



MOUNTAIN SAFETY RESEARCH

NEWSLETTER

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PART OF

Issue 4

FEB. 1971

Page 4-1

Greetings & Happy New Year! Response to the Newsletters has been enthusiastic, and distribution has risen to 7843 direct mail plus 1200 in bulk to clubs. The last issue was in May, and now readers are writing to ask where is the next one. Sorry for the delay. There were many reasons: we had an excellent climbing season, which wiped out my summer spare time; development of new ice axes; a surge in the glass engineering business which required me to go back to work instead of just having fun with MSR; testing of new products put on the market by others; travel to mountaineering meetings abroad; and election to the Board of Trustees of The Mountaineers, which is one of our arenas and which takes time. More about these in this issue and later.



Item 101

THUNDERBIRD*-Amazingly effective for chopping steps in ice. Excellent for self-arrest on hard snow and ice.



Item 102

EAGLE--Excellent for self-arrest on hard snow and ice and as ice dagger. Chop with adze



Item 103

ST. PARBAT--Similar to Nanga Parbat of Stubai, Everest of Ralling, and others.

NEW MSR ALL-METAL ICE AXES

\$13.75, \$12.85 ^{five} or more

Introductory prices. to be changed after May 10.

CHROME MOLY steel heads heat-treated to Rc 36-41 High-strength ALUMINUM ALLOY tubular shafts. High-strength spike design, with no ferrule joint. Both head and shaft coated with Neoprene-base for grip, heat insulation, and orange color. Light weight, one pound twelve oz. (790 gm) 32.5" length.

Plus packing and postage \$1.00 each west of Mississippi, \$1.50 elsewhere. Plus 5% tax in Washington State only. The quantity price is available to anyone; join with your friends. Any mix of heads and lengths: 22, 26, 29.5, 30.5, 31.5, 32.5, 33.5, 34.5, 35.5, 36.5, 37.5 inches. Supplied with glide ring and wrist strap. Polished heads on special order, \$5.00 extra.

Teeth on St. Parbat are standard, because the hooking capability depends on them. Teeth on Thunderbird are not wanted, because they make the pick stick too much in hard snow. Teeth on Eagle are available at \$1.00 extra.

Please improve your safety and order guards for your axe. Soft rubber. For all spikes and for picks of Eagle and St. Parbat. ---- Item 130--40¢ For pick of Thunderbird. ----- Item 131--50¢

For adze of all axes; leave guard in place in self-arrest. Item 132--50¢

HERE IS THE STORY

Background

We tried hard to get the well-known ice axe makers to improve the strength of their shafts. The uptake of our proposals was underwhelming. We then tried to buy heads, planning to shaft them with our own aluminum tubes. The makers were willing to sell heads only, and we did get a few in June-July 1970 from Stubai; but the few we could sell would not meet the general need for stronger axes for all climbers. The main production of the old makers would still be the same old wood that breaks. Further, the prices were high and deliveries too late to meet the 1971 season. We couldn't continue with the stainless steel heads; they were so costly that we could not reach the general market with them. In desperation, then, we turned to another process and found to our joy that it gives a superior product at low tooling and labor costs with short production time. Best of all, the new process is versatile, and it was possible to make improvements in design at low cost quickly.

*USA & Foreign Patents applied for. Printed in USA. Copyright Feb. 1971 MSR

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Feb. '71 - MSR Newsletter

MSR Process for Axe Heads

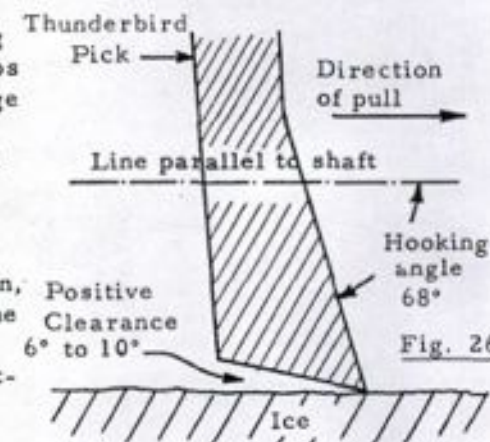
The new process is simple. The pick and tang portions are flame-cut as one piece from 1/4" plate, and the adze is stamped from 1/8" plate. The two are welded together by the TIG (Tungsten-inert gas) process. The steel is chrome-moly Type 4130 including the weld metal, the same as used in pitons and aircraft. The final shaping and finishing are done by conventional milling, grinding, and drilling.

