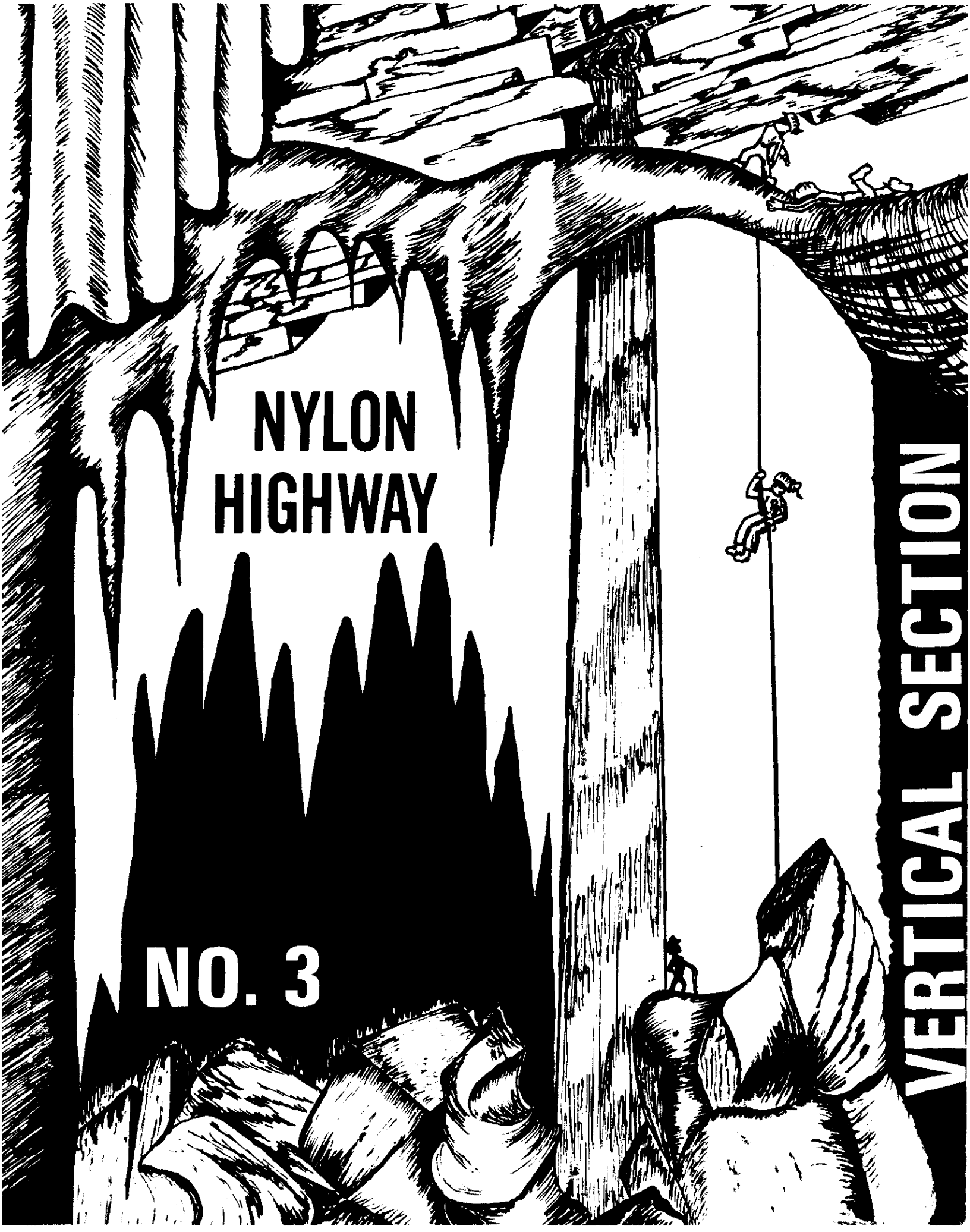
NYLON
HIGHWAY
NO. 3
VERTICAL SECTION

NYLON HIGHWAY

STAFF

Editor: Bruce W. Smith
1745 Woodside Dr.
Westland, Mich. 48185
Asst. Ed Barbara A. Smith
Sec. Kyle Isenhart
Advisors Bill Cuddington
Kyle Isenhart
Kirk MacGregor

ILLUSTRATIONS

All the illustrations found in this newsletter are orginal productions by the editor except those found in the Magnussen and Torode articles

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COVER The cover for the third issue is a pen and ink drawing by the editor of a vertical drop that is a combination of his reflections of Cass, Fern, Hellhole and a stretched imagination.

We Swap with:
Nittany Grotto
Underground Leader
Off Belay

HOW TO SUBMIT MATERIAL

In able to have an authoritarian vertical oriented newsletter we need good material on the subject of vertical travel and related topics. These articles can be reprints from other newsletters or original material. Letters to the editor are encouraged but the editor claims the right to censor or alter any article in a way as to fit the publication without changing the intent of the article. We do request that new material be supported with tests and field usage records. Let's please stay away from politics. All pictures are requested to be black and white pen and ink drawings. The editor is able to redraw upon request any pictures of explanation that are unclear. Please submit all material to Bruce W. Smith, 1745 Woodside Drive, Westland, Michigan 48185

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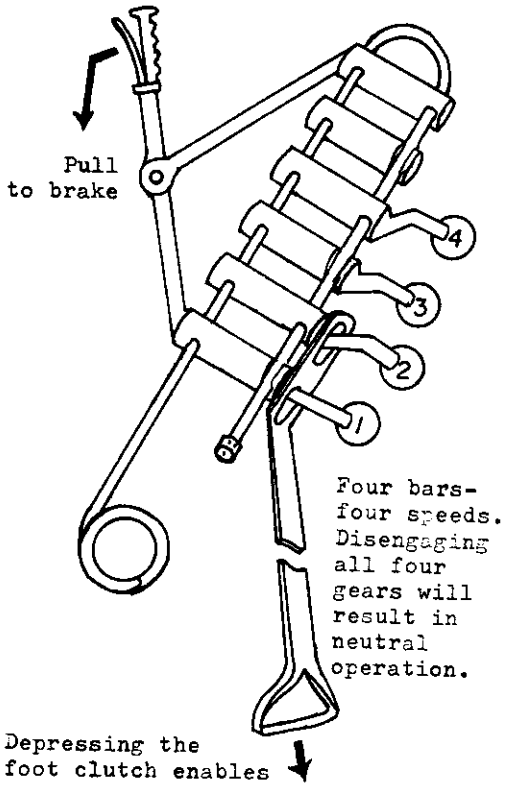
A GUIDE TO RAPPELLING

by Allen and Karen Padgett

Once upon a time there were two drunks sitting in a bar arguing about sky diving. One drunk said that a chutist landing, using his emergency parachute, would hit with the impact of a man jumping from the fourth floor of a tall building. (He was drunk.) The other drunk said that he was crazy, that any man jumping from a fourth floor window would surely die. (He was not as drunk.) The first drunk said, "Put your money where your mouth is," so the bartender held the money and the drunks went in search of a fourth floor window. The very drunk, drunk crawled out on the ledge while the other waited below to win his bet. The man on the ledge passed out and fell four floors landing in a bush. The impact woke him up, and as he crawled out he said, "See, I told you so!" A lot of vertical cavers hit the bush. Rappelling might be defined as lowering a climber by some method at a safe rate of speed down a fixed rope. The methods were crude at first, using body wraps or grass rope. This has evolved to the point today where brake bar racks are used on Bluewater III. If you think of the rack's use as a four speed car with a clutch and manual brakes, you can understand this article better. What it might be is a driver training manual for vertical cavers.

The first thing we must do is put the car together. The brake bar rack is the main ingredient. The trouble with racks is, they look simple. Any nut with a vise and three feet of cold rolled steel rod can make one. In fact, the rack is a complex machine. Even the type of steel is complex. Bending can cause crystallization and internal weakness, and the wrong length can defeat the braking effect. Brake bars are also a touchy metal machinist's job so leave them to the professional man. A lot of if's can be built into a device that your life depends upon. The safest way is to buy a commercially available rack and take care of it. Tandem bars out of horse and buggy days are dangerous; inflexible as to friction. Stresses sideways on carabiners and inherent weaknesses are part of this outmoded system. Now, back to the rack. A locking carabiner is needed to hook the seat sling to the rack. Any good D shaped carabiner is considered the easiest and best. Rappellers always wear gloves; there is some sort of status to it. For proper feel and safety, a pair of light leather work gloves will suffice. There is no need for the gungho welder's gloves or donkey brand fence stringing gloves.



"Think of the rack's use as a four speed car with a clutch and manual brakes..."

Now that you've got the rack, you've got to get it ready. First, decide which brake bar will be the top bar. Using a round file, carefully file the upper inside edges of the hole

and gate so that the bar will seat perpendicularly to the sides. The bar should not wobble in the rack. Now, so that the rope will run true down the center of the rack, rope grooves must be filed in the first three bars. These don't have to be great canals. Just file a small notch wide enough to fit the rope and just deep enough to keep it in the groove while in rappel. Remember on the first several rappels to keep the rope in the grooves. The reason for these grooves is to prevent torqueing up of the bars on the rack. If the rope is off to one side or the other, bars won't move, flexibility is lost, and an out of control rappel could result.

