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COATES, THOMAS EARL

INTRODUCTION TO BASIC ROCK CLIMBING: A MANUAL FOR STUDENTS

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INTRODUCTION TO BASIC ROCK CLIMBING:

A MANUAL FOR STUDENTS

Thomas Earl Coates

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INTRODUCTION TO BASIC ROCK CLIMBING:

A MANUAL FOR STUDENTS

APPROVED:

Graduate Committee:

Martha H. Whaley
Major Professor

A. H. Solomon
Committee Member

Wallace R. Maples
Committee Member

Henry D. Perry
Head of the Department of Health, Physical Education, Recreation, and Safety

Mary Martin
Dean of the Graduate School

ABSTRACT

INTRODUCTION TO BASIC ROCK CLIMBING:
A MANUAL FOR STUDENTS

by Thomas Earl Coates

In recent years Americans have demonstrated an increased interest in outdoor leisure activities. With this increased interest has come a greater emphasis on outdoor activities which contain elements of challenge, risk, and adventure. Rock climbing is such an activity and is increasing in popularity in America.

With the increased interest in rock climbing, more and more colleges and universities are offering courses in basic rock climbing for those who are interested. Texts presently available which deal with rock climbing are not designed to provide the emphasis on basic information and techniques which is needed for instructional courses such as these. The purpose of this study was to develop a basic instructional manual which would serve to introduce the beginning rock climber to the skills and techniques utilized in this sport.

Introduction to Basic Rock Climbing: A Manual for Students is divided into nine chapters, a glossary, and a

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reference section. Chapter 1 provides the beginner with an introduction to the sport of rock climbing. A historical overview is provided in Chapter 2. Clothing and equipment are covered in Chapter 3. Chapter 4 provides information on knots, slings, and rope coiling. Climbing signals and rating systems are presented in Chapter 5. Chapter 6 is devoted to climbing techniques including holds, counterforce holds, jamming, and slab climbing. The technique of belaying, with emphasis on top rope belaying, is presented in Chapter 7. Chapter 8 covers the fundamentals of rappelling with information on several of the most commonly used rappel systems. Ethics as they relate to rock climbing are presented in Chapter 9. The glossary contains terms and phrases the beginning climber may encounter. A reference section containing lists of books, periodicals, films, climbing schools, and clubs is provided as a source of additional information for the beginning rock climber.

ACKNOWLEDGEMENTS

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Doctors Martha A. Whaley, A. H. Solomon, and Wallace Maples for their encouragement, support, and cooperation on this project.

Miss Sheila Walker and Mr. Michael Rice for their assistance in preparing the photographs and illustrations contained in this document.

His wife Lynda and our daughters, Courtney and Megan, without whose constant love, patience, and encouragement this goal could not have been achieved.

T. E. C.

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PREFACE

In recent years there has been an increased interest in the pursuit of outdoor leisure activities in America. Heightened by increased economic ability, expanding facilities, growing environmental concern, as well as a combination of other factors, Americans are visiting the outdoors in record numbers.

With this increased interest in the outdoors and outdoor activities has come a rise in activities which contain elements of challenge, risk, and adventure. Rock climbing is an outdoor activity which contains elements of challenge, risk, and adventure and as such is increasing in popularity in the United States. Having evolved as a specific sport from mountaineering, rock climbing is today a sport with several different facets, each of which has appeal for different groups of individuals interested in entering the vertical wilderness.

With the increased interest in rock climbing has come an increased need for educating the would-be rock climber. More and more schools and colleges are offering courses in basic rock climbing for those who are interested. These courses are designed and conducted on the most basic level in an attempt to provide the beginning climber with the information needed to be safe and successful during his first guided encounters with the rock.

Texts presently available which deal with rock climbing are not designed to provide the emphasis on basic information and techniques which is needed for instructional courses such as these. It is the purpose of this study to develop such a text based on a review of literature relative to mountaineering and rock climbing. From the information collected form these sources, a basic instructional manual will be designed and developed to introduce the beginning climber to the skills and techniques of rock climbing which will be utilized in this sport.

The material contained in this manual will be limited to information and techniques essential for safe and effective movement in the vertical dimension of rock climbing at a beginning level. The information and climbing techniques included will provide a basis for but will not include piton, chock, or bolt placement, lead climbing, or aid climbing.

INTRODUCTION TO BASIC ROCK CLIMBING:
A MANUAL FOR STUDENTS

Thomas Earl Coates

Chapter 1

INTRODUCTION TO ROCK CLIMBING

Rock climbing is a sport of increasing interest in the United States. Unfortunately, it is an activity about which many Americans have little or no knowledge. Having emerged from a position of major importance in the sport of mountaineering to the level of a separate sport enjoyed by thousands throughout the world, rock climbing has become diverse in nature. To discuss rock climbing as scrambling or climbing up vertical broken or solid outcroppings of rock may be sufficient for the uninformed individual, but for someone who has experienced the thrill and exhilaration of an ascent into the vertical wilderness this definition is somewhat lacking.

Aspects of modern rock climbing include both scrambling and technical climbing. Scrambling refers to ascending near vertical surfaces which require no ropes or artificial aid. Technical climbing indicates the ascent of a vertical or near vertical surface which requires special techniques and/or equipment. Included are free climbing, which employs special techniques such as jamming to negotiate climbing problems, and aid climbing, which requires the use of special devices to ascend a vertical wall.[1] Additional consideration must also be given to such aspects of rock climbing as top rope climbing, where the climber is belayed from above; solo climbing, denoting climbs made alone and with little or no equipment; and bouldering, the practicing of difficult climbing moves on low rock faces or on large boulders.

Despite the obvious risks involved, rock climbing provides a meaningful adventure for many people, perhaps stemming from satisfaction derived from climbing as a child. Beginning with the climbing of fences, ladders, trees, and nearby hills or mountain sides, children display a satisfaction in the challenge, adventure, and excitement provided by ascent into the vertical dimension, although at the time they may not be aware of appreciating the dangers involved. As adults this same need for adventure and excitement still exists in many people with the added understanding, brought on by maturity, of the inherent risk involved in such ascents. For these people rock climbing provides an avenue by which certain needs can be met in an atmosphere of calculated risk, excitement, and adventure.

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[1]Alwyn T. Perrin, ed., The Explorers Limited Source Book (New York: Harper and Row, Publishers, 1977), p. 79.

To the non-climber, rock climbing often appears to be a risky and dangerous sport, void of reason and senseless in its nature. To the rock climber, the sport of climbing is an expression of skill and ability, of constant evaluation and decision making required to meet the challenge of a vertical wilderness. The rock is a vertical wilderness, and as a wilderness is void of concern for any man regardless of age, sex, race, or social status. The reason for this difference in the concept of rock climbing is primarily due to a general lack of understanding of the sport by non-climbers. Non-climbers generally lack an understanding of the skills involved, the equipment utilized, or the training and practice which is required to participate in climbing in a safe and enjoyable manner.

When first introduced to rock climbing, non-climbers are often overcome by the "how" and "why" of a sport about which they know nothing or at best very little. A major step forward is made in the process of understanding when non-climbers are made aware of the fact that the climbers are actually climbing the rock and that the ropes serve as safety lines in the event of a fall. This dispels the popular misconception that climbers are climbing the rope and not the rock. Once this breakthrough has been made the non-climber is prepared to comprehend the basic skill concepts of the sport.

The explanation of the "how" is much easier than the "why" where a non-climber is concerned. The question of "why" has been asked of everyone who climbs at one time or another, but it is a question to which there is no one answer. To find an answer to this question the rock climber must look within himself. Quite often the response is one which fails to convey the total meaning of the experience to one who has not had an opportunity to climb. Thus, the non-climber is hindered from grasping a thorough understanding of the "why" because he has never climbed.

In attempting to explain the "why" of rock climbing the response sometimes hinges on the philosophical view of risk and danger involved, the challenge of steadfast rock, the feeling of contact with nature on a basic level, the fun of climbing, climbing as a means of self expression, or any combination of these. There are certainly risks involved in rock climbing, but the climber, in an effort to increase the safety margin, uses his mind to analyze and thus reduce such risks to a minimum. Risks that are taken become calculated risks with the largest possible safety margin. Danger is also a very real part of climbing but here again the climber must use his mind, coupled with his skill and understanding of techniques, to anticipate possible dangers and plan to avoid or respond to them in the most effective manner if and when they are encountered. With a thorough understanding of rock climbing and the skills, techniques, and equipment utilized, the sport can be made extremely safe.

The challenge of competing against an unchanging rock becomes a focal point for some climbers. The climber is presented with a rock that will remain the same throughout the climb. The challenge is to meet the rock as it is, on its own terms so to speak, and accept the climbing situation as it is with the idea of matching climbing skill against the rock. When a climber succeeds in completing a climb he has merely accepted the challenge of the rock, not conquered it, for the rock is constant and the challenge remains.

For some rock climbers, the sport is an experience which brings them closer to nature. The closeness with the rock--the touching, the careful examination, the increased awareness of the finite rock and the fragile ecological system it supports--brings some climbers to a point of increased understanding and appreciation of the total environment which provides life for all.

Still other climbers consider rock climbing primarily as a means of self expression. On the rock the climber moves in smooth, rhythmical fashion with flawless technique and apparent calm and poise. The climber is at work applying the skills of his craft. The fruits of his labor are reflected in the successful completion of a particularly difficult move or the culmination of a specific climb. The success experienced is a reflection of the climber, a way of saying this is who I am, I am a rock climber, I have matched my skill against the rock.

Regardless of the "why" of rock climbing with all of its philosophical connotations, rock climbing is enjoyable for those who pursue it. But the enjoyment and fun do not come easy, for climbing requires hard work both in time to master the techniques of the sport and in the application of those techniques on the rock. Some who are introduced to rock climbing continue to participate in the sport for only a short period of time while others become recreational climbers and participate on an irregular basis whenever they find time. A smaller number become extremely dedicated to the sport and participate on a regular basis. Nevertheless, rock climbing is enjoyed by thousands of people throughout the country. It is estimated that from 100,000[2] to 250,000[3] Americans take part in the sport while numerous clubs, organizations, and schools specializing in wilderness skills offer courses in climbing to all who are interested. A recent survey of college and university catalogues identified one hundred thirty-nine programs which offer

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[2]Galen A. Rowell, "Assault on a Vertical Wall," National Wildlife, XVIII (August/September, 1980), 43.

[3]Barbara Graustark, "Ecstasy on the Rocks," Newsweek, XM (July 18, 1977), 64.

academic credit for rock climbing either as a part of a course in wilderness skills or as a separate course.[4]

Rock climbing, like any other demanding sport requires a balanced combination of physical conditioning, mental preparation, and technical ability.[5] The development of technical ability begins on the ground with familiarization with equipment and its proper use, knots, belaying techniques, and terminology, and continues to the rock where climbing skills of increasing difficulty are introduced, practiced, and perfected. Mental preparation implies a beforehand understanding of the risks involved in climbing and the development of mental attributes which will facilitate the complete acceptance of the challenge of the vertical wilderness. Physical conditioning also begins at ground level and, with emphasis on the development of such physical components as endurance, strength, flexibility, and balance, should prepare the climber for the physically stressful demands encountered in climbing.

The major portion of this text will be devoted to presenting material which will provide a sound introduction to basic climbing techniques. It must be emphasized,

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[4]Thomas E. Coates, "Rock Climbing as a College Course" (unpublished research, Middle Tennessee State University, 1981), p. 2.

[5]Ron Brown, "Rock Climbing Fitness," Off Belay, April, 1975, p. 8.

however, that reading about climbing techniques is no substitute for practice. The practice of climbing techniques should always emphasize safety and follow a logical sequence which will allow the beginning climber to progress from mastered skills to more advanced techniques within his ability.

Mental preparation requires psychological adjustment to the challenge of climbing with specific emphasis on the proper state of mind with regard to personal ability and the risk involved. Such mental attributes as will power, patience, team spirit, ingenuity, self-control, and humility are essential for successful rock climbing.[6]

A climber must have strong will power and self-control, a combination reflected in the mental toughness required to force the body to respond to the mind during adverse and stressful conditions. At the same time a climber must be patient with regard to other climbers and especially when faced with the realization that difficult climbing situations require a great deal of time.

When climbing with others, and most climbing should be done in this fashion, teamwork is very important for the success and safety of the experience. In a team effort

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[6]Curtis W. Casewit and Dick Pownall, The Mountaineering Handbook: An Invitation to Climbing (Philadelphis: J. B. Lippincott Co., 1968), pp. 18-20.

there is no room for a prima donna and the mental attitude of a climber should reflect this idea.

Perhaps one of the most important mental attributes reflected by proper mental preparation is ingenuity. A rock climber must be able to think, to plan ahead, to assume risk, and to react quickly and safely to a large number of possible situations. On the rock there is no specific set of moves to be made. The climb represents an exhibition of a climber's repertoire of skills from which he may choose a vast variety of combinations. The combining of moves to produce a smooth, rhythmic pattern of movement while ascending a vertical slab of rock requires ingenuity.

A climber can be expected to be proud of an especially good climb but this pride should not be overly expressed in boastfulness. A degree of humility should be exhibited by a climber for the display of his skill says more for his ability than can be expressed by verbal self glorification.

Physical condition is the third component necessary for safe and successful entry into the vertical wilderness. Emphasis should be placed on those components of physical fitness which contribute the most to movement in the vertical dimension. An adequate physical conditioning program stressing the development of such components as endurance, strength, flexibility, and balance should begin well in advance of concentration on the technical aspects of rock climbing.

One such physical conditioning program, developed by Ron Brown specifically for rock climbers, consists of fourteen exercises.[7] Each specific exercise is based on kinesiological studies and analysis of motion for rock climbing maneuvers and the specific muscle groups involved. Emphasis is placed on the development of cardio-vascular endurance, strength in the legs, abdominal region, back, arms, and shoulders, flexibility in the legs and shoulders, and balance. The fourteen exercises are as follow:

1. Jogging, preferably on hilly terrain, is recommended for the development of cardio-vascular endurance. Where jogging is not possible, rope jumping and running in place are suggested as alternatives. A beginning duration of two to three minutes is recommended with a gradual increase of up to thirty minutes.

2. The invisible chair, an isometric exercise, is recommended for strengthening the quadriceps. The exercise consists of holding a sitting position against a wall, without support, for a duration of from one-half to five minutes.

3. Toe stands are recommended for strengthening the calf muscles. The exercise is performed by supporting the

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[7]Brown, pp. 8-13.

body weight on the balls of the feet for a duration of fifteen to forty seconds.

4. Front splits are suggested for the development of flexibility and balance. Beginning from a prone position, both legs are drawn forward for a flexibility exercise. The exercise may be altered by drawing one leg forward at a time for increased balance. The exercise should be repeated ten to fifty times.

5. An isometric ankle exercise is recommended for strengthening the ankles. The exercise is performed by standing on the edge of a step or block with the heels suspended, the ankles at right angles, and the body weight supported by the front part of the feet. This position should be held from one to five minutes.

6. Strength in the forearm, wrist, and hand can be increased by a grip squeeze exercise. A ball or spring loaded gripping device should be repeatedly squeezed from twenty-five to one hundred times.

7. A prone bridging exercise is recommended for strengthening the muscles of the abdominal region, the shoulders, and the back used in jamming. The body weight is raised and supported between the hands and feet. This position is held for five to thirty seconds.

8. For increased flexibility in the shoulders, back, and legs a prone rock and roll is suggested. In a prone position the legs are raised and the arms are placed behind

the back. From this position a forward and back rocking motion is performed from five to twenty-five times.

9. Bent knee sit-ups are recommended for increasing abdominal strength. Sit-ups should be done in sets of seven to forty.

10. A knee squeeze performed by sitting on the floor with the knees up and spread is recommended for increasing strength in the inner thighs. From this position the knees are pressed together against resistance provided by the hands which are pulling on them. The exercise is to be repeated ten to thirty-five times.

11. Pull-ups are recommended for strengthening the biceps and shoulder muscles and should be repeated in sets of five to twenty.

12. Incline push-ups are suggested to strengthen the triceps and shoulders. The incline position is achieved by placing the feet on a chair or up against a wall. Push-ups should be done from ten to forty times.

13. An exercise called a rucksack lift is performed from a supine position by lifting a weighted rucksack placed at arms length behind the head. The rucksack is lifted to a height of six inches and held for ten seconds. The exercise is to be repeated seven to ten times.

14. Moderate knee bends are prescribed for general development of the thigh muscles. From a standing position squat to a position where the thighs are parallel to the

floor then back to a standing position. The exercise is repeated fifteen to fifty times.

By following a regular conditioning program such as the one just described, a reasonable level of fitness can be developed and maintained which will greatly enhance the experience of rock climbing for anyone who wishes to participate. As in any conditioning program the beginning level should be adjusted to the existing fitness level of the individual and progressively increased in duration and resistance as one's physical condition improves.

In summary, rock climbing is a sport of increasing interest in the United States. The many facets of the sport provide enjoyment to thousands who are willing to make the necessary mental and physical preparation as well as invest the time required to perfect the technical aspects of moving in a vertical dimension. Practiced with a clear understanding of the risks and dangers involved and a commitment to the personal preparation required to meet the challenge of the vertical wilderness, rock climbing can be extremely safe and enjoyable.

Chapter 2

A HISTORICAL OVERVIEW OF ROCK CLIMBING

Rock climbing has historically been a component of the broad adventure sport of mountaineering.[1] Mountaineering, the sport of climbing mountains or the exploration of high mountains for scientific purposes or conquest, consists of four major activities: walking, rock climbing, snow or ice climbing, and navigation.[2] Rock climbing, the art of climbing a steep rock,[3] is one means by which the objective of mountaineering can be accomplished.

Over the years rock climbing has emerged as a sport in its own right. The rock climber has chosen to utilize only the bare essentials, preferring to ascend the rock with just his fingers, feet, elbows, and knees whenever possible, whereas the mountain climber or mountaineer is often encumbered with a great deal of equipment. Today,

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[1]Royal Robbins, Basic Rockcraft (Glendale: La Siesta Press, 1971), p. 7.

[2]Walt Unsworth, Encyclopaedia of Mountaineering (New York: St. Martin's Press, Inc., 1975), p. 160.

[3]Ibid., p. 198.

mountaineering may imply a grand assault on a mountain peak involving extensive planning, logistics, a large party of mountaineers, and several days of climbing, while rock climbing has developed in a much simpler form requiring less time, less planning, and involving only a small party of climbers.[4]

Even though mountaineering and rock climbing have evolved in different fashions, the fact still remains that rock climbing grew out of mountaineering. In order to develop a perspective of the relationship of rock climbing to mountaineering, it is necessary to review the development of mountaineering as a sport and the eventual evolution of rock climbing as a leisure pursuit in its own right.

Man has been climbing mountains for various reasons throughout recorded history, but the sport of mountaineering began approximately two hundred years ago. There are several reasons for this late development. Mountains were considered outlandish, deserted, dangerous, and as such were useless and feared by our ancestors. The early church promoted the belief in supernatural powers and considered mountains as outposts of Satan's forces. Even as the Dark Ages were giving way to the Age of Reason, mountains were still considered dangerous and generally useless because of

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[4]Robert Gannon, "Rocks in My Head," Popular Science, CXCIV (April, 1969), 94.

their little agricultural value. It was not until the growth of natural science and the stirring of Romanticism that mountaineering began to develop.[5]

But even during the long period of mountain ostricism ascents were made into their passes and peaks. Hannibal crossed the Alps as did Pompey, Hasdrubal, and Caesar. Augustus built a road over the Great Saint Bernard which was later repaired and used by Napoleon. Leonardo de Vinci visited the Alps and climbed a section of Monte Rosa. In the thirteenth century King Peter III of Aragon claimed to have ascended Canigou in the Pyrenees.[6] Francaso Petrarch, the acclaimed spiritual father of mountaineering, and his brother Gerardo made the first recorded ascent of Mont Ventoux in 1336.[7] The first recorded climb of a snow peak came two decades later when Rotario d'Asti, a knight fulfilling a vow, climbed Rocciamelone.[8]

In June of 1492, a few weeks before Columbus set sail on his historic voyage, Antoine de Villie, under orders from Charles VIII, began the first recorded ascent of the precipitous walls of Mont Aiguille in southern France. The

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[5]Frances Keenlyside, Peaks and Pioneers: The Story of Mountaineering (London: Paul Elek Ltd., 1975), p. 9.

[6]Ibid., p. 10.

[7]Doug Scott, Big Wall Climbing (New York: Oxford University Press, 1974), p. 2.

[8]Keenlyside, p. 10.

assault was carried out with ladders and ropes by what is still probably the most difficult route. On the summit a stone hut was built where members of the party remained for six days. Though not the first important mountaineering achievement, the climbing of Mont Aiguille was the first serious rock climb for which detailed records exist.[9]

In North America, the first recorded mountain climbing experiences are associated with Cortes and his advance on Montezuma's capital. In 1519 Cortes encouraged some of his officers to attempt to climb Popocatapetl, which was then an active volcano, as a means of demonstrating their daring to the Indians. The party, led by Diego Ordaz, failed to reach the summit because of the smoke, sparks, and cinders expelled from the volcano. Not satisfied with this first attempt, Cortes sent a second party of five Spaniards, under the leadership of Francisco Montano, to the summit two years later for the purpose of retrieving sulphur to be used in the making of gunpowder. This second party reached the summit of the now quiet volcano where Montano was several times lowered in a basket into the crater. Though the operation proved successful in acquiring sulphur, Cortes concluded that it would be easier to import gunpowder from Spain.[10]

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[9]Ronald W. Clark, Men, Myths and Mountains (London: Weidenfeld and Nicolson Ltd., 1976), p. 3.

[10]Keenlyside, p. 10.

The history of mountaineering proper, mountain travel with the intent of reaching a summit, began with the climbing of Mont Blanc in the natural cradle of mountaineering, the Alps. As the culminating point of the Alps, Mont Blanc had drawn considerable attention from early travelers. Horace Benedict de Saussure was so impressed with the splendor of the mountain in 1760 that he offered a prize to the guides who could discover a route to its summit.[11] This prize was not claimed until 1786 when Dr. Michel-Gabriel Paccard, a doctor in Chamonix intent on making scientific observations from the summit, and Jacques Balmat, a local chamois and crystal hunter interested in the de Saussure reward, made the first ascent.[12] For his devotion to mountaineering de Saussure earned his place as a father of mountaineering. However, others feel that if anyone is the father of mountaineering it is Dr. Paccard.[13]

Following the conquest of Mont Blanc, the popularity of mountaineering began to increase. With the expeditions conducted by James David Forbes, a Scottish scientist and pioneer of mountain literature, British climbers began to arrive in the Alps in great numbers.[14] These Englishmen

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[11]Ibid., pp. 10-11.

[12]Clark, p. 14.

[13]Keenlyside, pp. 11, 14.

[14]Scott, p. 5.

were responsible for the development of the craft, the technique, and the skill necessary to overcome many of the most difficult peaks of the mountain range.[15] During the Golden Age of Mountaineering, generally considered to be the period from Alfred Wills' ascent of the Wetterhorn in 1854 to the first ascent of the Matterhorn by Edward Whymper in 1865, thirty-one of the thirty-nine major alpine peaks were climbed by British mountaineers with their guides, who were mainly Swiss.[16] The British were most responsible for the great sport of mountaineering.[17]

The phrase "Golden Age" is somewhat misleading. It refers primarily to a period of eleven years during which several great British mountaineering achievements were made. In fact, the climbing of the Wetterhorn by Wills in 1854 was not the first ascent but the third. This ascent received fame due to the conditions under which it was conducted and the excellent account Wills gave of the climb.[18]

Whymper's conquest of the Matterhorn received notoriety because of the success of the ascent and the disaster which befell the climbers as they descended. On

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[15] F. S. Smythe, British Mountaineers (London: Collins, 1946), p. 11.

[16] Scott, p. 5.

[17] Smythe, p. 11.

[18] Clark, p. 47.

earlier attempts to climb the Matterhorn, Whymper had been able to secure the services of Jean-Antoine Carrel, a guide from Breuil interested in climbing the peak from the Italian side and gaining fame for his own people and valley. But in 1865 Whymper was unable to persuade Carrel to accompany him and the result was one of nationalistic rivalry with Whymper and his party and Carrel, leading an Italian party, racing for the summit at the same time.[19]

Whymper and his party of six climbers were successful in reaching the summit via the Swiss ridge. Below, the Italian party under Carrel's leadership turned back under shouts of triumph and boulders from above; the attempt via the Italian side had failed again.[20] But the joy of Whymper's party was short lived. On their descent a fall claimed the lives of four of the seven. The deaths of these four men, one of whom was the heir to a marquisate, resulted in an outcry against mountaineering. Mountaineering was denounced by the press as an absurd, foolish, and unjustifiable sport. Queen Victoria inquired as to the possibility of stopping the practice by law. In the opinion of Captain Percy Farrar, a great alpine historian, the accident held back mountaineering for half a

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[19]Ibid.