Axe Head Design

Our initial thought was to make a reliable axe that would have excellent self-arrest capability on hard snow and ice, which would cut steps with the adze, but not with the pick. This axe head was named the EAGLE. It has a good hooking angle, 68°, and has a 30° included-angle point. Its main use will be for ice climbing specialists.

Suddenly, while testing the Eagle, came the dawn! By lengthening the radius of the upper edge of the pick, retaining the same hooking angle of the lower edge, the pick could also be used for cutting steps. In appearance, the upper edge and the lower edge of the pick diverge as they approach the point. By providing positive clearance of the cutting edge, self-arrest capability is retained. This is the design concept called THUNDERBIRD. Fig. 26.

Field testing quickly showed the THUNDERBIRD advantages. Kick (bounce, vibration) is gone! Steps can be cut with greater precision, both with the pick and with the adze. When cutting with the pick, the ice chips spurt to the right and left, not into your face. There is less tendency of the ice below the step to flake out because the splitting force is uni-directional, not 360° around the point. Excellent hooking power is retained.



This name, Thunderbird, comes from its resemblance to the beak of mythical thunderbirds on the totem poles of Western American Indians.

We think the Thunderbird axe is the best axe in the world today, and we recommend it for general climbers as well as for the experts. We offer you a money-back guarantee; if you give one a good trial and don't like it for any reason, send it back and we'll return your money plus postage both ways. Or you can trade it for a St. Parbat, but see comments under "Vibration".

MSR Process for Shafts

All MSR axes have aircraft quality aluminum alloy tubing as the main element. We chose this material over fiberglass for one basic reason: when fiberglass is overloaded, it breaks; when our alloy tube is overloaded, it only bends. MSR shafts are six times as strong as the weakest ash, and 2.3 times as strong as the best hickory. One end of the metal shaft is swaged down to 3/4" to receive the spike. This avoids a joint, which, in wooden shafts, is a weak point. The spike is made of cold-worked steel which has less tendency to skid on rock when the axe is being used as a cane. In time, the point will wear. Then it can be ground to a sharper point or it can be replaced by cementing in a new one. The other end of the shaft is formed down to a slot 1/4" wide to receive the tang, which is 1.2" wide by .25" thick. The tang is pressed in, a hole is drilled through for a stainless steel rivet, and 15 grams of epoxy are poured in to fill the spaces. This makes a joint so strong that we have not been able to make it fail. Some other part of the axe bends first. We are working on an invisible variation of the rivet which will be just as strong and lower in cost.

Some climbers have inquired about the cooling effect of the aluminum on the hands. We coat the aluminum to provide thermal insulation and to eliminate the slipperiness of bare aluminum. The new neoprene coating works well, and costs less than the fiberglass used last year. If anyone wants more insulation, the shaft can be wrapped with adhesive tape where needed. As a practical matter, the bare metal of the head has been cooling hands for a long time. We are coating the center part of the head also. This adds insulation, improves the grip, and reduces the cost due to omission of finishing under the coating. The new coating is tougher than the old fiberglass coating. In time, if it is marred by scraping on rock, the scratched places can be repaired with the same material simply by painting it on. We will offer this material in small cans later.



MSR Process for Shafts (Cont.)

Speaking of bending without breaking, you will be interested in the following incident which happened last summer. A climber set up a boot-axe belay, using an axe which we had reshafted with metal. He could get the axe only half-way into hard snow. The leading climber fell, and was caught on this belay. The rope rode upward to the head, the shaft bent 45° but did not break, and the belay held. Since the place where this happened was precarious, the belayer cheerfully paid to have another metal shaft put on. He was confident that a wooden shafted axe would have broken, with disastrous consequences.

