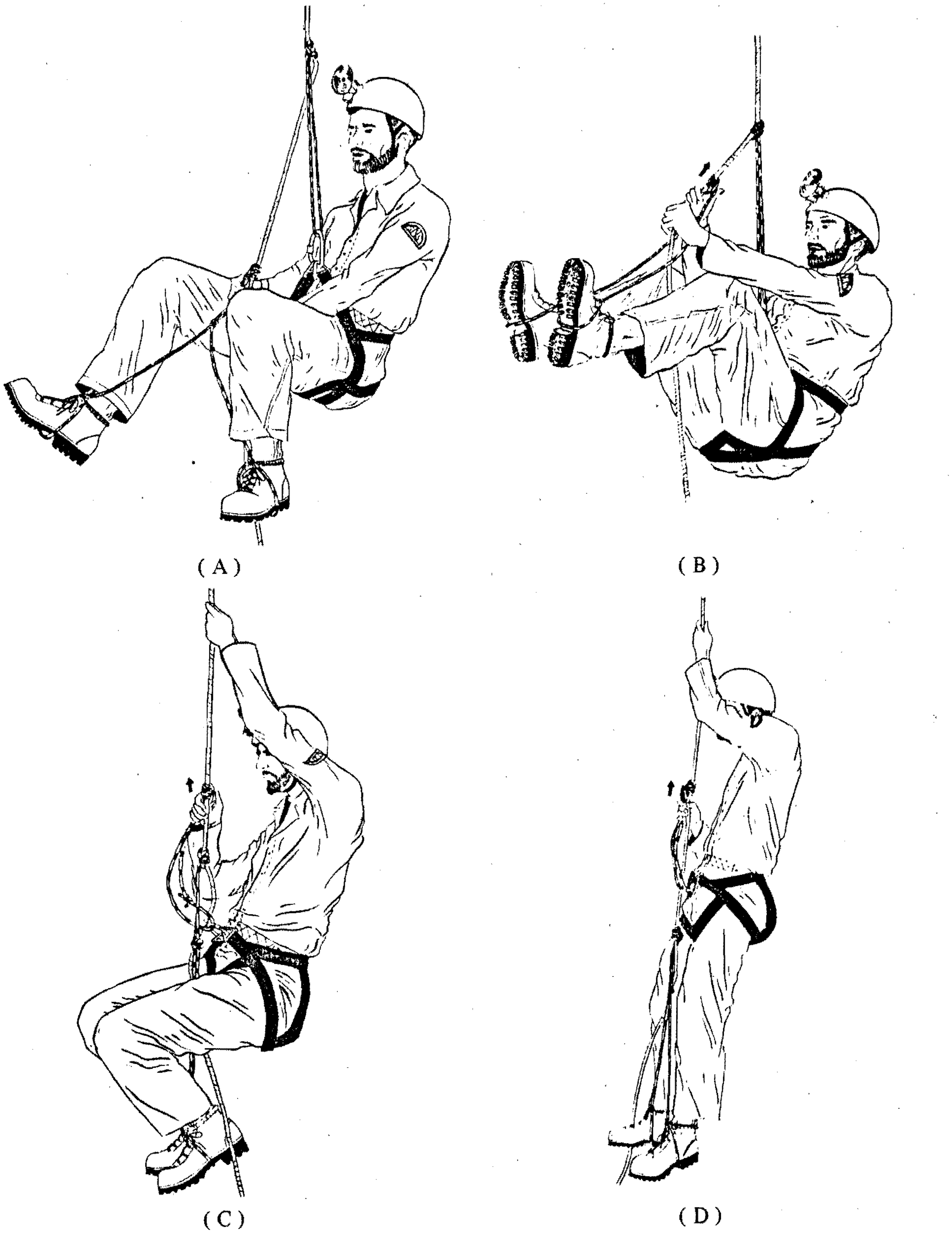
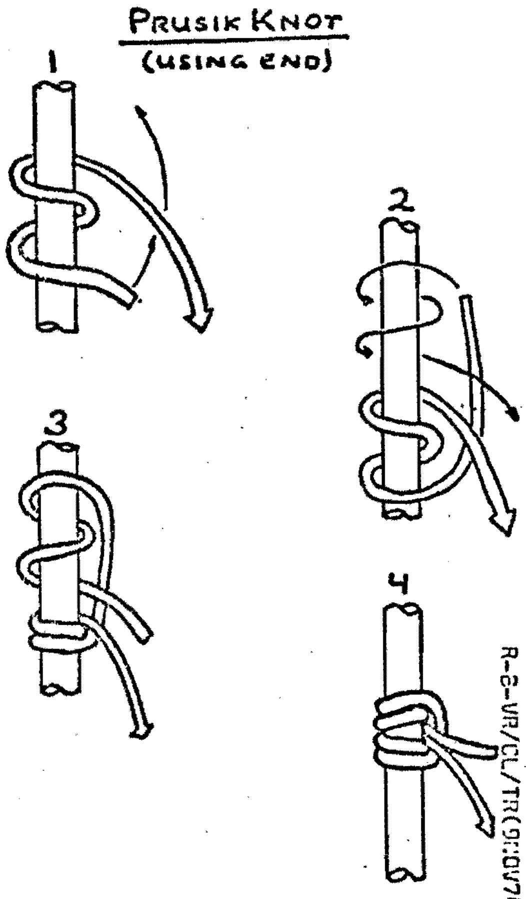