[20]Smythe, pp. 23-24.

generation.[21] There is little doubt that the fall marked the end of the Golden Age of Mountaineering.[22]

As the race for the conquest of Alpine peaks continued through the Golden Age the more exacting skills of rock climbing began to take shape as an important part of mountaineering. Undoubtedly, the greatest rock climb of this period was that of Carrel and his party who finally reached the summit of the Matterhorn via the Italian ridge at a later date. During the 1870's the popularity of rock climbing continued to increase as an even more specialized form of the sport developed with the ascents of the granite slabs, cracks, and chimneys of the Chamonix Aiguilles and the Dolomites.[23]

The 1880's and 1890's have been described as the Silver Age of British Mountaineering when the skills of rock climbing were further refined and implemented. The British hills served as the training area where techniques of rock climbing were perfected. As a sport in Britain, rock climbing was largely initiated by Walter Parry Haskett-Smith, the father of British rock climbing, and James William Puttrell. The 1886 ascent of the Naples Needle in the Lake District of Britain is often taken as the start of rock

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[21]Ibid., p. 25.

[22]Clark, p. 65.

[23]Smythe, pp. 26-27.

climbing as a sport, but this is more symbolic than historical.[24]

North America provided a much different setting for the development of mountaineering than was found in the European Alps. The American mountain ranges existed in wilderness areas, far from many of the conveniences found near the Alps. A wide variety of mountainous terrain was encountered from the low range of mountains in the east to the huge, complex ranges of the west.

The first recorded ascent in the United States was made by Darby Field in June of 1642. Accompanied by two Indians, Field climbed Mount Washington in the Presidential Range of New Hampshire, a trip which took eighteen days. It was not until 1820 that any of the other peaks in the range were climbed.

By the early 1800's the Colorado Rocky Mountains had been reached. In 1806 Captain Zebulon M. Pike led a party of pioneers to what they called the Mexican Mountains. On a cold November morning of that year, Pike and a few of his men stood atop the Grand Peak, later to be renamed Pike's Peak, for the first time.

After several successful ascents of Pike's Peak, the chief climbing goal in Colorado had shifted to Long's Peak by the mid-1800's. The first verified ascent of this peak

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[24]Unsworth, p. 200.

was made in 1868 by Major John W. Powell and a party of six climbers. Earlier claims had been made of successful ascents but none were verified before the ascent of the Powell party.

Farther to the north in what is now Wyoming and Idaho, the Teton Range began to attract attention. Nathaniel P. Langford and James Stevenson claimed to have climbed the highest peak in the range, the Grand Teton, in 1872. Their claim was later disputed by William Owen who was successful in reaching the summit in 1891. The result was a dispute which lasted for years.[25]

As the more difficult peaks of the Colorado Rockies were being ascended, a new set of explorers had begun to show an interest in the mountains farther west, the Sierra Nevada and Cascade Ranges. The first recorded sighting of the Cascade Range was by Captain George Vancouver in 1792. Vancouver not only recorded this sighting but also named many of the major peaks including Mount Rainier, Mount Saint Helens, and Mount Hood. Mount Saint Helens was the first of these major peaks to be climbed. In 1853 Thomas J. Dryer was successful in his attempt to reach the summit, an event which was reported in the Portland Oregonian.[26]

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[25] Clark, pp. 37-38.

[26] Ibid., p. 38.

In 1854 Dryer was successful in his attempt to climb Mount Hood. That same year Mount Adams and Mount Jefferson were climbed by separate parties. Mount Baker was ascended in 1868. The successful attempt to climb Mount Rainier came in 1870 when General Hazard Stevens and P. B. Van Trump were the first men to stand on the summit.[27]

Clarence King arrived in the Sierra Nevada Range in the 1860's and eventually became one of America's most famous early mountaineers. As a member of a California survey party, King explored vast expanses of the range including what is today Yosemite National Park. In 1864 King and a companion, Richard Cotter, climbed Mount Tyndall and from its summit viewed a higher peak which they named Mount Whitney. That same year he was sent to the Yosemite Valley to carry out an accurate survey of the region. While in Yosemite, King climbed many of the surrounding peaks. The one exception was Half Dome which he described as inaccessible and felt it never would be climbed.[28] King was proven wrong in 1875 when George Anderson ascended the northeast face of the peak after spending several weeks laboriously drilling holes in the rock which enabled the attachment of a hand line to the top.[29]

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[27]Ibid.

[28]Ibid., pp. 40-44.

[29]Galen A. Rowell, ed., <u>The Vertical World of Yosemite</u> (Berkeley: Wilderness Press, 1974), p. 1.

Even though mountaineering was being practiced in the United States, the mountains, for the most part, lacked the ice, the snow, and all around steepness and difficulty which had led to the popularity of Canadian peaks which were providing mountaineering experiences in the European sense. As a result, the potential of such climbing areas as the Colorado Rockies went unregarded[30] until an increased interest in rock climbing began to emerge.

In 1916 Albert Ellingwood, a professor at Colorado College, made several climbs in the Sangre de Cristo Range. Ellingwood, who appreciated a tough rock climb, had become interested in rock climbing while at Oxford and had visited the English Lake District, an important area in the evolution of the sport. To Ellingwood rope handling was rudimentary and these climbs were probably the first in the United States where a conscious effort was made to belay.[31]

By 1922 a Princeton mathematics professor, James Alexander, had begun climbing Long's Peak in what is now Rocky Mountain National Park. In two summers he made nineteen ascents and is credited with establishing three new routes.[32] The routes established by Alexander were

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[30] Chris Jones, Climbing in North America (Berkeley: University of California Press, 1976), p. 101.

[31] Ibid.

[32] Ibid., p. 103.

different from the one used by earlier climbers, who were merely strong hikers, for these new routes required genuine rock climbing skills.

Meanwhile in the East a break was beginning to develop which resulted in a gradual departure from mountaineering in Europe to rock scrambling and crag climbing in the United States. For many years it had been customary for educated Easterners to tour Europe for several months, and a visit to the Alps was a usual part of the tour. In the Alps many Americans were introduced to mountaineering and developed a taste for the sport. The Appalachian Mountain Club, the American club with the strongest tradition in alpine climbing, devoted much of its journal to describing mountaineering exploits which simply reinforced mountaineering while ignoring rock climbing.[33]

In 1928 the attitude of the Appalachian Mountain Club shifted when Robert Underhill became editor of the journal. Suddenly wide coverage was given to the emerging sport of rock climbing and the enthusiasm began to spread. That same year Underhill and Lincoln O'Brien made the first successful rock climb on Cannon Mountain in New Hampshire, a climb which was to become famous. In 1929 Bradley Gilman and Hassler Whitney climbed what was to become the Whitney-Gilman Route on Cannon Mountain, a climb which would remain

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[33]Ibid., pp. 111-112.

one of the most difficult in New England until the 1940's.[34]

The Grand Teton Range of Wyoming and Idaho continued to receive wide publicity in the late 1800's and early 1900's. Horace Albright, the superintendent of nearby Yellowstone National Park, drew attention to the climbing potential of the range by inviting climbers to visit and climb in the area. In 1919 LeRoy Jeffers visited the Tetons and made a solo climb of the lower summit of Mount Moran. Two Colorado mountaineers, Eleanor Davis and Albert Ellingwood arrived in 1923 and climbed the Grand, Middle, and South Tetons. Paul Petzoldt arrived in the Tetons in 1924 and, though he had little mountain experience, started a guide service. In 1925 Fritiof Fryxell came to the range and, together with Phil Smith, began a methodical attack on its major peaks. By 1928 Mount Owen was the only remaining unclimbed summit.[35]

Robert Underhill and Kenneth Henderson, the first to represent the Appalachian Mountain Club in the area, arrived in the Tetons in 1929. With them they brought technical climbing skills which would advance climbing in the Teton Range. Along with Fryxell and Smith, they ascended Mount Moran that same year. In 1931 Underhill made one of his

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[34]Ibid., pp. 112-113.

[35]Ibid., p. 117.

finest Teton climbs by ascending to the summit of the Grant Teton via the Underhill Ridge.[36]

Jack Durrance arrived in the Tetons in 1936 to work as a guide for Petzoldt. Fresh from Germany and well versed in the latest techniques being used in the Alps, Durrance provided a new standard for American climbing. In August of that year he, along with Paul and Eldon Petzoldt, ascended the North Face of the Grant Teton.[37]

Another climbing area which began to draw considerable attention in the 1930's and 1940's was Devils Tower in northeastern Wyoming. The first recorded ascent of this massive rock tower was in 1893 when two local ranchers, Willard Ripley and Will Rogers, built a ladder which advanced up a crack to the summit. Fritz Wiessner, along with Bill House and Lawrence Covney, made the first technical ascent of the towar in 1937.

Perhaps the most interesting and certainly the most unusual event in the climbing history of Devils Tower occurred in 1941 when George Hopkins parachuted onto its summit. Hopkins had originally planned to climb down the rock by using a one-thousand-foot rope, but the rope was lost when an attempt was made to drop it on the summit. As nationwide concern grew over the fate of Hopkins, several

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[36]Ibid., pp. 118-119, 125.

[37]Ibid., pp. 122-123, 125.

climbers arrived to rescue him. Among these climbers were Durrance and Petzoldt who had come to some disagreements in the Tetons and had parted ways. Durrance, who had made the second technical ascent of Devils Tower, prepared to lead the party to Hopkins' rescue with Petzoldt directly behind him. On the summit Hopkins received a quick lesson in rappelling and the party descended with Petzoldt assisting him and Durrance bringing up the rear.[38]

The late 1930's marked the arrival of a new age of climbing in the United States. During this time several parties of climbers had visited Shiprock in New Mexico and after surveying the two-thousand-foot outcropping of rock declared it unclimbable. Then, in October, 1939, a party of four climbers arrived from California to attempt a climb of the perpendicular sides of the massive rock. Three days later, on October 12, Shiprock was climbed. The ascent required the use of fifty-four pitons and four expansion bolts, the first such bolts used for climbing in North America.[39] The era of aid climbing had arrived and the result was one of conflict between climbing style and ethics.

World War II almost brought climbing in the United States to a standstill; however, some positive aspects did develop for the sport. Climbers from various parts of the

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[38]Ibid., p. 173.

[39]Clark, p. 160.

country enlisted and became part of the first mountain infantry battalion which was formed in 1941. The war effort also resulted in the development of new and improved climbing equipment such as aluminum carabiners, the first angle pitons and nylon climbing ropes. After the war this equipment was more plentiful and cheaper for those interested in climbing.

The first mountain infantry battalion began training on Mount Rainier in November of 1941. Meanwhile, in the east the Army had discovered Seneca Rock in West Virginia. Here, they set up a climbing school where the Tenth Mountain Division trained.[40] Because of the extensive use of pitons by the Army at Seneca Rock, one face is known as "The Face of 1,000 Pitons" in reference to the large number of steel pegs left embedded in the rock.[41]

After World War II there was an increase in rock climbing and the level of skill among climbers. With this increase in numbers and skill combined with the availability of surplus military climbing gear, the United States was in position to achieve international recognition for its quality of climbing. The Yosemite Valley in California became the focal point of many of the advancements in the

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[40] John Skow, "Second Man on a String," Atlantic, MMXXXIII (June, 1974), 52.

[41] Bill Thomas, "West Virginia's Mountain Climbing," Travel, MXXXIII (February, 1970), 30.

sport during this period and the quest of John Salathé in his attempt to ascend the Lost Arrow signifies a starting point.

In 1946 Salathé arrived in Yosemite with a new kind of piton, one made of high strength carbon steel as opposed to older ones made of softer iron. His objective was to climb the Lost Arrow, an impressive spire separated from the main part of the valley's granite wall by a gap one-hundred-fifty-feet wide. In August of that year he soloed to within forty feet of the top before being forced to retreat. The key to his success was his expert placement of his new type of piton which could be driven into narrow cracks of the rock without bending.

Salathé was to be denied this first ascent. Before he could return to complete the climb a rival group of climbers reached the Arrow Tip by throwing a line over from above and then climbing a rope which was attached to the line. Undaunted by this setback Salathé later went on to climb the Higher Cathedral Spire, Sentinal Rock, and the Lost Arrow Chimney, the last of which is a landmark in North American climbing.

As rock climbing was growing in Yosemite it was also developing in other parts of the country, namely, in the Shawangunks Mountains of New York and the Colorado Rockies.

[42]Jones, pp. 189-194.

After their discovery in the mid-1930's the Shawangunks became a popular climbing area in the East. Used by members of the Appalachian Mountain Club as well as other notable climbers, such as Hans Kraus and Jim McCarthy, the area provided many challenging and difficult climbs.[43]

Climbing developed somewhat slower in Colorado during this period, one reason being that the local climbers thought of themselves more as mountaineers than rock climbers.[44] But gradually this attitude began to change as the quality of rock climbing in the area was recognized. An important breakthrough came when the National Park Service finally opened areas in Rocky Mountain National Park to rock climbers.

The 1950's marked the arrival of such notable climbers as Royal Robbins, Warren Harding, Tom Frost, and Yvon Chouinard on the climbing scene. Robbins, a cocky teenager from Los Angeles who had proven his ability on Tahquitz Rock, was the best rock climber in California and, at that time, the best in North America.[45] By the mid-1950's the climbers' abilities and techniques had advanced to the point that the climbers were prepared to challenge

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[43]Ibid., pp. 213-218.

[44]Ibid., p. 221.

[45]Ibid., p. 197.

the ultimate of the big walls of Yosemite, a fast developing area of rock climbing competition.

Robbins and Harding teamed up for an unsuccessful attempt to climb the northwest face of Half Dome in 1955. After climbing some four-hundred-fifty feet of the two-thousand-foot face they were forced to turn back. Robbins returned with a new party in 1957 and successfully climbed the seemingly bald face. The first Grade VI climb in the world had been ascended indicating the ultimate in length and difficulty.[46]

Harding, after being beaten by Robbins in the ascent of Half Dome, turned his attention to El Capitan. In 1958 Harding made the first ascent, a process which required twelve days on his final assault, but which had involved a total of forty-five days over an eighteen-month period. This first ascent of El Capitan involved the extensive use of bolts, fixed ropes, and supplies hauled up from ground level at regular intervals, all methods disapproved of by climbers like Robbins who insisted on the use of the classic Alpine style in the ascent of the big walls of Yosemite.[47] The result was a conflict in style with climbers like Robbins, who represented the classic style with emphasis on

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[46] Doug Robinson, "Grand Sieges and Fast Attacks," Mariah/Outside, IV (September, 1979), 24.

[47] Ibid., pp. 22, 27.

free climbing and self support on one side and climbers like Harding, who were interested in climbing regardless of the techniques necessary, on the other. A symbolic resolvement of this conflict came in 1970 with the ending of the Golden Age of Big Wall Climbing. In that year Robbins tried to erase Harding's Wall of the Morning Light climb on El Capitan by climbing it and using a cold chisel to chop off the bolts Harding had placed.[48] Major emphasis would now be on the refinement of free climbing techniques.

The 1970's also introduced a period of increased use of artificial chocks. It was rapidly becoming obvious that many of the more popular climbs, especially in Yosemite, were suffering from the destructive effects of pitons. As pitons were placed and removed from cracks in rocks, the cracks were eroding away resulting in the need to use larger and larger pitons. The eventual result would be a permanent change in the climbing route and even its loss as a climbing area. A solution was needed and the answer was chocks.

The use of chocks, or more correclty chockstones, was not a new idea; in fact, they may well have been used since the earliest days of rock climbing. Their use had gained increased popularity among British climbers during the 1940's and 1950's as stones of suitable strength and size were selected for jamming into cracks in the rock.

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[48]Ibid., p. 28.

Once in place a length of line was placed around them as a source of aid for the climber.[49]

Chockstones were replaced by machine nuts in the late 1950's and early 1960's. The 1960's also brought the first shaped nuts or chocks, cast from aluminum.[50]

Royal Robbins, having learned the principles of nut placement while climbing with British climbers in Europe, brought the idea to Yosemite in the mid-1960's. As other climbers, such as Chouinard and Frost, became increasingly aware of rock destruction due to the use and misuse of pitons and bolts, climbing nuts came into more extensive use. By the early 1970's Chouinard and Frost were producing a wide variety of these climbing nuts and gradually the hammering of pitons was giving way to this new technique. In the spring of 1973 the first Grade VI "clean" climb was accomplished on the west face of Sentinel Rock.[51] The era of clean climbing had arrived.

In its relatively short history, rock climbing has undergone a variety of changes. From its beginning as a part of mountaineering with limited rope handling to the subsequent introduction of belaying techniques, pitons, expansion bolts, and nuts, rock climbing reflects the desire

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[49] Scott, p. 229.

[50] Ibid.

[51] Ibid., pp. 164-165.

of man to accept the challenge of nature on its own terms. In accepting the challenge of the vertical wilderness man has devised a variety of ways to climb more effectively and safely. As long as this challenge remains, man will continue to seek better ways.

Chapter 3

CLIMBING EQUIPMENT

In rock climbing, as in any other sport, it is easy for the beginner to become overly concerned with a variety of equipment. The end result of this concern is often a large expenditure of funds for equipment the beginner does not need, does not know how to use correctly and effectively, and which is beyond his technical ability. This is unfortunate because one of the nice things about rock climbing is its simplicity. Very little specialized equipment is needed in order to participate safely and enjoyably in the sport. The beginner would do well to remember this and begin with basic quality equipment; then as his climbing ability improves, selectively add additional pieces of equipment as needed. The result of this approach would be a well equipped climber with the necessary climbing equipment to match his skill level as opposed to an overly equipped novice.

Climbing equipment can be divided into two categories: personal equipment which includes clothing, footwear, helmet, and other miscellaneous items and technical equipment which includes ropes, webbing, and hardware. In rock climbing personal and technical equipment should be kept to a minimum and be selected carefully in order to insure quality and safety. Since the emphasis of this manual is directed toward the basic aspects of rock climbing, the discussion of equipment as presented in this chapter will be limited to equipment relative to basic rock climbing techniques.

PERSONAL EQUIPMENT

Rock climbing requires no specialized clothing and little other personal equipment. However, the selection of functional attire requires some consideration concerning the requirements of the sport. The adding of certain additional personal items increases the safety and comfort of participation in rock climbing and are worth considering.

General Clothing

Because rock climbing requires a great deal of movement often over rough surfaces, clothing worn during the activity should be loose fitting and durable. Tight fitting clothing restricts movement and should be avoided. Loose fitting clothing provides room for making the stretching moves which are so often a part of rock climbing.

Long-sleeved shirts and trousers provide better protection against abrasions than do short-sleeved shirts and shorts. The tail of the shirt or any other upper body garment should be tucked in to prevent entanglement with climbing gear, especially during rappels.

Footwear

Shoes are one of the most important items of personal equipment for serious climbers, but for the beginning rock climbers a good pair of sneakers or tennis shoes will suffice for introduction to the sport.[1] As skill progresses and if interest is strong enough to continue in rock climbing, a good investment is in the purchase of a quality pair of properly fitted climbing shoes.

Historically, the first shoes for climbing consisted of ordinary, leather soled boots with small metal cleats attached to the soles. These boots provided good grip on rock and ice but were unsuitable for delicate rock work so they were gradually replaced by normal, soft shoes with coils of hemp rope attached to the soles. This innovation known as scarpe da roccia, which is Italian for rock shoe, provided the rock-gripping quality needed to make many of the early technical ascents in Europe.[2]

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[1]Paul W. Darst and George P. Armstrong, Outdoor Adventure Activities for School and Recreation Programs (Minneapolis: Burgess Publishing Company, 1980), p. 126.

[2]Steven Schneider, High Technology (Chicago: Contemporary Books, Inc., 1980), pp. 93-94.

Red Ball sneakers were popular among many early leading American climbers. Their light canvas uppers and rubber soles made them superior to hemp sole shoes especially in steep friction climbs. The standard Red Ball sneaker is the immediate predecessor of today's rock climbing shoe.[3]

The first shoe specifically developed for technical rock climbing came from France. Manufactured by Galibier under the name of PA's, for their designer Pierre Allain,[4] the shoe was made of canvas with a rubber sole which provided excellent rock gripping and edging qualities.

The _kletterschuh_ was another early climbing shoe manufactured in Germany and Austria. The uppers were constructed of leather with rubber lug soles which were fairly stiff. This particular climbing shoe was very popular among American climbers especially in Yosemite during the 1950's and 1960's.[5]

There are basically four types of climbing shoes of which three may be considered suitable for rock climbing. Of these three types the least desirable for rock climbing is the heavy-duty mountaineering boot. Made of leather with a lugged rubber sole this boot can be used on rock to a

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[3]Ibid., p. 94.

[4]Darst and Armstrong, p. 127.

[5]Schneider, p. 95.

limited degree. The welt of the sole should be flush with the uppers to facilitate edging. The weight and overall design of this boot limits its functionability in serious rock work. For delicate rock climbing the second and third types, a lightweight kletterschuh and a sneaker-like shoe with a soft rubber sole, are recommended.

When being fitted in a rock climbing shoe make sure that it fits tightly, but not tight enough to reduce circulation and create pain. Shoes specifically designed for rock climbing should be fitted over a light pair of socks or over no socks at all. The foot should not slide in the shoe but there should be room for the toes to wiggle.

It is not necessary for the beginning rock climber to invest in a pair of climbing shoes. Beginning work may be done in sneakers, tennis shoes or a pair of lightweight hiking boots with a close welt and rubber soles. As interest in rock climbing increases a pair of properly fitted climbing shoes can add much to the sport.

Helmets

In rock climbing it is an accepted fact that there are certain dangers involved. One such danger is the possibility of being hit on the head by a falling rock, a piece of equipment, or other debris while climbing or standing in the immediate climbing area. Since this danger is real and ever present it is unfortunate that some climbers still do not wear protective headgear while climbing because they consider it a sign of a novice. Nothing could be farther from the truth. The wearing of a helmet while climbing is an indication of good common sense, and all climbers should wear such protective headgear while climbing or being present in the immediate climbing area.

The use of protective headgear began in Europe when early climbers realized that the wide brimmed hats they wore for protection from the sun also protected them from small falling pebbles. This discovery gave rise to the development of the first helmets made for climbing. European climbing helmets were eventually introduced to the United States where their use and popularity slowly began to increase.[6]

With the availability of quality climbing helmets on today's market, only those helmets specifically designed for rock climbing should be worn by today's climbers. Modern climbing helmets provide protection for the head in the event of a fall and from small falling objects.[7] The helmet should consist of an outer shell, made of plastic or fiberglass, and an inner crush liner. In addition to the inner shell there should be a suspension system which prevents

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[6] Ibid., pp. 84-85.

[7] Mike Banks, Mountain Climbing for Beginners (New York: Stein and Day, Publishers, 1978), p. 19.

direct contact between the climber's head and the inside of the helmet. A chin strap is essential in order to hold the helmet in place (see Fig. 1). Criteria for selecting a

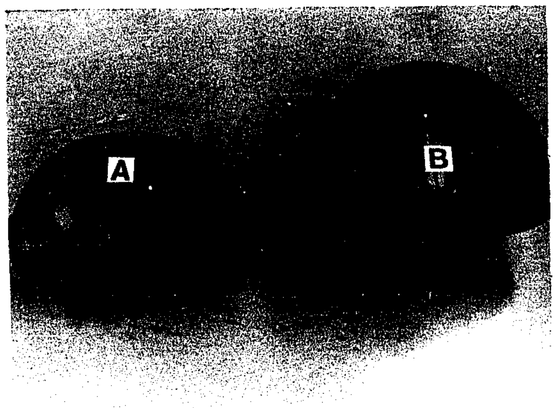

Fig. 1. Rock Climbing Helmets:
(A) Single Fiberglass Shell;
(B) Joe Brown Climbing Helmet

climbing helmet include (1) the impact strength of the helmet, (2) the ability of the helmet to absorb shock from top and sides, and (3) the ability of the helmet to stay on the head during a fall and at impact.

Gloves

One last piece of personal equipment which should be purchased by a beginning climber is a good pair of leather gloves. Gloves are not used for climbing but provide protection for the climber's hands while belaying and rappelling. Either of these basic rock-climbing skills can

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[8] Darst and Armstrong, p. 127.

be performed without gloves but when done incorrectly the result can be rope burned hands or a fallen climber.

Some unfounded arguments against the use of gloves include their interference with the feel of the rope while belaying and the suggestion that with gloves students tend to rappel too fast. These situations would seem to indicate a lack of proper training for beginning climbers rather than negative effects of using gloves. Since both belaying and rappelling make use of friction to provide braking and controlled descent, the potential for heat generation is ever present. The common sense approach to dealing with the potential for excessive heat build-up during either of these activities should be to provide preventive measures. The best preventive measures for controlling this potentially dangerous situation is, first, proper and thorough training in the necessary skills and, second, the wearing of leather gloves for protection of the hands.