COMMENTS ON THE THUNDERBIRD AND EAGLE IN SELF-ARREST

The hooking (or digging-in) capability of the Thunderbird and Eagle picks is so good that the next question concerns the strength of the bent fingers and arm to carry the load. Stewart Ferguson, Seattle, gave us this tip several years ago. Bring the wrist loop up over the top of the axe head to the wrist. Fig. 28 Then, if your fingers pull out, the load will still be carried by your wrist and arm.

Some climbers might be concerned that the Thunderbird has too much hooking ability. After testing it yourself, you can always grind or file away some of the lower edge to change the angle. You may even want more hooking ability.

The "book", p. 255, says that arrest on ice is very difficult to impossible. We are trying to make it readily possible and are studying new ways of transferring the load of a falling companion on the other end of your rope to the snow and ice without going through your arm. The hole in the pick is for attaching the free end of the rope to the pick after you have clipped in with a figure-eight loop to your harness. If you will help with the field testing of such techniques, please write for the diagram.



Fig. 28

VIBRATION = KICK = BOUNCE

When the pick or adze strikes ice or hard snow, there is a sharp reaction on the hand, called, vaguely, "vibration." One old-timer said to us, "You can't have metal for shafts; you've got to have wood to absorb the vibration!" His remark started us on a study of "vibration." What is it?

We began by striking various ice axes at 500 pound blocks of ice kindly donated to the cause by Dutch Gray at Rainier Ice & Cold Storage. It quickly became apparent that "vibration" is really a kick longitudinally of the axe shaft, and that the material of the shaft made no difference. What counted was the geometry of the pick and the angle at which it was striking the ice surface.

Fig. 29 shows one extreme, where the axe is striking the far side of a step being chopped. The head illustrated is a Parbat shape, which is a term we apply to all axes which have a short radius of curvature on the upper edge, and whose lower edge is nearly at right angle to the shaft.

It can be seen that the hump of the upper edge forces the axe toward the hand as the swing is completed; the hand feels this as "vibration." Fig. 30 shows the other extreme, where the axe is striking the near wall of a step being chopped. Here the kick moves the axe away from the hand.

You can measure this kick in any axe by the following method: Tape a piece of string to the side of the shaft at the place where you grip when chopping. Stretch the string tight past the tip of the pick. Mark the string at the upper corner of the tip. Swing the string to the center of the axe and note how much metal there is above the mark. This extra metal is what causes the toward-the-hand kick. In the Stubai Nanga Parbat, there is 1/4" too much metal for a 28" radius of swing. Repeat for the lower corner of the point. The excess metal below the second mark is what causes the "away" kick. In the same axe there is 1/2" too much metal for a 28" swing.

Measuring is a little complicated with the Aschenbrenner and the Wallner patterns of Stubai. On these the edges near the point are tapered. The amount of kick is related to the metal that would be there if the tapers were continued. Engineers will note that the diagrams show the extremes, and that there is one intermediate angle of strike where the toward and away kicks are balanced