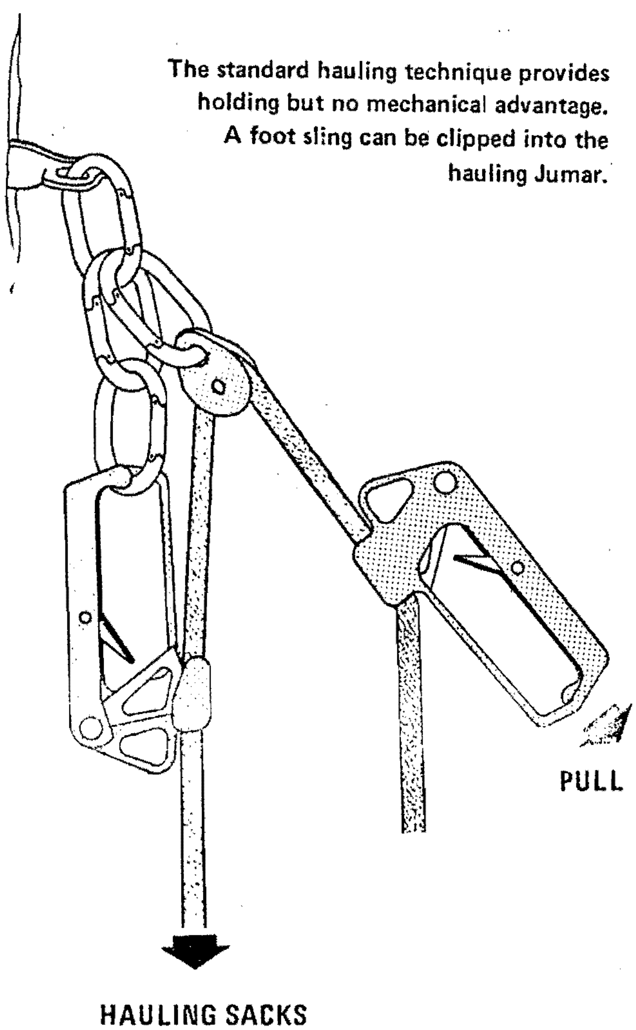