Remember to remove worn bars. As bars wear, the bending of the rope lessens and this lessens the frictional surface available to the rope. Other equipment wears out too. Seat slings should be inspected often for cuts, abrasions, and stitching wear. Any hardware dropped any significant distance should be retired and destroyed. Is a life worth a few dollars required to replace a piece of equipment?

One thing that may be worth a million bucks someday, is proper signals. Due to ups and downs of vertical caving, communications are necessary. Signals should be standardized and used. ON rope, or one whistle blast, means I'm rigged in and ready to go down or up. OFF rope, or two blasts, means EMERGENCY, all hell's breaking loose, help, and should only be used in such a case. Four blasts means ok or acts as an acknowledgement. Rock! means anything falling down the pit. Variances in pitch and inflection and volume can be used to denote the size of the missile. Be careful with worded instruction in pits. Echos and other noises can change words with disastrous results.

Have you ever had someone down in a pit try to tell you that the end of the rope is forty feet off the floor? Instructions get garbled and all you can understand is "Be careful!" As a preventative measure, each and every time, tie a small loop on the end of the rope before lowering it into the pit. The first man down should immediately untie the loop. The main rope should be treated as though your life depended on it because it does. Be sure to read "The Care And Feeding Of Nylon Rope" by Kyle Isenhart in Volume 1, Number 1 of the Nylon Highway. Pad the rope as a matter of principle rather than necessity. If padded each time, an accident will not occur just because someone thought it wasn't necessary. Caves are often muddy and mud makes rope work hazardous. To keep a rope clean in the cave, bag it. When lowering the rope into the pit, don't run it over a muddy ledge or you will wind up with 300 feet of Muddywater. Also clean your boots and other places on your body where the rope will touch. A spot of mud on the rope could cause a loss of friction enough to send someone out of control on rappel. Racks don't have mudgrip tires.

Like changing a tire, there is a procedure for rappeling into a pit. You should establish a ritual for getting into your gear and rigging in to the rope. Seat slings should be easy to get into and out of. Often, ledges are narrow and spaces confined. Don't forget the pack containing the prussik gear, at the top of the pit. Check your gear and then have someone else check it. If just one time you caught the mistake of someone else rigging in backwards, the constant effort would be well worth it.

Enter the pit by walking backwards feeding the rope into the rack. Depending upon the type of ledge, either continue walking in or, at sharp breakovers, get onto your left side and

ease into the pit. Take caution that the rack does not get hung on the ledge. If the pit is a squeeze type entrance, be prepared to feed the rack through the tight spot, or get slack above the rack and chimney down. In all pits, use too many bars until the way is clear and free fall has been reached. While going over the ledge, watch out for loose rocks and place the rope carefully on all rope pads. Mud can be a hazard, as a big blob can be knocked loose. Five pounds of mud, falling 150 feet, will do more than get you muddy. Watch out for hair, as racks love it. They also like shirts and gloves. Girls realize that they have long hair, but many guys don't. More and more guys get embarrassed everyday. If it does happen, get your prussik gear out and apply a sling above the rack. Loosen the rope in the rack and get your hair out, or simplify the whole operation and get out your pocket knife and whack it off being careful with the main rope.

When in rappel the left hand holds, in a cradling position, the lowest bar in use. Moving this bar and the one above it up and down regulates the friction and speed of descent. The right hand, or braking hand, should not squeeze the rope but rather push it into the hip and wrap it further around the rear end. The body, the center of gravity, should be kept in close so that no arm pressure is necessary to keep you sitting comfortably. The head should be to the right side of the main rope, watching the hair.

To stop for picture taking or just looking is a simple maneuver. With the left hand, jam the bars up tight and slow to a stop with the right hand. Then hang the main rope over the main bend in the top of the rack. Then you may wrap the rope over your leg for security.

One of the real heart stoppers in vertical caving is getting out of control on rappel. If it is not stopped in time, the result is crushed vertebra in the lower back and other nice injuries. The causes are many: improper equipment, wet conditions, a dirty rope, inexperience, etc. All are probable factors leading to lost control. Often, an out of control rappel is a result of one thing: panic instead of planning. So, when it happens, how do you stop it and get back in control? First scream BELAY! (We'll get into belaying on rappel later.) Then you must jam the bars up tight. Use the braking hand hard and well back on the rear. Kick the right leg around the rope to get into a leg wrap using the leg surface for added friction. The main thing you must remember is that you have to act quickly and decisively.

Often cases of loss of control have occurred in deep pits (300 feet plus.) The villain in these cases could have been the long drop phenomenon. This is a change in friction within the pit and is due to the change in the weight of the rope below the rappelers as he descends. Four hundred feet of rope, especially if it's wet, weights a great deal. This weight is a sizeable belay at the lip but when half-way down the pit, most of that belay is gone. To combat the long drop phenomenon, additional friction must be added. In the rappel several bars must be added to supply this friction so that control can be maintained.

A significant word to the wise. Due to the friction in the rack, it gets HOT! Your girlfriend or wife may wonder about that unexplained hickey on the left side of your neck. Racks are nice but not that nice.

Sometime in the course of rappeling you have to get off rope. In the summertime look around for snakes before you touch down. When your feet touch, loosen the bars to let the slack back through the rack. Then squat down and step back up. This should loosen the rope

enough to allow for easy removal, but get the rack off of the rope. Take the rope in hand and move out from under the the drop. Prepare to belay the next person down. Signal "off rope" and then you can remove your seat sling and rack.

Belaying is an important part of vertical caving. It allows for control of rappel from below. This technique works because downward pull on the rope presses the rope into the bars increasing the friction and slowing or stopping the rappeller. When a person is in need of a belay, several things must occur. When the person comes over the lip, safety of those below is paramount. When the person gets clear, the belayer needs to decrease the angle away from the climber. If a belay is applied from the side, the rappeller will be pendulumed and friction decreases. So when belaying, remember the slack. The best method for effecting a belay is to play Tarzan. Stand up-slope of the point of landing. Grab hold and swing out putting your whole weight on the rope, the guy out of control needs you. The first guy down should be the most experienced in the party and he should belay the second person down. The second should belay the third, and so on.

Remember the bush? Experience is the thing that keeps cavers out of the vicinity of that bush. Vertical caving is an area of technical expertise. One becomes an authority through information and an expert through experience. Novice vertical cavers, though old time horizontal cavers, should remember that they are ignorant. Experienced people should tell new people everything they know, <u>twice</u>. Experience is gained gradually. All new vertical people should do an out of cave drop of fifty feet, (a bridge, cliff, building, etc.) Then the first cave drop should be less than 150 feet. For you folks in Rhode Island, start small and work up, then you may do a 200 footer. Several more nice 200 footers should also be done. Then, pits with cave at the bottom, waterfalls, rough ledges, and mud should be taken gradually. Then pits like Fern and Fantastic can be attempted and only then under ideal conditions. Rough caves should not be attempted under adverse conditions unless the whole party is experienced in the cave and well prepared for the worst.

All vertical cavers should know how to change over to prussik and vice versa, and also how to go over a knot. Rig a rope in a tree and do it. This you just have to do to learn.

What is an expert vertical caver like? He has a coolness about him when things get hairy; he has emergency competence. His motto is, stay scared-stay alive. A good vertical caver has a healthy respect for the dangers inherent in vertical caving. He continues to learn new methods and techniques, while perfecting the old ones. Trying to stay one jump ahead, he tries to think up things that could happen, and solutions to these problems. When introducing new people to vertical caving, he is a good teacher and sets a good example. He is concerned with cavers outside of his own group and by conventions and publications he communicates with the rest of the NSS. In the Vertical Section, he represents competent vertical caving.

Now that you have read this article, you'll have to read Th[illegible]s book on prussiking so that you can get <u>out</u> of the pit you rappelled into: SAFELY.

CARABINER PROBLEMS

by Bruce Smith

Many articles have appeared and many incidents have occurred as a result of carabiner malfunctions. If is not my intention here to recount each accident but to highlight some important defects or flaws that have come to my attention over the years.

History has verified that there are at least 2 deadly carabiners on the market. Pierre Allain and Kamet. Both of these carabiners have a slanted face at the gate and if the locking sleeve unscrews or is left unscrewed the carabiners flex and the gates open in reverse. See Fig. 1. The Gendarme at the base of Seneca Rocks has two Pierre Allain carabiners on display with the gates snapped off.

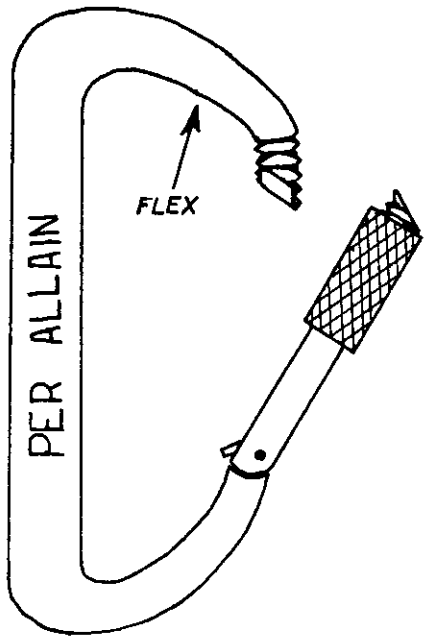


Fig. # 1. Pierre Allain locking carabiners will flex and open in reverse at approximately 150#'s when <u>not</u> locked.