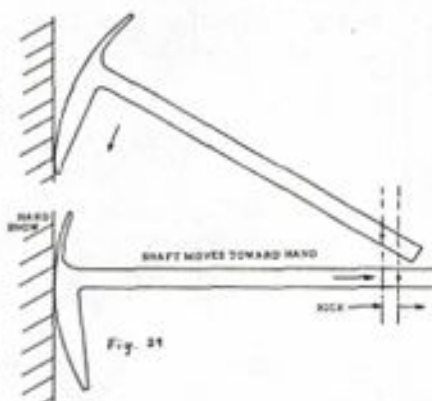


Fig. 29

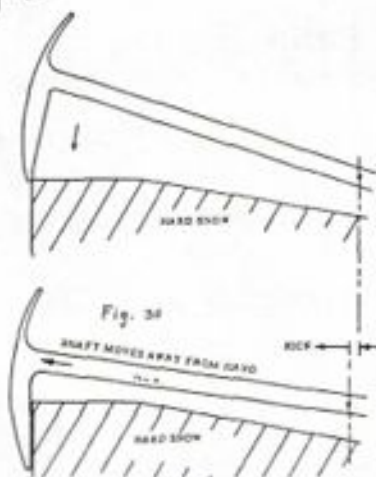


Fig. 30

The essential difference between picks of older design and the Thunderbird is that the upper and lower edges of older designs converge as they near the tip, whereas in the Thunderbird, they diverge. This divergence is why there is no "vibration" with the Thunderbird axe. The material of the shaft has nothing to do with it.

OTHER PHENOMENA IN ICE AXE DESIGN

While testing various axes in the field, we noticed some peculiarities. I was using a Hope Alpinist axe on a small ice wall. At the top, I socked the pick into the hard snow to use as a hook for pulling myself up over the edge. To my consternation, the pick came out of the snow and I nearly fell off. The lower edge of the pick had no teeth, and the hooking angle wasn't sharp enough. ... When a pick does not have teeth, it will come out of the snow when the hooking angle at the tip is greater than 78°. The Alpinist has an angle at the tip of 84°, curving to 89° near the shaft. When I got home, I filed 4" of teeth in the lower edge. ... To help you check the hooking angle of your own axe, we have drawn a 78° angle at the bottom of this page. Cut a larger piece of stiff paper to match this angle, and then compare with your axe. If the angle is greater, better file in at least 2" of teeth.

The Nanga Parbat has a hooking angle of 84° near the tip, curving to 87° near the shaft, and has five inwardly-cut teeth. When used as a hook, the Nanga Parbat rises out of the snow part way until the teeth engage. Unfortunately, this leaves only part of the pick in the snow, resulting in reduced holding power. The Ralling Everest has teeth which project from the lower edge, and is much better in this respect.

This tendency to rise out of the snow, when the shaft is pulled, is also of interest in self-arrest. Fig. 31. I know the book (Freedom of the Hills, p. 255) says you are supposed to lift the spike end of the shaft off the slope, changing the angle at which the pick meets the slope until it can begin to dig in. But did you ever actually accomplish this? Remember that you are lying with your chest on the shaft. Try this maneuver out on the lawn, and you will see what we mean.

I had never used a Nanga Parbat until this study, hence was startled to find that the pick ejects from hard snow when the shaft near the spike is pushed toward the snow. Try it for yourself. This is due to the strong curvature of the upper edge. Fig. 32... By now you may be wondering why we are offering a Parbat shape at all, when we don't have any compliments to say about it. Good question, and I have a tough time answering. Mostly, it is for climbers who want to continue with the more familiar shape of pick but who want a strong reliable shaft. For them, we also offer the Stubai Wallner head at \$18.75, which we will make up on order. See page 3-4

(Issue No. 3) ... Actually we have made some improvements in our St. Parbat version over the Nanga Parbat of Stubai. The tip of the pick has positive clearance and will not skate over hard snow and ice in self-arrest; the teeth extend 2" from the tip, instead of 1-1/8"; the teeth are projecting, instead of inwardly-cut; and the adze of our version doesn't have so much droop and will cut steps without much kick. Further, we have given it a spiritual name. In any case, the price is low and you can afford to buy a Thunderbird later

The end of the pick of some axes comes to a sharp point. When cutting steps, we observed that such points exert a force in the ice in all directions around the point, which makes the direction of fracture less predictable. The ice below the step will sometimes flake out unintentionally due to such non-directional forces. Practice in directing the blows can minimize this problem.

The most startling phenomenon we discovered in certain older ice axe designs concerns the ice-skate action of the tip of the pick, described on page 4-6.

ICE SCREW WARNING

Paul Ledoux, Jr., MIT, Cambridge, has written a warning about breaking of Charlet-Moser ice screws. He set a brand new one in hard water ice and the shank broke off at the threads. Luckily, he felt it break and replaced it. However, Doug Robinson wrote in "Mountain II", Sept. 1970, pp. 24-26, about a similar break, except the break was not detected until his second retrieved the screw. Luckily, Doug did not fall.