Gloves for belaying and rappelling should be made of leather, be unlined, and fit snugly. When selecting a pair of gloves concentrate on fit and comfort. Since the gloves should be unlined make sure that any inner seams in the gloves, especially in the fingers, do not rub or cause discomfort.

TECHNICAL EQUIPMENT

The last decade has brought widespread development and use of technical equipment in climbing.[9] Much of this equipment is more relative to mountaineering than to rock climbing. Emphasis in this section of the manual will be on that equipment most important to the beginning rock climber with some limited information on selected additional pieces which may be encountered.

Rope

The rope is the lifeline between the climber and the belayer and as such provides the primary source of safety for the climber. A beginning rock climber must learn the characteristics of a climbing rope, how to care for it, and how to handle it effectively.

The development of the climbing rope parallels the evolution of climbing. In early ascents the rope was used as an aid rather than for protection. Ropes used for climbing were constructed of fibers natural to Europe, such as hemp, flax, and cotton. When manila was introduced from the Philippines and sisal from Mexico, they became the natural fibers chosen for rope construction gradually replacing other natural fibers.[10]

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[9] Ibid.

[10] Walt Wheelock, Ropes, Knots, and Slings for Climbers (Glendale: La Siesta Press, 1967), pp. 4-5.

Manila and sisal continued to be the chosen material for climbing ropes until World War II. With the problems of importing natural materials into the United States during wartime, another material was needed for rope construction. After extensive testing the superior qualities of nylon in strength, elasticity, and aging characteristics were proven, and this synthetic material became the choice for rope construction for the United States Mountain Troops. After the war, surplus nylon climbing rope found its way into the hands of civilian rock climbers who were also quick to realize its superior qualities.[11]

Today there are two chief types of rope construction (see Fig. 2). The laid type of construction, also known as

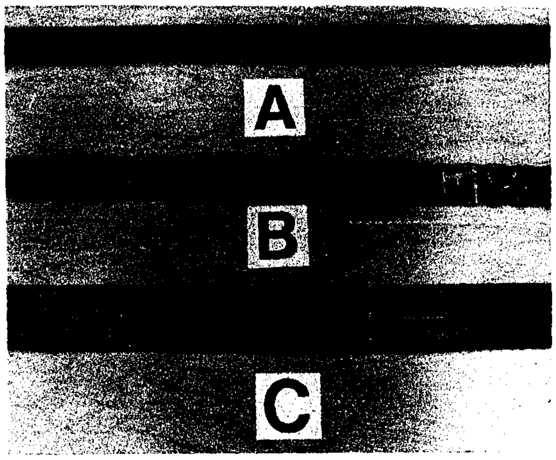

Fig. 2. Ropes and Webbing: (A) Kernmantel; (B) Laid; (C) One Inch Nylon Webbing

[11]Ibid.

twisted, hawser-laid, and "Goldline," consists of three groups of continuous nylon filaments twisted together. This construction pattern increases the elasticity of the rope up to 30 percent of its length, but also has a tendency to be stiff, kink badly, and spin a rappeller around and around in a free rappel. A word of caution must be injected here for the safety of novice climbers. Goldline is a brand name of a particular climbing rope and not a type of rope construction.[12] Not all laid climbing ropes are Goldline. Be careful when shopping and insist on knowing the quality of the rope purchased.

The second type of rope construction is kernmantel, from the German term kernmantel referring to core (kern) and sheath (mantel). This type of rope is mainly manufactured in Europe and, as the name implies, is constructed of an inner core of continuous filaments surrounded by an outer sheath or mantel. The material for construction of this rope is Perlon, which is a European trade name for nylon.[13] Kernmantel rope is less likely to kink, is softer and more pliable, and does not have a tendency to spin a rappeller when in a free rappel.

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[12] Raymond Bridge, Climbing: A Guide to Mountaineering (New York: Charles Scribner's Sons, 1977), p. 91.

[13] Ibid.

Ropes come in several diameter sizes, but the most popular for climbing in the United States are seven-sixteenths inch for the laid type and eleven millimeters for kernmantel rope. The most popular length of rope is one-hundred-fifty-feet, but this length may vary from one hundred twenty to one hundred sixty-five feet, depending on the climbing area in which it is to be used.

When selecting climbing rope insist on rope which has been approved by the Union Internationale des Associations d'Alpinism (UIAA). The approval of this organization assures the quality and strength of the rope. Both Goldline, by trade name, and most kernmantel ropes on the market are approved by the UIAA. If a rope is not approved by this organization its quality and strength are in question and as such may not provide the safety margin needed for climbing.

Special caution should be taken to properly care for and maintain a climbing rope in as good a condition as possible. The rope should be protected from dirt and grit as much as possible. Never step on a rope for tiny fragments of the rock may become embedded in the rope and damage the nylon filaments. A climbing rope should be washed when dirty. Washing the rope should be done using a mild detergent, with no bleach, and in lukewarm or cold water.[14] The rope should be allowed to dry naturally with care to avoid direct sunlight. When not in use the rope should be coiled loosely and stored in a cool, dry area away from sunlight, chemicals, and acids, all of which can damage the nylon in the rope.

When in use care should be taken to protect the rope from sharp edges, dirt, grit, and unnecessary stress. If a rope is required to support a climber's fall it should be checked as soon as possible for damage. When a rope shows signs of damage it should be retired immediately. The fraying of the outside of laid rope is not necessarily an indication of damage. Through regular use the nylon filaments on the outside of the rope break and produce a fuzzy condition referred to as "fat." Under close inspection there is an obvious difference between a "fat" laid rope and one which has severe filament damage.

Even with the best of care climbing ropes do not last forever. With average use a rope may be safely used for about two years.[15] But to define "average use" is not easy for there are a variety of conditions which may enter into the use of a rope. If the rock on which the rope is used is very abrasive the rope will show increased wear. The height of a fall supported by a rope is also a point for

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[14]Schneider, p. 161.

[15]Darst and Armstrong, p. 128.

consideration in determining the life of a rope. Estimation of this condition is complicated by the conditions of the fall: was the fall a direct descent, a pendulum, or simply sliding down a slab? As a rule ropes should be retired when they are cut, are required to support excessive stress, or when 50 percent of the surface strands are worn to fuzz.[16]

Webbing

In recent years the popularity of nylon webbing, also known as sling and tape, has increased among climbers (see Fig. 2). Webbing is constructed in two styles, flat and tubular, and serves in a variety of uses such as body slings, rappel seats, and runners.

Webbing should be given the same care as the climbing rope. It should not be exposed to unnecessary dirt, grime, or sharp edges which can damage the nylon filaments. Webbing can be washed in lukewarm or cold water with a mild detergent and should be stored in a cool, dry place, away from sunlight when not in use.

Carabiners

Carabiners are the most useful items in the rock climber's equipment list. Also referred to as biners, snaplinks, and crabs, carabiners are used to join a climber

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[16]Peggy Ferber, ed., Mountaineering: The Freedom of the Hills (3d ed.; Seattle: The Mountaineers, 1974), p. 116.

to a climbing rope or rappel, to join a belay rope to a climber, to join the climbing rope to a protection point, and to ensure smooth running of the climbing aid equipment to a protection point.[17]

Carabiners evolved from the pear-shaped karabiner used by German firefighters in the late 1800's. They were introduced to climbing in the Alps around 1910.[18] These early carabiners were made of steel and continued in use for many years. During World War II the American military developed a much stronger and lighter carabiner made of an aluminum alloy. After the war aluminum carabiners became standard equipment for climbers.

Today carabiners come in several shaped including oval, D-shaped, and modified or offset D-shaped (see Fig. 3). In addition, some D-shaped carabiners have a locking device for increased security. This locking device consists of a screw collar on the gate of the carabiner which crosses the gate opening when advanced into position, thus holding it secure. Before the gate can be opened the screw collar must be moved from across the gate opening. The locking D-shaped carabiner should be used for belaying and rappelling.

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[17]Darst and Armstrong, p. 128.

[18]Jones, p. 102.

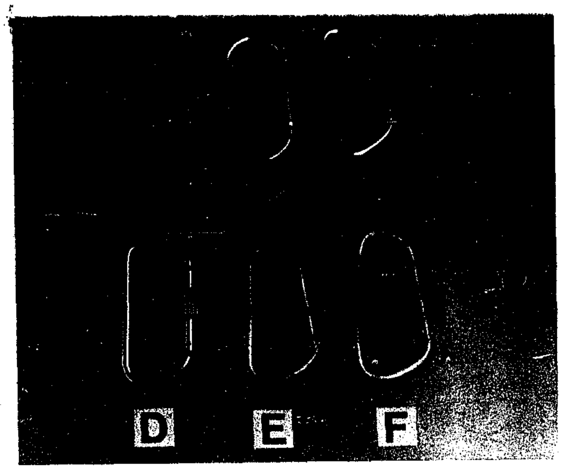

Fig. 3. Types of Carabiners: (A) Steel Oval; (B) Aluminum Oval; (C) D-shaped; (D) Locking D-shaped; (E) and (F) Modified D-shaped

The weakest part of a carabiner is its gate (see Fig. 4). Care should be taken to avoid placing stress on the gate of a carabiner. The gate is the point of failure for carabiners.[19]

D-shaped and modified D-shaped carabiners are structurally stronger than standard oval carabiners.[20] By design the line of force is shifted to a position nearer the long axis of the D-shaped carabiner and away from the gate which is the weakest part of the device. When compared with the standard oval design, which equally distributes force between the solid and gate sides of the carabiner, it

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[19]Schneider, p. 50.

[20]Ibid.

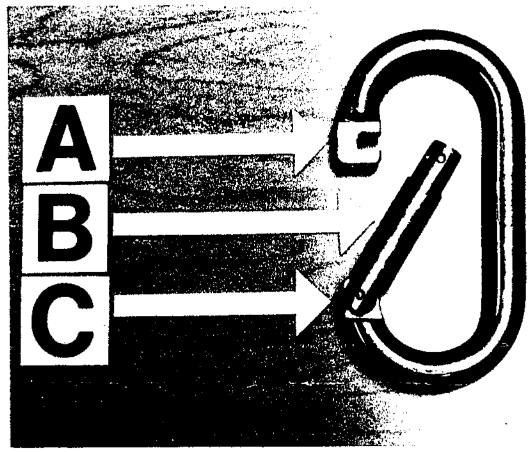

Fig. 4. Parts of a Carabiner: (A) Locking Notch; (B) Gate; (C) Hinge

becomes apparent that the greater potential for strength lies in the D-shaped design (see Fig. 5).

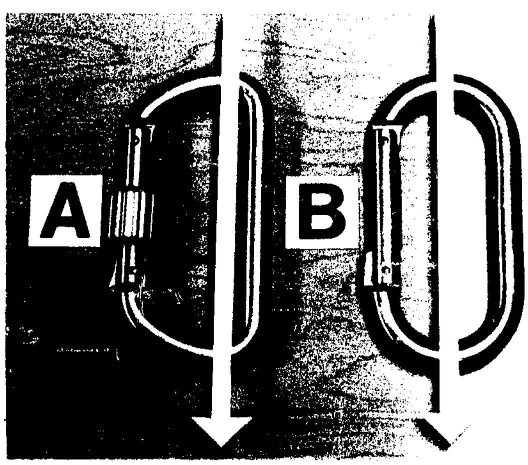

Fig. 5. Line of Force Through a Carabiner: (A) D-shaped; (B) Oval

Some carabiners are equipped with a blind gate. This refers to a raised area at the end of the gate which opens. This raised area aids one in quickly distinguishing the opening end from the hinged end (see Fig. 6).

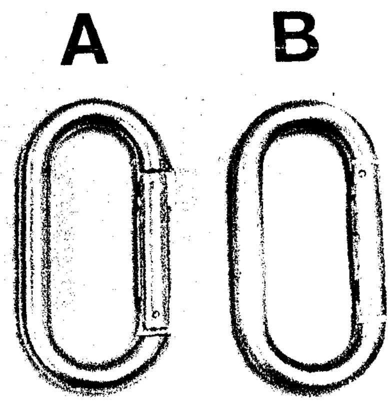

Fig. 6. Blind Gate Carabiner: (A) Oval with a Blind Gate; (B) Oval without a Blind Gate

Oval carabiners can be used in pairs for increased security when locking D-shaped carabiners are not available. In using oval carabiners in this fashion the gates should be placed in either opposed or reversed positions. The opposed position refers to two oval carabiners placed side by side with their gates on opposite sides and opening in either the same or opposite directions. Reversed gates indicates two oval carabiners placed side by side with their gates on the same side but opening in opposite directions.[21] Either of these placements decreases the likelihood of unexpected detachment from the carabiners.

The life expectancy of any carabiner is indefinite.[22] Proper care should include keeping them free of dirt and grit. Oil should not be applied to the gate spring since it only results in the accumulation of grime. The gate on a carabiner should work smoothly and close tightly when released. A carabiner with a gate which does not close correctly should be retired. Care should be taken to prevent the dropping of carabiners from a climb, for over a long fall hairline fractures may develop in aluminum.[23] Any carabiner which has sustained a long fall should not be used for protection.

Additional Hardware

Brake bar. A brake bar is a cylindrical piece of aluminum alloy designed to fit on an oval or D-shaped carabiner for the purpose of providing friction during a rappel (see Fig. 7). One end of the brake bar has a hole drilled in it to fit over the gate of the carabiner. A

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[21] Ferber, p. 148.

[22] Schneider, p. 51.

[23] Ibid.

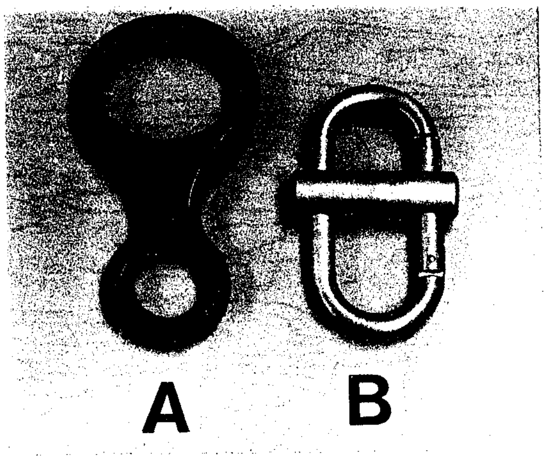

Fig. 7. (A) Figure-eight Descender;
(B) Brake Bar on an Oval Carabiner

notch is located at the other end which permits the brake bar to be latched over the solid side of the carabiner. When using a brake bar for rappelling care should be taken to make sure that the device is positioned properly with the notch down on top of the carabiner rather than up from the bottom.

<u>Figure-eight descender</u>. Also known as a figure-eight ring or simply eight ring, the figure-eight descender is a simple, effective device for providing friction for controlled descent in rappelling (see Fig. 7). Constructed of solid forged aluminum alloy the device is extremely strong and durable. In addition to being used for rappelling, the figure-eight descender can also be used for belaying.

Pitons. Pitons are metal spikes or pegs which can be driven into the cracks of a rock. They come in a variety of sizes from very small, such as the Lost Arrow, to very large, such as the bong-bong.

Due to increased awareness of the permanent damage done to rock cracks by pitons, these devices have received less use in recent years. More emphasis is now being placed on the use of chocks.

Chocks. Also referred to as chockstones and nuts, these devices come in a variety of shapes and sizes designed to fit a variety of rock cracks (see Fig. 8). They consist of a piece of aluminum fitted with a wire cable or drilled for the attachment of a length of rope. Chocks are increasing in popularity as the emphasis on clean climbing advances.

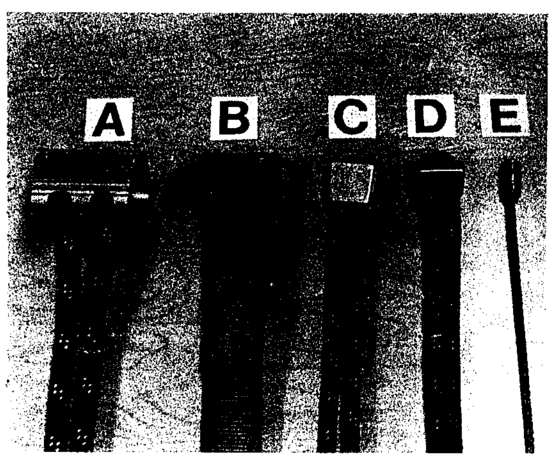

Fig. 8. Types of Chocks: (A) Camlock; (B) Titon; (C) Stopper; (D) Hexentric; (E) Cooperhead

Chapter 4

KNOTS AND SLINGS

One of the first skills the beginning rock climber is expected to perfect is the skill of knot tying. In climbing great emphasis is placed on properly tied knots in ropes and webbing for a climber's life may literally depend on the security of a knot. The seriousness of correct knot tying is expressed in the following poem, though in a rather lighthearted fashion:

A young mountaineer named McPott
Tied an insecure butterfly knot.
He screamed as he fell
(A maniacal yell - - -)
"My God! I'll be hardly a spot.[1]

There is no doubt that tying knots for climbing is a serious business. Knots in rope and webbing secure the climber to the belay rope, hold the belayer in position, anchor ropes for rappelling as well as numerous other tasks. The beginning rock climber must learn how to tie certain knots correctly and when to use each know in his repertoire in the most effective manner.

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[1]Walt Wheelock, Ropes, Knots, and Slings for Climbers (Glendale: La Siesta Press, 1967), p. 36.

The beginning climber is often faced with the problem of deciding whether it is better to learn a few knots well and hope they will be sufficient for a variety of climbing situations or to half-learn a variety of knots and trust luck when called upon to use them. This dilemma is unfortunate because a few carefully selected knots will meet the needs of a beginning climber in a variety of situations. The question then becomes, which knots to learn? In this section of the manual a few select knots will be covered which will, if learned properly and practiced frequently, serve the beginning rock climber well. In addition, the tying of slings and the coiling of rope will also be covered.

KNOTS

There is almost an endless variety of knots. From this list a few knots have emerged as climbing knots because they display certain desirable characteristics which make them more useful to climbers. Those desirable characteristics include (1) strength, (2) easiness to tie and untie, (3) ability to stay tied, and (4) efficiency.[2] By rating knots according to these characteristics, a strong

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[2] Paul W. Darst and George P. Armstrong, Outdoor Adventure Activities for School and Recreation Programs (Minneapolis: Burgess Publishing Company, 1980), p. 130.

knot which is difficult to tie is as useless as a weak knot which is easy to tie.

The list of possible climbing knots which display the desired characteristics can be further reduced by careful selection of a few knots which serve a variety of purposes. Thus, through a process of elimination and careful selection, a few select knots can be identified as important for the beginning rock climber to know. From a list of hundreds of knots it is possible for the beginning rock climber to be successful and competent in knot tying for climbing purposes by knowing only four basic knots which can be used in combination to provide a series of useful knots. These knots include the overhand, the figure-eight, the bowline, and the prusik.

Before moving into information on how to tie and use these knots, there are some basic terms relative to rope work which must be presented in order to provide clarity in later material. To this point the term knot has been used to denote a configuration in rope or webbing used to join two lines together or to fasten a rope or length of webbing into a loop or onto some other object.[3] What may be referred to as a knot in general terms may not be called a knot when referred to in more specific rope work terms. The change from general to specific terminology can result in

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[3]Wheelock, p. 12.

confusion for the beginner if he is unaware of the inferred meaning. In an effort to avoid such confusion, the following terms are presented and will be used throughout the discussion of knots to provide consistency and clarity for the beginning rock climber.

1. A bend is used to tie two ropes or pieces of webbing together.

2. A loop refers to a fixed or non-constricting circle of rope or webbing. In knot tying a loop refers to a turn of rope or webbing which crosses itself (see Fig. 9).

3. A hitch is a knot which grips a shaft or another rope or webbing (see Fig. 9).

4. A bight indicates a simple turn of rope which does not cross itself (see Fig. 9).

5. The running end of a rope or webbing is the free end and is generally referred to as the end.

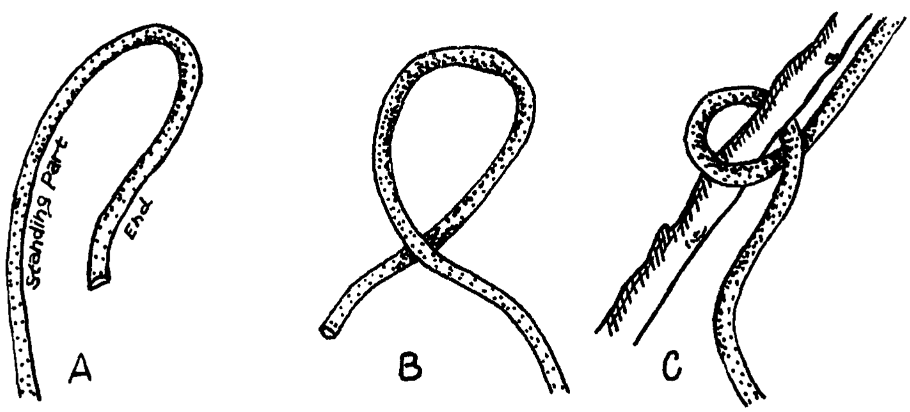

Fig. 9. Illustrated Rope Work Terms:
(A) Bight; (B) Loop; (C) Half-hitch

6. The <u>standing part</u> of the rope or webbing is the fastened part and may be referred to as the line or simply the rope.[4]

<u>Overhand Knot</u>

The overhand knot is the most fundamental knot and is often used with other knots to construct more complex knot configurations. To tie an overhand knot form a loop in a length of rope or webbing and pass the end through the loop[5] (see Fig. 10). The primary use of the overhand knot in rock climbing is to back up another knot. This refers to the tying of an overhand knot directly behind the primary knot to prevent possible slippage. Backing up knots is referred to as boomproofing.[6]

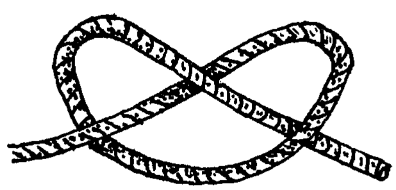

Fig. 10. Overhand Knot

Additional uses of the overhand knot to form configurations are described on the following pages.

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[4]Ibid., p. 13.

[5]Ibid., p. 14.

[6]Darst and Armstrong, p. 130.

Overhand bend. This knot, also known as the ring bend, water knot, overhand follow through, and webbing sling knot, is the only safe knot to use to join the ends of webbing together.[7] With the increased use of webbing for slings in recent years, this is one knot the beginning rock climber must master if he is going to use webbing while climbing.

At first, the overhand bend may appear to be complicated, but it is not. The key to tying the knot is to remember that it is based on the simple overhand knot.

There are two ways of tying the overhand bend (see Fig. 11). Two rope ends may be joined in an overhand bend by simply holding the rope ends together and tying an overhand knot in the doubled rope. This method may be used when it is not important which line carries the strain.[8] This is not the method recommended for tying the ends of webbing together.

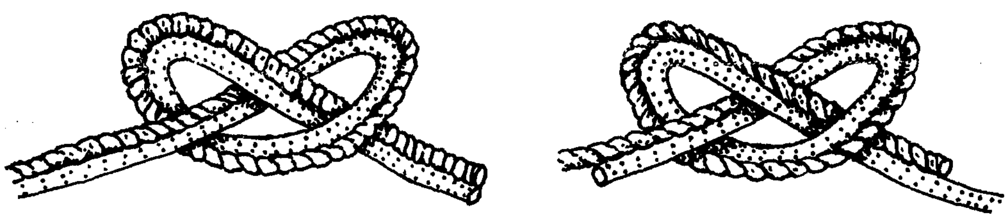

Fig. 11. Overhand Bend

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[7]Wilhelm Paulcke and Helmut Dumler, Hazards in Mountaineering (New York: Oxford University Press, Inc., 1973), p. 139.

[8]Wheelock, p. 16.

A second method of tying an overhand bend is to tie a loose overhand knot in the end of one length of rope or webbing. The second end is then passed through the first overhand knot in reverse order. When tied correctly this overhand bend should have an end and a rope or webbing extending from each side and will place the strain parallel to the rope or webbing.[9] This is the method for joining the ends of webbing together.

<u>Overhand loop</u>. This configuration is used to construct a loop in rope or webbing (see Fig. 12). It may also be referred to as the middleman knot indicating its use as a means of securing a climber to the middle of the climbing rope.

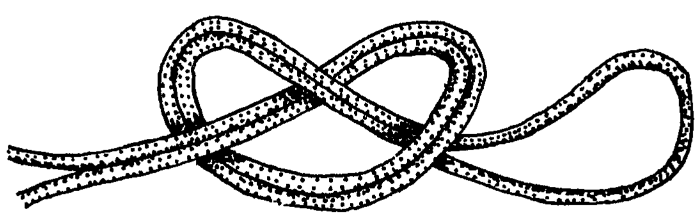

Fig. 12. Overhand Loop

The knot may be tied in two different ways. The first method requires the forming of a bight in the rope or webbing and then tying an overhand knot on the bight. The loop formed by this method is useful as a location for clipping into a rope or webbing with a carabiner.