I've personally seen three separate incidents where Pierre Allain carabiners gates reversed on the caver. One reversed gate caused a caver to fall 67 feet. Russell Harman, in the September 1969, NSS News, writes of his harrowing experience with a gate reversal in Grutos De Quintero with a Kamet.

MSR under the direction of Larry Penberthy did many carabiner research studies. Among these Kamet reversed its gate with only 275 pounds of force against the minor axies. They also made note that even if the biner were screwed shut the threads are cut so deep that the gate will break at 550 pounds; which brings us to a most important point. The <u>threads</u> on your carabiner can be dangerous. When you shop for carabiners know about threads. First of all a standard threaded carabiner on most models have the threads cut into the gate. If you start with a standard 11 millimeter rod and cut the threads to a depth of 1 millimeter you don't end up with the strength of a 9 millimeter rod.

There is a principle commonly practiced in industry called scoring. For example if you scratch or score a piece of glass, you have started the break or designated the weak spot. By threading you have scored your gate or designated the weak place where you want it to break.

So an 11 millimeter rod threaded down to a 9 millimeter solid rod may only have the strength of an 8 millimeter rod. You also must consider the 4 to 5 millimeter hole bored through the center of your gate where the return spring fits. Now obviously threads that are deeply cut into the rod are somewhat undesirable so let's see what else is available.

The following carabiner specifications are a sompilation of the manufacturer's data.

Carabiner Problems

CARABINER SPECIFICATIONS

BRAND AND MODEL	MATERIAL	MINIMUM BREAKING STRENGTH IN POUNDS (MAJOR AXIS)	MINIMUM LOAD IN POUNDS BEFORE GATE WILL NOT OPEN
R.E.I. Std. Oval	Aluminum	2780	200
R.E.I. Std. D	"	4770	200
R.E.I. Locking D	"	2835	200
Stubai Locking D	"	3190	N.A.
Stubai Locking D(Heavy)	"	5200	N.A.
Bonaiti D	"	4450	N.A.
Bonaiti Locking D	"	4510	N.A.
Chouinard	"	4000	250
Eiger Oval	"	2400	250
S.M.C.	"	2900	250
S.M.C. D	"	4500	400
S.M.C. Locking D	"	5600	400
C.M.I. Oval	"	2600	250
Cassin 1800 D	"	5400	350
Cassin 2200 D	"	4840	N.A.
Cassin 2500 D	"	7100	600
Cassin Locking D	"	6500	500
A.S.M.U. D	Steel	6700	N.A.
A.S.M.U. Locking D	"	4180	N.A.
German Oval	"	1500	N.A.
Cassin Pear	"	3000	N.A.
Cassin Oval	"	2500	50
Cassin Locking D	"	5000	N.A.
Marwa Kidney	"	5000	N.A.
Marwa Locking Kidney	"	5330	N.A.
Stubai Locking D (Large)	"	5800	N.A.
Stubai Locking D	Vanadium Steel	11,000	N.A.

Bonaiti, Cassin, Stubai, Salewa, Eiger, SMC and REI are a few of the most reliable biners available or at least the most trusted. MSR tests Bonaiti from 4000 pounds to 6000 pounds; Stubai between 4000 pounds and 5000 pounds and Salewa around 6000 pounds. SMC and REI have a high test, but look at the threads, yes! they are cut into the rod like the rest of the popular models, but they are like razors. See Fig. 4. I can personally testify that I saw an SMC chew 3/4 of the way through a 2" nylon seat harness in only 100 feet of texas prusik--which makes me wonder about all threaded carabiners.

Fig. # 2. Deeply cut threads

Fig. # 3. Flat crested threads

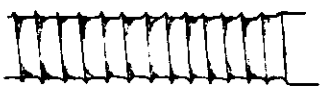


Fig. # 4. Rounded troughs but razor crests.

Figure # 3 is a better compromise. Look at the flat crests on the threads. You'll find this type of thread on some Stubai carabiners. The best thread so far is the acme thread. This you can find on some Bonaitis and Eigers. See Fig. 5. It consists of a small pin about 1/8" high and 1/16" in diameter on the gate. Around this the locking sleeve which has a square shoulder thread on the inside. The only problem is that so far all the manufacturers sledge both ends of the sleeve so you can't remove the sleeve to inspect or clean the locking mechanism.

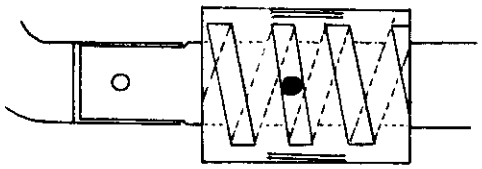


Fig. 5. Acme Threading. The black dot is an extruded pin, 1/8" high and 1/16" in dia.

Carabiners also have problems with side pressures. Our first point is that carabiners were not designed for brake bars. Brake bars and side gate pressures have been the direct cause of several deaths over the years. The weakest part of any carabiner is the gate and the weakest part of the gate is usually the hook shown in Figure 7. The second weakest part is the hinge end. If you cock the gate open you can almost bend the gate off sideways with your bare hands on most aluminum carabiners.

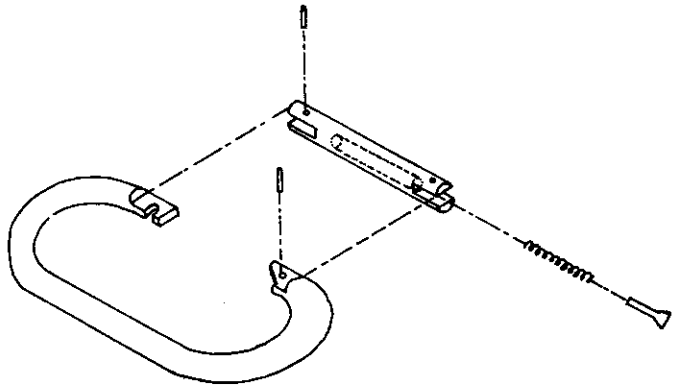


Fig. # 6. A regular oval carabiner showing its many parts.

What's needed is a short check off list or a set of guidelines that can be followed when making a carabiner purchase:

1. Look for brand names. By no means purchase an unmarked carabiner or one you don't know about.
2. Be sure that the test is stamped on the side.
3. Look for sturdiness of construction, especially around the gate. Avoid less than 11 millimeter rod material.
4. Look for acme thread construction. If this is unavailable look for threads that remain completely buried under the locking sleeve, whether open or closed.
5. Try to get a carabiner that the sleeve can be taken completely off.
6. If the threads are exposed, do they pose a threat to your harness. (Are the teeth sharp?)
7. Be sure the locking sleeve is a little difficult to rotate so that it will lock properly when screwed tight.
8. Inspect workmanship carefully on each piece you buy and inspect it often during use.

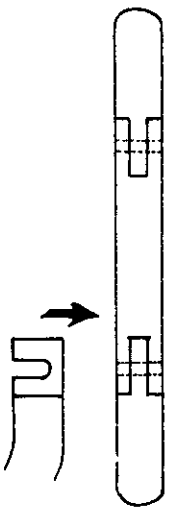


Fig. # 7 Side gate pressure when the gate is open will tear most aluminum gates off.

In October 1970 issue of the Texas Caver, Jerry Johnson recounts a Kamet carabiner that had the hole drilled crooked through the center of the gate and actually came through the side of the gate. He never noticed it because his locking sleeve always covered the flaw. See Fig. 8.

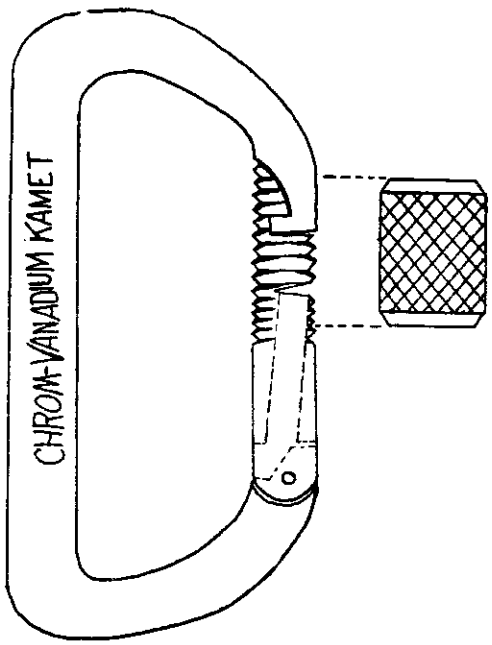


Figure # 8 A manufacturing flaw in a Kamet where the return spring hole was drilled crooked and actually emerged through the threads.

The stories are endless and the supply of cavers these days seem the same, but lets hope we don't loose anymore due to carabiner failures. Hopefully now! one can approach a carabiner counter with a few more reasons why you want to buy a particular kind of carabiner and not just settle for the brand of display. You can't afford not to be choosey.