Several climbers in Europe told me about the breaking of Stubai ice screws of the same type (corkscrews). When I asked Stubai, they replied that they get reports of "only 4 or 5 a year." Questions: Why do manufacturers continue to sell such equipment? Why do retailers continue to handle it? Do climbers continue to use it because they haven't heard of this unreliability? Pass the word around.



Fig. 31 Self-Arrest from "Freedom"

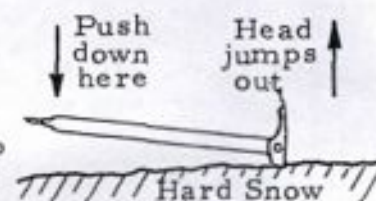


Fig. 32

NESTER "SUPER-SCREW" ICE PITON

This newly-advertised ice piton appears to have some problems. We tested three for hardness and ductility. The hardness was Rockwell C 46-47, 39-44, 36-39. (All sub-surface readings.) The ductility in simple bending to failure was 6°, 8°, and 15°. In our view, the hardness spread is too great. 46-47 is too high for a part as severely notched as this. (All pieces broke at the root of the threads.) The ductility is not good enough to handle the problem if the surface layer of ice is softer than the interior, and thereby transfers the load to the threaded portion. Note that our tests were made at room temperature and that the ductility would be poorer at lower temperature. Neither the manufacturer nor Recreational Equipment, Inc. has made measured load tests on these pitons, and therefore we suggest that you not test them either if your life is at stake. Better stay with Salewa Tubular ice screws.

SNOW SHOVEL WARNING

Three readers have reported that Recreational Equipment, Inc. has been selling a Parsenn Snow Shovel (Swiss) that breaks during the first use. The spot welds are defective. Growl! Why should it be left to the customer on the mountain to discover such defects? What happened to the eight-man advisory group REI bragged about at the September meeting? I went to the REI store today and found they are still selling it in spite of the complaints. Never mind, the Conditions of Sale on p. 41 of the 1970 catalog says that if you return a defective item unused within 30 days they will give you another one just like it. Free. The one that Bob Swenson, Sumner, Wash., got at REI broke in his pack, unused. He wouldn't take another from the shelf. He made them put in four rivets first.

RECREATIONAL EQUIPMENT INC. ELECTION

As you will recall from Issue 1, I got started in equipment testing on request of The Mountaineers Climbing Chairman in March 1968 to learn why four 3/8" Goldline ropes from REI had broken in snow practice. REI hadn't found the answer. I did find the weakness of the orange oval "safety" carabiner. Lloyd Anderson and Jim Whittaker saw the demonstration where a 200 lb. dummy falling only 36" broke this carabiner, but refused to take it off the market. The club published a warning. Seattle Manufacturing Co. (about 5 employees, owned half by Jim Clark and half by Recreational Equipment itself) replied with a letter to The Mountaineers threatening "actionable trade libel." I responded with a formal complaint to the Federal Trade Commission. The FTC forced REI to stop sale and manufacture of that carabiner.

Next I tried to build a fire under REI on the weakness of their ice axe shafts. When Derek Rouse (June 1969) took back his nearly-new axe which broke while he was hanging from it in crevasse rescue practice, the response was, "No adjustment, that's just the breaks of the game.", and they continue selling unreliable new axes. In May 1970, I noticed they were selling a low-elongation rope (Braided Goldlon) without warning that a climber would get a helluva jolt if he fell on it. In fact, they didn't even know about it. They were just selling it. They continued to offer it even after my warning at a directors' meeting 12 May 1970. They put SMC stamped rings on the market without test. Then they tested two and published 3900 pounds. I objected; they tested ten and published 2400 pounds. I objected again and they published 2195 pounds. They made a mistake in quality-control of the liners of sleeping bags, changed to sewn-through construction, and sold 600 cold-sleeping down sleeping bags without warning to the buyers. SMC made and REI marketed a new line of angle pitons without metered testing. The grain of the metal was across the axis of the piton. I objected. Their lawyer threatened me with civil suit for defamation of property. I replied with another formal complaint to the FTC for false and misleading advertising. Management of REI practically ignored the resolution passed in June 1969 "to institute and maintain an effective safety equipment testing program." When seven of us climbers went formally to protest at the board meeting in May 1970, we got nowhere. In June 1970, we submitted a valid call for a members' meeting. They defied us to go to court to get it. The following week they changed the by-laws to make it nearly impossible to get any matter brought up by members only to a vote of the entire membership. In September 1970, we formally asked that a quality-control engineer be employed. Nyet.