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[9]Ibid.

A second method for tying an overhand loop requires the tying of a loose overhand knot in the standing part of a rope or webbing. The end of the rope or webbing is then passed back through the loose overhand tracing the knot in reverse order. The resulting knot can be used to tie in a climber for belay purposes by the creation of an overhand loop around a sling. Aspects of this technique will be presented later during the section on belaying.

The overhand loop has largely been replaced by the figure-eight loop which is easier to untie.[10] However, there are some instances when it is still recommended as a method of tying climbers to a belay.[11]

Fisherman's knot. This particular knot, also called the Englishman's knot, is not usually so closely associated with the overhand knot. It is included here to emphasize its simplicity based on the use of the overhand knot. The primary use of this knot is to join the ends of two ropes together.

The fisherman's knot is created by first tying a loose overhand knot in the end of one rope. The end of the second rope is then passed through the loop formed by this knot and the end of the second rope is used to tie an

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[10]Ibid.

[11]John Kudlas, The Rock Climbing Teaching Guide (Washington: American Alliance for Health, Physical Education, Recreation, and Dance, 1979), pp. 28-29.

overhand knot around the first rope (see Fig. 13). The two overhand knots are then tightened and slid together to make the knot secure.

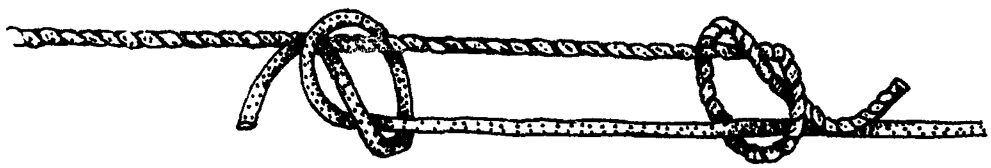

Fig. 13. Fisherman's Knot

Figure-eight knot.

The figure-eight knot is similar to the overhand knot and is often used instead of the latter because it is easier to untie. This knot is tied by forming a loop in a rope and then passing the end under and around the rope before taking it through the loop (see Fig. 14). The knot produced is bulkier than the overhand with more gentle turns in the rope.[12]

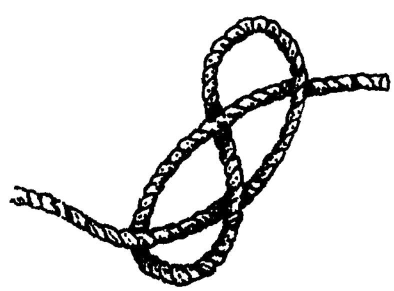

Fig. 14. Figure-eight Knot

Figure-eight bend. Also called the Flemish bend, this knot can be tied two different ways (see Fig. 15). One method requires placing the two rope ends together and tying

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[12]Wheelock, p. 14.

a figure-eight knot in the double rope. Another method is to tie a loose figure-eight knot in one end of a rope and then lead the end of the second rope through the first knot in reverse order.

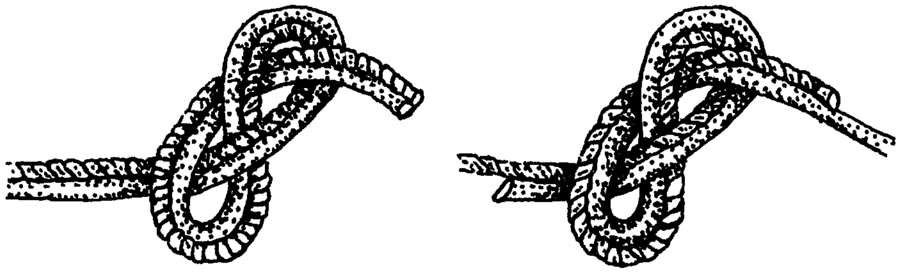

Fig. 15. Figure-eight Bend

Figure-eight loop. The figure-eight loop has largely replaced the overhand loop because the former is easier to untie (see Fig. 16). It may be tied in two different ways. One method requires the forming of a bight in the rope or webbing which is then tied in a figure-eight knot. The second method requires the tying of a loose figure-eight knot in the rope or webbing. The end of the second rope or webbing is then passed back through the first knot in reverse order. The figure-eight loop can be used in place of an overhand loop and is especially popular for tying in climbers.

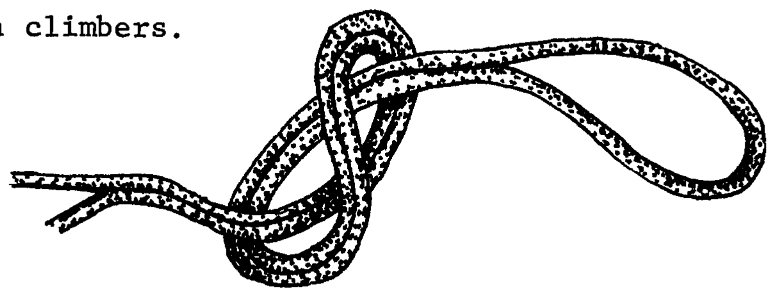

Fig. 16. Figure-eight Loop

Bowline

The bowline is the basic climbing knot and is often referred to as the king of all knots.[13] Its primary uses in climbing have been as an end-man knot to secure a belay rope to a climber and to secure a belay rope to an anchor point. The use of the bowline as an end-man knot has been reduced greatly by the increased use of webbing for slings.

There are several different ways to tie a bowline, but the knot should always look the same. One method for tying the knot begins with a loop on the standing part of the rope. The end of the rope is then passed through the loop, around the standing part of the rope, and back through the loop (see Fig. 17). When the bowline is tied, the end should be on the same side as the standing part of the rope. If the end is on the opposite side from the standing part, the knot loses about half of its strength.[14]

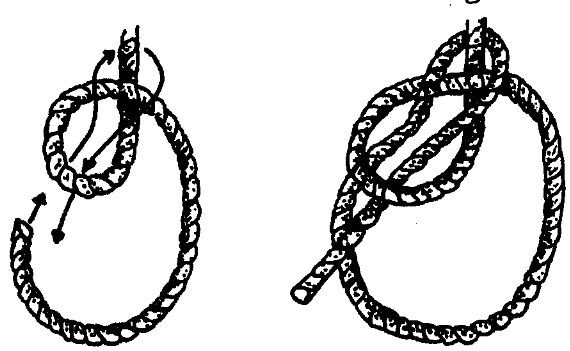

Fig. 17. Bowline

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[13]Ibid., p. 17.

[14]Ibid.

Bowline-on-a-coil. This variation of the bowline provides a wider surface area which tends to equalize the tension placed on a rope tied around an object.[15] For this reason the bowline-on-a-coil has gained popularity as an end-man knot.

To tie a bowline-on-a-coil begin by wrapping the rope around the waist four or five times to form a coil. Then form a bight in the rope and pass it up and to the inside of the coil. The bight is then twisted to form a loop with the standing part of the rope on top. The end of the rope is then passed down through the loop, around under the rope and back up through the loop (see Fig. 18). The knot should then be secured by pulling the rope.

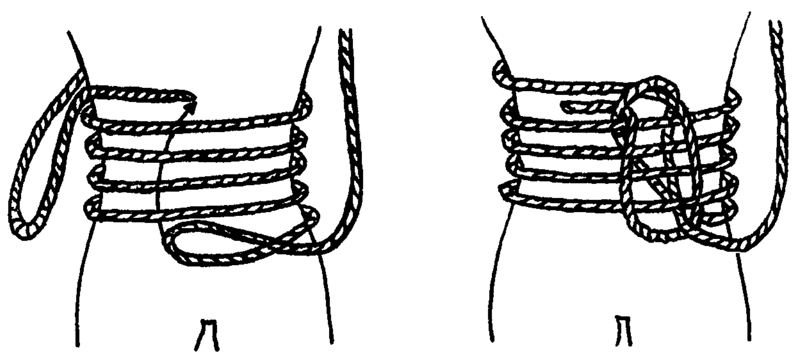

Fig. 18. Bowline-on-a-coil

Prusik Knot

The prusik knot, which is actually a hitch, was invented by Dr. Karl Prusik for the repairing of violin

[15]Ibid., p. 19.

strings. It was later adapted for the climbing of a rope.[16]

The prusik knot is included in the list of basic knots for beginning rock climbers in order to provide one knot which can be used to climb a rope or to grip and securely hold a main rope in an emergency. It consists of a smaller rope wrapped around a larger rope (see Fig. 19). The prusik knot will hold better if the smaller rope is wrapped around the larger rope three times instead of twice.[17] When pressure is applied to the knot it grips the rope and holds securely. When the pressure is released, the knot can be slipped up or down the rope as desired.

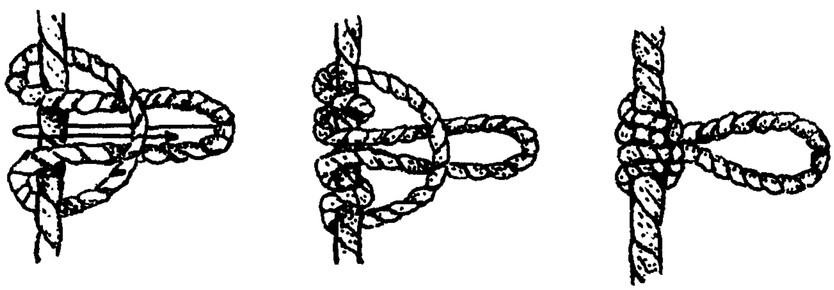

Fig. 19. Prusik Knot

It is not necessary for the beginning rock climber to have an extensive repertoire of knots in order to be able to participate in rock climbing safely. By knowing how to tie an overhand knot, a figure-eight knot, a bowline, and a

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[16]Doug Scott, Big Wall Climbing (New York: Oxford University Press, 1974), p. 2.

[17]Wheelock, p. 23.

prusik knot, plus loop and bend variations of the overhand and figure-eight, the beginner will have enough knots to successfully begin climbing. He should remember, however, that all knots, with the exception of the prusik, should be backed up with an overhand knot to increase their security.

SLINGS

The first use of ropes for belaying signified an important step forward in the advancement of climbing. The application and refinement of belaying techniques for climbing provided a means by which the mountaineer could extend his ability to a greater degree with a reasonable feeling of safety provided by the belay. These same belaying techniques were refined further and applied to rock climbing as the sport evolved.

Rappelling techniques have also improved over the years as their use increased. These improvements gradually removed the rappel rope from direct contact with the body of the rappeller to contact with other equipment by which friction could be developed.

A significant advancement in both belaying and rappelling techniques was brought about by the development of alternate ways to tie into the rope in an indirect rather than a direct manner. The earliest method for tying into a belay rope was with a bowline around the climber's waist. An early form of rappelling was the dulfersitz or body rappel. Both of these direct tie-in techniques placed the rope in contact with the body and often proved less than satisfactory.

Indirect methods of tying into a belay or rappel rope required the use of a sling. These slings were originally lengths of rope which could be wrapped around the body in the desired configuration. With the increased availability and use of webbing in recent years, the use of ropes for slings has steadily decreased. The use of webbing for the tying of slings is now a standard practice with most rock climbers.

Slings, also known as seats, harnesses, harness seats, and wraps, have taken different forms. The beginning rock climber should be aware of how to tie slings, the advantages they provide, and when to use them most effectively. This section will provide information on several types of slings, how to tie them and when to use them.

Swami Belt

The swami belt, also known as a waist loop, was first devised by Yvon Chouinard and T. M. Herbert.[18] It consists of a length of one-inch nylon webbing, fifteen to thirty feet long, wrapped around the waist and secured with

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[18]Ibid., p. 30.

an overhand bend (see Fig. 20). The belay rope may be tied directly to the swami belt by using an overhand or figure-eight loop or be connected by a locking carabiner.

Fig. 20. Swami Belt

The swami belt provides a greater area of contact than does the more traditional bowline. This increased contact provides for better distribution of force received from the impact of a belayed fall but this force is still applied to the abdominal region of the climber's body which is extremely sensitive to such shock.

The swami belt is used for tying in a climber to a belay rope and as a means of tying a climber into an anchor point. Though much simpler than some of the other slings, the swami belt has a disadvantage in that it imparts force directly to the abdominal region of the body.

Diaper Sling

The development of this sling has been associated with rappelling. The basic configuration resembles a diaper and consists of a suitable length of webbing, approximately ten feet long, the ends of which have been secured with an overhand bend. The sling formed by the webbing is passed behind the back with the two ends held in front of the waist. Slack is then provided which will allow the center of the lower part of the sling on the back to be lowered and passed between the legs to be joined with the two ends in front of the hips. These three loops are then joined together by passing a carabiner through each (see Fig. 21).

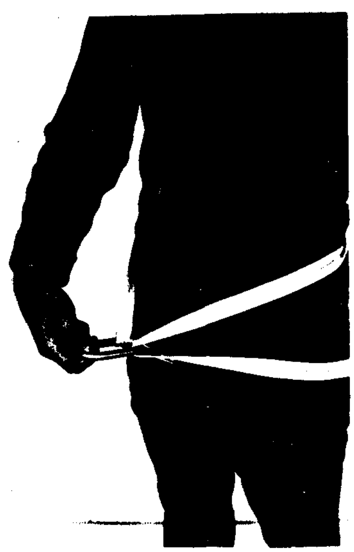

Fig. 21. Diaper Sling

The diaper sling has the advantage of distributing the force of a rappel through the hips of the rappeller. It also removes the point of friction, which is necessary for controlled descent on a rope, from the body to pieces of hardware. These factors combined make the sling configuration comfortable and safe for rappelling.

Figure-eight Sling

The figure-eight sling, also known as a figure-eight seat, is constructed of a length of webbing five to six feet long. After joining the ends of the webbing using an overhand bend, the sling is twisted one-half turn to form a figure-eight. One leg is placed in each loop of the figure-eight and the sling is slipped up the legs to the top part of the thighs (see Fig. 22). A carabiner is clipped around the junction of the two loops, which is between the legs, to provide a point of attachment to the sling.

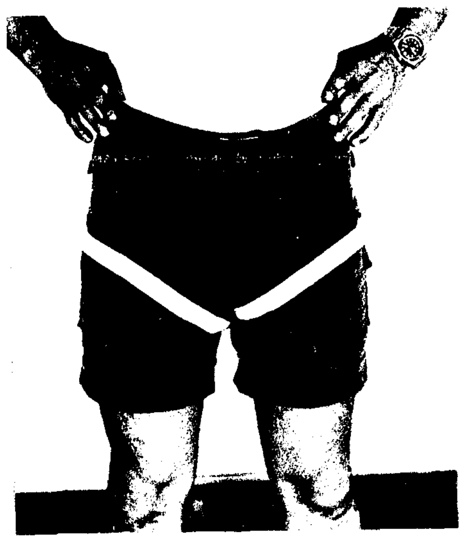

Fig. 22. Figure-eight Sling

Though simple in nature, the figure-eight sling has a major disadvantage in the fact that it is located below the rappeller's center of gravity and makes him top heavy. This results in a stability problem which tends to turn the rappeller upside-down if the body weight is not maintained over the sling. Stability for the sling can be increased by clipping it to a swami belt,[19] but this requires an additional length of webbing.

The use of the figure-eight sling is limited to rappelling. Because of the problem of stability it presents, this sling is not recommended when an alternate method is available.

Swiss Seat

This particular sling configuration has gained popularity as a result of its use by the military as well as its versatility. To construct the seat begin by placing a length of webbing, fourteen to sixteen feet long, across the back so that the center is on one hip. Tie an overhand knot in the sling in front of the body and pass the ends of the sling back between the legs. The two ends are then brought up over the hips and passed around the waist where they are joined with an overhand bend (see Fig. 23). To clip into the seat for rappelling, pass a carabiner through the loop around the waist and the point at which the sling forms the overhand knot. A belay rope may be attached via a locking

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[19]Peggy Ferber, ed., Mountaineering: The Freedom of the Hills (3d ed.; Seattle: The Mountaineers, 1974), p. 147.

carabiner placed in the manner just described or by tying into the sling directly using an overhand or figure-eight loop.

Fig. 23. Swiss Seat

The Swiss seat is used by the military for rappelling,[20] but it may also be used as a means of attaching a belay rope to a climber and as a convenient means of attachment to anchor points. Major advantages of this configuration are its potential for distribution of belayed fall impact force through the hips, which is a broader and less sensitive area than the abdominal region of the body, and its formation nearer the center of gravity of

[20] U.S. Army, Military Mountaineering (Baltimore: U.S. Army Adjutant General Publications Center, 1976), pp. 34-35.

the body which makes it a much more stable rappelling sling. When tied correctly this sling may be worn for an extended period of time with reasonable comfort.

For maximum effectiveness the sling should be tightly wrapped around the hips and waist. This may lead to some minor discomfort for the climber when force is applied. Possible discomfort can be reduced by taking care to place the sling in such a manner as to avoid any unnecessary twist which will cut into the hips and waist.

Modified Swiss Seat

Developed as a variation of the Swiss seat, this sling configuration is also known as the inverted Swiss seat and in some areas as the Swiss seat. This has led to some confusion as to the type of sling implied and may create some communication problem for beginning climbers.

To tie the modified Swiss seat begin by passing a length of webbing across the back with the center on one hip. Hold both ends of the webbing in front of the waist in the left hand while reaching back between the legs and pulling the webbing around the back through with the right hand. Pass the two ends down through the loop formed by the webbing passed between the legs and slip the resulting loops up onto the hips. Then wrap the remainder of the webbing around the waist and join the ends with an overhand bend (see Fig. 24). The seat may be clipped into by passing a

Fig. 24. Modified Swiss Seat

carabiner through the loop around the waist and down through the section of sling between the leg loops. A direct tie-in can also be made by using an overhand or figure-eight loop and placing the rope in the same manner as described for the carabiner.

The modified Swiss seat requires approximately the same length of webbing as the Swiss seat. It may be used for rappelling, belaying, and for tying into an anchor point. For some climbers the modified seat provides increased comfort plus all the advantages of the regular Swiss seat. Like the Swiss seat it may be worn for extended periods of time with reasonable comfort.

Double Loop Seat

The double loop seat is similar to the modified Swiss seat in its configuration. To tie this seat begin by finding the center of the webbing and tying two overhand loops large enough to slip around the upper part of the thighs, one on each side of the sling, three inches from the center. Place one leg in each loop and slip the loops up the legs to the upper part of the thighs. The remainder of the sling is then wrapped around the waist and secured with an overhand bend[21] (see Fig. 25).

Fig. 25. Double Loop Seat

Like the two Swiss seats previously described, the double loop seat can be used for attachment of a belay rope

[21]Darst and Armstrong, pp. 142-143.

or to anchor points as well as for rappelling. To clip into this seat with a carabiner, pass it around the waist wrap and down around the section of sling between the two leg loops. A rope can be tied into the seat by using an overhand or figure-eight loop by passing the end of the rope along the path described for the carabiner.

The double loop seat has the same advantages as the previous Swiss seats described. In addition, it may be more comfortable because the leg loops are tied to fit the climber's legs and do not rely on tension created in the rest of the sling to remain in place. A disadvantage is that the tying of the leg loops requires time and must be adjusted to fit the climber's legs.

Slings are very much in use in modern rock climbing for both climbing and rappelling. The beginning rock climber must know how to tie slings and effectively use them in order to take advantage of many of the latest climbing techniques. All of the slings mentioned above, with the exception of the swami belt, can be used for rappelling where hardware is used for braking. With the exception of the diaper and figure-eight slings, all of the slings previously mentioned can be used as a means of indirect belay rope attachment to a climber. The most versatile slings are the Swiss seat, the modified Swiss seat, and the double loop seat. Because of this versatility and the fact that they are centered around the body's center of gravity and distribute the force of a rappel and the impact of a belayed fall through the hips and away from the abdominal region, they are most highly recommended.

ROPE COILING

An important task which each beginning rock climber should master is rope coiling. The sequence for coiling a rope should result in neatly and evenly formed loops and a secure wrap. A properly coiled rope will be easier to carry, uncoil or throw, and store.

There are several methods for coiling a climbing rope. A simple method is described below (see Fig. 26) and is similar to the mountaineer's coil.[22] Since the length of most climbing ropes makes coiling around the hand difficult for beginners, it is suggested that the legs be used instead.

To coil a rope begin in a sitting position with the knees up and separated and the heels of the feet together with the toes turned out. Place the end of the rope on top of the right knee and pass the rope over the left knee and around under the feet and back to the right knee to form the loops (see Fig. 26, A and B). Hold the end of the rope in place until the first four or five loops have been formed to prevent it from falling loose. Continue looping the rope

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[22]Ferber, p. 123.

around the knees and feet until the last loop fails to reach the starting point on the right knee. This unfinished loop plus the previous loop are removed. From this end section of the rope, form a short loop around the knees and across the middle of the lower leg (see Fig. 26, C). As this loop passes the right knee, form a bight in the rope (see Fig. 26, D). With the remaining rope begin wrapping the loops together at a point just to the left of the right knee (see Fig. 26, E). When all of the rope has been used for this wrap, place the end of the rope through the bight (see Fig. 26, F). The bight is then tightened by pulling on the right side of the short loop (see Fig. 26, G). A rope properly coiled in this fashion should not have excessive lengths of rope extending from the wrap (see Fig. 26, H).

(A) Starting Position

(B) First Loop

(C) Short Loop

(D) Bight

Fig. 26. Rope Coiling

(E) Beginning Wrap

(F) Finish Wrap

(G) Securing Wrap

(H) Coiled Rope

Fig. 26. Rope Coiling (cont.)

Chapter 5

CLIMBING SIGNALS AND RATING SYSTEMS

Communication is an important part of rock climbing. During a climb it is essential for the climbers to be able to quickly and effectively exchange information in a simple yet clearly understood manner. To meet the demand for such a basic means of communication during a climb, a sequence of climbing signals has been developed. Though there are some variations in the verbal signals, the basic sequence is fairly well established.

Another important aspect of communication relative to rock climbing is the rating of a particular climb. Rating a climb refers to assessing the difficulty of a climb and assigning it a particular numerical and/or letter value. This rating provides interested climbers with an indication of the difficulty of the climb and the climbing skill required. The rating may also indicate the approximate duration of the climb and whether or not aid will be needed.

The assignment of a numerical and/or letter rating to a particular climb is done according to any of several climbing rating systems now in use. In this section some of the most used rating systems will be presented along with the use of climbing signals.

CLIMBING SIGNALS

Climbing signals establish and maintain verbal communication between the climber and belayer which is essential for the safety of both. The climbing signal sequence, though it may vary from one climbing group to another, serves four sequential purposes: (1) it confirms the fact that the belay has been established; (2) it informs the belayer that the climber is climbing; (3) it provides a series of special verbal signals; and (4) it indicates that the belay has been terminated. With these basic purposes in mind, a simple sequence of climbing signals exchanged between a climber and belayer would go as follows:

<u>Climber</u> (commands)	<u>Belayer</u> (responses)
Belay On	On Belay
Climbing	Climb
Slack	(no verbal response)
Tension	(no verbal response)
Falling	(no verbal response)
Rock (used when appropriate)	Rock (used when appropriate)
Off Belay	Belay Off

The first signal, "belay on," is in the form of a question in which the climber is asking the belayer if the belay is ready. The response, "on belay," from the belayer signals to the climber that he is on belay and the belayer is ready. If the belayer is not ready to belay the climber he should so indicate and the climber should not indicate that he is climbing until the belay has been established and the belayer is ready.

Once the belay has been established, the climber indicates to the belayer that he is ready to begin climbing by giving the signal "climbing." The belayer responds by signaling "climb" which indicates that he is ready for the climb to begin and to take up the belay rope as the climber moves. If during the climb the rope becomes too taut or the climber needs extra rope to make a particular move he signals "slack." There is no verbal response to the signal on the part of the belayer, he simply provides slack in the rope to accommodate the climber. The climber may also signal "tension" if he is in a very insecure climbing situation and wants the belayer to pull the belay rope taut. Again, there is no verbal response on the part of the belayer, simply the physical response. If during the climb the climber falls he should attempt to signal the situation to the belayer by calling out "falling." By giving this verbal signal the belayer is prepared, even if only by a split-second, to respond to the impact force of the fall of the climber on the belay rope.

Once a climb is completed the climber signals "off belay." This verbal signal indicates to the belayer that the climber is in a safe position and anchored in and is ready to be released from the belay rope. The belayer should check the position of the climber and if satisfied with the safety of his position respond "belay off" and then terminate the belaying process.