THE BOTTOM BELAY

by Kyle Isenhart

Some experienced cavers and many neophites do not know what a bottom belay is, when and how to use it or the principles by which it works. The bottom belay is by far the simplest, and in most cases the safest way to control the descent rate of another individual rappeling with a brake bar type device. It is easily performed by simply pulling down on the bottom of the rappel rope. Usually a force of less than 10 lbs. is sufficient to slow a rappeler and 20 pounds is enough to immediately stop him. The person administering the belay should not be directly below the rappeller, this greatly decreases the probability of his being struck by falling rocks, etc. It has been successfully used at angles in excess of 45° between the belayer and the rappeller. The bottom belay has almost completely replaced the use of a second line and static belay from above while rappelling. The use of the second belay line from above is extremely dangerous and should always be avoided in free drops as the ropes become easily twisted and serious melt abrasion and snarling usually results.

The bottom belay works with all brake-bar type rappelling devices and other rappelling methods which obtain a significant amount of their control from the difference in tension above and below the device. As the tension of the rope below the rappel device increases in relation to the tension above it the amount of "braking effect" of the device increases tremendously. One advantage of the bottom belay is that the closer the bottom of the rope an individual comes the more efficient the belay is.

The addition of 10 pounds belay load to 3 pounds of rope is much more significant than the addition of 10 pounds load to 80 pounds of rope. The bottom belay's only disadvantage is that it cannot be used by the first rappeler on a descent. He must rely upon some of the other more difficult self-belay methods. This alone points up the fact that an unexperienced person should never be the first to descend. After the first person descends he should take the end of the rope and move to a safe vantage point. Then the communication for the

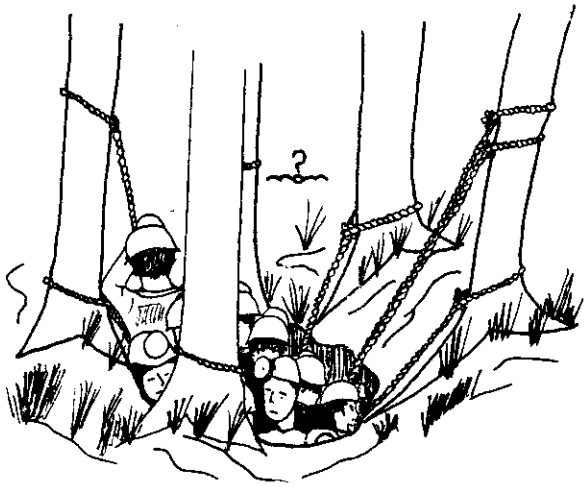
next person to descend should be made. In this manner the belayer is already in position to provide immediate assistance. As well as its use as a safety device the skillful use of the bottom belay is convenient in helping inexperienced people around obstacles such as ledges and waterfalls encountered while rappelling.

In conclusion it should be said that the bottom belay is a simple, effective, and essential technique that should be known by all cavers who plan to do any rappelling. If you are not familiar with it or are skeptical try it. It really works! The bottom belay is used as a safety for all rappellers regardless of experience and proficiency. Anyone can misjudge speed or distance, be struck by a rock, have their glasses steam up, or some other unexpected occurrence happen and the use of a bottom belay by a thoughtful companion could prevent serious injury or worse.

THE PIT POPULATION EXPLOSION

by Sam Pitthan

Everyday more and more people are taking up vertical caving. What should be done about it? Well, there are a few answers to this problem. (1) We could shoot them. (2) Cut their rope. (3) We too often avoid them and shun them. (4) Help instruct them in proper techniques, safety and courtesy.



Obviously the education answer is the best. If instruction and help is denied these people then someday we might have to help them out after sustaining an injury or death. Anyone who has done a pit rescue even in favorable conditions knows the hassell involved. None likes to do it yet they do knowing that someday it may be themselves requiring assistance., so let's prevent this from the start.

I'm not saying to go out and recruit pitpoppers but if anyone wants help let it be known that you are willing to help. A Saturday seminar on an old cliff, and evening in a tree, or rapping by the fireplace with a beer in hand can help. Everything and anything taught in the proper manner will help these people enjoy a pit and reduce the chances of a rescue by having them familiar with their vertical gear. (Editors Note:) The safety and techniques committee of the NSS is preparing a detailed education program directed towards the instruction of vertical cavers. As far as I can tell the program looks as if it's going to be superior to any program that preceded it.

When in the field avoid over populating a pit. There are plenty around and every rope in the country doesn't have to be in the one pit at the same time. By helping others you can help yourself. Remember the 6 P's of vertical caving: Prior Planning Prevents Poor Pit Performance.

HOW STRONG IS A STITCHED SPLICE IN NYLON WEBBING?

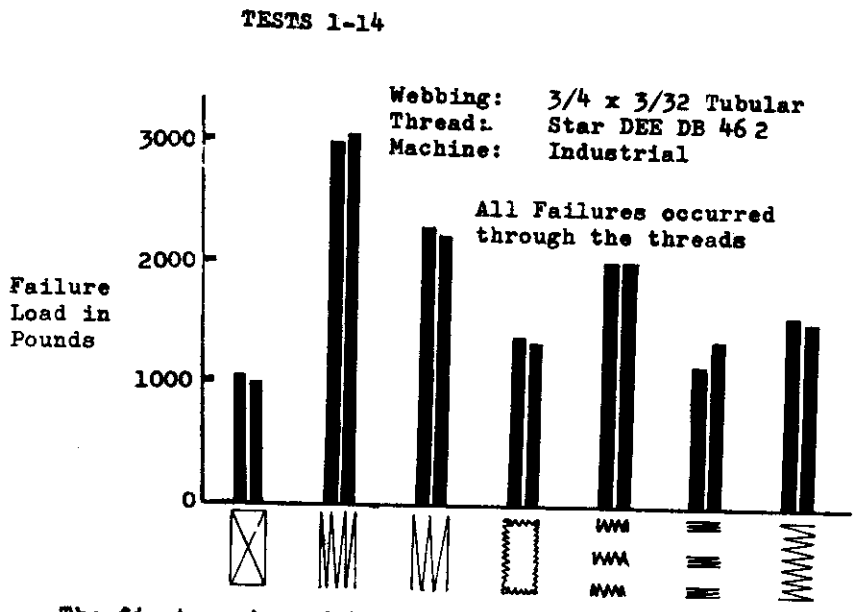
by Cal Magnussen

Tubular nylon webbing is one of the most versatile materials used in mountaineering. It is used for rappel anchors, rappel slings, chest slings, runners, hero loops, jam nut rigging, swami seats, and many other uses that the imaginative mind will conceive.

Joining the Ends

Probably the most common method for joining the ends to make a loop is with a knot. There are a number of different knots that can be used quite successfully, but all knots have certain disadvantages. The efficiency of knots varies from less than fifty percent to possibly seventy-five percent. Some knots require several inches of material, thus the sling or loop is heavier and bulkier than necessary. Some knots in slippery nylon materials tend to work loose unless they are pulled extremely tight or safetied by additional knots.

Sewing the ends of a piece of webbing together to form a loop of a sling, if done properly, is much better than a knot. Some of the advantages of a sewed splice over a knot are higher strength, smooth surface, less material required, and more secure in use.



The first series of tests was designed to determine optimum stitch pattern. Thread and webbing size were selected to insure failure in the splice.

Testing For Optimum Splice

A series of tests were made using 3/4" x 3/32" tubular nylon webbing sewed with various stitch patterns to determine the most efficient splice. Tests 1 through 14 shows the stitch patterns and their respective test strengths. Several rows of parallel longitudinal stitches proved the best of all the patterns tested.

In the first series of tests the thread broke in all of the specimens so another set of loops were made using heavier thread and the longitudinal stitch pattern. (See tests 15 through 21) Most of the second series failed at the one-half inch diameter bolt attaching the loop to the test machine, thus indicating that the optimum splice was achieved.