Fig. 51. The Texas prusik method. A sitting position is the start of the cycle (A). It provides a convenient rest position. The legs are raised and the lower knot is moved up (B). The climber then transfers his weight to his feet and loosens his top knot (C). He stands up and pushes the top knot up (D). He then sits down and starts the cycle over at (A). A very long gain per cycle can be achieved by kicking the leg very high (Figure 52, which shows a one-legged Texas prusik). The high kick can only be used by strong climbers.





The standard hauling technique provides holding but no mechanical advantage. A foot sling can be clipped into the hauling Jumar.

Rigging the Foot Cam

by Vern Smith

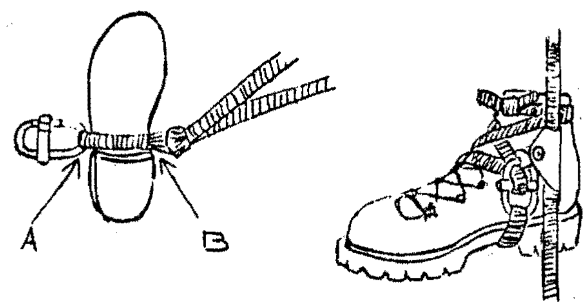
(Reprinted with permission from the December 1973 issue of the California Caver.)

Upon finding the usual way of riggins the Gibbs ascender to the foot with a length of webbing unsatisfactory, I began looking for another method of rigging it.

The way it is mostly rigged is by tying the ascender to a piece of webbing and then wrapping and tying it to the foot. The result is to find, when on the rope, the rigging has loosened considerably and is riding somewhere around the center of the top part of the arch of the foot. This loses about five inches per step and feels just plain sloppy.

The method described below will provide a way of rigging the ascender solidly to the boot in a position it will stay in no matter how much you climb on it. The materials needed for this system can be found in any vertical caver's pack--about 6 feet of 1-inch tubular webbing, 1 standard oval carabiner, and 1 brake bar.

1. Tie an overhand knot in the center of the sling material to form a loop.
2. Place a carabiner in the loop of webbing. The distance between the knot and the carabiner (Points A and B) is important. It should be long enough to just fit under the sole on the instep of your boot.



3. Now add the ascender and the brake bar as shown. Be sure the brake bar opens away from the boot.
4. Place this assembly under the instep of your boot with the knot on the outside. Take one end of the webbing and bring it over the top of the foot and around the brake bar.
5. Bring that end back around the side of your foot and cross the other end over the opposite side of the foot. Draw this up as tight as you can get it.
6. To finish the rigging off, I tie a knot in the back, then one in the front.

You may have to retie the loop in the webbing (step #1) if the length under the instep becomes too long when the knot tightens for the first time. It is important that the knot be right on the side of the sole of your boot. I have been using this for quite some time and found it to work very well with no problems. It may be used with any Gibbs ropewalker or floating cam systems.

BEYOND THE 7th TOOTH —

Into the Twilight Zone with Gibbs Ascenders by Don Davison Jr.

The amount of wear which a Gibbs Ascender cam jaw* can sustain and still hold multiple body weights ia a critical factor in the ascent of long drops and the assembly of rescue hauling systems. It is important that all vertical cavers be familiar with this wear-point since Gibbs Ascenders are becoming increasingly popular.

In developing and testing the Davison System, individual components are taken to destruction under actual caving situations. In this manner, the effects upon safety and mobility can be fully analyzed. The average caver should never experience component failure with the System because its approach is very obvious, and the component will have been replaced long before the actual failure point is achieved.

The following incidents will serve to illustrate the critical importance of the cam jaw wear-point on 7/16" rope. We were working with the rescue-lift method of the Davison System and I (180 lbs.) started up the rope with no problems. Approximately 6 feet from the ground a second man (175 lbs.) clipped into one of the slings hanging from my leg loops and I cammed up (total 355 lbs.) an additional 6 feet with no problems. At this point, a third man (160 lbs.) clipped into the second sling and I attempted to cam (total 515 lbs.) up the rope. My foot cam held well, but the knee cam slipped continuously. I could only raise the three of us four feet before the load tired my right leg excessively. At this point, the third man broke away and I was able to continue easily up the final 20 feet of rope with the 355 pound load causing NO cam slippage. All this took place on marine lay Goldline in free fall conditions.

Since the knee cam held under 1 and 2 body weights, it was pushed further. About 80 feet after the initial slippage (515 lbs.), during a high speed climb under 1 body weight, the knee cam slipped continuously on the mountain lay Goldline. Just over 800 feet (750 ft. on Bluewater II) after the knee cam failure (515 lbs.), the foot cam slipped continuously on mountain lay Goldline. Note that if either one of these cams had been used as a stop cam in a rescue hauling capacity, or as a belay cam, the results could have been extremely undesirable, even though they held under 1 body weight.

*The cam jaws referred to in this article are those with the most recent involute pattern (tooth arrangement). This type has been sold exclusively since about 1972, and is shown in the illustration.

indication of the need to retire the jaw, followed by scratch development. Cam jaws should be inspected before use in a hauling system to make sure that the mold line ridge of the 7th tooth is not polished and be inspected closely during cleanup after each trip, especially after polishing of the 6th tooth is noticed. The fact that a cam holds your body weight does not automatically mean that it can hold a much greater load.