These few simple climbing signals are basic to climbing safety and should be used, as needed, with all climbs. But there are other climbing signals which may be used in addition to these fundamental ones. For example, if there is an excess of belay rope between the climber and the belayer at the start of or during a climb, the climber may signal to the belayer to take up the excess rope by calling "up rope." The belayer responds by taking in the excess rope until he receives a signal from the climber that a satisfactory level of tautness has been achieved. To relay this information to the belayer, the climber calls "that's me," "OK" or some other suitable response. A word of caution to the beginning climber, do not confuse the use of the signals "up rope" and "tension." "Up rope" is used to remove excessive slack at the beginning of or during a climb. "Tension" is used when the belay rope is held at a desirable level of tautness yet because of the circumstances the climber wants the belayer to pull the rope tighter.

The climber may also wish to test a belay before beginning a climb to make sure the belay system is anchored soundly and that the rope is free to be taken in as he ascends the rock. In this situation the climber would signal to the belayer "ready to test." The belayer would respond "test" indicating that he is ready. The climber would then call "testing" as he begins to pull on the rope, gradually applying his total body weight. Once the testing process is completed the climb begins.

Another set of signals which is useful when throwing a belay or rappel rope down to a point where others are waiting is "rope" and "clear." These signals are especially useful in top rope climbing where the belay rope is extended down from above to a waiting climber below. The sequence is initiated from above by the signal "rope" which indicates that the free end of the anchored rope is to be thrown down. All persons below should respond by moving away from the landing area of the free end of the rope and signal to the person above that they have done so by calling "clear." The rope is then thrown down.

In rappelling situations the signals "on rappel" and "rappel off" may be used. These signals indicate to others, especially the belayer if the rappeller is being belayed, that the rappeller is attached to the rappel system and is ready to rappel and that he has completed the rappel and has detached himself from the systems. When used in conjunction with a belay, these signals should be used after the appropriate signal has been given to indicate that the belay system has been activated and before detachment from the belay system.

One final signal which is extremely important and may be used by anyone at any appropriate time while in the climbing area is "rock." This is the signal given to indicate to others that something, usually a rock, is falling from above on the climb and may present a possible danger to those below. If a piece of hardware is dropped no attempt should be made to verbally identify it during its descent, such as calling "carabiner" or "piton," simply call "rock." Should an unsuspecting climber be hit by a piece of hardware or a rock, the result could be the same and the identification of the object becomes irrelevant at the moment of impact, so a simple signal of "rock" is sufficient.

When the signal "rock" is given all individuals in the immediate area should take appropriate action to protect themselves. Beginners are often tempted to look up for the rock. This should not be done for it can result in head and facial injuries. If it is not possible to immediately move to an area of safety out of the path of the rock, the climbers should lean into the slope of the rock face to minimize exposure to the falling rock.[1] By assuming this position while looking straight ahead, the head and the neck can be more effectively protected by the climbing helmet, assuming a helmet is being worn.

The correct and regular use of climbing signals is essential for climbing safety. They should be given in a

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[1]U.S. Army, Military Mountaineering (Baltimore: U.S. Army Adjutant General Publications Center, 1976), p. 15.

loud, clear manner while facing in the direction of the intended recipient of the signal in order to project the voice. Signals should follow a specific sequence and should be utilized with consistency by a climbing group.

CLIMBING RATING SYSTEMS

How difficult is a certain rock climb? This is a familiar question among rock climbers to which a quick, brief response is desired. To meet the need for a brief, straightforward means indicating the overall difficulty of a climb, rating systems have been devised. Climbing rating systems, also referred to as classification systems and grading systems, convey the difficulty of a climb in terms of numbers and, in some systems, letters in a simple and understandable fashion.

One of the first climbing rating systems was devised by the Sierra Club. This system was based on the equipment recommended and its use during a specific climb. It classified climbs into one of six classes with a basic description of each class as follows:[2]

Class 1: Walking upright; trail hiking.

Class 2: Rock scrambling; use of hands for balance.

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[2]Henry I. Mandolf, ed., Basic Mountaineering (3d ed.; San Diego: Neyenesch Printers, 1975), pp. 63, 75.

Class 3: Climbing steeper ground and rock; proper climbing technique required.

Class 4: Climbing with increased exposure; rope required; easy free climbing or balance climbing.

Class 5: Climbing a difficult route with severe exposure; protection required for lead climber, severe free climbing.

Class 6: Direct aid needed; holds and cracks in rock not adequate; aid climbing.

The Sierra Club rating system served as the basis for rating climbs for many years, but, as the interest in rock climbing began to increase, especially with emphasis on more challenging climbing areas, the system became inadequate. With the emphasis on technical climbing in the 1950's the vast difference between climbs in class 5 and class 6 became more apparent. At Tahquitz Rock in California a decimal system was invented which broke down each of these two classes into ten categories, 5.0 to 5.9 and 6.0 to 6.9. This decimal system was an important modification to the classifying of rock climbs and is still perhaps the most widely used system in the United States.[3]

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[3]Raymond Bridge, Climbing: A Guide to Mountaineering (New York: Charles Scribner's Sons, 1977), p. 244.

As the ability of climbers improved the 5.0 to 5.9 class was extended to include 5.10 to 5.11.

The decimal rating system is most feasible for beginning climbers since the climbs they undertake will be of rather short duration and will not emphasize the more skilled aspects of lead climbing. Aid climbing will not be considered a part of beginning climbing, for purposes of this manual, so the 6.0 to 6.9 ratings will not be described. The 5.0 to 5.11 ratings are described as follow:[4]

5.0-5.2	Very easy technical climbing.
5.3-5.4	Easy technical climbing.
5.5-5.6	Moderately difficult technical climbing.
5.7-5.8	Difficult technical climbing.
5.9-5.11	Technical climbing requiring expert skill.

The decimal system has been refined into the Yosemite Decimal System (YDS) which provides even more information to the would-be climber. The Yosemite Decimal System is divided into three parts, each of which provides specific information. The first part of this system is expressed as a Roman numeral, from I to VI, to indicate the overall difficulty of the climb. The second part is expressed as a decimal, 5.0 to 5.11, which indicates the most difficult free climbing to be encountered. Part three

[4]Ibid., p. 247.

indicates the hardest aid climbing to be encountered and is expressed as A1 to A5.[5] A more complete breakdown of the first and third parts of the Yosemite Decimal System are provided below. Part two of the system is the same as the decimal system described above.

Overall Difficulty[6]

I	A climb of two to three pitches requiring no more than a couple of hours.
II	A climb requiring three hours to a half-day and consisting of five to eight pitches.
III	A demanding climb requiring most of a day and usually including more than five long pitches.
IV	A long, serious climb requiring a full day and perhaps a bivouac.
V	A climb of one to three days which requires a great deal of competence and effort.
VI	A climb requiring several days and a great deal of effort by the strongest climbers.

Aid Difficulty[7]

A1	Fairly easy and reliable placement of anchors for direct aid.

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[5] Alwyn T. Perrin, ed., The Explorers Limited Source Book (New York: Harper and Row, Publishers, 1977), p. 103.

[6] Bridge, pp. 245, 249.

[7] Ibid., p. 248.

A2 More difficult placement with less reliability.

A3 Aid placement awkward and strenuous but will generally hold body weight; rotton rock common.

A4 Placement very strenuous and difficult; difficult to make placements which will support body weight.

A5 Long stretches of very marginal aid with protection impossible over considerable heights.

An example of a Yosemite Decimal System is III-5.6-A3. This example indicates a demanding rock climb which would require most of a day to complete, with the most difficult free climb to be encountered rated at a moderately difficult level, and with some awkward and strenuous aid placement in possibly rotten rock.

The Yosemite Decimal System was first used to rate climbs in the Yosemite Valley because of the sheer size of the climbs involved. Grades V and VI refer to the big wall climbs which require the greatest competence and effort.[8]

In the 1960's the National Climbing Classification System (NCCS) was introduced. This new rating system was also composed of three parts, the first and third of which were identical to the Yosemite Decimal System. The only difference in the two systems was in the rating of the most difficult free climb to be encountered. For this rating

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[8]Ibid., p. 245.

the National Climbing Classification System used F1 through F11 to replace classes 1 through 5 and 5.0-5.11. The breakdown of this relationship is as follows:[9]

NCCS	YDS
F1	1 and 2
F2	3
F3	4
F4	5.0-5.2
F5	5.3-5.4
F6	5.5-6.6
F7	5.7
F8	5.8
F9	5.9
F10	5.10
F11	5.11

Referring back to the previous example of the Yosemite Decimal System, III-5.6-A3, the corresponding National Climbing Classification System rating would be expressed as III-F6-A3. When using either of these two rating systems, it is important that the specific rating system being used is clarified to prevent any misunderstandings.

Beginning rock climbers will find that the simple decimal system will serve them quite well when it comes to rating rock climbs. However, because of the increased use of both the Yosemite Decimal System and the National Climbing Classification System to describe climbs, familiarity with these systems is also important. It would

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[9]Ibid., pp. 246-247.

be advisable for a beginning rock climber interested in remaining with the sport and improving his skill level to become familiar with all of these rating systems.

Chapter 6

CLIMBING TECHNIQUES

When the groundwork is finished, equipment has been chosen, knots mastered, and climbing signals learned, it is time to make that first contact with the rock for the purpose of climbing. This encounter is often a time of excitement and apprehension for the beginning rock climber because this first climb provides an opportunity for the application of previously learned skills in an actual situation. All of the skills mastered and knowledge acquired are to be used as the climber puts himself to the test of making that first ascent.

Before the beginning climber steps forward to begin an ascent into the vertical wilderness, there are some fundamentals of climbing and climbing techniques which should be understood. Without this understanding the experience of rock climbing will not be as successful or as enjoyable as it could be. In this section the fundamentals of climbing will be presented along with a categorized presentation of climbing techniques.

CLIMBING FUNDAMENTALS

Climbing a rock is similar to climbing a ladder. Granted, the holds, ledges, and cracks in a rock are not as evenly spaced and well defined as the rungs on a ladder, but they are there and the climber must approach most climbing situations with the same fundamentals of climbing that would be applied to climbing a ladder. Beginning climbers, because of fear, anxiety, and a lack of understanding, often forget this simple comparison and proceed to violate many climbing fundamentals.

Beginning climbers have a tendency to lie on or lean into the rock, a practice referred to as "hugging the rock." This practice should be avoided because it interferes with the climber's field of vision, results in an increased potential for the feet to slip, and is uncomfortable. A rock climber should maintain an erect body posture whenever possible. An erect position increases the climber's field of vision allowing him to look about for holds and to plan his next move. It also maintains the weight of the body over the feet. In this position, the force exerted by the weight of the body is projected directly downward, through the feet onto the point of contact with the rock. If the climber "hugs the rock" this same force is projected downward and outward, thus creating a situation where the feet may be forced off the ledge or out of a hold which is supporting the body. It is also more comfortable to climb in an erect position where the field of vision is better, the placement of the feet feels more secure, and the weight of the body is supported by the skeletal system.

As the body weight is lifted to make the necessary moves for the ascent of the rock, the larger muscle groups of the body, more specifically developed and accustomed to providing such lifting force, should be used. Inexperienced climbers often try to pull themselves up by using their arms only to find that their strength is inadequate for the task or that it fails within a short period of time. This common mistake made by beginners again indicates a violation of a basic fundamental of climbing. When lifting the body weight use the legs which, with their larger and stronger muscle groups, are better prepared for the task.

In situations where a beginning climber is hugging the rock and struggling to lift his body with his arms, other fundamentals of climbing are also being violated. The hands should be used to feel the rock and locate handholds and footholds as the climber advances. At the same time the hands should be used for balance as the legs serve to lift the body. This can not be done if the hands and arms are incorrectly used to pull up a climb.

Another fundamental of climbing is three-point suspension. This refers to moving only one limb, such as a foot, while the other three, the two hands and the other foot, maintain contact with the rock and support the body. If, during the process of making a move a hold should fail, the weight of the body will be supported by at least two of the remaining contact points. Climbing stability and security are promoted by application of three-point suspension.[1]

All of these fundamentals of climbing are brought together and used as a part of controlled movement on the rock. The act of climbing should be a fluid, rhythmic sequence of planned moves in which the climber concentrates on unhurried, deliberate movement emphasizing balance and finesse instead of brute strength. The idea of such a movement pattern is to conserve strength and energy for more difficult climbing situations where they may be needed. In order to develop this desired pattern of movement, the rock climber must stand erect, use his eyes and hands to "see" the rock, lift with the legs, and plan moves in advance.

When climbing a ladder, the climber maintains a comfortable, erect posture with the weight of the body concentrated directly over the feet. The eyes are used to locate hand and foot placements while the hands are used primarily for balance and the legs for lifting. The hands and feet are moved one at a time as the eyes shift from one

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[1]Peggy Ferber, ed., Mountaineering: The Freedom of the Hills (3d ed.; Seattle: The Mountaineers, 1974), p. 183.

placement point to another to visually insure the required contact. Movement is in an unhurried, steady, rhythmic fashion as the climber methodically ascends with stability and security, exercising care to avoid any positions which would result in excessive strain. These same climbing fundamentals are applied to climbing a rock. The beginning rock climber should keep this similarity in mind and concentrate on application of the fundamentals of climbing until they become an unconscious part of every move made on the rock.

CLIMBING TECHNIQUES

A clear understanding and proper application of the fundamentals of climbing are important, but the beginning climber must also know how to use his hands and feet in a variety of ways to overcome the force of gravity which is constantly pulling down on him. The most effective and less strenuous manner of using the hands and feet to ascend a rock is to position the body in such a way as to utilize the pull of gravity to maintain contact with the rock. An example of this technique would be standing on a ledge. But such desirable situations are not always available in which case the climber must rely on his own strength and application of certain physical laws to overcome the downward pull of gravity and ascend the rock.

There are a variety of climbing situations and an equal variety of ways in which the hands and feet can be used to ascend a rock. Free climbing can be divided into face climbing and slab or friction climbing. Face climbing provides a wide range of climbing problems including crack climbing which emphasizes the utilization of jamming techniques. In this section various climbing techniques will be presented. For purposes of clarity and organization these techniques will be presented as holds, counterforce moves, jamming techniques, chimney stemming, mantling, slab climbing, down climbing, and falling.

Holds

Handholds and footholds come in a variety of shapes and sizes. Some holds are very small and require exact placement while others are large and provide large contact areas for the hands and feet. The beginning climber must learn to use whatever holds are available in the most effective manner possible.

Holds should be chosen for firmness, convenience, and size, with each hold tested before placing the weight of the body on it. Kneeholds should be avoided because the knees provide little stability and are susceptible to injury.[2]

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[2]Ibid.

Fig. 27. Edging

In securing a foothold, place the foot on the available flat surface of the rock creating the maximum amount of contact possible between the sole of the shoe and the rock, sole-to-rock contact. When the hold provided is a narrow ledge, turn the toes out so that the inside of the foot can be used to support the weight of the body. This technique is known as edging (see Fig. 27). The inside of the foot is stronger and better able to support a climber in position. Placing the toes on a ledge requiring them to support the climber should be avoided because it results in great stress on the muscles of the leg and causes rapid fatigue. This strain and subsequent fatigue often results in a spasmodic up and down motion known as "sewing machine leg." Support of body weight on the outside and heel of the foot should also be avoided for they are also weak supporting positions.

When selecting footholds care should be taken to avoid situations which would result in crossing the feet. The left foot should stay on the left side of the vertical climbing line and the right foot on the right side. Crossing the feet can be very dangerous because it reduces the base of support for the body and the turning position required to facilitate such a move places the body's center of gravity farther away from the rock. On a narrow ledge, the alignment of the body's center of gravity over a narrow base of support may be difficult or impossible, resulting in a climber being forced off the rock because his weight shifted away from the rock and outside his base of support. Crossing the feet can cause this situation.

Footholds must be secure enough to provide a base of support for the legs which should lift the body. Use as much space as is available and maximize sole-to-rock contact. If the hold is a narrow ledge, establish this contact with the inside of the foot as previously described. When a sloping ledge is used, flex the ankle to allow for increased sole-to-rock contact. Should a foothold consist of an indentation in the rock, place as much of the foot as practical in the cavity and position it for support.

In selecting and using footholds, the fundamentals of climbing should be applied. Footholds should be selected which will allow the climber to remain in an erect position, support his body weight directly over his feet, and facilitate the lifting of the body with the legs. At the same time the climber should maximize sole-to-rock contact while avoiding holds which overextend his reach and result in fatigue and remember to stay off the knees.

Handholds, like footholds, come in a variety of shapes and sizes. Some may consist of a large ledge or knob on a rock while others will be only a small ledge or a flake. Such handholds are located by visually examining the rock with the eyes and feeling with the hands to determine their usability and safety. On occasions, in locating handholds, the use of the hands becomes more important than the eyes. In such situations what looks like a good hold may prove inadequate upon inspection by the hand. At other times the formation of the rock may obstruct the field of vision and the climber must rely on his hands to find holds.

When handholds are used, place the fingers over the edge of the hold and slide the finger tips back as far as possible. If the hold is narrow, hook the tips of the fingers over its edge and place the palm and heel of the hand as flat as possible against the outer surface of the rock (see Fig. 28). This hooked position will provide security and by placing the heel and palm of the hand flat the hooked fingers will pull down onto the hold and not be forced out. If the handhold is a knob, place as much of the hand as possible around it and grip it securely (see Fig. 29).

Fig. 28. Fingertip Handhold

Fig. 29. Knob Handhold

Fig. 30. Downward Pressure Handhold

Ledges which slope downward are of little use as handholds when the fingers must be used to secure the position from below. However, from above where pressure can be exerted downward onto such a sloping ledge, such slopes can be very useful. When placing the hand in such a hold, turn the palm in, the fingers out, and create as much contact between the hand and the rock as possible (see Fig. 30). The friction resulting from this contact and downward pressure exerted by the weight on the extended arm will be sufficient to secure the handhold.

The hands are used primarily for balance rather than for pulling the climber up the rock. Handholds should be selected with this in mind. Also, handholds often become footholds as the climber advances.

Counterforce Moves

Another type of climbing technique which may be used to climb rock relies on counterforce, which is the application of force in opposite directions. The application of this force may be accomplished by placing various parts of the body in positions where they can exert forces that oppose each other, thus developing the counterforce necessary to hold the climber's body in position. Positioning of body parts for the development of counterforce moves, also referred to as opposition moves, varies from placement of the hand for a pinch-grip hold to laybacks and underclings where the entire body is brought into play.

The hands are often used to develop counterforce moves while rock climbing. One of the most often used counterforce hand positions involves a pinching or gripping technique. Application of the force created by placing the thumb on one side of a rock flake or knob and the fingers on the other side and then pinching or gripping inward will usually develop sufficient counterforce to provide a stable and secure handhold. In this technique the opposing forces are directed inward toward each other (see Fig. 31). This same technique can be applied to the use of both hands by placing them in a position of opposition and then pressing inward (see Fig. 32).

The hands may also provide a means of applying the technique of counterforce by directing the opposing forces outward away from each other. An example of this technique often applies to the use of a crack or fissure to make a particular climbing move. In order to develop the necessary counterforce to facilitate a stable and secure handhold in this situation, place the hands back to back with the palms out in the crack and press against the inside edges of the crack. By exerting pressure outward against the edges of the crack, counterforce is developed (see Fig. 33).

To this point the application of counterforce to accomplish climbing moves had only involved the hands which

Fig. 31. Pinch Grip

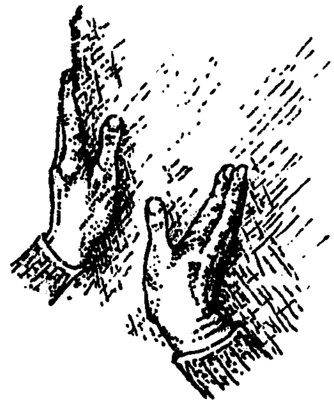

Fig. 32. Inward Pressure

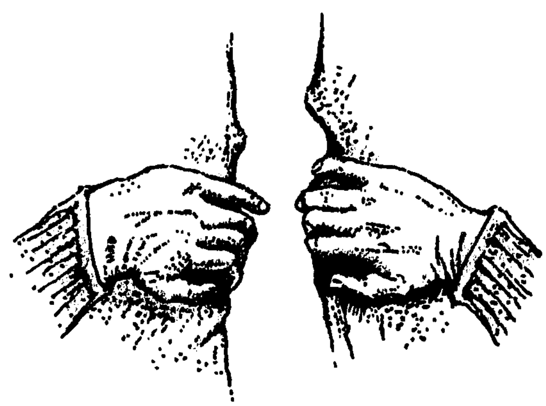

Fig. 33. Outward Pressure

require only one or two contact points with the rock. The entire body may also be used to accomplish a counterforce move by placing the hands and the feet in positions where they can exert forces in opposite directions. Examples of such moves are the layback and the undercling.

The layback, also referred to as a lieback, is often used in crack and dihedral climbing. It requires the placement of the fingers in the crack where they can exert a pulling force toward the body. At the same time the feet are placed against an adjoining wall and exert pressure away from the body (see Fig. 34). In this position the potential for the development of counterforce is present but unless proper body position is maintained these forces may not be exerted in direct opposition to each other and the layback is not successful. Because of poor body position many beginning climbers have problems with this particular technique.

When executing a layback, hook the fingers over the edge of the crack, fully extend the arms at about shoulder level, and lean back exerting the weight of the body on the hooked fingers and extended arms. It is important that the arms be fully extended because a layback is a strenuous move and flexion of the arms only brings additional unneeded muscle groups into use and hastens fatigue.

Fig. 34. Layback

With the placement of the hands and extended arms at about shoulder level, the placement of the feet becomes crucial for the success of the layback. The feet must be placed on the adjoining wall in a position which will permit the exerting of the opposing forces in directions which are more or less parallel to each other. If the position of the feet is too low, which is often the case with beginners, forces developed do not directly counter each other. The result of this situation is that the force exerted by the weight of the body, which has been moved from a position over the feet or base of support by leaning back on the extended arms, is projected downward at an angle through the legs to the feet. This results in the feet being forced downward and the climber falls out of the layback as the feet slide down the rock. To avoid this problem the feet should be placed on the rock at a position level with the hips. At the same time the legs should be extended as much as possible with the ankles flexed to allow more sole-to-rock contact.

Once the proper body position has been achieved, ascent is accomplished by alternately moving the hands and feet upward, taking care to move only one limb at a time. As the ascent is made, maintain proper body position. It is usually easier to move the hands than the feet, but if the hands are moved too high and the parallel application of opposing forces is greatly disturbed, then the advantage of counterforce is lost, the feet slide down, and the layback fails.

The undercling is similar to the layback in principle except that it is accomplished in a more or less horizontal fashion while the layback is primarily vertical in nature. In an undercling, the fingers are hooked under a ledge and exert an upward pull. The arms are extended to minimize stress as the body is leaned back to a position which will result in downward pressure being projected through the legs to the feet. The legs are extended to accept this downward pressure in a less strenuous manner and the ankles are flexed to maximize sole-to-rock contact (see Fig. 35). Counterforce is thus developed by the upward pull by the hands and arms and the downward push exerted on the feet.

Fig. 35. Undercling

Moving in an undercling position is facilitated by maintaining a wide base of support. The feet are separated to about shoulder width or as wide as possible if less space is available. This position increases the base of support and provides greater stability. As in other climbing techniques, one limb is moved at a time.

There is a variety of counterforce moves which may be used in rock climbing. Counterforce moves work because the combination of two opposing forces, which can be exerted either inward or outward, combine to produce a total force, the counterforce, which is greater than the downward force of gravity exerted on the climber's body.[3] But the application of counterforce may place the body in a very strenuous position. To prevent or minimize such stress,

[3]R. C. Aleith, Bergsteigen: Basic Rock Climbing (New York: Charles Scribner's Sons, 1975), p. 33.

attention should be given to positioning the body in such a manner as to place the weight of the body on the skeletal system and not on the muscular system.

Jamming Techniques

It is possible to climb a rock without using holds as they have been described thus far. The technique by which such climbing may be accomplished is referred to as crack climbing or jamming. Jamming refers to the placement of a part of the body in a rock crack or fissure and positioning that body part in such a manner as to exert pressure and create friction against both sides of the opening. When pressure and friction created by this technique are sufficient to counter the downward pull of gravity, the body may be balanced and supported while climbing.

Jamming techniques, also referred to as jams, are divided into two categories according to the manner in which the necessary pressure and friction required for support and balance are produced. Wedging constitutes one category and refers to the placement of a body part in a narrow crack where it is forced into a position which, without maintaining a constant state of flexion or rotation, results in pressure being exerted on the sides of the crack producing the friction needed. Opposite pressure is the second category of jams and involves situations similar to wedging except that the cracks are wider and a continuous flexion or rotation of the body part involved is required in order to maintain the necessary contact with the sides of the crack.