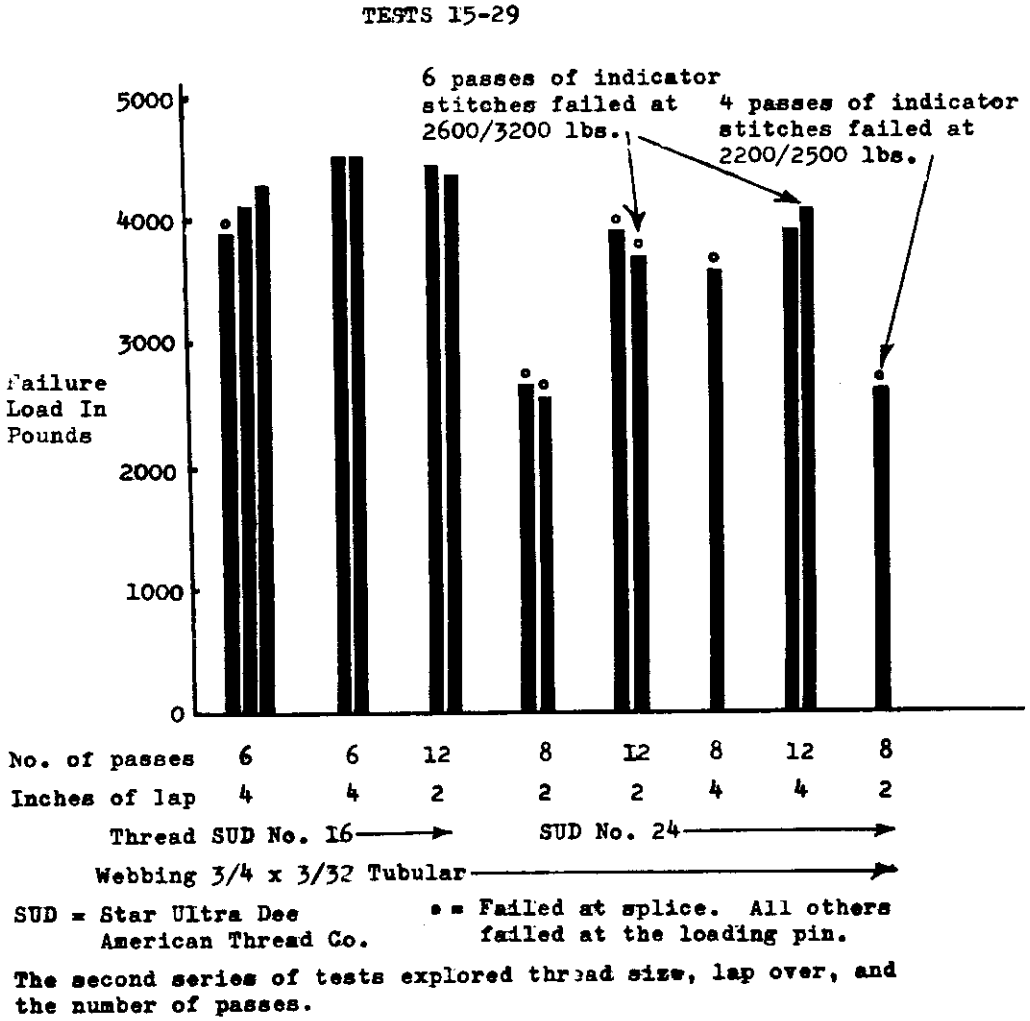
How Strong Is A Stitched Splice In Nylon Webbing?

On The Home Machine

The first two sets of loops were sewed with an industrial sewing machine using polyester thread. Since most climbers only have access to a home sewing machine and very few have industrial machines, a third series of tests were run with loops sewed on a Singer portable sewing machine using Number 24 Star Ultra Dee polyester thread and eight stitches per inch See Tests 22 through 29.

How Much Is Enough

Once the seam strength per inch with a certain thread is determined, the optimum splice for any type webbing can be calculated. As shown in Figure Two, twelve passes on a four inch lap was stronger than the webbing around a one-half inch diameter bolt. A two inch lap was only slightly lower in strength then the webbing over the bolt so would undoubtedly be adequate for any normal use. One inch tubular webbing with a breaking strength of about two times that of the 3/4" x 3/32" webbing would require twenty-four passes using the same type thread to obtain the optimum splice. The 9/16" x 1/16" webbing would require about ten passes.



A series of test samples were made up using 9/16" x 1/16" blue tubular nylon webbing. The splices with ten passes both broke at the thread so additional loops were made increasing the number of passes, length of splice and stitches per inch.

The loops with twelve passes both failed at the splice by webbing fracture rather than thread breakage indicating the optimum splice was achieved. Since the 9/16" webbing is thinner than 3/4" webbing, the stress due to bending around the one-half inch diameter bolt is

less with the 9/16" webbing. This would account for the fact that more passes were required than the calculation indicated to obtain the optimum splice and that the failures occurred at the splice rather than at the bolts.

Overload Indicator

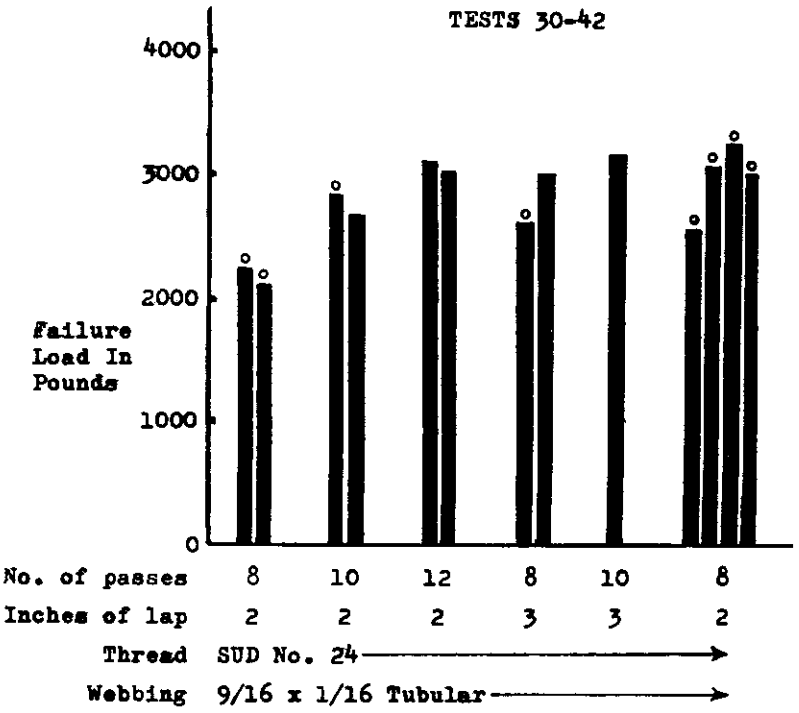
An indicator devised by Harmon Jones of Seattle, Washington was tried on several of the test loops See Test 25, 28, and 29. If a sling is subjected to a high load the nylon fibers take some permanent set as well as some reduction in strength. The indicator stitches will tell if the splice has been subjected to a certain predetermined load.

The splice is made in the normal manner except that an extra inch of material is used. Thus for a two inch splice, the ends are lapped over three inches. About half of the passes run the full three inches while the other half only run from one edge to the two inch mark.

As the loop is loaded up,the indicator stitches will fail first at a load somewhat lower than the breaking strength of the splice.

Nuts

Several jam nuts were rigged with loops made from 9/16" x 1/16" blue tubular webbing. The webbing loop can be sewed together so that the splice is near the nut and the face of the webbing is parallel to the nut. This provides a fairly stiff convenient handle for easier insertion of the small size nuts into relatively deep cracks.



The third series of tests continued the investigation on a smaller size webbing.

In all cases, the webbing loop on the jam nuts broke at the nut at about fifty-one to sixty-three percent of the strength of the optimum webbing loop. Nuts rigged in this manner would be satisfactory for protecting leads providing the climber does not advance too far above the nut without additional protection, or sufficient rope is cut between the belayer and the protecting nut to insure a dynamic belay in case of a fall.

Thread

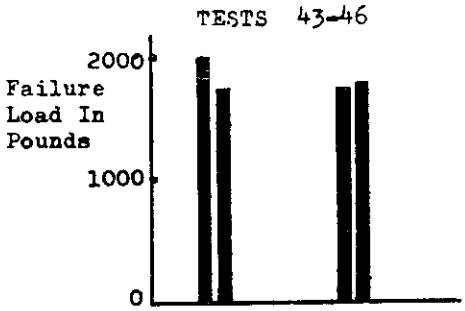
The thread used to sew the webbing loops made for these tests was made by American Thread Company and was purchased at Sewing Machine Service Company in Renton, Washington.

Other thread manufacturers probably make similar thread that would be satisfactory for sewing nylon webbing. The thread size and seam strength information is available in litera-

ture published by the thread manufacturers. The yellow pages in you telephone directory will help you find your nearest supplier.

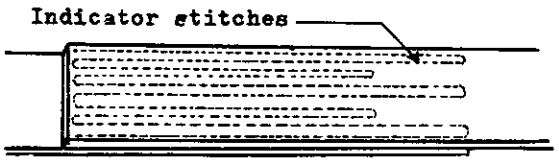
Hints On Sewing

The ends of the webbing should be hot cut, or melted after cutting to prevent ravelling. The rows of stitches should all be as near the same length as possible except for the indicator stitches if they are used. On some sewing machines the webbing may tend to slip out from under the presser foot if the first pass is made near one edge. If the first pass is made down the center of the webbing, better alignment can usually be achieved. Stitches should not run over the ends of the webbing as they would be more subject to abrasion as well as higher stress under a load.



All failures occurred through the webbing at the top of the nut

Eight to twelve stitches per inch is probably best. More stitches per inch would be stronger but the machine may not feed properly if the stitch if the stitch length is too short. Some experimenting with tension and stitch length may be necessary to get the best results.



Indicator stitches will fail when the splice loaded to 60-80% of its ultimate

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FINANCIAL REPORT

Of interest to a few and importance to many is our financial report for the 1973-74 term. This, of course, was our first year in existance where we actually handled money and because of this it is important to know where the money went.

CREDITS (Money we received)			DEBITS (Money spent)		
Dues and Subscriptions	$218.50	95.6 %	Printing	$102.00	42.5 %
Donations	9.90	4.4 %	Paper	42.14	17.5 %
Total Assets	$228.40	100.0 %	Postage	59.89	25.0 %
			Refunds	10.00	4.2 %
			Miscellaneous	25.99	10.8 %
			Total Debits	$240.02	100.0 %

Deficit of ($11.62)

As you can see, just like our higher officials in government, I ran a deficit budget of $11.62. I must explain that "refunds" included the reimbursements to those people who had paid too much for their dues or subscriptions, while "miscellaneous" included newsletter mailing envelopes, mailing labels and a phone call from the printer.