This attitude is still with us. Why do they continue to sell such crummy snow shovels? Why did they insist on selling out those dangerous Kamet (weak gate) carabiners? Why are they selling Nester Ice Pitons without testing? Why haven't they tested ice screws in general and why are they still selling corkscrews? Why are they still selling the same old unreliable wooden ice axes? In last year's catalog, they advertised their vinyl rain garments with the word "Flammable." This year they said they are going to sell the same items, deleting the word "Flammable." Regardless of flammability, the Mountain Rescue Council pointed out in their movie, By Nature's Rules, that these garments shred in the cold and wind. Why do they insist on selling such junk? In late 1970, we circulated REI Dissatisfaction Forms; over 100 complaints came in. (If you want some of these forms, send a self-addressed stamped envelope marked "REI Forms.")

The point of all this is that management has told me that they are "merchants." It appears that a majority of the present directors go along with that policy. Sales go up every year, everything is OK. But a fatality due to failure of their equipment could result in a lawsuit that could result in a judgment equal to the entire net worth of the organization. We feel that some directors are needed who are oriented toward consumer protection. For this reason we ask you to vote for:

LOUISE MARSHALL, Editor of Signpost Magazine for hikers and backpackers; chairman of the Trail Group of The Mountaineers; a strong conservationist; a consumer-protection advocate.

DAVID MISCHKE, engineer; active in rescue; climber, skier, and caver; member of The Mountaineers and Sierra Club; also a strong conservationist; active in equipment testing; author of a coming article on dynamic testing of climbing ropes.

Louise and Dave are in no sense MSR candidates. They were each nominated and endorsed by 60 widespread members of REI. We think they will do a better job of policing the merchant attitude of the management than the other candidates, and we hope you will vote for them. In 1962, President Kennedy proclaimed the consumer's Magna Charta: 1. The right to safety; 2. The right to be informed; 3. The right to choose; 4. The right to be heard. Readers, make your views known.

POSITIVE CLEARANCE OF THE TIP OF THE PICK OF ICE AXES

We have been bothered by a series of separate accidents where self-arrest was inadequate on hard snow and ice. Accident one: Dr. Gene Mason told of the wild slide of his rope team 400 feet down an ice slope on Kilimanjaro, with self-arrest not working. Accident two: Chris Marshall, survivor of a rope team of three Mountaineers that slid at high speed 1000 ft. down Winthrop Glacier and fell into a 110 ft. crevasse, said that he was in self-arrest at the beginning, and that the self-arrest did not hold. Accident three: Another Mountaineers rope team of three fell into College Crevasse on Mt. Baker, each in turn. Witnesses report that the last one to be pulled in, the climb leader, was in self-arrest unsuccessfully. Suddenly in the midst of comparative testing of new ice axe shapes, we became aware of the importance of positive clearance of the tip of the pick for digging-in power on hard ice; and realized that the tip of some axes acts as an ice skate!

Fig. 33 shows the Stubai Nanga Parbat pick, which has a 10° negative clearance. Such an axe will ride over the ice, in self-arrest. As in the cigarette warning, this could be hazardous to your health.