The hands and feet are most often used for jamming, but as cracks of wider dimensions are encountered jamming techniques may be employed which progressively involve the entire arm, leg, or body of the climber. Beginning with the fingers, which can be jammed into narrow cracks, the application of jamming techniques continues up the arm and may involve an extended hand, a flexed hand, a fist, wrist, elbow, or eventually the shoulder as wider and deeper cracks are encountered. The same is true involving the foot and leg. The toes can be wedged into narrow cracks for support and, as wider cracks are encountered, the foot can be used, either in an extended or rotated position, to fill the gap and maintain contact with the sides of the crack. In even wider cracks the knee and hip may be used for jamming.

Cracks which are wide enough to admit the entire body of the climber are referred to as chimneys. Chimneys which are narrow and barely provide room for the body are referred to as "squeeze chimneys."[4] These narrow cracks can often be ascended by using a combination of jamming techniques. Wider cracks may require a climbing technique known as chimney stemming which will be discussed later.

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[4]Ferber, pp. 197-198.

The application of jamming techniques which involve wedging are less strenuous than opposite pressure jamming techniques. Where wedging is employed the body part is simply forced into a tight crack. Wedging with the unprotected hands is less comfortable than wedging with the feet which are protected by shoes.

Opposite pressure jamming techniques require flexion or rotation of body parts and may result in fatigue if held for an extended period of time. In cracks which are too wide to allow wedging of the hand, the gap can be bridged by flexing the hand forcing the knuckles against one side of the crack while the fingers and the heel of the hand are forced against the other side (see Fig. 36). This flexion of the hand provides the means by which opposite pressures can be exerted on the sides of the crack.

In a wider crack the hand may be inserted and flexed to form a fist, known as a fist jam, which contacts and exerts pressure on the sides of the crack (see Fig. 37). Similar situations with even wider cracks may be overcome by inserting the arm as far as possible and flexing the wrist, elbow, and/or shoulder to facilitate the necessary connections with the inside edges of the crack.

The foot and leg may be used in methods similar to the hand and arm to accomplish a satisfactory jam. Because of the protection provided by shoes, the feet are less susceptible to the bruises and abrasions which will befall

Fig. 36. Hand Jam

Fig. 37. Fist Jam

the hands when jamming. In narrow cracks the toes or even the entire foot may be wedged to provide support for the climber (see Fig. 38). If the crack is too wide to allow for wedging in this manner, the foot may be rotated, toes to the outside and heel inside, so that the length of the foot can be used to span the gap. This is referred as a heel-toe jam (see Fig. 39). Along with this rotation, flexion of the foot may also be necessary to more effectively accommodate the width of the opening. When wider cracks are encountered, the foot, knee, and/or hip may be inserted and, with the flexion of various joints, connection with the sides of the crack is accomplished.

In squeeze chimneys the arms and legs are used in alternate support positions to facilitate the ascent. While the feet and legs are jammed in position the body is extended and the hands and arms are positioned. The pressure

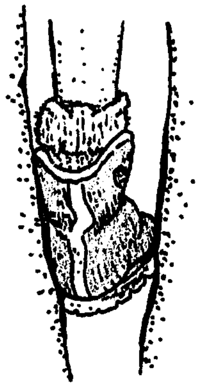

Fig. 38. Foot Jam

Fig. 39. Heel-toe Jam

exerted by the feet and legs is then released allowing them to be moved up and placed in a higher support position. Once the feet and legs are again prepared to provide support, the hands and arms release their pressure and are again moved up. This sequence is repeated again and again until the chimney is ascended.

The mastery of jamming techniques requires practice and adaptability and adds another dimension to the sport of rock climbing. Any way a part of or the total body can be positioned in an opening in a rock and by either wedging or creating opposite pressure provide support for a climber can be a jam. Jams are often used in combination, as are all climbing techniques. Seldom is the perfect crack found. They all vary in width, depth, angle, and texture which makes them all different. The challenge for the climber is to use his body extremities to fill the crack sufficiently to aid the ascent.

<u>Chimney Stemming</u>

Chimneys which are wide enough to allow easy entry of the entire body may be ascended by using a technique known as stemming. This technique provides for the arms and legs to work in an alternating scissor action to produce counterforce on the sides of the chimney (see Fig. 40).

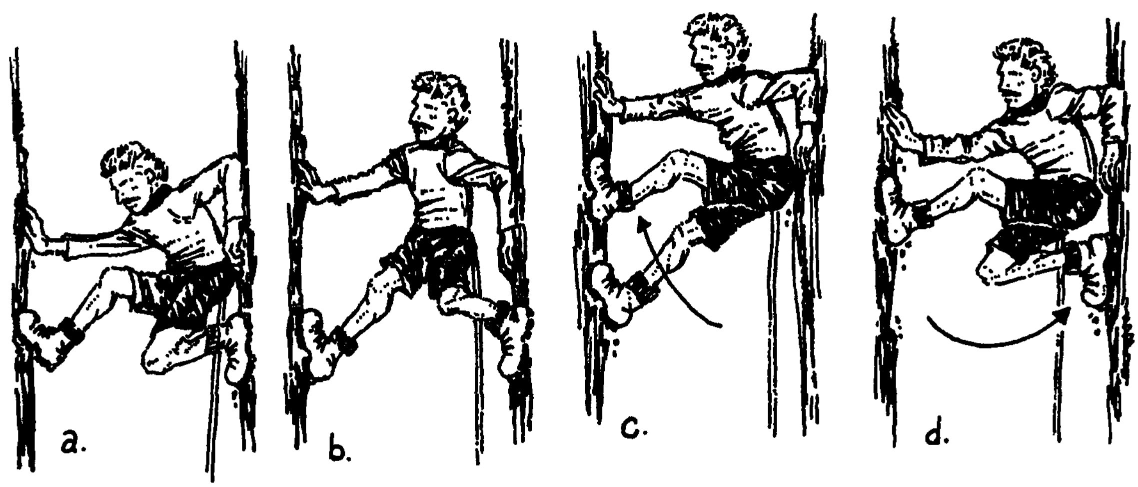

Fig. 40. Chimney Stemming

Chimney stemming begins with the climber entering the crack with his back to one wall and placing one hand and one foot against each side. One foot is drawn up to a position just below the buttocks with the other foot placed on the opposite side of the chimney at about hip height. The back and one arm are pressed against one side of the chimney while the remaining arm is extended so the hand can be pressed against the other side. In this position the legs are prepared to lift the climber while the arms are in positions of support.

To ascend using the stemming technique, begin by extending both legs. Once the legs have been extended the arms can be raised and positioned at a higher level. When the arms have been positioned for support, the rear leg is brought forward and placed at hip level. This shift is followed by the front leg moving to the rear just below the buttocks. The first sequence is thus completed. In order to continue the ascent this pattern is repeated, switching the position of the legs each time, until the climb is completed.

Mantling

Also referred to as mantleshelving, chinning, and retabling, mantling is a climbing technique used to ascend a ledge where no holds are available above. This particular move requires sufficient strength in the arms and shoulders to support the body weight and sufficient flexibility in the legs to bring the feet up to the ledge once the arms are in position to support the body.

In order to execute a mantle begin by placing the hands on the ledge, about a foot apart, palms down. Once the hands are in position the climber is lifted by a quick extension of the elbows. This lifting process can be made easier by springing up with the legs if footholds are available. After the elbows have been extended they are locked to support the climber's weight. While the climber's weight is supported on the extended arms, one leg is brought up to the ledge and positioned to lift the climber to a standing position (see Fig. 41).

Fig. 41. Mantling

Fig. 42. Slab Climbing

Slab Climbing

Slab climbing is low angle face climbing where friction is utilized to ascend an area with few, if any, holds. The climber utilizes sole-to-rock contact to provide the necessary friction while the weight of the body is directed down to the feet through the legs. The hips are held high in order to project the pressure created by the body weight directly onto the feet. The hands are used primarily for balance. To increase the potential for sole-to-rock contact, the ankles may be flexed (see Fig. 42).

As the angle of the rock increases, small holds become more important. Where available such holds are used to facilitate the ascent. But, even when small holds are available, correct body position is maintained.

Slab climbing is different from holds used in face climbing or in ascending a crack. It requires calm, deliberate, graceful moves while constantly maintaining the body's weight over the feet. Each move must be planned in advance while concentrating on problems ahead.[5]

Down Climbing

Information on climbing techniques would not be complete without some mention of down climbing. The emphasis in rock climbing is primarily on ascending but occasionally a climber is required to descend because of poor route selection or the top of the climb has been reached and there is no other way down.

Climbing down is more difficult than climbing up.[6] Because the climber is above the holds necessary for the

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[5]Royal Robbins, Basic Rockcraft (Glendale: La Siesta Press, 1971), p. 57.

[6]Ibid., p. 59.

descent, it is difficult to see them, and the feet must be used to feel out positions of support. The hands should be kept low and in position to provide support for the climber.[7] On low-angled rock, the climber should face outward[8] with his back to the rock and carefully place the feet and hands for support as the descent is made. As the angle of the rock increases, the climber turns to face the rock which provides a more balanced position but reduces the field of vision. To compensate for this reduced visibility, the climber may look over his shoulder as he descends or hold the body away from the rock which will enable him to look down between his feet.

Down climbing is a technique not often practiced by rock climbers. This can lead to problems when it is necessary to make a descent. The beginning climber should provide time for the practice of down climbing while working to master climbing techniques.

Falling

It may seem strange to mention falling when describing climbing techniques, but falling is a part of climbing. Sooner or later everyone will peel off the rock at some height and when this happens the climber should know

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[7]Ferber, p. 202.

[8]Ibid., p. 201.

how to protect himself as much as possible. Reacting in a logical manner is difficult during a stressful situation such as falling from a height. For this reason it is important for the beginning rock climber to know what to do in case of a fall so that during an actual falling situation a position can be assumed which will help minimize injury.

With the development and utilization of slings for the purpose of belaying, there is little excuse for securing the belay rope to a climber in a manner that will result in constriction of the diaphragm, thus retarding breathing, or that will shift to a position below the climber's center of gravity, thus flipping him upside-down in a fall. However, on occasions a climber will, when falling, drop his hips and allow the feet to achieve a position above them resulting in the climber being suspended upside-down. In this case, assuming an adequate belay rope attachment has been used, the climber may right himself by hooking one leg around the belay rope and while forcefully swinging the other leg down behind himself use the momentum created to raise the upper body high enough to grasp the belay rope with his hands. Once in this position the fallen climber should be able to pull his body back into a climbing position.

Assuming that a fall is not complicated by turning upside-down, the climber should be concerned with protecting himself as he falls. The climber should try to remain in a position facing the rock. This position will allow the use of the feet and hands to keep the body away from the rock. The feet will be less susceptible to abrasions than will the unprotected hands. At the same time the helmet, if worn properly, should protect the head from blows to the front and side. If the fall results in a pendulum, the climber should try to protect the body from any surfaces it might swing into. The legs may be very useful here to absorb the impact of the swing contact with the rock.

Once the fall has been checked by the belay system, the climber should get back on the rock and assume a position which will provide stability and security. By getting back on the rock the climber relieves the tension placed on him and the belayer handling the stretched belay rope.

Falls happen very quickly and provide only for a split-second reaction. With a sound belay system and utilization of proper belaying techniques, falls should be only for a short distance. However, without some concern for body position, injuries may occur even with short falls.

Chapter 7

BELAYING

Belaying is the most important skill the rock climber must master.[1] The term belay comes from a nautical term meaning to secure a rope.[2] In rock climbing, belaying refers to a technique of providing security for a climber by means of a rope. In addition to security, belaying also serves to minimize the length of a fall and the resulting consequences.[3]

The application of belaying techniques to rock climbing is a fairly recent development in the sport of climbing. It was not until the early 1900's that a serious effort was made to apply belaying to American climbing. The utilization of the technique provided a means of advancing climbing by increasing security for climbers. As the sport of rock climbing began to grow and expand, so did the application of the basic principles of belaying.

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[1]Raymond Bridge, Climbing: A Guide to Mountaineering (New York: Charles Scribner's Sons, 1977), p. 114.

[2]Royal Robbins, Basic Rockcraft (Glendale: La Siesta Press, 1971), p. 24.

[3]Peggy Ferber, ed., Mountaineering: The Freedom of the Hills (3d ed.; Seattle: The Mountaineers, 1974), p. 125.

The process of belaying involves rope surface contact points, the belay rope, several knots, the belayer, and the climber. Everything involved in the belaying process, from the belay anchor to the climber, is referred to as the belay chain. As with any chain, the belay chain is only as strong as its weakest link and that weakest link must be strong enough to support a climber's fall or the system will fail. The belay rope must be strong enough to withstand the impact force of a falling climber. It must be securely anchored to a stationary point. The belayer must be anchored in a safe, secure position and prepared to control the belay rope. The climber must be attached to the end of the belay rope in such a manner as to provide security and safety in the event of a fall. All knots used throughout the belay chain must be tied correctly and possess the relative strength to withstand the stress exerted by a climber's fall. Each of these components or links in the belay chain must possess sufficient strength to absorb, without failing, the impact force of a fall.

There are three principal elements of a belay: (1) friction; (2) position; and (3) anchor. Friction is used by the belayer to hold and control the rope during a climber's fall. The production and control of sufficient friction to accomplish this task is a primary concern of the belayer. Once a technique has been developed whereby the necessary friction can be produced, the belayer must position himself in such a manner as to protect himself from the impact shock of a climber's fall while allowing for effective utilization of the friction generated. To insure the safety of the belayer once an appropriate position has been assumed, a secure anchor must be established.[4]

Belaying deals with a fundamental problem of absorbing energy.[5] The energy which must be absorbed is kinetic energy, the energy generated by a body in motion. When a climber falls, kinetic energy is generated and at any instant is equivalent to the climber's weight multiplied by the distance of the fall. The more a climber weighs and the farther the fall, the more kinetic energy is developed. This energy must be absorbed by the belay chain in such a manner as to prevent serious and potentially destructive impact force on any part of the system. If this can not be done, the belay chain fails, the system is voided, and the climber continues in an unchecked fall.

Different rope handling methods have been developed to deal with the absorption of the kinetic energy generated by a falling climber. These methods are commonly referred to as types of belays. Basically, there are two types of belays, the static belay and the dynamic belay; however,

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[4]Robbins, pp. 24-25.

[5]Arnold Wexler, "The Theory of Belaying," The American Alpine Journal, VII (1950), 379.

other types have been described. This has led to confusion concerning what exactly constitutes a static belay and a dynamic belay. What is referred to as a dynamic belay by some[6] is classified as a resilient belay by others.[7] In other instances what constitutes a resilient belay is referred to as a static belay.[8] There also seems to be some confusion as to which is better for rock climbing, a static belay[9] or a dynamic belay.[10] It is no wonder that a beginning climber becomes confused when faced with the theory of belaying.

To provide some consistency in terminology, a static belay will be defined as a belay system which does not give to the impact force of a falling climber. In this situation the belay chain is required to immediately absorb the full force of the fall. A dynamic belay, on the other hand, gives to the impact force and allows for gradual absorption of the kinetic energy generated by a fall. The advantage of

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[6] Walt Unsworth, Encyclopaedia of Mountaineering (New York: St. Martin's Press, Inc., 1975), p. 35.

[7] Wexler, pp. 387-390.

[8] R. C. Aleith, Bergsteigen: Basic Rock Climbing (New York: Charles Scribner's Sons, 1975), pp. 50-52.

[9] Paul W. Darst and George P. Armstrong, Outdoor Adventure Activities for School and Recreation Programs (Minneapolis: Burgess Publishing Company, 1980), p. 133.

[10] Wexler, p. 405.

the dynamic belay is that it lessens the strain placed on the belay chain by allowing for gradual, as opposed to immediate, absorption of kinetic energy. It has been suggested that a dynamic belay can be achieved by the belayer allowing the belay rope to slip, under control, through his hands as he gradually arrests the fall of a climber.[11] But is this practical in actual climbing situations? There are also the dynamic elements of the rope and the give of the climber's and belayer's bodies, assuming the belay rope is passed around the belayer's body, to be considered. Perhaps it would be better to rely on these dynamic elements in the belay chain and apply them to what some would call a static belay in order to provide the potential for what others would refer to as a dynamic belay. The major point is that the belay system must be effective in arresting the fall of the climber without placing excessive stress on the belay chain.

Within the scope of this manual, emphasis will be placed on the simplest kind of belay, top rope or upper belay. This belay provides maximum security and is often used for practice climbing. Because of its simplicity and security it is recommended that beginning climbers receive extensive practice in its use in order to master the basic

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[11] Ibid., p. 390.

belaying technique before going on to more difficult belays.[12]

A top-rope belay is established by securing the belay rope to a stationary object, such as a tree or large boulder, on top of a ledge. After anchoring the belayer to the anchor point, the belay rope is passed around his waist, and extended down to the climber waiting on the ground below. This belay requires no lead climbing since the top of the ledge is approached by a more accessible route that is offered by its rock face. The maximum length of any climb will be one rope length. As the climber ascends the rock, the belayer takes up the rope so that very little rope slack exists between them. If the climber should fall, his descent will be very short.

THE BELAY CHAIN

As previously indicated, the belay chain consists of every part of the belay from the anchor to the climber. Each component of the belay constitutes a link in the chain and subsequently reflects the total strength of the system. All links in the belay chain must be capable of withstanding the impact force of a climber's fall and absorbing the kinetic energy it generates if the belay is to be successful. The establishment of each link thus becomes

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[12]Bridge, pp. 115-116.

crucial to the success of the belay. An examination of each link in a top rope belay chain is presented on the following pages for the purpose of clarity for the beginning rock climber.

The Anchor

The first step in establishing a belay is to locate an appropriate anchor. An anchor refers to a stationary object to which the belayer and belay rope can be securely tied. Large trees and boulders provide natural anchors but may not always be available. Where such anchors are not available, artificial anchors such as pitons, chocks, and bolts may be used. If it is necessary to use artificial anchors, two anchor points are better than one. Each of these anchors should be secured independently so that failure of one will not void the total system.

The belay rope should be attached to the anchor by use of a suitable knot. For natural anchors, the rope can be looped around the anchor point and secured with a bowline or a bowline-on-a-coil. The knot used should be backed up to increase its security. When artificial anchors are used, a figure-eight loop can be tied in the anchor rope and attached to the anchor by use of a carabiner.

As the ultimate support for the entire system, the anchor should also establish the belayer in a safe and secure position. In addition to attaching the belay rope to the anchor, the belayer is also anchored to the point. Little would be accomplished by a belay system which allowed the belayer to be dragged off the rock because he was not anchored in.

The Belayer

The belayer may be attached to the anchor in several ways. One method of anchoring the belayer is to tie one end of the belay rope around the belayer's waist, form a bight in the belay rope, and tie the bight around the anchor. An alternate form of this anchoring method is to attach the belay rope to a sling tied around the belayer's waist before forming the bight in the rope and tying it to the anchor. Slings which may be used for this indirect rope attachment include the swami belt, the Swiss seat, the modified Swiss seat, and the double loop seat, all of which were presented in Chapter 4. The belay rope may be attached to the sling by means of a knot, the figure-eight loop is recommended, or by a locking carabiner. The belayer may also be attached to the anchor by tying a figure-eight loop in the belay rope at the desired distance from the anchor point and clipping the sling around the belayer's waist to the loop by means of a locking carabiner. Regardless of the manner in which the belayer is attached to the anchor, the belayer should be in a secure and safe position. Absolutely no slack should exist between the belayer and the anchor point. If slack does exist and the climber falls, the belayer will be pulled out of position and possibly endangered by the impact force.

The anchor point should also permit the belayer to assume a comfortable position in the line of pull. A comfortable position is determined by the terrain but in a top rope belay situation a sitting position is usually most practical. In this position the feet should be braced to help support and absorb the impact of a fall. The belayer should also be positioned where he will not be pulled into an object and injured. A helmet should also be worn to protect the belayer's head in case he is pulled into such an object.

Positioning of the belayer in the line of pull is referred to as aiming the belay. Ideally, the impact of a fall exerted on a belayer should be in a direct line with the anchor.[13] If the belayer is not on this direct line and a fall occurs, he will be forcefully pulled out of position. By shortening the distance between the belayer and the anchor, the distance of the pull can be reduced, but it would be much better to be in line before the fall.

Once the belayer has been securely anchored and is in position, the belay rope is positioned for management and control. As the climber ascends, the belayer must take up

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[13] Ferber, pp. 129, 131, 134.

the rope to remove slack while remaining constantly prepared to arrest a possible fall. To accomplish this, the belay rope must be positioned in such a manner as to produce the friction necessary to allow the belayer to hold the rope securely with the hands, thus allowing the belay chain to absorb the kinetic energy of the fall. This rope handling process requires an emphasis on rope placement with management and control in mind and use of the hands in a sequential manner to insure a constant readiness to arrest a fall.

The sitting-hip belay provides an ideal means of protecting a climber under most circumstances. Because of the strong, solid position it provides, this belay is recommended for beginning rock climbers in a top rope situation. In this belay the belayer assumes a comfortable sitting position with the legs separated and the feet solidly braced. The belay rope runs between the separated legs and around the belayer's back just above the hips (see Fig. 43). With the rope looped around the belayer's body in this fashion, the hand on the side of the rope leading down to the climber is referred to as the feeling hand and pulls the rope up as the climber ascends. The hand on the other side is the braking hand and is responsible for holding the rope securely in the event of a fall.

When the belay rope is placed around the belayer, consideration should be given to the fact that the impact of

Fig. 43. Sitting-Hip Belay

a fall will either pull the belayer up or down. In most, but not all, top-rope belay situations the pull will be down. It is possible to establish a top rope belay which will pull the belayer up if the climber falls. This type of situation most often occurs with beginners when an instructor wishes to position the climber and belayer where they can be closely supervised. To do this the belayer is anchored at the bottom of a short climb. The belay rope is extended from the anchor point up to the top of the climb where it is looped around a stationary pivot point. From this pivot point, the rope is extended back down the climb and secured to the climber who is waiting at the same level as the belayer. The major point of concern in this situation is the fact that the impact from a climber's fall will pull up on the belayer rather than down.

If the impact from a climber's fall will result in a downward pull on the belayer, the belay rope should be placed around the belayer's waist above the anchor rope. This will prevent the belay rope from being pulled down off the hips and under the legs, thus voiding the belay system. When the impact of a climber's fall will result in an upward pull on the belayer, the belay rope should be placed under the anchor rope. By positioning the belay rope in this manner, the impact of a fall will not pull it up the back of the belayer which could result in rope burns and a voided belay system.

The sitting-hip belay provides for the body of the belayer to be involved in the absorption of the impact of a climber's fall. This means that in the event of a fall the belay rope will be pulled into the belayer's back and sides. The result of this pressure is not very comfortable. A method of removing this potential pressure may be achieved by modifying the sitting hip belay by looping the belay rope through carabiners instead of around the belayer's back. Two carabiners are clipped into a loop tied into the anchor rope close behind the belayer. The belay rope is then placed in these carabiners as it is passed behind the belayer (see Fig. 44). While reducing the pressure which may be exerted on the belayer, this modification also has a disadvantage of reducing the rope contact area which is needed to provide the friction necessary for the belayer to

Fig. 44. Belaying Through Carabiners

Fig. 45. Figure-eight Belay

control the belay rope in the event of a fall. The process is then a trade-off, more comfort for less friction.

Another method of belaying in a sitting position which has been developed in recent years makes use of the figure-eight descender to provide the rope contact area necessary for friction. This technique is similar to the sitting hip belay except that the belay rope is placed on a figure-eight descender rather than around the belayer's body. Once the belayer is in an anchored and comfortable sitting position, the belay rope is placed on the figure-eight descender which is then attached, in front of the body by a carabiner, to a sling around the belayer's waist (see Fig. 45). To position the rope on the figure-eight descender, hold the device with the smaller opening toward the body. Form a bight in the rope, pass it up through the larger opening, and bring it back and over the smaller opening allowing the rope to come to rest on the shaft of the descender. If the right hand is to be the brake hand, the left side of the bight should extend down to the climber when the rope is placed on the descender. This position is reversed if the left hand is to be the brake hand.

The figure-eight descender is attached to a sling around the belayer's waist by means of a carabiner. This attachment is in front of the belayer and provides an opportunity to observe the working of the belay system. To take up the rope as the climber ascends, the belayer uses the same rope handling techniques as would be used for a sitting hip belay. This technique is described in the following pages. However, to brake the rope with the brake hand when using the figure-eight descender, the hand grips the rope and moves away to the side of the body rather than across the body as is standard procedure.

Each time the climber makes a vertical move on the rock while being belayed by the top rope technique, slack results in the belay rope. The belayer, in order to increase the security and insure the safety of the climber, must take up the rope, thus keeping the slack to a minimum. This process is achieved by a sequential series of hand movements coordinating the efforts of the feeling and the braking hands. During this movement pattern the braking hand never leaves the rope.