Submitted by Bruce Smith

THE BACHMANN KNOT
"Let's tie it right"

by Bruce Smith

Being the oldest of all semi-mechanical knots,[1] you would think by this time that climbers would use it correctly. There are actually three varieties that are generally referred to as two wrap, three wrap and four wrap Bachmann. Each have their special place with regard to climber's needs.

To begin with let's tie it right and use it correctly. Under most conditions the three wrap Bachmann is the most reliable. Follow the procedural steps depicted in Figures 1-5. Figure 6 shows a four wrap Bachmann. It is not necessary to use a locking carabiner. In more than 5 miles of Texas prusik with Bachmann I've never had any difficulties with regular carabiner and never had problems with knot inversions. I had continuous problems with carabiners other than regular. "D" shaped, Marwa, pear shaped and Chouinard carabiners all slipped and provided unsatisfactory performance.

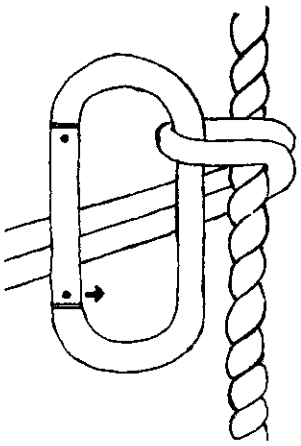

Fig. # 1 Starting the Bachmann.

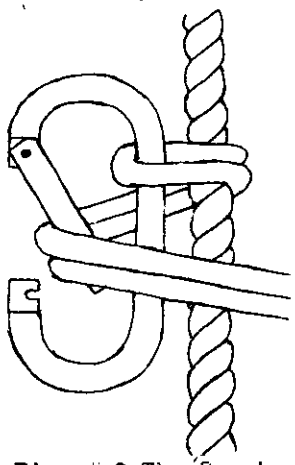

Fig. # 2 The First Wrap.

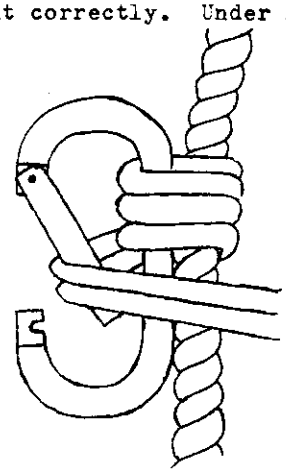

Fig. # 3 The second wrap.

The gate must be down. Be sure there is no gap in the coils like that shown in Figure 10. The coils gripping power becomes less effective. The key to the knot is in the main line or standing line kinking as shown clearly in Figure 9. Notice how the cord pulls the main line inside the carabiner and kinks it. Here is where your critical gripping takes place. If your finished knot looks like Figure 4, your not finished - always rotate the carabiner into the main line. On a stiff rope a 2 wrap Bachmann may kink the rope all you need on standard Bluewater, Goldline, Old Samson, 3 wrap will be necessary while on New Samson or wet, muddy new Bluewater 3 wraps may be required. I've never been on a rope or in a situation that one or two more wraps didn't cure.

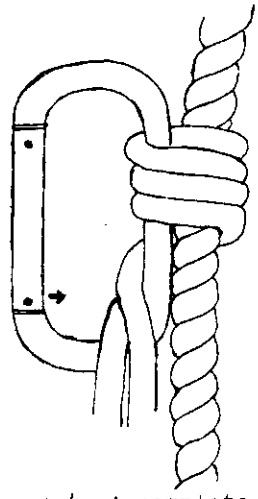

Fig. # 4 A complete two wrap Bachmann before the carabiner is rotated into the main line.

Now, when climbing, on occasion you'll sit down (texas prusik) and the knot may slip. You sat down <u>wrong</u>. Never sit down slowly for the rope won't kink properly and yes the knot will slip. When you sit down, sit down <u>hard</u> and pull that rope inside that carabiner.

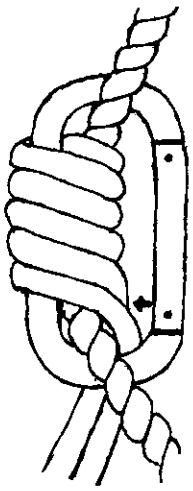

Fig. # 5 A three wrap Bachmann after carabiner rotation.

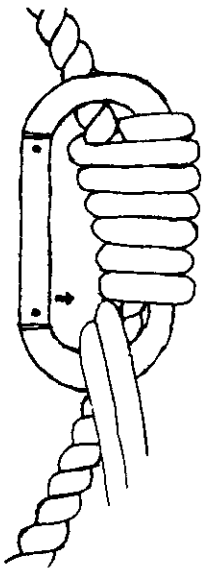

Fig. # 6 A four wrap Bachmann.

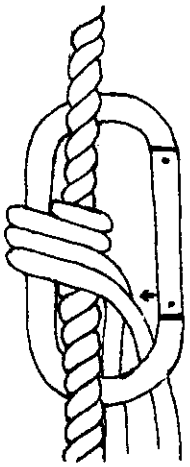

Fig. # 7 A completed two wrap Bachmann.

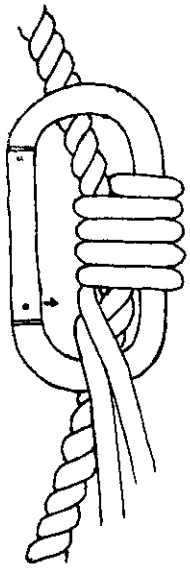

Fig. # 8 Completed three wrap Bachmann viewed form the other side. See fig. # 5.

Other problems may arise such as the knot over tightening. The foot Bachmann becomes the most difficult to slide. First may I recommend that on most average used ropes a three wrap on the seat harness and a two wrap on the foot works very well. The foot has a tendency to over tighten with the standard three wrap. If the coils do over tighten simply push the cords through the carabiner eye and you'll loosen the knot. See Figure 11. The knot works well with 1/4" to 5/16" limp nylon, polypropolene or one inch webbing as your prusik cord medium. There are a few more don'ts associated with the Bachmann knot. First never use the carabiner as a handle either to lift yourself up or to slide the knot up. You must maintain proper orientation with the rope. Never allow the carabiner to assume any other position than vertical. Always push the knot up from below, as shown on page 19. Don't grab the knot itself. The really big advantage to the Bachmann is that it can be removed and retied to a rope about as fast as with a Gibb and you need not remove it from your seat sling like a prusik knot. As a prusik safety, it's great.

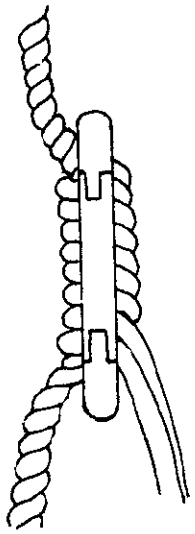

Fig. # 9 Side view showing the distinct kinking that the main line must take for proper holding.

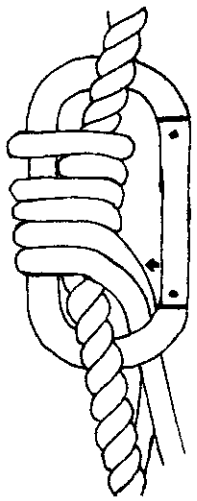

Fig. # 10 Wrong! The gap in the upper coil is a mistake and holding power will be lost.

The Bachmann knot works well with almost any kind of material. The only criteria for the cord selection is pliability and of a

Bachmann Knot

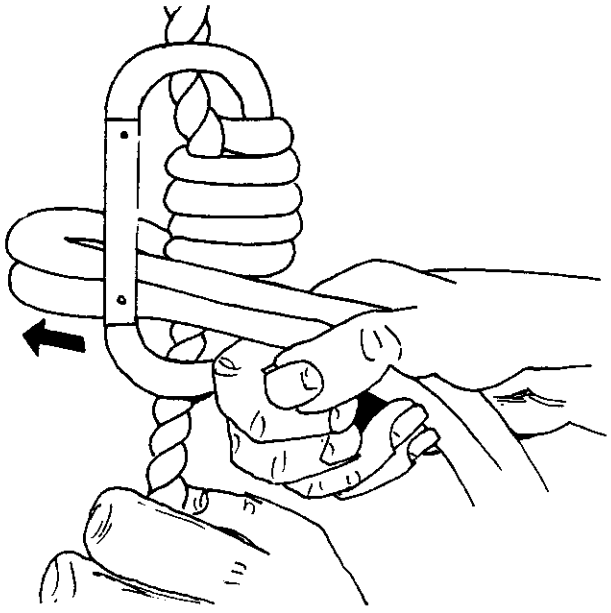

Fig. # 11 Push the prusik cords through the eye of the carabiner to unjam or unlock an over tightened Bachmann.

smaller diameter than your main line. Webbing works great. If you ever get trapped at the bottom of a pit with no prusik cords, and you're using laid rope, unravel a few feet at the bottom of the rope and use one of the lays for your Bachmann cord. I always use a piece of one inch webbing for a belt that fits around me twice when I cave. This can be, and has on many occasions, been converted into a Bachmann cord at very short notice.

Hopefully through this article we can generate some enthusiasm with regard to some of the older forgotten modes of vertical travel.