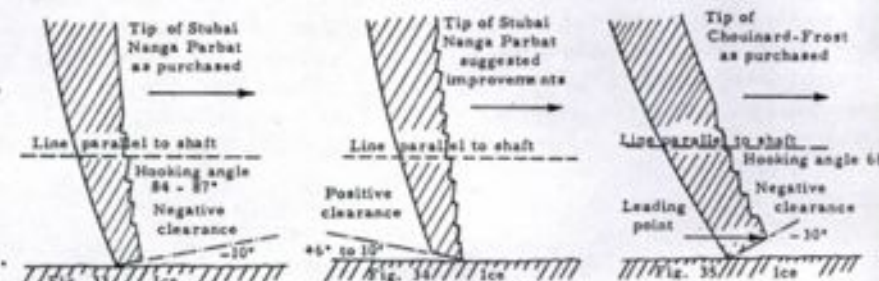


Fig. 34 shows our suggested improvements for this and similar axes: change the tip from negative to positive clearance. While you are at it, cut in more teeth.

This can be done with a sharp, medium-cut file, using slow strokes with very light oil or kerosene as a lubricant.

Fig. 35 shows the Chouinard-Frost pick with an excellent hooking angle but severe negative clearance. The desirable hook cannot come into action if the ice is so hard that the leading point doesn't get under the surface. The suggested improvement is to change the clearance from negative to positive as in Fig. 34. The hooking angle is already so good that more teeth are not needed. But remember that these axes have wooden shafts which may or may not be strong enough for boot-axe belay. Better fiber-glass them or change to a metal shaft. Many axes have a sharp point, and hence the clearance is very good. Further, both clearance and hooking angle are not important if the snow is medium or soft.

SLEEP

Reasonable sleep the night before is a factor in safety and performance during the day. Several of the medical kits list Doriden for sleep. But it made me excessively dizzy, with a head buzz (more than normal I beat you to it). Dr. Joe Eschbach, active in Ski Patrol, prescribed Placidyl, which works much better, and fades after about 5 hours. Better get the child's size 200 mg capsule, or even the 100 mg size for persons weighing near 100 pounds. The adult size, 500 mg is more than usually needed. Dr. Gene Mason warns to avoid Nembutal, Seconal, and the other barbituates; their effects linger too long (morning hangover.)

HELP!

We are indeed grateful to you who sent in \$3 or \$10 donations; enough came in to pay for this issue. From now on, however, the Newsletter will be more of a magazine and less of a catalog, because the list of items we expect to offer is substantially complete in the first four issues. We have a whole file of test results and letters from you with safety suggestions that will be interesting, we are sure.

We will continue the Newsletter, but whether we can continue to send it to all who ask depends on your donations. Many of you will not be able to send in anything: those of you who can, please help. Thanks a lot.

NEW -- MSR 10,8 mm Rope with Controllable Stiffness

The new rope has 10% more weight than the 10.5 mm rope, and will pass the UIAA test. The UIAA test is a drop of 15.6 feet on a static anchor, weight 176 pounds, fall factor almost 2 to 1. The test calls for a minimum of two drops, and ours has taken five drops without failure. The stiffness of the new rope can be controlled by you: if you want a stiffness factor of about 70, soak the rope ten minutes in water at 150° F. If factor 100, 180°. If factor 115 (about the same as Edelrid and Mammut), near boiling. Dye can be added at the same time. Identified by red stripe. Braided core and braided cover, kernmantel type, Nylon 6-6. The elongation at rupture when boiled has been increased from about 33% to 43% between figure-eight loops. The figures over polished steel drums, as reported by some manufacturers, would be higher but not realistic for the mountaineer. Consider the advantages of having every climber carry a 60 ft. rope.

Unprocessed, with simple instructions. Allow for shrinkage of 17%; order 73 ft. unprocessed for 60 ft. after processing; 146 ft. for 120 ft; 182 ft. for 150 ft; 200 ft. for 165 ft. Item 124-U--14¢/ft. 4.2 lbs./100 ft.

Processed by MSR, 100% stiffness, 18¢/ft. 60 ft, \$10.80; 120 ft. \$21.60; 150 ft., \$27.00; 165 ft. \$39.70. Wt. 4.8 lbs./100 ft.