To begin the sequence, the braking hand, positioned near the body, and the feeling hand, positioned at an extended arm's distance, pull the rope up as the climber advances (see Fig. 46 A and B). At the completion of this first move the braking hand is at an extended arm's distance while the feeling hand is near the body, a position which is not conducive to effective braking. The feeling hand is next extended to a position in front of the braking hand where it holds both parts of the rope (see Fig. 46 C and D). This move is of major importance if the braking hand is to remain in its proper position. The feeling hand must reach

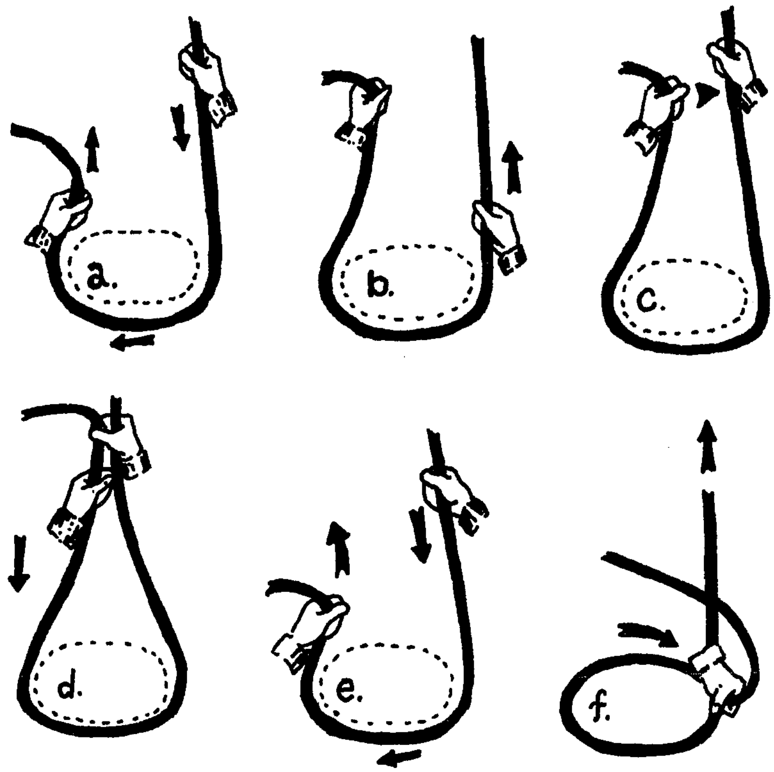

Fig. 46. Rope Handling

a position in front of the braking hand otherwise the braking hand would have to terminate contact with the belay rope in order to assume a position where it could be moved back near the body. It is this move which most often confuses beginning rock climbers. As the feeling hand holds both parts of the rope, the braking hand slides back to its original position near the body. The feeling hand then drops the rope on the braking hand side and the first sequence is completed. This pattern of hand movements is repeated again and again as the climber advances up the rock. The feeling hand constantly monitors the tension of the belay rope and when it is slack the rope is taken up.

Should the climber need to reverse his direction and descend, the sequence of hand movements is reversed.

In addition to taking up the belay rope, the belayer must also brake the rope to hold a fall. To brake, the belayer grips the rope tightly with the braking hand and, at the same time, wraps the rope around the body (see Fig. 46 F). If the impact of the fall results in a downward pull, the braking hand should overcut the belay rope. If the pull is in an upward direction, the braking hand should undercut the rope. This prevents the belay rope from interfering with the braking process by cutting into the wrist and forearm of the braking hand.

The sequence of moves just described for belay rope management and control would, by some definitions, constitute a static belay. However, there are dynamic elements in this rope handling technique. First, there is the belay rope which possesses a certain degree of elasticity. This elasticity provides a dynamic dimension to the belay by allowing for gradual absorption of the kinetic energy generated by the falling climber. Next are the bodies of the belayer and climber which, by their resilient nature, gradually absorb part of the energy of the fall. This is followed by the anchor rope which, along with the waist sling to which it may be attached, may also absorb part of the kinetic energy. An additional dynamic element which is often overlooked is the hands. If the previously mentioned elements can not deal with the total impact of the fall, the belay rope will be pulled through the belayer's hands. This slipping of the rope is the major component of what is defined as a dynamic belay. If such slipping occurs, the belayer should hang on tightly to the belay rope. As the kinetic energy is absorbed, the rope will stop slipping and the climber's fall will be checked. To protect his hands while belaying the belayer should always wear gloves.

The Rope

As the rope is taken up it should be dropped in a neat pile of coils beside the belayer. It should never be allowed to hang down over the climbing area. If the rope comes in contact with any sharp edges, padding should be provided to protect the rope from possible damage. When a belay rope supports a severe fall it should be inspected as soon as possible for damage. The rope is the life line for the climber.

The Climber

At the end of the belay chain is the climber, the person for whose safety and security the system has been established. The belay rope is attached to the climber either directly, by tying it around his waist, or indirectly, by connecting it to a sling tied around his waist. These direct and indirect methods of attachment provide several choices of securing the rope to the climber.

Direct belay rope attachment may be accomplished by tying a bowline or a bowline-on-a-coil around the climber's waist. These knots have served as end man knots for many years and are still in common use today. However, the use of such direct rope attachments is hazardous and as a result of recent research is not recommended.[15]

Indirect rope attachment methods, with the exception of the swami belt, provide better security and safety than do the direct attachments. Slings which may be used for indirect attachments include the Swiss seat, the modified Swiss seat, and the double loop seat. The belay rope may be tied directly to these slings by using an overhand or figure-eight loop or attached by means of a locking carabiner clipped through the sling and a loop tied in the end of the belay rope. A detailed description of the slings which may be used for indirect rope attachment and the procedure for connecting the belay rope is provided in Chapter 4.

Once the climber has been securely attached to the belay rope, the belay chain is complete. After the necessary exchange of signals, the climber begins his ascent

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[15]Barry Allen Nelson and John McNamara, "Climbing Harnesses," Off Belay, August, 1979, p. 12.

with the belayer taking up the rope as the climber advances. At the top of the climb the belay is terminated after the climber is secure and the appropriate signals exchanged.

Chapter 8

RAPPELLING

Almost everyone has been exposed to rappelling at one time or another. Television programs, commercials, movies, magazines, and newspaper articles provide visual and verbal descriptions of rappels being made feet-first, head-first, down mountain sides, from overhangs, buildings, and helicopters. With so much exposure, rappelling has been accepted by many as a safe and simple skill to master, but they are wrong. Unfortunately, the type of information relative to rappelling provided to the general public through mass media is often misleading and contrary to sound rappelling techniques. Rappelling is a serious undertaking and when performed carelessly and without regard for proper safety precautions it can be lethal.

Because of the exposure rappelling has received, beginning rock climbers usually come to the rock thinking they have a good idea how it is done. They either do not know or do not appreciate the fact that rappelling is a Class 6 climbing technique which indicates that the rappeller is relying totally on his equipment for support.[1] To these beginners, rappelling is perceived as effortlessly bounding down a steep rock face or leaping from a huge overhang and swinging in a free rappel. This concept comes from what they have seen in films and pictures which emphasize, unrealistically, the excitingly photogenic nature of a rappel. Beginners are also influenced by reading various accounts of rappelling ventures which are often written by persons ignorant of the facts.

There is no denying the fact that rappelling is exciting and fun, but it also has the potential to be extremely dangerous. Beginning rock climbers should master the skill of rappelling for it can be very useful in a variety of climbing situations. A thorough mastery of this skill requires a sound understanding of the principle of rappelling, how to establish a safe rappel system, and how to rappel correctly. This section is devoted to presenting information relative to these areas.

THE PRINCIPLE OF RAPPELLING

A controlled descent with a rope requires the application of certain physical laws. As the rappeller descends, the downward movement of his body brought about by

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[1]R. C. Aleith, Bergsteigen: Basic Rock Climbing (New York: Charles Scribner's Sons, 1975), p. 109.

the pull of gravity results in the development of kinetic energy. The development of this kinetic energy must be controlled or the rappeller descends too rapidly. To control the descent, the rappeller utilizes friction which may be developed in several different ways by various rappelling techniques. It is the development and proper utilization of friction which allows for controlled descent.

A by-product of friction is heat. Heat generation caused by friction must be controlled or the rappeller's hands and body may be burned and the rappel rope damaged. It thus becomes necessary for the rappeller to develop the proper amount of friction at the proper time in order to check the kinetic energy developed by his descending body. If too little friction is applied the kinetic energy increases, thus requiring more friction to check the descent in turn generating excessive heat. If too much friction is applied, the kinetic energy of the rappeller will be checked and the descent slowed or stopped. The principle of rappelling thus becomes a process of generating and applying the proper amount of friction in order to keep the kinetic energy generated by the descending rappeller in check, thus allowing the desired rate of descent.

ESTABLISHING THE RAPPEL

In establishing a rappel, the rappel rope is attached to or looped around a secure, stationary object.

Two lengths of rope should be provided for the rappel, a technique known as double line. By providing two rope surfaces instead of one for the rappel, friction is increased, thus providing better control as well as adding an additional safety factor. The use of the double line should be standard practice for rappelling.

In practice situations, where the rappel ropes can be easily retrieved, they may be tied to a secure stationary object such as a tree or rock. Each rope should be secured separately by using a bowline or a bowline-on-a-coil, depending on the amount of rope available.

Tying the rappel rope to the anchor point is not practical if once the rappel is completed it will be impossible to retrieve the rope. In situations such as this the rappel rope will have to be retrieved by pulling it down. This process is accomplished by looping the rope around the anchor point rather than tying to it. Again a secure stationary object is required. A tree or rock may be used for the required placement by simply placing the rope around them, tying a bulky knot, such as a figure-eight, in the two ends, and throwing the rope over the ledge. The purpose of the bulky knot is to prevent the rappeller from rappelling off the end of the rope. Once the rappel is completed, the knot is untied and, by pulling on one end of the rope, it is retrieved. This process works well but results in unnecessary wear on the rope caused by the friction created when pulling it over the tree or rock. The problem such friction causes can be greatly reduced by tying a length of webbing around the anchor and then looping the rope through the webbing, thus creating indirect contact. As the rope is pulled down friction is only produced between the webbing and the rope which in turn greatly reduces the wear on the rope. Webbing used in this manner is left in place because it is impractical to retrieve it. If such webbing is retrieved in a later climb it should not be used because the friction-generated heat created by pulling down the rope may have weakened it substantially.

Once the rappel anchor has been securely established and the rope ends tied together and tossed down, the rappeller is ready to attach himself to the rope. There are several methods for attachment, referred to as rappel systems, which may be used. Some of the more common systems are presented on the following pages.

RAPPEL SYSTEMS

Climbers have devised several methods or systems by which the friction necessary for a controlled rope descent can be achieved. These systems can be separated into two types according to the primary surface area provided for rope contact. The first type uses the body as the contact area and includes the arm or hasty rappel, the dulfersitz or body rappel, and the guide's body rappel. All of these rappel systems have the advantage of requiring no equipment except the rope. However, since they depend on contact with the body to produce the friction necessary to control the rappeller's descent, rope burns are an ever present hazard. The possibility of sustaining such burns can be reduced by wearing heavy clothing to protect the major contact areas such as between the legs and the shoulder. Special care should also be taken to protect the neck by buttoning the collar or wearing a hooded shirt when the rappel rope crosses over the shoulder.[2] With the development of rappel systems which utilize hardware to provide the primary source of friction the body contact rappels are receiving less use.

The second type of rappel requires hardware and webbing, in addition to the rappel rope. This method is referred to as brake system rappels which have the advantage of removing the primary source of friction from the body surface and placing it on a piece or pieces of hardware attached to the body by means of a sling. Rappel systems of this type include the sling rappel, the carabiner wrap, the carabiner brake rappel, the brake bar rappel, and the figure-eight descender. The disadvantages of these systems are that additional equipment is required, the utilization of slings and hardware create additional links in the rappel

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[2]Raymond Bridge, Climbing: A Guide to Mountaineering (New York: Charles Scribner's Sons, 1977), p. 198.

Fig. 47. Arm Rappel

chain, and, in some cases, they are somewhat complicated for the beginner. However, in spite of the disadvantages, these rappel systems are receiving increased use because they are more comfortable as a result of the removal of the rappel rope from direct contact with the body.

Arm Rappel

This rappel, also referred to as the hasty rappel by the military,[3] is useful for short, low-angle slopes.[4] To establish the arm rappel place the rappel rope across the shoulders and wrap each extended arm once around it (see Fig. 47). Gripping the rope with the hands, combined with

[3]U.S. Army, Military Mountaineering (Baltimore: U.S. Army Adjutant General Publications Center, 1976), p. 34.

[4]Peggy Ferber, ed., Mountaineering: The Freedom of the Hills (3d ed.; Seattle: The Mountaineers, 1974), p. 145.

the friction provided by the arms and shoulders, controls the rate of descent. Stability may be a problem with this system but it can be improved by facing downhill and broadening the body's base of support by spreading the feet. Security is minimal with the arm rappel and the beginning climber is cautioned that it is to be used only on easy, short, low-angle slopes.[5]

Dulfersitz Rappel

Also referred to as the body rappel and the Swiss body rappel,[6] this rappelling technique provides extra friction because of its large amount of contact area. As a simple all-purpose rappel it is recommended that all climbers learn this system.

In order to establish the dulfersitz rappel, the rappeller straddles the rope while facing the anchor point. With one hand the rope is brought forward from behind the rappeller and around one hip. The rope is then passed across the chest, over the head, and placed on the opposite shoulder. From the shoulder the rope is passed across the back and returned to the side of the wrapped leg (see Fig. 48). The hand on the side of the wrapped leg becomes the brake hand and should be used to lift and place the rope

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[5]Ibid.

[6]Paul Petzoldt, The Wilderness Handbook (New York: W. W. Norton and Company, Inc., 1974), p. 181.

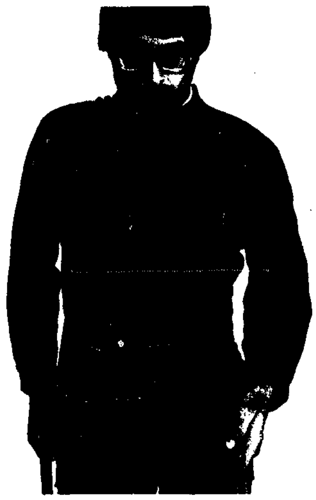

Fig. 48. Dulfersitz Rappel

in position over the shoulder. The other hand will be used for balance.

A hazard of the dulfersitz rappel is the possibility of unwrapping the leg, especially if it is held higher than the free leg.[7] If this happens the rappeller loses a major portion of contact area, thus friction, while at the same time being placed in a very unstable position with the rope under one arm and over the opposite shoulder. This situation can be avoided by keeping the wrapped leg low during the rappel.

A major disadvantage of this classic rappelling technique is the heat generated by friction between the legs and across the shoulders. To avoid rope burns in these areas padding or heavy clothing is recommended.

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[7]Ferber, p. 146.

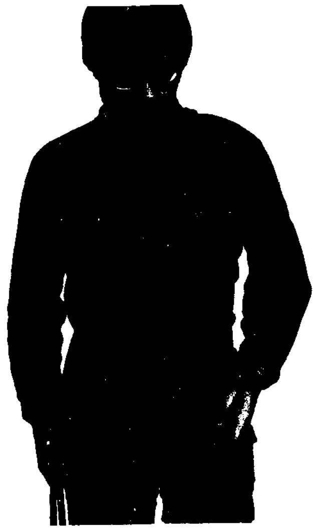

Fig. 49. Guide's Body Rappel

Guide's Body Rappel

Similar to the dulfersitz rappel, the guide's body rappel is a safe, easy technique for use on short pitches where the rock is less than perpendicular. To establish the rappel, straddle the rope while facing the anchor. With one hand bring the rope forward, across one hip, and continue upward placing the rope on the shoulder corresponding with the wrapped leg. The rope is then passed across the back to the opposite side and held by the hand opposite the wrapped leg and shoulder (see Fig. 49). This hand is the brake hand while the other hand is used for balance.[8]

The guide's body rappel is less awkward than the dulfersitz but otherwise shares the same advantages and disadvantages. Again, the rappeller is cautioned of the

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[8]Petzoldt, p. 181.

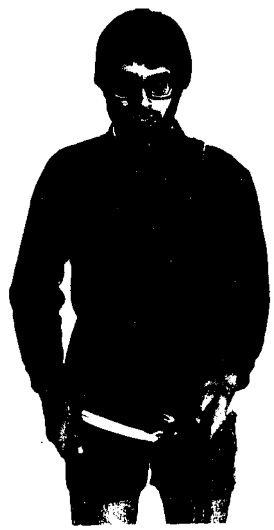

Fig. 50. Sling Rappel

possibility of rope burns where friction is produced. If this rappel is used, heavy clothing or padding should be available for protection.

Sling Rappel

This rappelling system, also called the carabiner rappel[9] and seat-shoulder rappel,[10] provides a way of removing part of the friction from the body and placing it on carabiners. The sling rappel is similar to the dulfersitz system except that, instead of passing the rappel rope between the legs, it is placed in carabiners attached to a sling tied around the rappeller's waist. This requires the rappeller to carry a sufficient length of webbing to tie

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[9]Ibid.

[10]U.S. Army, p. 35.

the desired sling and two carabiners, in addition to the rappel rope.

To establish this rappel system begin by tying a suitable sling around the waist. Slings which may be used for this purpose have already been presented in Chapter 4. Two carabiners are then clipped on the sling side-by-side with their gates opening up and away from the body. The rappel rope is then inserted into the carabiners, via the gates, placed across the shoulder, and passed diagonally across the back to the opposite hip as in the dulfersitz (see Fig. 50). Before proceeding into the rappel the carabiners are placed in an opposed position by turning one carabiner one-half turn. This places the gates of the carabiners on opposite sides and opening in opposite directions which will prevent the rappel rope from accidentally coming loose.

The sling rappel drastically reduces friction on the body by deleting the necessity of placing the rappel rope between the legs. It does, however, require rope contact with the shoulders which will require protection from possible rope burns.

Carabiner Wrap

Of apparent military origin, where it is referred to as the seat-hip rappel, this system requires a sling and a carabiner in addition to the rope. Once the sling is in

Fig. 51. Carabiner Wrap

place and the carabiner has been clipped in with the gate opening up and away, the rappel rope is placed in the carabiner where it is looped around the solid side and placed into the gate again. It is this turn of the rope around the solid side of the carabiner, along with some contact with the side of the hip, which provides the friction necessary to control the descent. When in position around the carabiner, the rope is held behind and slightly above the hip[11] (see Fig. 51).

This rappel system provides less friction and is faster than others which may be used. Special care should be taken when placing the rope in the carabiner to make sure that it does not press against the gate possibly forcing it open.[12]

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[11]Ibid., pp. 35-36.

[12]Ibid., p. 36.

The carabiner wrap system has not found much favor with rock climbers and is not recommended. Though it virtually removes all friction from the body, its dependence on the carabiner and the potential for speed as a result of reduced friction makes its use in a civilian setting less than desirable in terms of maximizing safety. If this rappel is used, it would seem better to replace the one carabiner with two oval or one locking carabiner. Perhaps it would be best to leave this system with the military where speed and utilization of a minimal amount of equipment is emphasized.

Carabiner Brake Rappel

This rappel system, sometimes referred to as a multiple carabiner or Yosemite rappel, utilizes carabiners across carabiners to provide the braking mechanism required for controlled descent. Five or six oval carabiners are required plus a suitable length of webbing to tie a sling around the waist. Two carabiners are clipped on the sling with their gates in opposed position. Two additional carabiners are clipped in the first carabiners also in opposed position. The rappel rope is then passed through the second set of carabiners to form a bight. While holding the bight in place, the remaining two carabiners are clipped around the second set with their solid ride up toward the

Fig. 52. Carabiner Brake Rappel

rope. The rope is then placed around and behind the hip and gripped by the brake hand (see Fig. 52).

The friction provided by this system is sufficient for an easy, controlled descent. If more friction is desired the crossed carabiners supporting the rope can be increased to three or four. The system may also be "stacked" by extending it and adding another set of six carabiners as described above.

While effectively removing the source of friction from the body, the carabiner brake is rather complicated. Faulty arrangement of the carabiners can result in a potentially dangerous situation.

Brake Bar Rappel

The brake bar rappel requires a specialized piece of hardware, known as a brake bar, designed to fit across a carabiner from the gate to the solid side. In addition to

Fig. 53. Brake Bar Rappel

the brake bar a suitable length of webbing, one oval carabiner, and one locking carabiner are needed. The locking carabiner is clipped onto the sling and locked. The second carabiner is clipped into the locking carabiner and the brake bar positioned on its gate. The rappel rope is then passed up through the second carabiner forming a bight. While holding the bight in position, the brake bar is placed down in position across the carabiner. It is extremely important that the brake bar be placed in such a manner as to be held in position by the rappel rope. If it is placed up from below the carabiner the weight of the rope and the rappeller will dislodge it and void the system.

The rope is passed to the solid side of the brake bar carabiner to prevent any unnecessary strain on its gate. From here the rope is positioned in the brake hand just behind the hip (see Fig. 53).

The brake bar rappel is a simple system which requires only one small piece of specialized hardware. Friction is removed from the body yet is provided in sufficient quantity to enable a slow, steady descent. The most critical point in the process is the proper placement of the brake bar. If the brake bar is placed upside-down, the system will fail.

Figure-eight Descender

One of the safest rappelling devices available is the figure-eight descender. It is a solid figure-eight shaped device with one large and one small opening. Because it is solid and has no gates the device is very strong.

As with all brake system rappels, this rappel begins with a suitable sling tied around the waist. A locking carabiner is clipped into the sling to accept the figure-eight descender. Before placing the descender on the carabiner, the rappel rope must be placed in position. To position the rope on the descender, hold the device in front of and with the smaller opening pointing toward the body. Form a bight in the rope and pass it up through the larger opening. When forming this bight, if the rappeller intends to brake with the right hand, the end of the rope should extend down on the right side of the bight while the left side extends to the anchor. If the left hand is to be used for braking, the positions should be reversed.

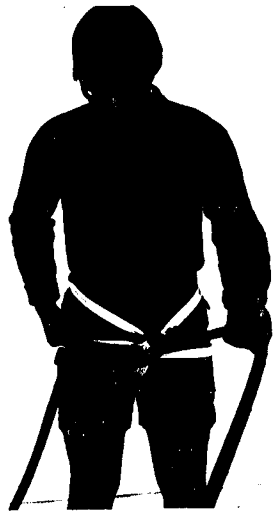

Fig. 54. Figure-eight Descender

After passing the bight up through the larger opening of the descender, place it over the smaller opening allowing the rope to rest on the shaft of the device. Place the small end of the descender in the locking carabiner and secure it. The rope is then gripped by the brake hand which is placed behind the hip (see Fig. 54).

The figure-eight descender is an excellent device for providing the friction necessary for controlled descent. Placement of the rappel rope on the device may seem complicated and lead to confusion for beginners. To insure that the device does not become disconnected while in use a locking carabiner should always be used to attach it to the sling.

BODY POSITION AND BRAKING

Once a rappel system has been selected and the proper contacts and/or attachments made with the rappel rope, the rappeller is ready to begin the descent. As the rappeller leans back, placing his body weight on the rappel rope, positioning of the body to provide increased stability and safety becomes more important. The proper use of the hands to provide the braking control and balance needed to execute a safe rappel also assumes a role of major importance. It is not enough for the rappeller to only know how to establish a rappel system, he must also know how to control his body once the rappel has begun.

To increase stability in a rappel, the rappeller increases his base of support by spreading the feet to about shoulder width and maximizing sole-to-rock contact. This position provides protection from pulls from the sides which may occur when the rappeller moves out of the vertical drop line of the rappel rope. As the feet are spread the legs are extended and maintained at a position perpendicular to the rock surface. The angle of the rock may remain constant or vary drastically, but the legs should be maintained at a constant position of near ninety degrees. This position provides for the greatest exertion of force through the legs and directly onto the rock surface. If the contact angle is allowed to increase or decrease, the force exerted will be in an upward or downward angle causing the feet to slide up or down respectively. Should the feet slide up, the rappeller will flip upside-down. Decreasing the contact angle and allowing the feet to slide down will result in the rappeller being slammed face first into the rock. It thus becomes obvious that the maintenance of perpendicular contact with the rock is extremely important for the up and down stability of the rappeller.

Once started, the rappeller assumes a semi-sitting body position, flexing the knees slightly to allow for comfort. A semi-sitting position increases stability and prevents the possibility of the rappeller turning upside-down, a condition which may result from leaning back too far.[13] In this position the rappeller walks, not bounds, backwards down the slope making sure that the feet are placed in secure positions. By looking over his shoulder the rappeller inspects the slope to determine the best locations for foot placement.