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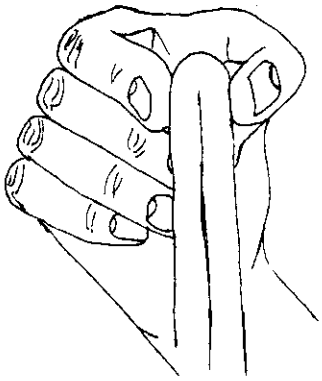
[1]Robert Thrun, Prusiking, Speleo Press, Austin, Texas. 1971, page 11.

WHEN TO RETIRE A PRUSIK CORD

by Bruce Smith

If you use a white pliable hardware store nylon for your prusik cord you must be aware of a critical danger signal. As a cord gets used, it picks up dirt and other foreign particles. This dirt makes the cord stiff and unworkable. It doesn't hold a knot, and won't grip a rope so let me propose this simple test. If the cord can be bent or squeezed as shown in the figure to the right it is still good and should serve you well for at least a few moere ascents. If it doesn't compress as shown, retire it.



VERTICAL SECTION MINUTES

The meeting was called to order at 4:15 P.M. by Bill Cuddington, chairman of the board of the Vertical Section. Board members present were: Bill Cuddington, Kyle Isenhart, Pete Strickland, and Kirk MacGregor. Absent was Allen Padgett. In the absence of Allen who was the secretary Kyle Isenhart was appointed to act as secretary for the meeting. The meeting was conducted by Kyle Isenhart under the direction of Bill Cuddington.

Vertical Section Minutes

A motion was presented, recorded and passed unaminously to continue the newsletter, The Nylon Highway with Bruce Smith as editor.

An appeal was made to all members by the board to submit material to be considered for publication by the newsletter.

A motion was presented, seconded, and passed unaminously requiring dues and making the following classes of membership in the section:

Charter members are those who signed the charter when the Section was formed in 1972. Charter members may endorse N.S.S. mambers for membership in the section if they are paid up for the year. If they are paid up they receive all publications.

Regular members are those who have been in the section over two years. Regular members may endorse N.S.S. mambers for membership in the section, if paid up they also receive all publications.

Associate members are those who have been paid up members of the sections for one or two years. Associate members may not recommend N.S.S. members for membership in the section. If they are paid up they receive all publications.

Family Dependent Members of any of the preceeding three categories. Family dependent members who are charter members or have been paid up members for over two years can recommend N.S.S. members for membership in the section. Family dependents receive no publications.

Dues for the membership were set at $3.00 per year for charter, regular and associate members. Family dependent membership dues $1.00 per year. Dues are to be paid at the Annual Convention meeting or as soon there after as possible. Membership is from convention to convention and not by the calendar year. If a member does not pay their dues they will not be listed as a member for the year but upon payment of annual dues will re-instate to their previous category if charter or regular members. If a first year associate member they will advance to their second year as an associate. Family dependent members will be treated as the previous three categories dependent upon their status.

The subscription fee for the Nylon Highway was set at $3.00 per year.

It was determined that an additional fee of $1.00 to help cover the cost of postage for members and subscribers outside North America excluding A.P.O.'s etc., receiving the publications be imposed.

It was decided that those foreign members unable to pay their fees at convention or in cash should pay them in money orders payable in U.S. currency. If this is not possible they should include additional amounts to cover exchange fees, etc.

An appeal was made by Bill Cuddington to the section members for more support during the convention with the prusik contest and training program.

The following motion was presented, seconded, and unaminously passed:

A member may be expelled from the section for persistantly advocating and/or utilizing bad conservation or safety practices, etc. This would require the affirmative vote of 3 of the board members after a hearing at which all interested parties may attend and of which the member in question has been notified at least one month in advance. This will be done at the annual convention meeting.

A call for the election of officers was made by the board and the floor was opened for

nominations. The present board of Bill Cuddington, Allen Padgett, Kirk MacGregor, Pete Strickland, and Kyle Isenhart was renominated. A motion was then introduced, seconded and passed closing the nominations. The nominees were voted in unaminously.

It was announced that immediately following adjournment of the meeting new members could join the section and that dues from members and subscription fees would be collected.

The meeting was adjourned at 5:50 P.M.

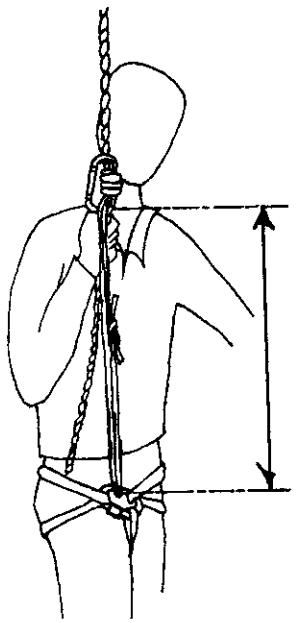
Immediately following the meeting the board met and elected Bill Cuddington as Chairman and Kyle Isenhart as Secretary.

Submitted by Kyle Isenhart

THE CRITICAL LENGTH FOR THE LONG TEXAS

by Bruce Smith

If you're like most of us and can't afford all the Jumars or Gibbs we would like to, you have probably been forced to revert back to such methods of ascent as the texas prusik. Well, cord length as always is critical, but if your truckin' up more than 100 feet texas style, it would behoove you to get your cord length right.



The optimun lenght of the seat prusik cord. Elbow against your side.

First let's get the seat harness tight. You can't afford to have it do any shifting around. The prusik cords should attach in the top of your seat harness locking carabiner. Never use a jumper biner or extra biner. Keep it simple, less can go wrong. Please look at the diagram to the left. Depicted is the maximum length that a cord should be. Notice that the elbow is against the climbers rib cage. If the cord is any longer, the strong bicep muscle loose their effectiveness and the weak shoulder or deltoid muscles take over. These shoulder muscles tire quickly and on the long texas prusik climb, it can really get tough. On the other hand, if the cord is any shorter than that shown, you are loosing efficiency.

This not only goes for the Bachmann knot shown, but prusik knots, RBS knots, Jumars, Gibbs and all other ascending devices that you may prefer. Don't wear yourself out unnecessarily, use the proper optimum lengths of prusik cord and you'll climb longer with less effort.

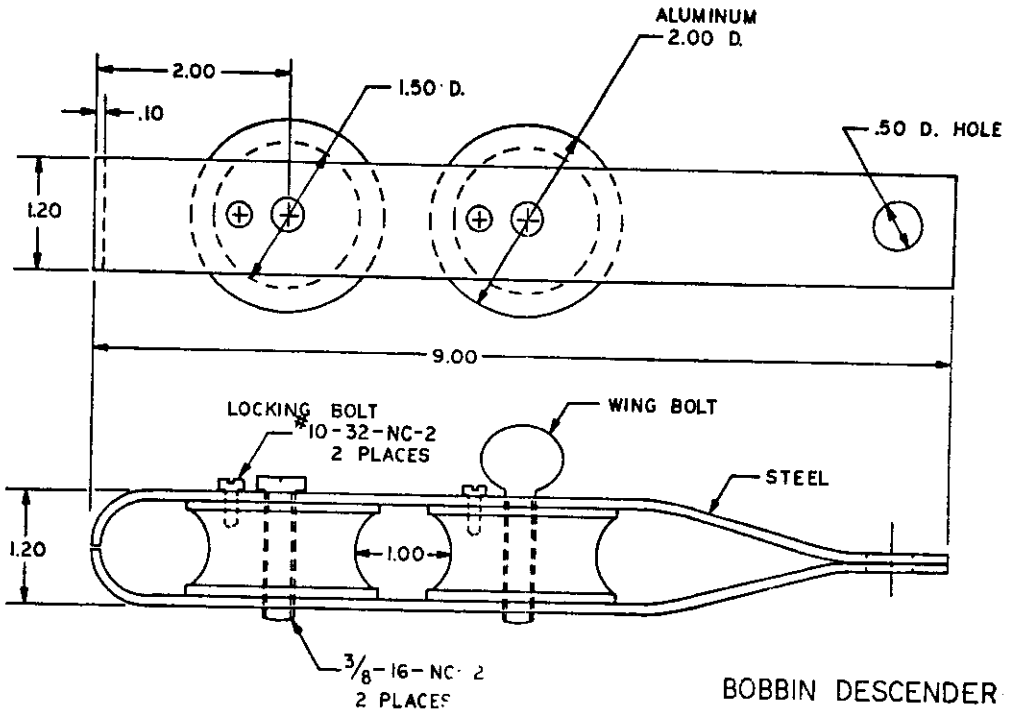
And while I'm on the subject of energy and climbing with less effort; a good rule of thumb for you pit plungers, is never attempt a pit that you know you haven't got the energy to do twice. Except under unusal cases like El Sotono.

THE BOBBIN

by Bill Torode

In the Summer of 1967 John Cole, a Huntsville caver, went to France to do some caving. In January and February 1968 issues of the NSS News, was an article about John's trip. On page 24, of the February 1968 NSS was a sketch of a descending device called a "bobbin." The rappelling device was being used by the French and Spanish cavers. The bobbin, John learned, was invented in Pamplona, Spain by a caver around 1965.

John told me a little about the device, it was all aluminum and was small enough to fit in a shirt pocket. With that information and the sketch I set about to build a bobbin. At this time I had access to a machine shop where I worked. First I designed the device on paper. I didn't like the thin aluminum sides and thought that steel would be stronger and safer and not that much heavier. The next thing that became apparent was that the French device was made for a smaller diameter rope 9 millimeter or 11 millimeter, this is a smaller diameter than most caving ropes at that time.