4-U Climbing Rope, MSR 10.5 mm, unprocessed,
p. 1-4. See p. 4-6 for shrinkage, .12 per ft.

4-P	Same, except processed and dyed yellow-orange	.17 per ft.
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NEW STORE HOURS MARCH-AUGUST
MON.-WED. 9-6 THURS.-FRI. 9-7
SAT.-CLOSED

HIEBELER-SALEWA MOUNTAIN TENT

This tent is a 3 lb. Quonset Hut, made of water-repellent, slightly-porous nylon top, and waterproof, coated nylon floor. The hoops are fiberglass rods which joint together. Erected, 46" x 75" x 32" high, which is spacious for one person; two can manage readily by heading opposite directions. Drawstring type closures, both mosquito net and nylon cloth. Light-weight anchors for tie-down cords can be tin can lids with center holes for the cords, on both dirt and snow, (not included.) Quite stable in wind, with less flapping than with flat-side tents. A fine tent. Packed, 3-1/2" diameter x 24" long. Carrying sack, rods and cords included. Item 96.
Wt. 3 lbs. \$63.00

CATALOG CHANGES

- | | |
|-----|---|
| 84 | <u>Crampons, Salewa</u> adjustable, 12 point light-weight, p. 3-3. Wt. 2 lbs. \$16.15 |
| 126 | <u>Crampons, Stubai</u> adjustable, 12 point light-weight, p. 4-7. Wt. 2 lbs. \$22.45 |
| 85 | Crampon Cord, polypropylene .85 pair |
| 86 | Crampon Point Protector, 12 point, rubber. \$1.50 pair |

<u>Auto-Belayer</u> , reduced price	\$5.95
p. 1-4, Item 34	

<u>Snow-Flukes, reduced prices</u>	
Item 11 - 4"x7"	\$6.50
Item 12 - 5"x10"	6.95
Item 13 - 8"x12"	7.25

The feature of two tether cables (patent pending) makes this anchor stable in snow. Can absorb much more energy than a boot-axe belay.

Be sure to fiberglass your wooden axe shaft. \$3.65
p. 1-3. Kit Item 59. Color included, specify.

Carabiners, NEW, Bonaiti, D-shaped, aluminum alloy, 11 mm diam. body, 12 mm gate, 2200 kg (4840 lbs). Item 127. \$2.25 each. Five for \$9.00. Ten for \$17.50.

Carabiner, NEW, Bonaiti, D-shaped, aluminum alloy, UIAA rated. Item 128. \$2.50

MSR Pack, reduced price. p. 3-6 \$45.00
Item 90-U. Frame and bag, back cords not strung.
Item 90-S. Same as above, except strung. \$49.50
Rescue Pulley Wheel, red nylon. p. 2-4

Sticht Belay Plate, p. 2-5, replaced by MSR Sticht
Link, aluminum, Item 69-L. .95
Crampon Non-clogging Covers, p. 3-3, Item 83
PVC replaced by Item 83-N, coated nylon cloth.



FROM:

Mountain Safety Research, Inc.
631 South 96th Street • Seattle, Washington 98108

Address Correction Requested

Ship to:

THOMAS BOWEN
6084 N SAN PABLO AVE
FRESNO CA 93714

Zip

[illegible]

Simplified Postage Table:
multiply the total shipping
weight by the postage rate
per pound for your state.

Wash., Ore.
60¢ plus 5¢ per lb.

Subtotal

Ida., Mont., Wyo., Colo.
Utah, Nev., Calif.
80¢ plus 10¢ per lb.

5% tax
Washington
state only

All others
\$1.00 plus
15¢ per lb.

Postage

Send self-addressed 4"x 9"(or larger) envelope, with 6¢ postage on it for each issue wanted. Send Issue (circle) 1 2 3 4

☐ Put my name on mailing list.

Outside USA,
ask your
local
post office

Balance due us
or you (last order)

Total enclosed

Zip

BULK RATE
U.S. POSTAGE
PAID
SEATTLE, WASH.
Permit No. 884

MSR