The brake hand controls the rate of descent[14] by varying its grip on the rope and adjusting the amount of rope contact with the body. When the rappeller wishes to slow down, the brake hand grips the rope tighter and wraps it around the body, thus creating more friction. To speed up the rappel, the brake hand is relaxed and contact with the body reduced. Regardless of what happens in a rappelling situation, the brake hand never leaves the rappel rope.

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[13]Ferber, p. 149.

[14]Ibid., p. 150.

The other hand is used for balance and is referred to as the balance, guide, or uphill hand. The balance hand holds the rappel rope loosely, allowing it to slide through its grip with minimal resistance. Beginners have a tendency to try to brake with the balance hand which only leads to a hot hand due to the amount of friction being produced. This undesirable practice should be discouraged, for it is of no value in controlling the descent.

OVERHANGS AND FREE RAPPELS

Not all rappels can be made down a rock slope exhibiting a fairly consistent angle. Some situations require rappelling over an overhand which may brake away sharply underneath, placing the rappeller in a position where placement of the feet may be limited, if at all possible. Where an overhand breaks away sharply, leaving the rappeller suspended on the rappel rope without contact with the rock, a free rappel situation exists.

An overhang represents an obstacle which the rappeller should learn to overcome safely. The method used to clear the overhang must allow the rappeller to clear the ledge, protect himself from a pendulum swing back into the rock face, and, once completed, provide for a continued safe rappel. One method of doing this is to back out to the edge of the overhang, spring out releasing all braking, and drop free. Once the ledge is cleared, place the feet in front of the body to absorb the impact of the pendulum swing into the rock face and continue the rappel.[15] While seemingly straightforward in its approach to negotiating an overhang, this method does have some drawbacks. It can not be used with all rappel systems, especially those relying on a brake system. It also assumes that the rappeller will clear the overhang and find suitable footing below. If this fails to be the case, the rappeller could be slammed, face first, into the rock.

Another method of approaching an overhang eliminates the springing out and away from the ledge and minimizes the pendulum swing which results from such a jump. The rappeller approaches the ledge with the weight of the body exerted against the rappel rope. Maintaining a perpendicular position with the rock by adjusting the feet on the ledge, the hips and upper body are lowered. Once the head and balance hand are low enough to clear the lip of the overhang, the feet are dropped to absorb any shock resulting from the short pendulum swing. The positioning of the feet is extremely important in this method. Since the hips will be below the feet, the contact angle with the rock may be increased, resulting in an upward push on the feet. If the feet are not securely positioned this upward push can cause the rappeller to flip upside-down. This potential problem

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[15] Aleith, pp. 127-129.

can be partially eliminated by dropping the heels below the edge of the ledge and allowing the feet to pivot around this contact point as the body is lowered.

The advantages of this method of clearing an overhang are that it enables the rappeller to overcome the ledge with certainty while greatly reducing the pendulum swing back into the rock face below. It also enables the rappeller to see what is below and adjust accordingly. The fact that the rappeller is placed in a position where he could be flipped upside-down is the main disadvantage of this method.

A free rappel, which usually follows the clearing of an overhang, dramatically emphasizes the rappeller's dependence on his equipment. Suspended in space on the rappel rope, the rappeller resembles a spider inching his way toward the ground. Braking in a free rappel is the same as with other rappels. The brake hand controls the rate of descent while the other hand provides balance. Avoid gripping the rope with the balance hand. A slight modification of the semi-sitting body position occurs as the legs are dropped, tilting the body forward. The resulting body position should be comfortable and safe.

SAFETY IN RAPPELLING

The dependence of the rappeller on the rappel equipment and its proper use emphasizes the potential danger of this skill. From the time the rappel rope is secured to the anchor until the rappeller is safely on the ground below, any failure on the part of the rappeller or the equipment could be disastrous. It is therefore of the utmost importance that every possible safety precaution be taken to eliminate or reduce this potential danger.

The rappeller should be properly dressed including the wearing of a helmet and gloves. All loose clothing, including the hair, should be tucked away so it will not become entangled in the rappel system. Gloves should always be worn while rappelling to protect the hands from the heat generated by contact with the rope.

The rappel rope must be anchored securely. A double line is recommended for rappelling because of the safety element it provides. If the anchor fails there is total failure of the rappel.

A sound rappel system should be used. With the development of such devices as the brake bar and the figure-eight descender which effectively removes rope contact and friction from the body, there is little reason to use older systems which rely on direct body to rope contact. Older methods of rappelling involve a greater potential for rope burns and discomfort for the rappeller.

All beginning rappellers should be belayed. The belay rope should be attached to the rappeller's waist in a manner which will prevent it from interfering with the rappel system. All first rappels by any rappeller on any established rappel should be belayed to insure its soundness. An alternate safety method is to attach a prusik sling to the rappeller and around the rappel rope. As the rappeller descends he slides the prusik knot down the rope with the balance hand. This method, while in widespread use, has some serious drawbacks. If the sling is too long and the rappeller loses contact with the prusik knot, he may become suspended on the rappel rope unable to move up or down. The use of the prusik sling provides no back-up for possible total rappel failure. Finally, the use of the prusik sling for a back-up safety in rappelling has been questioned because of the possible failure of the prusik knot to tighten under sudden heavy loads.[16] The best solution is to belay with a second rope.

During the rappel, the rappeller should maintain proper body position. The legs should be perpendicular to the rock surface with the feet spread to shoulder width. The descent is accomplished by walking backward down the slope. Jumping and bounding are dangerous and serve no practical purpose. Such actions place unnecessary stress on the rope and anchor and reduce the ability of the rappeller to concentrate on proper body position and foot placement.

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[16]Ray Smutek, "The Questionable Prusik Safety," Off Belay, December, 1976, pp. 14-17.

Jumping and bounding should be discouraged in the strongest possible manner.

Once on the ground the rappeller should call out the appropriate signals to indicate to others that the rappel has been completed. Be careful of being slapped by the recoil action of the stretched rappel rope. Rappelling stretches the rappel rope similar to extending a rubber band. If the rappeller is near the end of the rope when the brake hand is removed and the rope is still under tension, it can recoil and inflect a painful slap.

With a little common sense and a good deal of practice, rappelling can be safe. Always maximize the safety elements and provide additional safety features whenever possible. Double checking should be a standard practice before beginning a rappel.

Chapter 9

ROCK CLIMBING ETHICS

To provide information which would enable a beginning rock climber to safely and enjoyably enter the vertical wilderness without attempting to develop within him a sense of responsibility and a respect for the environment he is to encounter and share with others would be inexcusable at the least. As with any sport, rock climbing possesses elements which may lead to questionable practices, misuse and abuse, and negative reflection on the sport as a whole and those who participate in it. For this reason, a brief section directed toward the stirring of a greater sense of respect and responsiblity among beginning rock climbers would seem appropriate.

This topic can be divided into two aspects: (1) respect for other climbers and (2) respect for the environment encountered. Though presented as separate elements here, these two aspects of responsible rock climbing are interrelated and in actual application are usually combined.

RESPECT FOR OTHER ROCK CLIMBERS

Rock climbers are a special breed. Independent, adventurous, fun-loving, they are willing to risk life and limb for the thrill, exhilaration, and fun of ascent into the vertical wilderness. Rock climbers are not always understood by non-climbers who view them from the confines of the horizontal domain. Climbers are often thought to be somewhat lacking in mental faculties and/or secretly harboring death wishes. The problem is a lack of understanding between the non-climbers and the climbers. It is here that the beginning climber may be required to show respect for his fellow participants.

If rock climbers could group together and within the confines of an inner circle practice their craft away from the eyes of the uninformed, then there would probably be no need to inform and educate non-climbers. But this is neither desirable nor feasible, so it becomes obvious that sooner or later the climbers are going to have to explain to the non-climbers the "how" and the "why" of rock climbing. Often the beginning rock climber is faced with this responsibility because of his enthusiasm, his increased visibility by virtue of numbers, and his apparent neophyte stage. This is unfortunate because the beginning rock climber may not have yet fully developed within himself a clear explanation of the "how" and, more important, the "why" of climbing. Unfortunate or not, when faced with the questions of non-climbers, the beginning rock climber must respond in such a manner as to educate and inform. This is a responsibility the beginning climber must accept in order to develop a respect for rock climbing and rock climbers on behalf of non-climbers.

Rock climbers must respect the rights of both climbers and non-climbers. When a potentially promising climbing area has been located on private property, permission to explore and climb in the area should be secured from the property owner. Once permission has been secured and the area has been entered, climbers should conduct themselves in a courteous, respectful manner. Do not disrupt the environment of the area and especially do not litter. Your actions as a rock climber are reflections on all rock climbers.

When in a rock climbing area frequented by other climbers, treat all climbers with courtesy and respect. With the problems of overcrowding in popular climbing areas, climbing routes may have to be shared. Be aware of the climbing ability of other climbers and remember that all should have the right to use the area, within the range of their climbing ability.

Fixed hardware should be left in place. Once pitons and bolts have been fixed they may be used, if considered safe, or not used as desired. At the same time a specific climbing area should not be reduced to a series of fixed pitons and bolts, thus reducing the quality of the climb for others. To reduce a climb in such a manner is to reduce the challenge it presents for more experienced climbers. There are no written regulations to control the use of fixed hardware so the use of such devices becomes a matter of personal choice and indicates the degree of respect a climber has for others.

Another aspect of rock climbing which has been questioned is the use of chalk while climbing. The use of chalk on the hands of climbers absorbs perspiration and makes hand holds more secure but it also does something else which may be annoying to others. Chalk rubs off on the rock and when used extensively on a popular climb has the effect of marking each hand hold in white. Some climbers find this situation disagreeable for the chalk marked handholds reduce the challenge of the climb by showing moves rather than allowing the climber to explore and determine his own, even though the end result in movement technique may be the same. Again, there is no regulation concerning the use of chalk while climbing. Its use or nonuse is a personal decision, but one which should be made with others in mind.

RESPECT FOR THE ENVIRONMENT

Rock, that apparently steadfast, solid, everlasting foundation of the very earth on which we live, is, nevertheless, finite in nature. It is a fairly well known fact that rock is worn away or eroded naturally by the action of water, wind, and certain types of plant life, but man also takes his toll on rock, eroding it in unnatural ways. In the past rock climbers were very much involved in this unnatural erosion during the period of the development of technical rock climbing and the use of pitons and bolts. The piton added a new dimension to climbing by allowing climbers to extend their ability into areas where formally no protection was available. The sound of pitons being hammered into rock fissures became a sound associated with rock climbing.

The addition of the expansion bolt to the equipment list of the rock climber signalled another advancement. By means of a well placed bolt, a climber could create a point of protection or aid on any surface. These bolts were designed to be permanent while pitons could usually be removed, especially if they were made of strong steel.

The use of hardware signalled an advancement in rock climbing and made possible many climbs which would have been impossible otherwise. The continued use and misuse of such hardware, especially pitons, over the years began to result in visible evidence of the finiteness of the rock. Rock fissures, into which pitons had been driven and removed over and over again, were eroding away, becoming wider and wider. As these cracks became wider, larger and larger pitons were introduced to span them. By the 1960's it became obvious to many rock climbers that something had to be done or cracks in popular climbing areas would be eroded to the point that they could no longer be used.

These developments and the increased concern over rock erosion resulted in the introduction and increased use of chocks or climbing nuts. The utilization of these metal wedges which could be jammed into rock fissures and then removed without chipping away the edges of the crack ushered in the era of clean climbing. Today responsible rock climbers rely heavily on chocks for protection and aid, choosing pitons only as a last resort.

The permanent defacing effect of bolts has also come under criticism in recent years. This criticism has been directed toward the misuse of bolts by lesser skilled rock climbers to reduce the challenge of a climb to their level. The placement of a bolt in a rock requires the drilling of a hole and even if the bolt is removed later, an event which almost never occurs, the hole remains.

ETHICAL CONDUCT

A responsible rock climber must be aware of the finite nature of the vertical wilderness into which he enters. The rock that is used for climbing today must, within man's limited concept of time, last forever. If it is defaced and destroyed by careless actions it will be lost forever.

The shaping of an individual's attitudes is a combination of both inner feeling and outer experiences. The development of ethics draws from these attitudes and reflects an individual's concept of right and wrong, good and bad, beautiful and ugly. Ethics go much deeper than actions dictated by rules and regulations designed to steer all individuals in a similar direction. This is why understanding and meaningful experiences on the part of beginning rock climbers is so important.

Rock climbing exists without rules and regulations, without officials and governing organizations. The rock is there extending the same challenge to all. When a climber accepts this challenge, he does so according to his own ethical standards. Hopefully, these standards will reflect a respect for all fellow climbers and the environment they must share. Such standards are the mark of a responsible climber--one who climbs with concern for those who came before and those who will follow; one who realizes and appreciates the finiteness of rock.

GLOSSARY

Abseil--(German) rappel.

Aid--any protective hardware used for holds.

Aid climbing--direct aid climbing; artificial climbing; climbing which requires the use of aid, such as pitons, chocks, and bolts, in order to ascend.

Anchor--a natural or artificial point where a rope or webbing may be attached and secured.

Artificial climbing--see aid climbing.

Angle piton--a piton with a rounded U-shaped blade.

Arrowhead chock--a type of chock which is wedge shaped and fitted with a cable.

Ascenders--any of a number of mechanical devices, such as Clog, Gibbs, and Jumar, used to climb a rope.

Balance climbing--a climbing technique used on smooth rock which requires careful balance and hand and foot placement.

Belay--a method of arresting the fall of a climber by means of a rope.

Belayer--one who provides a belay.

Belay chain--the total belay system.

Bend--a know configuration used to join two rope ends.

Bight--a turn in a rope which does not cross itself.

Biner--see carabiner.

Blade piton--a flat bladed piton.

Body rappel--dulfersitz; a type of rappel which makes use of a rope wrapped around the body to provide the friction needed for controlled descent.

Bolt--a type of climbing aid; an expansion bolt fitted into a hole drilled in a rock.

Bong-bong piton--a large piton with a U-shaped blade which receives its name for the sound it makes when struck.

Bouldering--a high standard of climbing practiced on boulders where the height is not great and falls are rarely serious.

Bowline--an end man knot; a type of non-slip knot usually tied around a climber's waist.

Bowline-on-a-coil--a variation of the bowline tied on a coil of rope wrapped around a climber's waist.

Brake bar--a cylindrical device placed on a carabiner to produce friction for rappelling.

Bugaboo piton--a special piton with a long thin blade.

Carabiner--snaplink; biner; crab; an oval or D-shaped device with a spring loader gate used for various attachments in climbing.

Carabiner wrap--a method of rappelling which utilizes a rope wrapped around a carabiner.

Clean climbing--a method of climbing which relies on the utilization of climbing nuts for protection and aid.

Chimney--a fissure in a rock large enough to accommodate the body of a climber.

Chinning--see mantleselving.

Chock--see climbing nut.

Chockstone--a stone inserted in a small rock fissure and used for protection or aid.

Climbing nut--a piece of metal designed to be jammed into a small rock fissure and used for protection or aid.

Copperhead chock--a small chock with a cylindrical head fitted with a steel cable.

Counterforce--utilization of opposing forces for climbing.

Crab--slang for carabiner.

Descenders--metal devices used to produce friction for rappelling.

Dihedral--see open book.

Direct aid climbing--see aid climbing.

Dulfersitz--see body rappel.

Dynamic belay--a method of belaying which gradually absorbs the impact force of a fall; belay from below.

Eight ring--see figure-eight descender.

Englishman's knot--see fisherman's knot.

Exposure--a climber's awareness of height and the increased sense of a possible fall compounded by the steepness and sheerness of the rock.

Face--a vertical rock wall.

Free climbing--climbing vertical surfaces without aid.

Figure-eight bend--Flemish bend; a figure-eight knot configuration used to join two rope ends.

Figure-eight descender--eight ring; a metal device shaped like a figure-eight used primarily for rappelling.

Figure-eight knot--a knot similar to an overhand knot but with an extra turn to give it a figure-eight shape.

Figure-eight loop--a loop tied in a line by means of a figure-eight knot.

Fisherman's knot--Englishman's knot; a knot configuration which uses the overhand knot to join two ropes together.

Fixed pitons--a piton driven into a rock fissure and not removed.

Fixed rope--a rope anchored into position to provide easy up and down access to a climb.

Foot jam--the wedging of a climber's foot into a rock fissure for support.

Foxhead chock--a wedge shaped chock on a steel cable.

Free climbing--climbing done without aid, as opposed to aid climbing.

Friction climbing--a climbing technique which relies on resistance between the feet and the rock to accomplish an ascent.

Hand jam--the wedging of a hand into a rock fissure for support.

Hardware--a general term referring to metal devices used for climbing.

Harness--a rope or webbing configuration wrapped around the waist and/or hips to provide a point of rope attachment.

Hawser-laid rope--a rope constructed of three groups of filaments plaited together.

Hexcentric chock--a six sided chock.

Iron--a general term referring to pitons.

Jamming--a climbing technique utilizing a part of the body wedged into a rock fissure for support.

Jumar--a type of mechanical ascending device.

Jumaring--the use of jumars to ascend a rope.

Karabiner--(German) carabiner.

Kernmantel--(German) a type of rope construction consisting of an inner core and an outer sheath.

Kletterschuke--(German) lightweight climbing boots.

Knife blade piton--a piton with a thin, flat blade designed to fit into narrow, shallow rock fissures.

Laid rope--see hawser-laid rope.

Layback--lie back; a method of climbing which places the climber in a leaning back position with the hands gripping an edge while the feet press flat against the rock.

Lead climber--the first climber in a roped party.

Lead climbing--an ascent which utilizes a lead climber who advances ahead of the remaining party members while being belayed from below.

Leeper chock--a chock with a Z-shaped head.

Leeper piton--a piton with a Z-shaped blade.

Loop--a turn in a rope which crosses itself.

Lost arrow piton--a piton with a tapered blade and an eye forged at a right angle to the blade.

Mantling--see mantleselving.

Mantleselving--mantling; chinning; retabling; a technique in climbing used to surmount a ledge.

Middleman knot--any knot used to tie a climber into the middle of a rope.

Muscle-up--a term referring to any strenuous move which uses mainly the muscles of the arms and hands.

Nut--see climbing nut.

Open book--dihedral; two vertical rock walls joining at a ninety degree angle.

Overhand bend--ring bend; water knot; overhand follow through; webbing sling knot; a knot configuration which joins two rope ends by means of an overhand knot.

Overhand knot--the most basic knot, consisting of a loop with the end of the rope passed through it.

Overhand loop--a loop tied in a line by means of an overhand knot.

Overhang--a rock face which is beyond the perpendicular.

P.A.'s--a lightweight rock climbing shoe designed by Pierre Allain.

Peel off--to fall off a climb.

Peg--a piton.

Pendulum--a sideways swinging movement across a rock face.

Perlon--a German trade name for nylon.

Pitch--the distance between two stops or belay points on a climb.

Piton--a metal spike or wedge designed to be driven into a rock fissure.

Protection--the placement of hardware, such as pitons and chocks, to provide anchor points for a climber.

Prusik up--to ascend a rope by using a prusik knot and sling.

Prusik knot--a locking hitch used to ascend or descend a rope.

Rappel--a method of controlled rope descent.

Rappel pad--a pad, usually leather, designed to protect the shoulder from the friction of a rappel rope.

Retabling--see mantleselving.

Retire--to remove from use, as to retire a climbing rope.

Ring piton--a piton with a welded ring instead of a fixed eye.

Roof--a sharp, near vertical overhang.

Roping down--rappelling.

Rurp--realized ultimate reality piton.

Scrambling--climbing on easy broken rock, usually without a rope.

Slab--a large flat rock inclined between thirty and seventy-five degrees.

Sling--a loop tied from a length of rope or webbing.

Snaplink--see carabiner.

Solo climbing--climbing alone with or without a belay rope.

Static belay--a belay without give or slack.

Stopper chock--a small double tapered, wedged chock.

Swami belt--a length of webbing wrapped and secured around the waist.

Tape--webbing.

Technical rock climbing--negotiating vertical surfaces by means of special techniques and/or aid; includes both free and aid climbing.

Tension--a tightly held belay.

Three-point climbing--a basic principle of balance climbing which provides for three points of contact with the rock at all times.

Titon chock--a chock with a T-shaped head.

Top rope climbing--climbing while belayed from a rope lowered from above; does not require lead climbing.

Traverse--to cross or move horizontally.

U.I.A.A.--Union Internationale des Associations d'Alpinism; an international body with representatives from various countries and mountaineering clubs which sets standards for climbing equipment.

Undercling--a method of climbing which places the climber in a vertical position with the hands gripping the upper edge of a large rock fissure as the feet press against the lower edge.

Vertical piton--a piton with its eye in the same plane as the blade.

Vertical wilderness--a vertical rock or climbing area.

Wall--a rock face inclined between seventy-five and ninety degrees.

Webbing--tape; woven flat or tubular nylon belts.

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San Francisco, Ca. 94104

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Banff, Alberta
Canada

Climbing
Box E
Aspen, Co 81611

Mountain
Mountain Magazine Ltd.
56 Sylvester Rd.
London N. 2 England

Mountain Gazette
2025 York St.
Denver, Co. 80205

Mountain Life
British Mountaineering Council
26 Park Crescent
London WIN4EE, England

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P.O. Box 9131
Providence, R.I. 02940

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P.O. Box 1889
Big Bear Lake, Ca. 92315

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American Alpine Club
113 East 90th Street
New York, N.Y. 10028

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P.O. Box 312
Tillson, N.Y. 12486

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Dept. O
P.O. Box 1763
Boulder, Co. 80306

Trango Tower
Charneleon Films
25 St. Ann's Way
Headingly Road
Leeds, England

Sentinal: The West Face (16mm, color, 25 minutes)
Les Calanques (16mm, color, 12 minutes)
Taut que Nous l'Ainnerous (16mm, black and white, 20 minutes)
Chouinard Equipment
Box 150 Ventura, Ca. 93001

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Crystal Productions
Box 11480
Aspen, Co. 81611

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Matterhorn, The North Face
HTV Ltd.
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The Climbers
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67 Vanbtugn Park
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Balance for Life (color, 30 minutes)
The Other Season (color, 30 minutes)
Assault on Mount McKinley (color, 30 minutes)
Joe (color, 31 minutes)
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Annapurna, Women on Top
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El Capitan (16mm, color, 60 minutes)
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Colorado Mountain Center
P.O. Box 914
Boulder, Co. 80306

Colorado Mountain School
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District of Columbia

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Washington, D.C. 20008

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Washington, D.C. 20016

Georgia

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RR2
Dahlonego, Ga. 30533

Too Distant Horizon Climbing School
3401 Valley View Drive
Marietta, Ga. 33006

Wolfcreek Wilderness
P.O. Box 596
Blairsville, Ga. 30512

Idaho

Ee-Da-How Mountaineering and Guide Service
P.O. Box 207
Ucon, Id. 83454

Sawtooth Mountaineering, Inc.
5200 Fairview Avenue
Boise, Id. 83704

Iowa

Iowa Mountaineers, Inc.
P.O. Box 163
Iowa City, Ia. 52240

Massachusetts

Appalachian Mountain Club
5 Joy Street
Boston, Ms. 02108

New Hampshire

Eastern Mountain Sports Climbing School
Main Street
North Conway, N.H. 03860

International Mountain Climbing School
Box 1277
North Conway, N.H. 03860

International Mountain Equipment, Inc.
Main Street
Box 494
North Conway, N.H. 03860

North Country Mountaineering, Inc.
Box 951 C
Hanover, N.H. 03755

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Adirondack Mountain Club, Inc.
172 Ridge Street
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North Carolina

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Washington

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North Cascades Alpine School
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The Mountain School
P.O. Box 728
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The Mountaineers
719 Pike Street
Seattle, Wa. 98107

<u>Wyoming</u>

Exum Mountain Guide Service and School of Mountaineering
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Jackson Hole Mountain Guides
Teton Village, Wy. 83025

Recreation Unlimited
Jackson, Wy. 83001

CLIMBING CLUBS

American Alpine Club
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New York, N.Y. 10028

Adirondack Mountain Club
172 Ridge Street
Glen Falls, N.Y. 12801

Appalachian Mountain Club
5 Joy Street
Boston, Ms. 02108

Arizona Mountaineering Club
P.O. Box 1695
Phoenix, Az. 85001

Colorado Mountain Club
P.O. Box 914
Boulder, Co. 80306

Iowa Mountaineers
P.O. Box 163
Iowa City, Ia. 52240

Chicago Mountaineering Club
2901 South Parkway
Chicago, Il. 60616

Mountaineering Club of Alaska, Inc.
P.O. Box 2037
Anchorage, Ak. 99501

The Mountaineers
P.O. Box 122
Seattle, Wa. 98111

Potomac Appalachian Trail Club
1718 N. St. N.W.
Washington, D.C. 20036

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