BOBBIN DESCENDER
DRAWN BY BILL TORODE NOV 1970

I made my bobbin both wider and longer. The first bobbin I made is what I still use today. The aluminum spool that the wing bolt goes through is threaded all the way through, this keeps the wing bolt from dropping out and becoming lost. This wing bolt also gives positive locking and greater overall strength. On the Spanish bobbin the carabiner in the attachment hole is what holds the sides together.

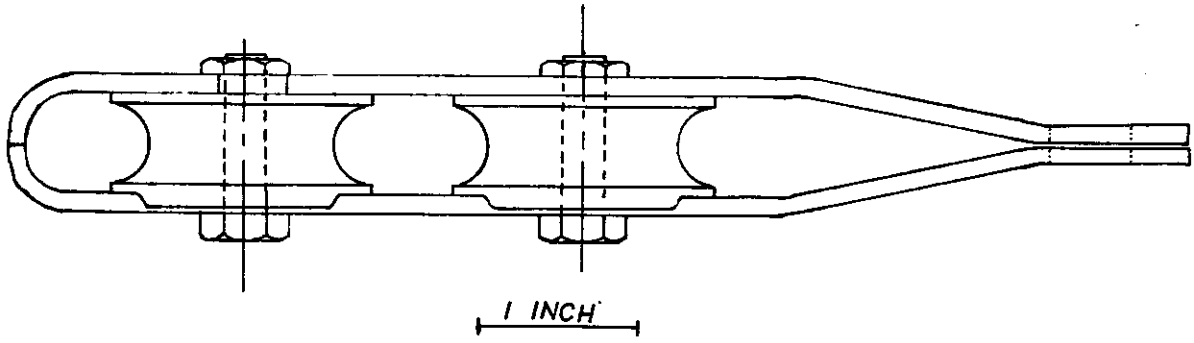
After a few years of rappelling with my bobbin, the aluminum spools wore down to the locking bolts, at which time I replaced the spools. Anyone making a bobbin should make several replacement spools at the same time.

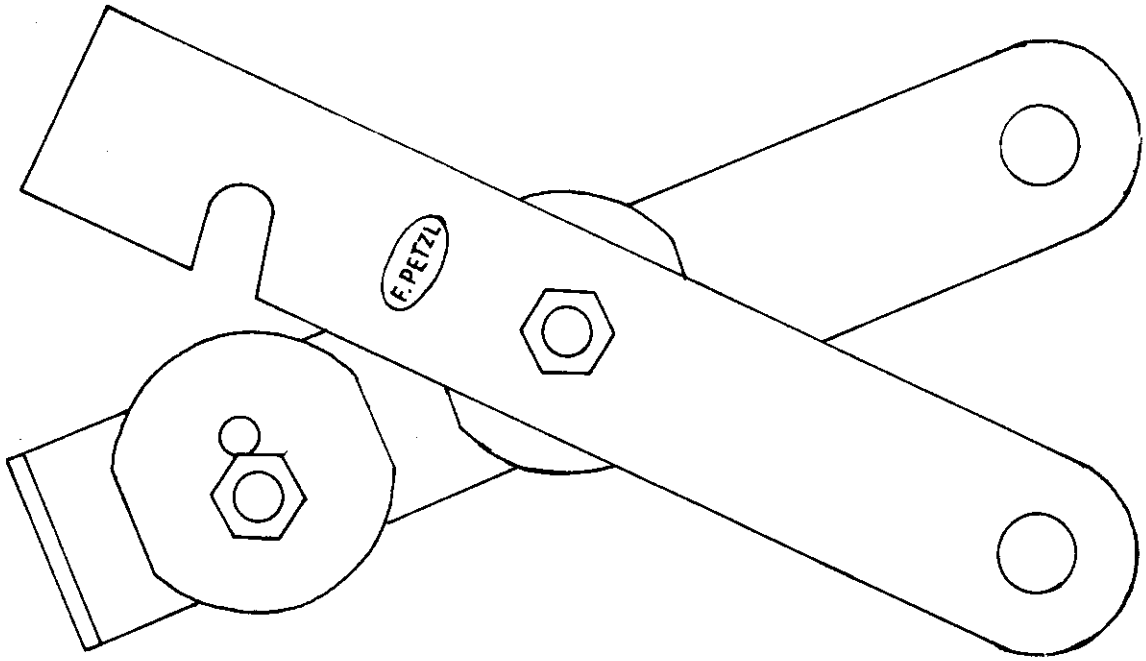
As these spools wear down over a period of time you will notice that your rappel will be slightly faster, or if you should use a smaller diameter rope you will have a faster rappel.

The Bobbin

At times like these I will clip the rappelling rope through the carabiner attached from the seat sling to the bobbin, this will give you more friction. The use of this device, like the use of most rappelling devices, still relies on the finer control by the caver of running the rope through a gloved hand and against you side.

During Christmas of 1972 and 1973, French Canadians from Quebec came down to North Alabama to visit some of our caves. They were using the Spanish bobbin and had two sizes one for 9 millimeter and one for 11 millimeter. They said that the bobbins costs around $12.00 which I thought was more than I wanted to pay. They also had a different name for them but



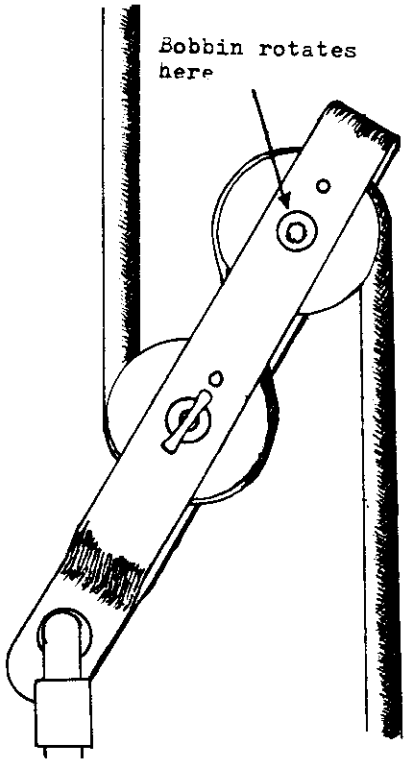


SPANISH BOBBIN FOR 9MM ROPE

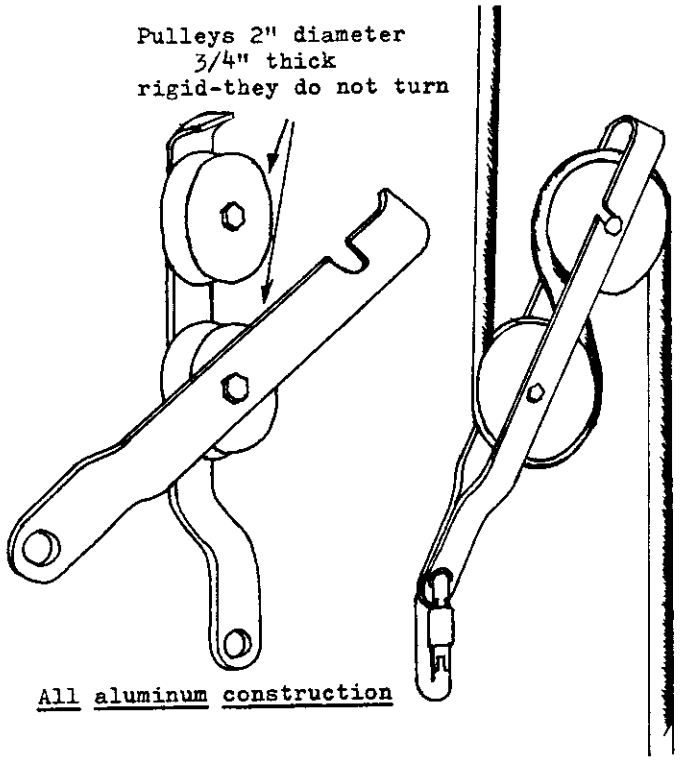
The Bobbin

I never did catch it.

I have been using my bobbin for around five years and have been pleased with it. I am sure that improvements in its design can be made. Anyone building one may experiment with their own design and make improvements.



TORODE'S BOBBIN
Add friction by clipping the rope through the seat carabiner. Drawing made from a photograph submitted by Bill Torode.



BOBBIN-SPANISH DESCENDER
Different sizes for different diameter ropes.
Drawings made from sketches submitted by W. Torode.

Letter From The Editor

I was really pleased to receive word from the Vertical Section that I'd been elected for a second term and I hope you're appreciating our third attempt at authoritative vertical literature. We've tried to put some of the new as well as the old in each issue. Keeping abreast of new vertical ideas isn't as easy as one might think.

I feel that we could really grow and expand and be able to prepare a much finer publication if each person took it upon himself to take an issue or two to their next grotto meeting or to their next cave campground and talk our little newsletter up with friends.

NYLON HIGHWAY # 4 is already underway and we've got a super article on ladders coming up for all you ladder freaks. Please let me hear from you. I'd like to know what you and your grotto have been doing vertically. Let me hear some constructive criticism.

Vertically yours,

Bruce W. Smith